ANALYSIS OF AGRIBUSINESS DEVELOPMENT OPPORTUNITIES IN EASTERN INDONESIA

A literature review of key commodities

Prepared for

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Collins Higgins Consulting Group Ltd

PREFACE

A report prepared for the Australian Centre for International Agricultural Research (ACIAR), SRA - Analysis of Agribusiness opportunities in Eastern Indonesia.

This report is a final report, presenting a literature review of the agricultural sub-sectors in Eastern Indonesia, to assess the commodities and contribute to the direction of further AusAID investment through the Australia Indonesia Partnership for Decentralisation (AIPD).

Authors of the study are Stuart Brown, Teddy Kristedi, Scott Waldron, Chaseley Ross, Rouja Johnstone, Fred Levitan and Matt Zimmerman.

The views expressed in this report are those of the consultants and do not necessarily reflect the views of ACIAR or that of the Government of Indonesia.

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1) MARINE CAPTURE FISHERIES SUB-SECTOR

THE MACRO ENVIRONMENT

POLITICAL

Government policy on fisheries can be divided into four phases. During the first phase (1968–1993) the fisheries sector focused on increasing the domestic consumption and export earnings, supplying raw material for industry and poverty alleviation. During the second phase (1994–1997), the policies changed to focus on development of human resources, increased supply and distribution of fisheries products, employment opportunities and development of the industry. In the third phase (1997–1998) fisheries policies were part of the government's efforts to overcome the country's monetary and economic crisis by fostering export earnings through a program known as PROTEKAN (Program Peningkatan Ekspor Perikanan).

In recent years the fisheries sector has been linked closely with the government's decentralization policy. In this phase, fisheries policies have been particularly aimed at promoting participatory management, the role of women in fisheries, and institutions and investments for fishers and fish farmers. As well, policies are also aimed at maintaining the quality of aquaculture, increasing value adding of the fisheries product and providing better infrastructure, such as roads, transport and communication (Koeshendrajana and Hartono, 2006).

The Strategic Plan of the Ministry of Marine Affairs and Fisheries (2010-2014) outlines the vision, mission, goals and strategic objectives of the development of the marine fisheries, as follows:

Vision: Make Indonesia the largest producer of marine and fishery products in 2015.

Mission: To ensure the welfare of the marine and fishery society.

Goals:

- Institutional and human resource development
- Sustainable management of the marine and fishery resources
- Improving the productivity and knowledge base
- Expanding both domestic and international market access

In terms of National Development Priorities, marine and fisheries development is directly related to the following:

Priority 1: Bureaucratic Reform and Governance
Priority 4: Poverty Reduction
Priority 5: Food security
Priority 9: Environment and Disaster Management
Priority 10: Underdeveloped regions, Foremost, Outermost and Post-conflict

Indonesia's Fisheries policy aims to improve fishermen's income while ensuring the sustainable use of the fishery resources. It also aims to increase fisheries' contribution to the economy in foreign exchange earnings and to create job opportunities, as well as respond the nutritional needs of the population by providing enough protein to the national diet.

The Policy direction and strategy of the Ministry of Marine Affairs and Fisheries is implemented through the following sector development programs:

- Program for the Development and Management of Capture Fisheries
- Program for Improvement of Aquaculture Production
- Program for Improvement of Fisheries Products Competitiveness
- Program for Management of Marine Resources, Coastal and Small Islands
- Program for Surveillance of Marine and Fisheries Resources
- Program for Research and Development of Marine and Fishery Science and Technology
- Program for Development of Marine and Fisheries Human Resources
- Program for Inspection and Improvement of the Accountability of the MMAF Apparatus

"The middle and upper class represent 20% of the population and they eat imported fish. Our concern is the other 80% section of the population, so we focus on how to increase the fishery contribution to protein supply." Stated Saut Hutagalung, Director of Foreign Market Development, Directorate General of Fisheries Product Processing and Marketing under the Ministry of Marine Affairs and Fisheries (Worldfishing&Aquaculture, 2008).

New Regulations promoting domestic fisheries processing were in 2008 following sustained lobbying by fish processing and exporting companies requesting government support in reducing the large volume of unprocessed fish exported directly by foreign vessels fishing in Indonesian waters. These were contained in the Minister of Marine Fisheries *Decree 05/2008* and the Directorate General of Fishery Products Processing and Marketing *Decree No 33/2008* (Worldfishing&Aquaculture, 2008).

In order to ensure further sustainable growth, the Government has supported the expansion of domestic processing, resulting in more jobs creation. The Government plans were to increase processing of raw material up to 20% by 2009. This is based on the existence of canning and processing factories that are under utilised. The new regulations aim to increase the volume of marine fish processed locally and is expected to benefit the wider domestic fishing community as foreign companies planning to fish in Indonesian waters could chose to team up with local fishing enterprises and expand the size of the nation's deep sea fishing fleet.

The Government strategy, according to Saut Hutagalung, is to start with part-processed fishery products and to export fresh products that have a higher market value for example, tuna sashimi to Japan (Worldfishing&Aquaculture, 2008).

The outlook for improved processed fishery product exports is good as Indonesia has already successfully addressed a number of quality problems that previously affected fishery exports to the European Union. Indonesian exporters faced difficulties supplying the EU market prior to 2005 due to fish handling problems that affected the marine capture fisheries sector. In March 2006 the EEC Commission issued directive 232/2006 stating that any fisheries consignment from Indonesia entering a European port would be subject to individual inspection (Worldfishing&Aquaculture, 2008).

Further to stimulating the growth of national processing capacity, the Government has introduced a policy that obliges foreign fishing vessels to land more of their catch in Indonesia. This is in line with the Government's commitment to combating illegal fishing including foreign vessels entering Indonesian territorial waters. It will allow for more effective tracking of fish catches and ensure further sustainable use of the resource and further open the door for environmentally and socially conscious markets such as the EU (Worldfishing&Aquaculture, 2008).

Finally, while Indonesian policy is aiming to ensure food security for the vulnerable rural population and value-adding to existing catch by stimulating the growth of processing, there is an increasing emphasis on the development of

aquaculture. The development of aquaculture is seen as an important means to effectively decreasing the pressure on marine fisheries, in order to respond to environmental concerns regarding sustainable management of the wild stocks (Worldfishing&Aquaculture, 2008).

ECONOMIC

In 2004 the GDP of the fisheries sector was equal to 16.11% of the GDP of agriculture grouops or 2.31% of the national GDP. In 2008, these figures had changed to 19.13% amd 2.75%, 2009 the latter had grown to 3.1% of the national GDP. The growth of fisheries reaches 5.74% per year and a 27% average increase in value in the period 2004-2009 (JICA 2010).

Major marine fisheries areas are located in southern Indonesia and extend into the Indian Ocean, also in eastern Indonesia in the Arafura Sea. The country's largest fishing port is located in the capital, Jakarta, on the north coast of West Java. Other major fishing ports are located at Kandari in southern Sulawesi and at Pelabubon Rake on the south coast of West Java. Fishing vessels often land their catch at Indonesian fishing ports other than their own; one example being fishing boats from Jakarta which often unload their catch in Bali (Worldfishing&Aquaculture 2008).

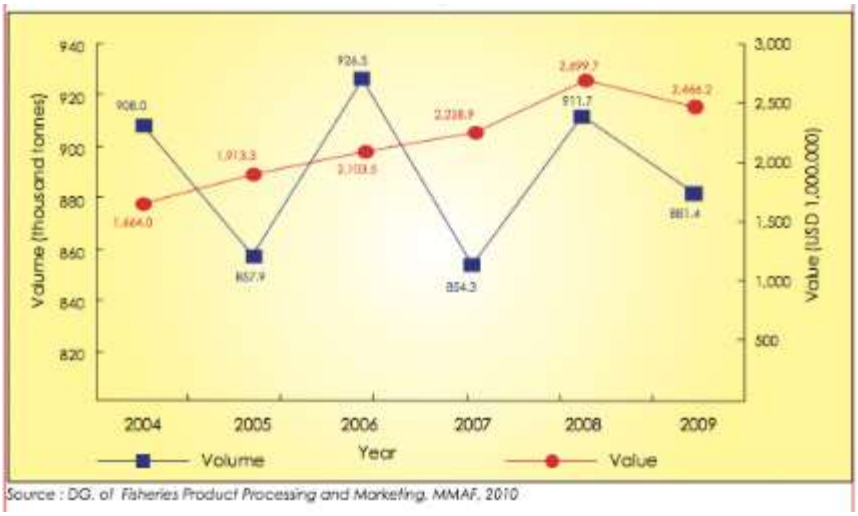


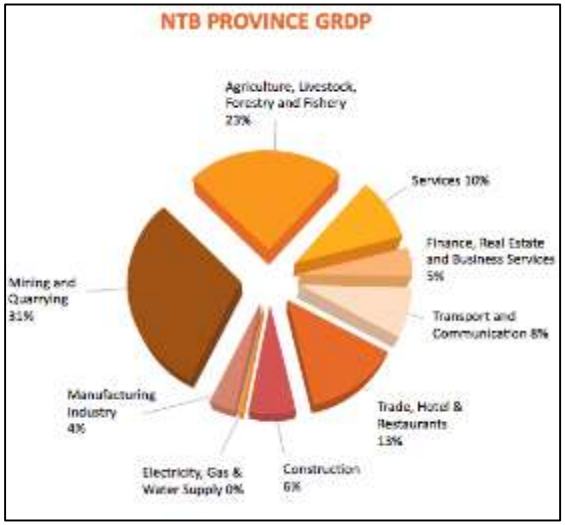
Figure 1: Fisheries product exports in volume and value 2004-2009

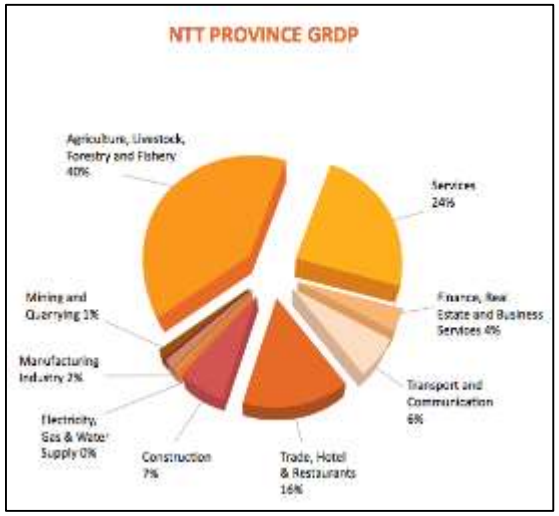
Indonesian fishing companies have increased their investment in fishing boats alongside investors from China, Thailand and Taiwan, also forming joint ventures mainly producing for export. Indonesia's fleet of motorized fishing vessels increased by 15% from 337,188 in 2005 to 387,178 in 2007 (FAO 2008). Most investment is in fish processing such as filleting, surimi products and prawns, targeting one of the three traditional export markets - Japan, the United States and Europe, who account for about 70% of Indonesia's total fishery exports.

Fishery products are an important source of foreign exchange earnings. According to Government figures, exports reached a record US$2.3 billion in 2007, with government plans calling for fishery exports to increase by 15% in export value to $2.6 billion in 2008 (Worldfishing&Aquaculture, 2008). The fisheries sector has contributed about 1.8% of national GDP, with production dominated by capture activities. Indonesian capture fisheries contribute about 60% of the gross value of fishery output, the remaining share representing the contribution of aquaculture (Lord, Oktaviani and Ruehe, 2010).

In the last decade the expansion of the world fishery trade has exceeded the growth in total fish production. This reflects the increase in consumption of marine products in the EU and US markets as well as Asia. (Lord, Oktaviani and Ruehe, 2010)

The *Masterplan: Acceleration And Expansion Of Indonesia Economic Development 2011-2025*, outlines the development strategy of the Indonesian Government on the basis of the development of six economic corridors. The theme of Bali - Nusa Tenggara Economic Corridor is the Gateway for Tourism Industry and National Food Support. Development in this corridor focuses on three main economic activities: tourism, fisheries and animal husbandry.





Source: Coordinating Ministry For Economic Affairs (2011)

Figure 2: The contribution of major sectors to NTB and NTT GRDP

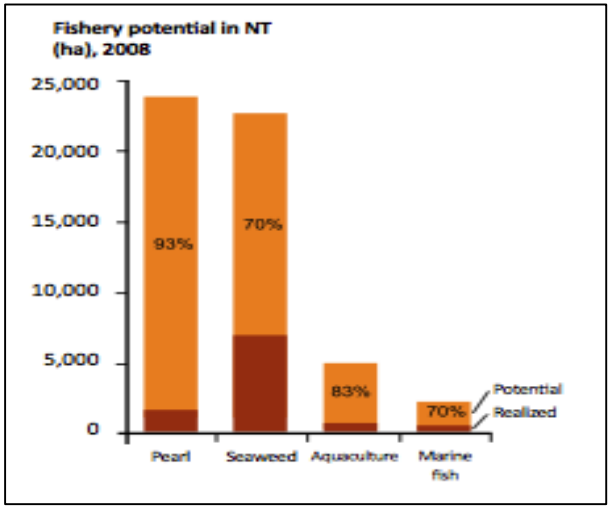
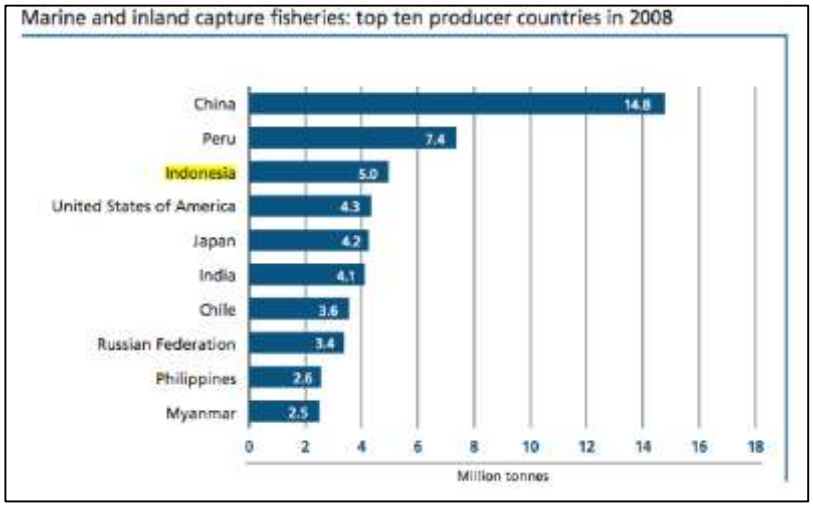


Figure 3: Fisheries potential in NTB

The NTT Province Gross Regional Domestic Product (GRDP) is 40% derived from agriculture, livestock, forestry and fisheries (Figure 2: The contribution of major sectors to NTB and NTT GRDP). Fishery activities can be divided into two types, namely capture fishery and aquaculture. Fishery activities also include marine products, such as seaweed and salt. Fishery activities in Indonesia grew by 10.29% per year on average. In the period 2009-2010, aquaculture production increased by 16.34%, with the largest production obtained from sea cultivation. The increase was higher than capture fishery production, which increased by only 4.71% (Coordinating Ministry For Economic Affairs, 2011).



Source FAO 2008

Figure 4: Marine and inland capture fisheries: top 10 producers in 2008

In NTB, the importance of agriculture, livestock, forestry and fishery is almost half of that in NTT, and 23% of the GRDP. (Figure 3) However, the contribution does not necessarily reflect the importance fishing to subsistence or food security or the potential for its future development. For Bali - Nusa Tenggara Economic Corridor, the main economic activities of fisheries currently contributes 13.2% to GDP from the food agriculture sector. According to data from Center of Environment, Bogor Agricultural Institute (IPB), fisheries are using less than 25% of their marine potential in Indonesia.

The NTB area has very strong marine potential (Figure 3). The success of the main economic activities of fisheries can be a main force for the economy of the Bali - Nusa Tenggara Economic Corridor (Coordinating Ministry For Economic Affairs, 2011). Despite the untapped potential, the current level of marine and inland capture fisheries production in Indonesia is only surpassed by China and Peru in the world (Figure 4). Indonesia is a main supplier to the world market. For example, Indonesia has become increasingly involved in the trade in grouper, which has become an important economic activity in the Asia–Pacific, involving more than 20 producing countries, with an estimated commercial value of US$350 million a year. The main market for this product is countries in East Asia, especially Hong Kong and the Peoples Republic of China (Koeshendrajana and Hartono, 2006).

Fisheries have contributed substantially to foreign earnings, in the sense that export value is greater than import value. In addition, the export value tends to increase while the import value tends to fall (Figure 5). Thus the contribution of fisheries to national foreign currency earnings has shown a consistent rise, increasing the importance of fisheries to the economy.

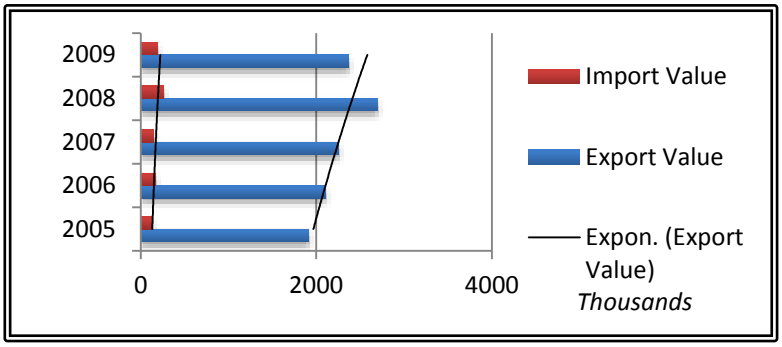


Figure 5: Value of trade 2004-2009

While export value has gone up by 6.17% on average for the period 2005-2009, the volume of exports has decreased by 1.42% for the same period, which indicates an increase in the unit price of exports, which is a result of increasing fishery product prices as well as an increase value-added prior to exportation (Figure 6). Imports have gone up both in value and volume; however the available data does not allow the segmentation of products and market in order to identify the specific imports and their target markets.

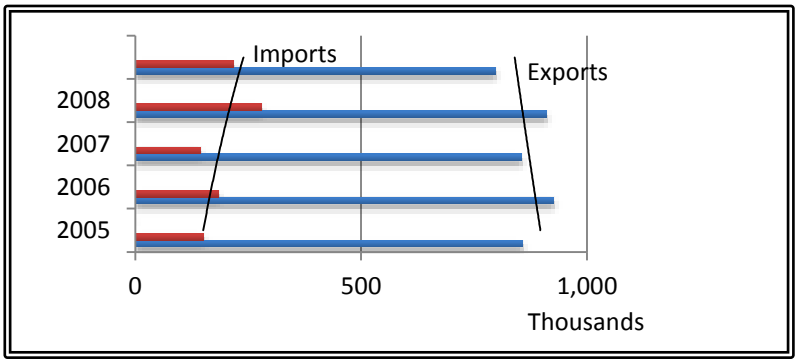


Figure 6: Volume of trade 2004-2009

However, despite the relatively small growth in terms of employment, in the last ten years (1995-2005) capture fisheries production has been increasing at a rate of 2.68% per year, from 3,622,640MT (1995) to 4,705,869MT (2005) (Ministry of Marine Affairs and Fisheries, 2007).

According to government figures Indonesia produced a total of 8 million tons of fisheries products in 2007. Marine capture fisheries accounting for 63% of output is the largest sector producing 4.9 million tons while aquaculture produced 3.1 million tons (Ministry of Marine Affairs and Fisheries, 2007).

In 2000 fisheries output was 70% marine capture and 30% aquaculture but figures are beginning to change in favor of aquaculture, with production coming 63% from marine capture and 37% from aquaculture by 2007. Fisheries activities in eastern Indonesia involve mainly tuna fishing and small local coastal fisheries (Worldfishing&Aquaculture, 2008).

The number of marine fishing boats has increased by 3.36% to 555,581 in 2005. The number of motor powered boats is increasing by 6.13% for outboard motors and 8.39% for inboard motors (Ministry of Marine Affairs and Fisheries, 2007).

SOCIAL

According to government figures the fisheries sector provides 6.8 million jobs. With the typical Indonesian family unit numbering five people, the fisheries sector is estimated to support 34 million people throughout the country. Fishing is

an all-year-round activity, most marine fishers are full time fishers and in the last ten years their numbers have increased by annual average of 2.79%. The number of part time fishers has also been going up slightly with under 0.5% on average per year. The overall fisher numbers has increased by 1.54% in the 1995-2005 period (Ministry of Marine Affairs and Fisheries, 2007).

Table 1: Number of fishery workers 2005-2009 (million people)

Details	2005	2006	2007	2008	2009	% Increase 2006-9
Capture fisheries	2.59	2.70	2.76	2.74	2.75	1.55
Aquaculture	2.51	2.28	2.34	2.76	2.83	3.49
Processing & marketing	0.53	0.55	0.59	0.65	0.79	10.82
Supporting services	dta	0.06	0.04	0.06	0.06	8.33
Total	5.4	5.63	5.59	5.73	6.21	6.43

Source: JICA (2010)

In 2009, fisheries employed directly over six million people — almost three million fishers and three million fish farmers, and indirectly employ almost a million involved in fish processing and trade, and auxiliary activities such as boat building, gear mending (Table 1). There is a positive rate of increase of fishery related employment with the main growth being in the marine culture fisheries and marine capture fisheries showing the slowest employment growth rate.

Figure 7 shows that there was a sharp decline in the number of marine fishers after 2004, which was caused by the Tsunami disaster that affected negatively the marine fishery sector.

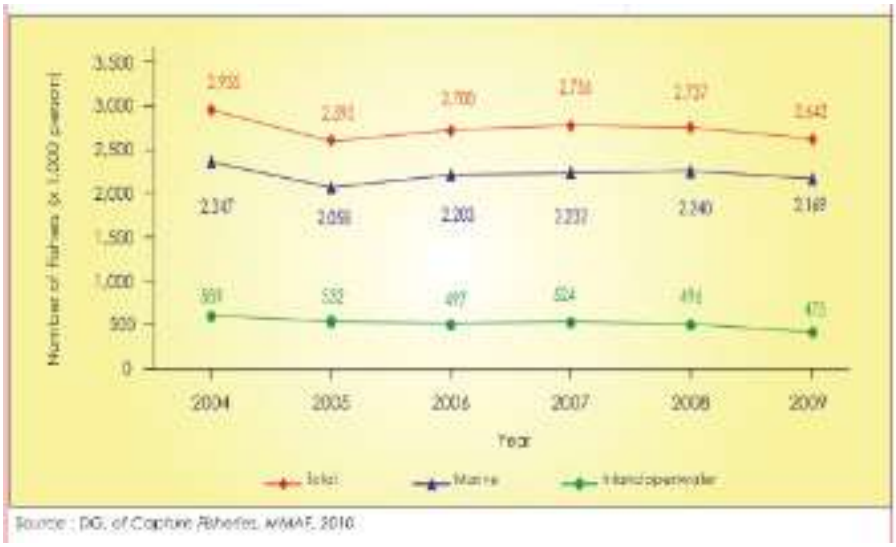


Figure 7: Number of fishers 2004-2009

In addition to employment, fishery products form an important part of the typical Indonesian diet and account for 65% of the national protein supply (Worldfishing&Aquaculture, 2008). This makes fisheries one of the main economic activities that directly impacts national food security. Currently, fishery products as source of animal protein have the highest consumption level in Indonesia. Fisheries product consumption reached 30.4 kg/capita/year, which is 72% of animal protein consumption/capita/year, and higher than other animal protein sources like chicken, meat or eggs (Coordinating Ministry For Economic Affairs, 2011).

Fish consumption is highest in Indonesia's eastern Mollucas region where consumption is about 48kg per capita annually compared to the national average of about 26kg per capita. The lowest average consumption is just 12kg per capita in Yogjakarta in eastern Java where local authorities are trying to improve the image of fish products by providing fish to schools to serve at lunch and distributing fish among housewives to prepare for their families (Worldfishing&Aquaculture, 2008). Fish and fish products are an important part of the Indonesian diet, thus about 90% of the fish prodution is consumed domestically (Lord, Oktaviani and Ruehe, 2010).

Approximately 90% of the fishery industry in Indonesia is small-scale. It is highly labor intensive with production being concentrated in Java, followed by Sulawesi and Sumatra.

TECHNOLOGICAL

A comparison between the three provinces reviewed, shows that East Java has a far higher number of fishing units than the other two provinces of NTB and NTT (Table 2). The fishing industry is predominantly comprised of small-scale fishers, using a demersal fishing unit, such as long lines, traps, gillnets and scoop nets, shows the top four types of gear used in each Province (Table 2). In addition to the traditional legal gears, there are also illegal fishing units operated by fishers using explosive and chemical devices (cyanide), which are not going to be examined in this section.

The traditional fishing gears, such as traps, nets and lines are simple fishing technologies that have been used by generations of fishers along the coast. Thus small-scale, traditional capture fisheries, is a low technology activity that does not require major technological investments or know-how. In East Java the predominant fishing gear used in portable traps found on 73% of the fishing units, while in NTB and NTT line fishing is the predominant type of gear used.

Table 2: Fishing units and gear used (2005)

Province	Total number of fishing units	Gear 1 (% of units using)	Gear 2 (% of units using)	Gear 3 (% of units using)	Gear 4 (% of units using)
EJ	247,981	Portable traps *(73%)*	Other lines *(5%)*	Pelagic seine *(4%)*	Trammel nets *(4%)*
NTB	24,638	Hand lines *(16%)*	Set gill net *(13%)*	Shrimp gill net *(11%)*	Troll line *(11%)*
NTT	88,287	Other lines *(36%)*	Drift gill net (20%)	Spear gun *(15%)*	Troll line *(13%)*

Source: Ministry of Marine Affairs and Fisheries (2007)

Capture fisheries in Indonesia, are categorized into traditional/small-scale fisheries and industrial fisheries. Small-scale fisheries are characterized by boats without engines (non-boat engines), out-board engines (out-boat engine) and in-board engines (in-boat engine) with a capacity less than 5 GT (Figure 8) (Koeshendrajana and Hartono, 2006). The tendency is for non-motorized boats to drop in numbers, while motorized boats, especially the larger size, are increasing dramatically. This type of change impacts the structure of the fishery and use of the resource. However, despite the increasing numbers of motorized boats, small un-motorized artisanal boats, using traditional low-technology fishing gear, still largely dominate the marine fishery.

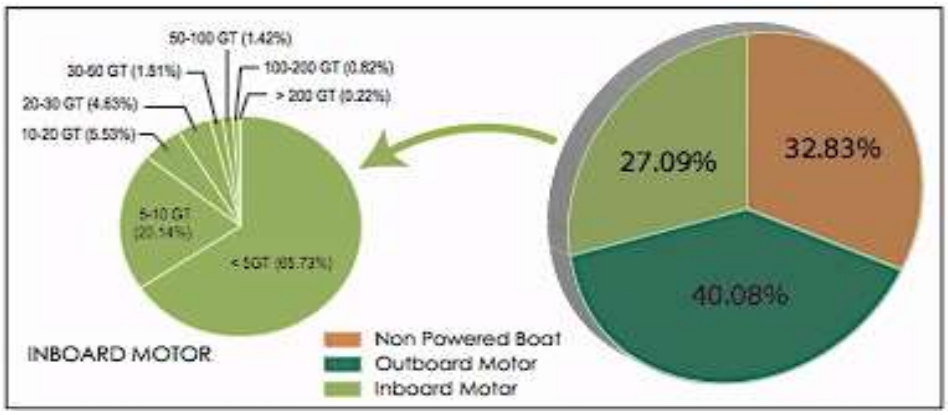
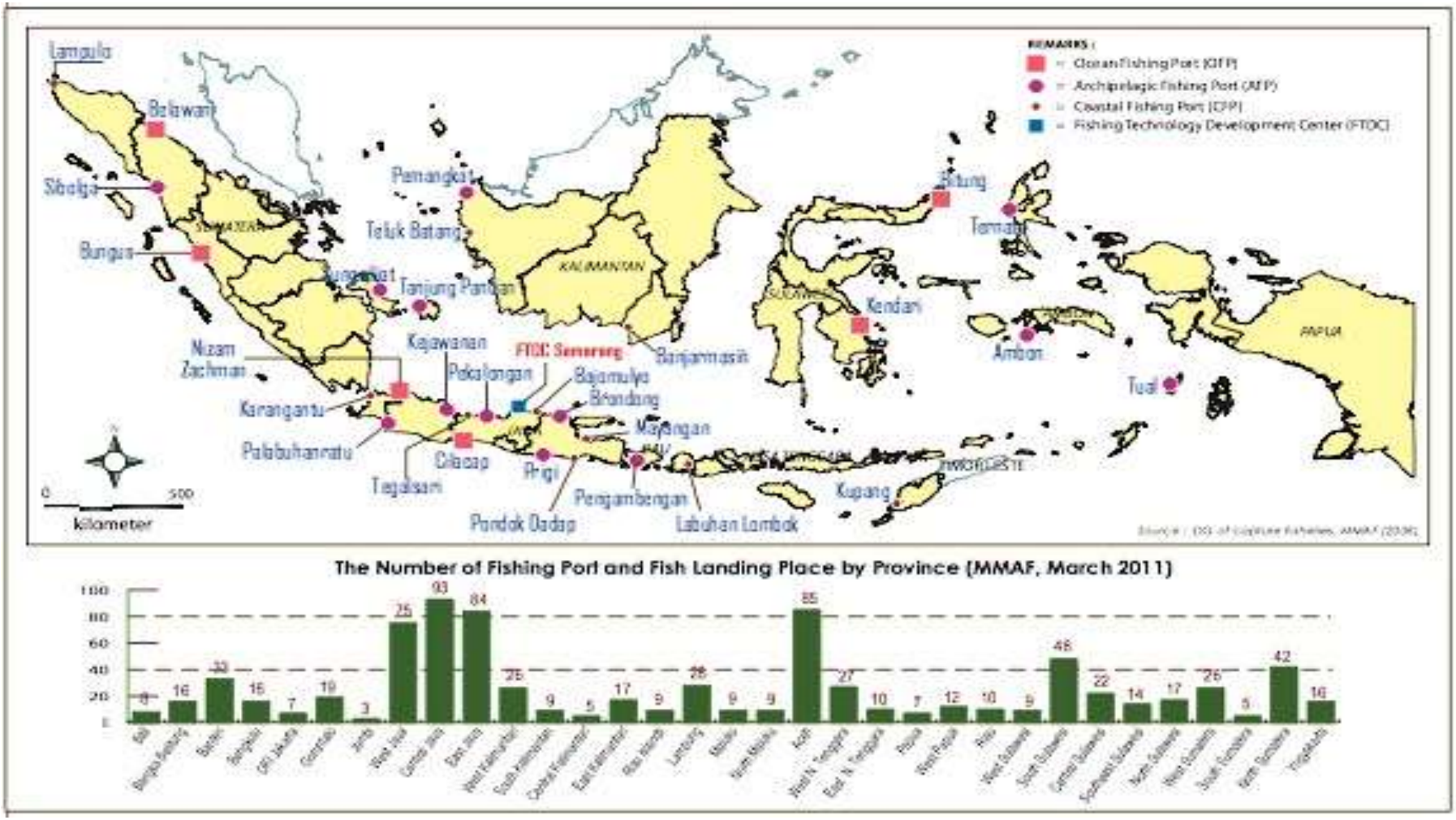


Figure 8: Percentage of marine fishing boats by category and size (2009)

In terms of fishing ports and landing sites, East Java has 84 ports and landing sites, while NTB and NTT have 27 and 10 respectively (see Figure 9). The number of coastal infrastructure greatly impacts the growth and development of the sector and the ability of local fishers to link to markets. Therefore, while NTB and NTT might have potential for development in terms of resource availability, the infrastructure relating to post-capture and conservation as well as trade is a limiting factor.

There are no Fishing Technology Development Centers in any of the three provinces which further indicates potential constraints to technological development and innovation.



Source: MAFF and JICA (2011)

Figure 9: Number of ports and fish landing sites by province 2011

ENVIRONMENTAL

Indonesia is a maritime country with 5.8m sq. km of marine waters, an estimated Maximum Sustainable Yield (MSY) of 6.4 million tons/year, a Total Allowable Catch (TAC) of 5.12 million tons/year (80% MSY) and production of 4.81 million tons (MAFF and JICA, 2011). As an archipelago Indonesia's geography is extremely favorable to the development of fishery activities. The country has access to an abundant marine fishery with 76% of its surface area being seawaters. As such, Indonesia has a considerable challenge in implementing effective monitoring, control and surveillance of its territorial waters and protecting the sustainable and legal use of its marine resources. The two main areas of environmental concern are the tuna fishery and coral reef fishing both of which need to be closely regulated in order to avoid damage to valuable species and vulnerable habitats. By 2009, marine conservation areas have totaled 13,529,068Ha (JICA, 2010).

The Regional Plan of Action (RPOA) to Promote Responsible Fishing Practice including Combating IUU Fishing in the Region is a regional initiative is a regional initiative that agreed by 11 (eleven) countries (Indonesia, Malaysia, Australia, Thailand, Philippines, Vietnam, Cambodia, Singapore, Brunei Darussalam, Papua New Guinea and Timor Leste). Indonesia-MMAF is the Secretariat of RPOA for the period of 2008-2009, 2010-2011 and the Coordinator of Coordination Committee (MAFF and JICA, 2011).

Indonesia, like Australia, has an exclusive economic zone in the eastern Indian Ocean, where Indonesia's commercial and artisanal tuna catch accounts for 15% of the total catch of tuna in the Indian Ocean. This area contains key spawning grounds for tuna species, and the waters south of eastern Java and Bali are the only known spawning area for southern Bluefin tuna (SBT).

However, in the last 10 years, fishers have reported declining catches for some species, in terms of numbers and size of fish caught. These observations are strong indicators that current fishing practices are unsustainable and could lead to the collapse of a fishery. A dramatic decline in these valuable fishery resources could threaten not only the industry but also the livelihoods of fishing communities. In 1994 the Commission for the Conservation of Southern Bluefin Tuna (CCSBT) was formed to ensure the conservation and optimal utilization of Bluefin stock.

Australia, Japan, Korea and Taiwan sought Indonesia's membership of the CCSBT, to ensure better fishery management. A key requirement for Indonesian membership (and to allow continued sale of tuna to the high-value markets of Japan, Taiwan, Korea and the US) was an objective assessment and agreed management of tuna fisheries stock (ACIAR 2009a).

In addition to the tuna fishery, Live Reef Food Fish (LRFF) has also become the subject of wide concern. With the rapid growth in population and rise in household income, demand for fresh marine fish has increased significantly. With high demand and high market prices, these marine species are widely exploited. The LRFF trade has been become a global as well as regional concern. Available evidence suggests that LRFF have been over-exploited in many parts of Southeast Asia, including Indonesia. An important species of concern is the grouper fish, known as 'Kerapu' (Koeshendrajana and Hartono, 2006).

One of the main markets for LRFF is China. There, LRFF has been traditionally consumed by the southern coastal populations where fish is considered a symbol of prosperity and good fortune and where fresh marine fish, especially the high-valued live reef food fish has an important cultural and social role for special occasions (Koeshendrajana and Hartono, 2006).

With the rise of demand, bad management threatens the sustainability of the live grouper fish industry. Significant price increases on the international market lead to intensive and uncontrolled fishing pressure on a particular species. Many fishers use prohibited devices, such as explosive material and cyanide poison, causing at degradation of the coral reefs. The grouper is considered a 'sedentary species' that lives in a particular habitat and takes a long time (5–10 years) to reach maturity. Thus negative impacts on its natural environment or over fishing can lead to extinction of particular species in certain areas. (Koeshendrajana and Hartono 2006) It has been estimated that 90% of Indonesia's coral reefs have been damaged by a combination of non-environmentally friendly fish-catching practices, over-fishing, sedimentation and land-based pollution, and coral mining (Worldfishing&Aquaculture, 2008).

The use of destructive fishing practices by coastal communities dependent on local marine resources has been explained by the desire for high profits and, through the use of cyanide, to provide in a short time a way for the younger generation to obtain money to build houses and establish new, independent families. In addition, illegal fishing methods such as cyanide bring about an economic status that is appealing to fishery newcomers (Koeshendrajana and Hartono, 2006).

The Indonesian Government is trying to tackle the issue of illegal practices by conducting awareness-raising campaigns and encouraging field staff to develop new and efficient environmentally friendly technologies. However, there are no fish dynamiting regulations and the vast marine fishery is impossible to effectively survey and control. Therefore, in order to tackle illegal fishing issues, according to Saut Hutagalung, Director of Foreign Market Development, people must be given an alternative livelihood or fishing technique (Worldfishing & Aquaculture, 2008).

Other factors such as climate change and the impact of En Nino have also negatively impacted reef health through coral bleaching and changing water temperatures, both of which affect fish habitats and food sources and can cause migration of particular species and thus affect the related fishery.

As a result of all these challenges and the realization that sustainable fisheries involve protecting the country's large coral reef systems, the Government is working with other countries in the Asia-Pacific region on a joint coral reef conservation initiative.

LEGAL

The institutional structure administering and managing Indonesian Fisheries is headed by the Ministry of Marine Affairs and Fisheries (MMAF). The Ministry has six line offices: Agency for Marine Affairs and Fisheries and five Directorate Generals: Aquaculture; Capture Fisheries; Coastal and Small Islands; Marine and Fisheries Resource Controls; Capacity Building and Marketing. At provincial level the responsibilities rest with the Provincial Marine and Fisheries Services.

The Ministry of Marine and Fisheries Affairs was established specifically to manage the marine and fisheries sector in Indonesia (Appendix 1). The establishment of this Ministry did not automatically reduce the authority of other ministries in relation to managing marine and fisheries resources, due to the Indonesia government view that the sea is a key territorial area for defence, but with additional values including ecosystem conservation, marine and fisheries services, tourism, mines and quarrying areas, transportation and potential natural resource areas. Many authorities on marine and fisheries areas are presently under government control, subject to various legislative and regulatory instruments including:

- Regulation No. 11/ 1967 on Mines and Quarrying
- Regulation No. 8 / 1971 on Government Oil Company (Pertamina)
- Regulation No. 1 / 1973 on the Indonesia Continental Zone

- Regulation No. 3 / 2002 on Indonesia National Defense
- Regulation No. 5 / 1983 on the Indonesia Economic Exclusive Zone
- Regulation No. 5 / 1990 on Natural Resource Conservation and Ecosystem
- Regulation No. 9 / 1990 on Tourism
- Regulation No. 21 / 1992 on Sea Transportation
- Regulation No. 26 / 2007 on Spatial Planning
- Regulation No. 31 / 2004 on Fisheries
- Regulation No. 32 / 2004 on Local Government
- Regulation No. 27 / 2007 on Coastal Zone and Small Island Management

(Indonesian Centre for Marine and Fisheries Socio-Economic Research, 2009)

Therefore, marine capture fisheries are affected by a number of different ministries and their respective sector policies and the ability of government ministry and agencies to coordinate their effort in creating an enabling environment for economic growth.

The main law governing fisheries is Law No.31 of 2004 on Fisheries. It highlights the importance of sustainable resource management and alongside Law No.22 of 1999 on Regional Administration makes Provincial Government responsible for the management and conservation of marine resources in territorial waters. However, conflicts in the utilization of marine resources and fisheries are still common in the area of regional autonomy and division of territory, triggered by regional socio-economic inequality, resource limitations, and unclear coastal spatial planning and rules dissemination. In addition, although Law 27/2007 on Management of Coastal Areas and Small Islands has been published, much of the supporting legal framework for implementation is still lacking (JICA, 2010).

A major focus for legal development has been the area of conflict management in situations where there is a conflict between the different fishery subsectors (artisanal vs. industrial) or inter-sectorial conflicts such between fisheries and tourism, or mining concessions.

Due to the above mentioned conflicts, its reliance on fisheries, as well as international pressure for sustainable marine management, Indonesia has stepped-up its efforts to combat unreported and unregulated (IUU) fishing, as well as over-fishing. Indonesians are heavily reliant on wild-catch and aquaculture fisheries production/resources to sustain their livelihoods and there is a growing concern that these resources are under threat (ACIAR, 2009a).

The trade of live fish or fishery products is heavily regulated. The Government represented by the MMAF, controls food quality in the Indonesian fishery sector. In addition, exports are also subjected to specific agreements with the export markets such as the EU, USA or Japan.

SECTOR POTENTIAL FOR DEVELOPMENT

PRODUCTION

The fisheries sector production has grown by 10.82% on average in the period 2004-2009. The major share of the growth is due to aquaculture with an average growth of 22.14%, as compared to the 2.10% growth in capture fisheries. Among the sub-sectors the fastest growing is the marine aquaculture sector with 34.44%, while brackish water aquaculture is in decline with -5.46% on average (Table 3). These figures demonstrate the prioritization of aquaculture and the effort saturation of the marine fishery.

Table 3: Fisheries production, 2004-2009 (tons)

Production	2004	2005	2006	2007	2008	2009	Increasing Average 2008 - 2009 (%)
TOTAL	**6,119,731**	**6,869,543**	**7,488,709**	**8,238,302**	**8,858,315**	**9,816,536**	**10.82**
CAPTURE FISHERIES	**4,651,121**	**4,705,869**	**4,806,112**	**5,044,737**	**5,003,115**	**5,107,971**	**2.10**
Marine	4,320,241	4,408,499	4,512,191	4,734,280	4,701,933	4,812,235	2.35
Inland Openwater	330,880	297,370	293,921	310,457	301,182	295,736	-1.81
AQUACULTURE	**1,468,610**	**2,163,674**	**2,682,597**	**3,193,565**	**3,855,200**	**4,708,565**	**22.14**
Marine	420,919	890,074	1,365,918	1,509,528	1,966,002	2,820,083	34.44
Brackish Water	559,612	643,975	629,610	933,833	959,509	907,123	-5.46
Fresh Water	488,079	629,625	687,068	750,204	929,688	981,358	5.56

Source: DG. of Capture Fisheries and DG of Aquaculture, MMAF, 2010

Capture figures show growth of captures for all major species except shrimp and seaweed both of which are increasingly the product of aquaculture (Table 4). Commercially valuable tunas are among the main targeted species while 'other fish' composed of many different species represents the largest volume of the catch. Table 5 below breaks down production figures per province.

Table 4: Indonesian marine capture fisheries production by major fish (tons)

Major Commodities	2004	2005	2006	2007	2008	2009
Total	**4,320,241**	**4,408,499**	**4,512,191**	**4,734,280**	**4,701,933**	**4,812,235**
Tuna/Tunas	176,996	183,144	159,404	191,558	194,173	203,269
Cakalang/Skipjack tunas	233,319	252,232	277,388	301,531	296,769	338,034
Tongkol/Eastern little tunas	310,400	309,794	329,169	399,513	421,905	404,283
Other Fish	3,112,018	3,246,770	3,293,729	3,340,120	3,308,788	3,381,673
Shrimp	245,913	208,539	227,164	258,976	236,922	236,870
Seaweed	8,677	9,670	4,996	4,643	2,917	3,030
Others	232,918	198,350	220,341	237,939	240,459	245,076

Source : DG. of Capture Fisheries , MMAF, 2010

Table 5: Marine capture fisheries production by Province 2009 (tons)

PROVINCE	PRODUCTION	SHARE (%)
Total National	**4,812,235**	
Bali-NusaTenggara	**318,337**	**6.62**
NTB	99,221	2.06
NTT	117,190	2.44
Java	**971,359**	**20.19**
East Java	395,510	8.22

Source: MAFF and JICA (2011)

The figures clearly demonstrate the relatively higher importance of Java (20.29% of the total national catch) to the national production in comparison with Bali-Nusa Tenggara (6.62%). Among the three Provinces, the lowest capture volume is in NTB.

All provinces have a diverse fishery that is not dependent on one particular species, although fish species account for over 90% of the catch, with crustaceans and mollusks accounting for less than 4% of the total (Table 6).

In East Java is by far the biggest marine fishery both in terms of the volume of the marine capture fisheries as well as their economic value. The volume of the catches is more than twice the volume of capture in NTT and three times the catch in NTB. The fish catch is composed of Scad[1] (13%), Goldstrip sardinella (9%), other species (8%) and Shortbodied mackerel (7%). The most economically valuable catch is composed of Scad (12% of total fish value), Frigate tuna[2] and Spanish mackerel representing 10% and 9% if fish catch value respectively.

Photo 1: Goldstripe sardinella

Photo 2: Scad

Photo 3: Frigate tuna

Photo 4: Shortbodied mackerel

In terms of economic value, crustaceans, which account for 17% of the total value of the fishery, are presented by some high value species such as the Brown tiger prawn, which accounts for 26% of the value of all crustaceans, and Spiny Lobsters contributing 24%.

Mollusks in all provinces are 4% or less of the catch, this fishery is almost exclusively dominated by the common squid.

NTB has the smallest fishery in terms of volumes (about ¾ of NTT); however in terms of value it is almost the double of NTT. The catches are diverse and fishes constitute 93% of the total catch. The top species caught in terms of volume are Frigate tuna (9%) and Goldstripe sardinella (8%). However in terms of value, the Skipjack tuna, Anchovies and Frigate Tuna are the top economic earners for the sector.

1 Scad (Trachurus Trachurus) commonly knows as Horse Mackerel
2 The Frigate Tuna is a member of the Scombridae or Tuna, Bonito, and Mackerel Family. See <www.mexfish.com/fish/tunas/tunas.htm>

Crustaceans account for 14% of the value of the sector and 3% of the volume of the total catch. Spiny lobster contributes 42% to the value of this fishery. Similarly to East Java, Mollusks are mainly squids and are valued at 5% of the total value and 4% of the volume of the catch.

Table 6: Capture fisheries and value per province (2005)

Province	Top species caught	Volume MT	Percentage of group total	Top commercially valuable species	Value (Rp.1000)	Percentage of group total
East Java	**Total 270,793MT**			**1,872,292,541 Rp**		
	Fishes 245,093MT		*91%*	*1,369,983,687 Rp*		73%
	Scad	31,008	13%	Scad	162,708,406	12%
	Goldstrip sardinella	21,392	9%	Frigate tuna	134,138,200	10%
	Other fishes	19,338	8%	Spanish mackerel	127,572,975	9%
	Short bodied mackerel	16,865	7%	Short bodied mackerel	113,422,566	8%
	Crustaceans *12,122MT*		4%	*316,984,485 Rp*		17%
	White shrimp	3,857	32%	Brown tiger prawn	83,140,860	26%
	Other shrimp	2,822	23%	Spiny lobsters	75,769,650	24%
	Swimming crab	2,115	17%	White shrimp	71,258,135	22%
	Mud crab	1,382	11%	Swimming crab	32,301,530	10%
	Mollusks 11,505MT		*4%*	*181,895,984 Rp*		10%
	Common squids	7,622	66%	Common squids	161,683,465	89%
NTB	**Total 81,610Mt**			**882,155,071 Rp**		
	Fishes 75,873MT		93%	684,017,791 Rp		78%
	Goldstrip sardinella	6,108	8%	Skipjack tuna	68,592,120	10%
	Frigate tuna	6,524	9%	Anchovies	61,771,200	9%
	Other fishes	5,394	7%	Frigate tuna	58,712,580	9%
	Short bodies mackerel	4,837	6%	Blue lined seabass	53,611,678	8%
	Crustaceans 2,110*MT*		3%	*119,520,030 Rp*		14%
	Other shrimps	469	22%	Spiny lobsters	50,527,400	42%

	Swimming crab	460	22%	Other shrimps	17,966,530	15%
	Spiny lobster	459	22%	Brown tiger prawn	16,570,000	14%
	White shrimp	199	9%	Swimming crab	13,787,700	12%
	Mollusks 2,903MT		*4%*	*42,028,850 Rp*		5%
	Common squids	2,179	75%	Common squids	32,682,450	78%

NTT	**Total 124,872Mt**			**497,123,173 Rp**		
	Fishes 122,560Mt		*98%*	*462,327,883 Rp*		93%
	Goldstrip sardinella	25,098	20%	Goldstrip sardinella	57,481,986	12%
	Trevallies	13,569	11%	Skipjack tuna	50,355,003	11%
	Other fish	14,216	12%	Trevallies	48,517,384	10%
	Frigate tuna	11,745	10%	Frigate tuna	45,660,553	10%
	Crustaceans 339Mt		*0%*	*5,960,490 Rp*		1%
	Other shrimps	165	49%	Spiny lobsters	3,239,000	54%
	Spiny lobsters	73	49%	Other shrimps	1,974,000	33%
	Molluscs 1,563MT		*1%*	*5,982,800 Rp*		1%
	Common squids	1,471	94%	Common squids	5,573,200	93%

Source: Ministry of Marine Affairs and Fisheries (2007)

NTT is a province with abundant fishery resources dominated by Goldstrip Sardinella, Trevallies, other fish and Frigate Tuna. However the value of these resources is comparatively low, making NTT rank third among the three provinces compared. Goldstrip sardinella accounts for 12% of the fish value, followed by Skipjack Tuna (11%), Trevallies (10%) and Frigate Tuna (10%).

Artisanal fishers who contribute not only to the local economy but also ensure local food security do majority of the fishing in these provinces. They operate using relatively small boats and simple fishing gear. Their catch is split between home consumption and sales and is often sold fresh at landing sites or village markets. The major problem and challenge facing fishermen and other supply chain participants is to reduce the mortality of live fish (Morey, 2008).

In addition to selling the fish right away, many fishers bring their live fish catch back to their village and store in a karumba (fish holding tank in the sea water). The fish may be kept for up to 2 months to improve their growth or their health and to build up stock. The live fish is then sold to Collectors who then sell to traders. In these cases, the supply market chain is as follows: Fishers catch live fish; ➔sell to other fishers who own a karumba; ➔ Collector boats pick up live fish; ➔and sell to packers or traders /packers are owned by traders or businessmen; ➔ Traders take the fish from packers; and ➔send to exporters or bigger traders; ➔sell to national retail or export.

A specific example is the time schedule of the marketing chain for live fish from Kendari to Hong Kong: late afternoon (5pm) fish arrive by boat at the packing shed in Kendari; ➔ unloaded and placed into holding tanks for refreshing; ➔ start packing into boxes at 2am; ➔ by 4am the boxes of live fish are sent to the airport; ➔Lion Air departs at 6.30am; arrives in Jakarta at 9.00am; ➔fish are collected and unpacked into holding tanks in Jakarta (near airport) for refreshing; ➔ quality checks and repacked in early morning; ➔ sent to HK on morning flight (Morey, 2008).

Often fishers are tied by collectors through advance payments or through the provision of fishing gear, which is repaid by the estimated value of their production. While fishers often do not have access to price information, traders hold all the current information regarding supply and demand for a particular species. Thus, producers are in a weak bargaining position. The value chain of the fishery industry can be described by the role of each of its participants. Marine capture fishery value chain starts with the fishers, who then sell to middlemen and to national retail or sell to processors who are mainly working with exporters (Figure 10). Many processors export directly without involving traders.

Figure 10: Wild Catch Flow

The market chain, which delivers fish from the fishers' hook to the plate of the consumer, has many different shapes and participants depending on the market, the level of processing and the final product offered. As a highly perishable product, fresh fish needs efficient market linkages and a cold chain in order for the product to be delivered fresh. While the domestic market in Indonesia is not strictly regulated in terms of product safety and hygiene, when destined to export markets, especially Europe, there are strict requirements regarding fish handling along the entire chain. While the exports to the Europe, the USA and Japan are growing there are some Export Quality Infrastructure (EQI) issues, which are mainly related to maintaining the cold chain and the hygienic conditions on board the vessels and landing sites.

Value adding at this level of the chain is primarily concerned with the type of the targeted fishery, its sustainable management and the correct handling of the product. However the authorities currently inspect few small vessels and often the factories that supply the ice used by fishers do not have the necessary standards for export.

The level of investment in boats and motors is an indicator of the level of importance of the fishery to the fishers and their families as well as of the economic level of development of the coastal communities. In East Java is the province with highest rate of motorized boats, the majority of which are fitted with out-board motors. In NTB the split between motorized and non-motorized is almost even and in NTT the over 70% of fishing boats are not powered (Table 7).

The productivity of fishers is low due to the domination of the national fleet by small boats, which means that fishing days are short and boats have smaller catching capacity, as well as incur more post-capture losses to the lack of appropriate onboard facilities and cold storage.

Table 7: Number of marine fishing boats by size and province (2005)

	Total number of fishing boats	**Non powered boats sub-total**	**Out-board motor sub-total**	**In board motor Sub-total**
EJ	42,810	6,946 (*16%*)	30,382 *(71%)*	5,482 *(13%)*
NTB	20,090	8,951 *(45%)*	8,060 *(40%)*	3,079 *(15%)*
NTT	29,494	20,852 *(71%)*	3,629 *(12%)*	5,013 *(17%)*

Source: Ministry of Marine Affairs and Fisheries (2007)

The percentage of powered boats is closely reflected in the fishers' type of engagement in the fishing activities, the increasing costs of petrol have to be compensated by a positively balanced cost/unit effort. In East Java, 78% of fishers are full-time engaged in fishing, while in NTB just over 50% fish full-time, and just over 30% do so in NTT (Table 8).

Table 8: Number of fishers per province (2005)

	Total number	Full-time	Part time (major)	Part time (minor)
EJ	151,551	118,629 *(78%)*	21,585 *(14%)*	11,337 *(7%)*
NTB	63,507	34,316 *(54%)*	17,246 *(27%)*	11,945 *(19%)*
NTT	93,924	30,820 *(33%)*	46,677 *(50%)*	16,427 *(17%)*

Source: Ministry of Marine Affairs and Fisheries (2007)

The numbers of both fishers and boats have to be taken as a conservative estimation due to the fact that many boats and fishers are not legally registered and my not be included in the statistical data.

According to the 2010 population census data and the number of fishers accounted for in the statistics of 2005, it appears that fisheries engages under 1% of the population in East Java, 2% in NTT and 1% in NTB.

PROCESSING AND TECHNOLOGY

Processing for the local or national market is generally different from the processing done for export markets. This reflects dietary preferences and the consumer demand of the different markets. For example, besides fresh fish, national rural market demand is for traditionally processed fish such as dry or salted. International markets such as those of USA, Japan, China or Europe prefer fresh fish or frozen products.

In reflection of these differences, the upgraded processing factories in Indonesia mainly process products for exports. In accordance with the catch volume and the overall size of the fishery, each province has a number of Fish Processing

Units (FRU) (Figure 11). East Java has by far the greatest number of FPUs, among which 54 are ranked as 'Big' in terms of the scale of their operations (Table 9). It is interesting to note that while NTB has lower number of boats and volume of capture in comparison to NTT the value of its fishery is much higher and so is the number of FPUs present in the province. Thus, while not being the largest fishing province in terms of volumes of catch or size of the effort, NTB is clearly benefiting from a high rate of value-adding processing.

Table 9: Number of fish processing units (FPU) in 2010

Province	FPU	Classification of FPU			
		Micro	Small	Medium	Big
East Java	10,640	9,620	456	510	54
NTB	3,550	3,346	124	80	-
NTT	280	272	6	2	-
Total National	60,117	53,054	5,313	1,628	122

Source: MAFF and JICA 2011

There are a number of processing operations that are applied to seafood such as: freezing; processing with value added such as filleting, breading, smoking or canning. These activities require substantial capital investments. Although frozen seafood dominates exports, demand for processed products by Indonesian's fishery products buyers is increasing. The globalization of fishery value chains is growing fast and large retailers increasing control distribution, thus many Indonesian producers link their export-oriented products with firms located abroad.

Table 10: Fish sold by type of processing (2005)

	Total Sold (MT)	Sold fresh (MT)	Processed[3] (MT)	Frozen (MT)	Canned (MT)	Fish Meal (MT)
EJ	270,793	149,471 *(55%)*	102,593 (38%)	10,905 (4%)	4,342 (2%)	3,482 (1%)
NTB	81,610	63,427 *(78%)*	18,183 *(22%)*	-	-	-
NTT	124,872	90,749 *(73%)*	34,123 *(27%)*	-	-	-
% Sold per type of processing		64%	32%	2%	1%	1%

The data shown in Table 10 clearly demonstrates that the majority of fish is sold fresh. It also shows that there is a greater variety in the types of fish processing in East Java than in NTB or NTT Provinces, which also reflects the bigger size of the fishery in this province. Processed fish is mainly destined for the domestic and regional markets, while fresh, frozen and canned fish, as well as fishmeal are products that more readily enter the international markets.

Government has encouraged the processing of fish as a means of value adding to fisheries produce. During the 4th Indonesia Fisheries Expo (IFE) at Balai Kartini, Jakarta in October 2011, fisheries and marine processed-products from NTT were presented and received both national and international attention.

With the help of the Regional Fisheries Livelihoods Program for South and Southeast Asia, a total of 20 local products including seaweed crackers (pilus), sweets, syrups and seaweed jelly, shredded fish, crackers, jerky dried fish and dried squid developed in four NTT districts – Kupang City, Kupang District, Rote Ndao and Alor – were exhibited at IFE for the first time. Household producers (fishers and coastal communities) who have received production, packaging, labeling

[3] Includes: drying/salting; boiling; fermentation (belachan; fish peda; fish saucing)

and product certification support from RFLP and DKP NTT have presented their products (Regional Fisheries Livelihoods Programme for South and Southeast Asia, 2011).

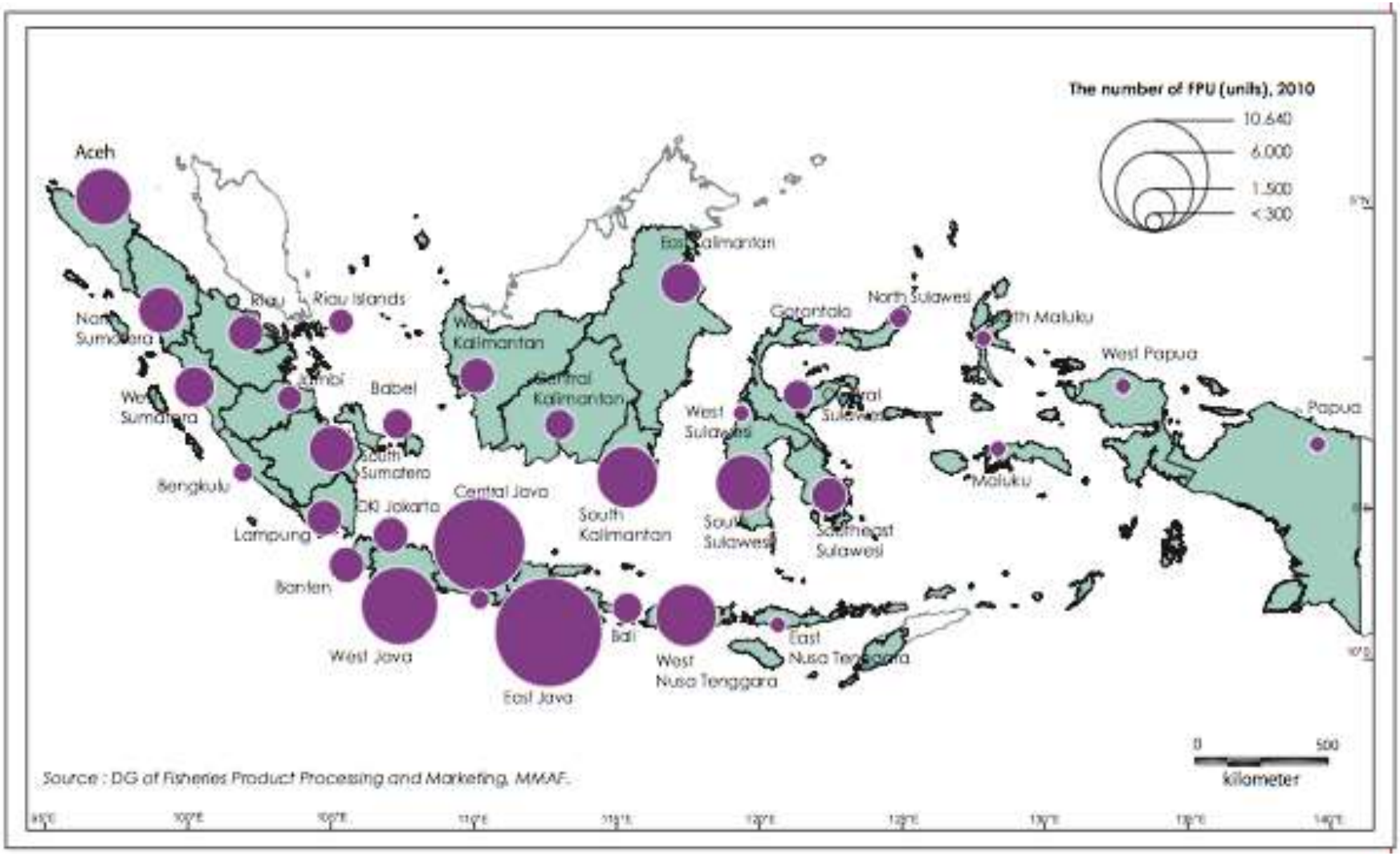


Figure 11: Number of FPU in Indonesia 2010

QUALITY STANDARDS AND CERTIFICATION

The quality standards and certification of fishery products is a process that is important for exports, especially to the European markets. Currently Indonesia is improving its ability to meet international standards. EU support has enabled Indonesia to tackle quality problems affecting its fishery exports, the number of problems reported declining each year recently (Worldfishing&Aquaculture, 2008).

According to Mr. Hutagalung, "The problem for Indonesian exporters is the added cost and time involved as containers are at the ports for two to three weeks. With EU support Indonesia was able to work on improving fishery quality management to meet the EU standards requirement. The Government has sent staff to Europe for training to improve technical skills and to strengthen the Quality Control laboratory facilities. The Government is dedicated to improving Indonesian exporters compliance with international standards." (Worldfishing&Aquaculture, 2008).

The primary responsibility for the implementation of the legislation pertaining to control of Quality and Safety Assurance of Fishery Products falls with The Directorate General of Fishery Products Processing and Marketing (DGFPPM). The Approval Commission is responsible for recommendations on issue of certificates. Relevant certificates include: Good Handling Practices (GHdP), Good Manufacturing Practices (GMP) and Hazardous Analysis and Critical Control Point (HACCP). There are currently 32 laboratories issuing health certificates, 25 of which are accredited and the other 7 are in the process of accreditation.

The number of certified FPUs in 2010 was 505 in total, 705 with HACCP. In East Java there were 221 HACCP and 104 FPU certified and in NTB and NTT, 1 and 4 HACCP and 6 FPU respectively (MAFF and JICA, 2011).

For verification of compliance with requirements regarding wild catch involving fishing vessels, freezer vessels and the unloading process the authority lies with the Directorate General of Capture Fisheries (DG-CF) (Lord, Oktaviani and Ruehe, 2010).

Many of the tasks related to monitoring and control of the process are assigned to the Provincial Fishery Services and Laboratories. This decentralization of the process of control of quality issues along the value chain requires efficient coordination among the various levels of government and the General Directorates. There are efforts made by MMAF to improve efficiency and quality of the system.

Fishery processors often have to provide additional certificated required by international buyers, these include: ISO 22000, Food Safety, Quality and Food Defense Audit (NSF International), BRC Global Standard for Food Safely, Marine Stewardship Council (MSC) on sustainability of sea catch. These types of certifications and audits can add-up to a significant cost.

IMPACT POTENTIAL

PRODUCERS AND PROCESSORS

At the level of fishers, the establishment and provision of certification program that guarantees the quality of handling of the catch can further improve the ability of small-scale fishers to link to export or high value markets.

There are also opportunities to provide technical assistance to SMEs to improve fish processing techniques and optimize the potential for added value.

The motorization of the artisanal fleet and improvement of fishing gear can also be facilitated through the provision of micro credit schemes and fishing associations.

The facilitation of access to current prices will also improve fishers bargaining power with collectors and traders.

Increasing the production of high value-added processed fishery, which include frozen fish, canned fish, fishmeal processing, and processing of seaweed flour (Keraginan). Currently, the added value of processed fishery products is very low. Increased economic value added fishery product processing can be accomplished by:

- Development of fishery industrial clusters that includes the fishing industry's raw material production;
- Connectivity (infrastructure) development, which is important to support the increase of fishery production through:
    - Improvement of the level of service of cross district roads, particularly to NTT, and improve access from fishing ports to the nearest cross-districts roads;
    - A review of local port capacity to support industrial activities;
    - Acceleration of energy expansion program through capacity increase of Power Plants;
    - Develop the Mbai Airport located at Nagekeo Regency, NTT to transport high value but highly perishable marine fishery products;
    - Acceleration of water treatment plants construction, especially in NTT to support the development of aquaculture and industrial fisheries and marine product processing.

(Coordinating Ministry For Economic Affairs, 2011)

MARKET DEMAND

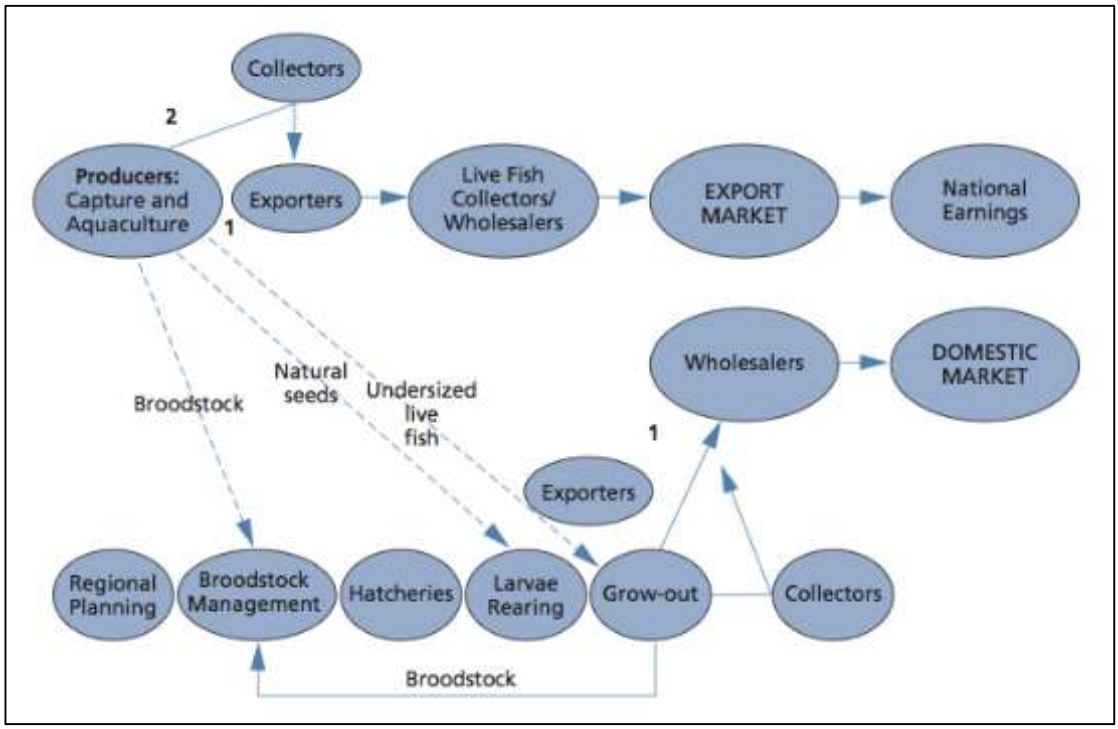
The fastest expanding market for marine fish in the region is the Live Fish Trade with China, Hong Kong, Taiwan and Singapore being the largest consumers of Indonesian live exports. Indonesian production is yet to meet export demand, due to fluctuations in supply. In addition with the improvements of EQI the volume of exports to Europe and the US are also bound to grow.

However, the live fish business has many challenges that need to be addressed in order to maximize the potential of marine fisheries. Some of the main issues are:

- Inconsistency of supply that makes the attraction of larger international clients more difficult;
- Lack of technical knowledge by fishers on how to keep the fish fresh, alive and in a healthy condition which leads to post-harvest loss of value as well as physical losses; There is a need for training of fishermen to reduce the mortality of live fish through improved husbandry practices (Morey, 2008).
- Fishers are not market focused. They are not demand driven, which leads to lower or discounted returns if the seafood doesn't meet specifications on size, freshness or water content. The lack of knowledge on market requirements puts fishers in the position of price takers. Thus, there is a need for better communication between traders and fishermen on market requirements (Morey, 2008).

- Limited infrastructure, such as cold storage facilities and un-certified ice making providers. Improved fish handling would also involve improved live fish holding tanks and packing facilities. An opportunity to introduce packing facilities in fishing communities so that they can hold and pack fish for the market will bring the fishers closer to the market and potentially increase in profit per kg of seafood (Morey, 2008).
- The lucrative Grouper trade that depends more on capture than culture activities is also growing although there is a is relatively small domestic demand in Indonesia, mainly by the wealthier urban markets (Koeshendrajana and Hartono, 2006).

Figure 12 provides an example of the typical marketing distribution for live reef food fish in Indonesia:



Source: Koeshendrajana and Hartono (2006)

Figure 12: Structure of the live fish trade channels in Indonesia

In most cases, the structure of the live reef food fish market is an oligopsony (occupied by only two or three traders). This is often due to the remoteness and lack of good road access to fishing landing sites, as well as the lack of holding/storage facilities owned by fishers. The result is a market situation where fishers are price takers, who are selling a highly perishable product often without current knowledge of its market price (Koeshendrajana and Hartono, 2006).

POTENTIAL PITFALLS

The main risks associated with Indonesian fishery products exports are related to the capacity and institutional constraints as well as exchange rate policies at macroeconomic level. The problems internal to the industry are the limitations related to EQI resulting in difficulties to meet WU market access requirements (Lord, Oktaviani and Ruehe, 2010).

Factors that influence the development of fishery activities are divided into 3 major aspects: fishing/ cultivation, processing, and the distribution of processed fishery. There are several challenges associated with the three aspects of the development of fishing activities, such as:

- A lack of accurately mapped potential for marine fishery and the weak control of spatial plan implementation;
- Low levels of technological development of the fishing fleet and fishing equipment reducing efficiency and potentially increasing the cost per unit effort;
- Insufficient private sector in processing of fishery and marine products, resulting in low economic value-added of processed marine fishery products;
- Insufficient knowhow and training of both fishers and fish processors in standard handling and processing techniques;
- Shortage of capital and difficult access to capital for local communities in support of the development of community-based fishery activities or individual production investment;
- Limited distribution channels and marketing of fishery products and processed products;
- The need for supporting facilities and infrastructure (including roads, water and electricity), primarily to serve the marine fishery processing industry, has not been fulfilled. This causes high production cost of fishery products and processed products;
- Lack of access connecting the locations of marine fishery producer with the location of its processing industry, as well as with regional markets and export facilities.

(Lord, Oktaviani and Ruehe, 2010; Coordinating Ministry For Economic Affairs, 2011)

To overcome these challenges, common strategies and action plans that will be developed in Bali – Nusa Tenggara Economic Corridor are:

- Map the potential of fisheries and marine resources;
- Monitor the implementation of spatial planning;
- Establish seed centers;
- Establish training centers for fishermen and provision of certification program; and develop fishing technology;

The key institutional problems are:

- Confusion over the jurisdiction of MMAF and other enforcement agencies;
- Lack of adequate infrastructure and manpower
- Weak governance at provincial level

These weaknesses lead to risks to programs aimed at promoting fishery exports by presenting limitations related to EQI needed to meet export requirements. In addition the lack of coordination and collaboration on regulating the industry results to weak policing of EEZ and thus low level of IUU prevention, which negatively impacts the requirements of western markets for environmentally and socially responsible practices (Lord, Oktaviani and Ruehe, 2010).

CURRENT DONOR ACTIVITIES

ACIAR has invested around A$20 million in Indonesian fisheries research and development (R&D) since the 1980s, a total of 41 projects. It has addressed aspects of the management of wild stocks and aquaculture farming practices. Motivated by concerns that stocks are being depleted, ACIAR R&D focuses on reliable catch data collection and analysis, and developing fisheries models to better inform and improve management.

Projects involve red snapper, shark and rays, tuna and IUU fishing. The program equipped Indonesia's Ministry of Marine Affairs and Fisheries with improved capacity to analyze, interpret and report on data for stock assessment.

In April 2008 Indonesia was accepted as a member of the CCSBT and its capacity to provide reliable data was fundamental to its membership (ACIAR 2009a).

RFLP field activities in Indonesia are undertaken in the Province of Nusa Tenggara Timur (NTT) and specifically in four out of 20 regencies, namely Kupang, Kota Kupang, Rote Ndao and Alor. The RFLP Project Coordination Office is located in Kupang and works closely with the Directorate General of Capture Fisheries of Ministry of Marine Affairs and Fisheries (MMAF), which is the implementing agency. At field level, the responsibility for implementation is delegated to the Marine and Fisheries Agency (Dinas Kelautan dan Perikanan - DKP) in NTT which is responsible for activities within the province.

"**Promoting Economic Cooperation in BIMP-EAGA**" (2005-2011) was funded by the Federal Ministry for Economic Cooperation and Development and commissioned for implementation to the German Technical Cooperation (GTZ). It aims to extend cross-border cooperation in the sub-region in order to contribute to employment generation, poverty reduction and the prevention of social conflicts in the sub-region. The Project concentrates predominantly on three interventions areas:

- To strengthen public sector institutions, notably the BIMP-EAGA Facilitation Center (FC) to transform into a joint Secretariat capable of carrying out coordination and promotion tasks effectively and efficiently;
- To facilitate the dialogues at different levels among public and private sector stakeholders, including regional development partners like ASEAN and ADB with the goal to create new strategic options for a more accelerated and extensive development of BIMP-EAGA;
- To support sub-regional cooperation in cross-border value chains through the Value-links Approach, specifically in tourism, seaweeds, palm oil and halal products and fisheries.

FISHERIES: Support in developing the "BIMP-EAGA Fisheries Consortium" to generate inputs in drafting a cooperation scheme in BIMP-EAGA. In a 4-countries-meeting the following key actions had been agreed upon:

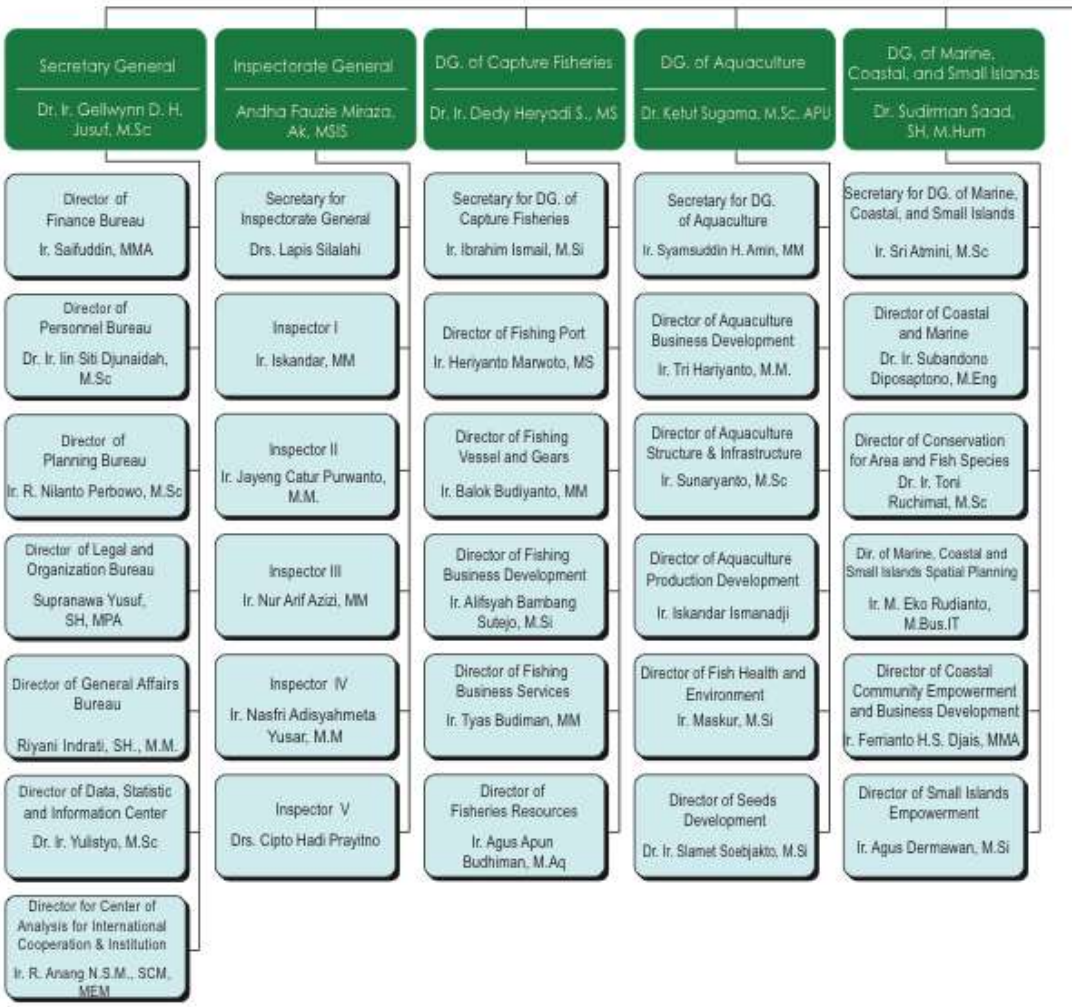
- Formulate Business Model for "Fisheries Consortium" & set up the same collection & analysis of data & dissemination of information
- BIMP-EAGA investment forum & business matching events
- Harmonization of conservation fisheries standards & practices in BIMP-EAGA

Please see for a detailed list and description of the international cooperation on fisheries management and development.

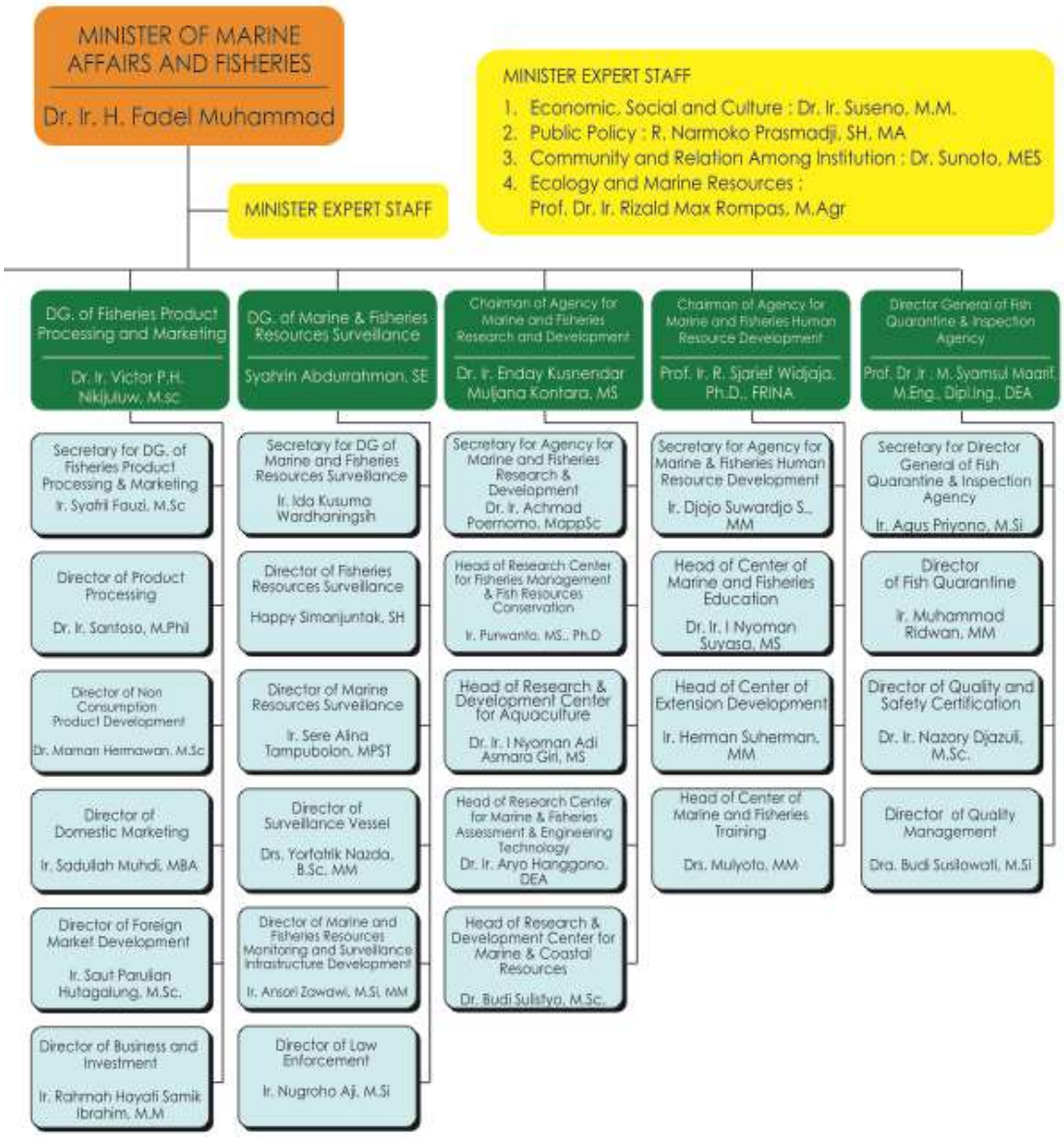
NOTE

- Current literature on marine fisheries does not provide any information on women's role in fisheries or the gender segregation of roles and responsibilities in the sector
- The literature also does not refer to any co-management or community based organizations involved fishery management

APPENDIX 1: ORGANIZATIONAL STRUCTURE OF MMAF



Source: JICA 2010


MINISTER OF MARINE AFFAIRS AND FISHERIES
Dr. Ir. H. Fadel Muhammad
MINISTER EXPERT STAFF
MINISTER EXPERT STAFF
1. Economic, Social and Culture : Dr. Ir. Suseno, M.M.
2. Public Policy : R. Narmoko Prasmadji, SH, MA
3. Community and Relation Among Institution : Dr. Sunoto, MES
4. Ecology and Marine Resources : Prof. Dr. Ir. Rizald Max Rompas, M.Agr
DG. of Fisheries Product Processing and Marketing
Dr. Ir. Victor P.H. Nikijuluw, M.Sc
DG. of Marine & Fisheries Resources Surveillance
Syahrin Abdurrahman, SE
Chairman of Agency for Marine and Fisheries Research and Development
Dr. Ir. Enday Kusnendar Muljana Kontara, MS
Chairman of Agency for Marine and Fisheries Human Resource Development
Prof. Ir. R. Sjarief Widjaja, Ph.D., FRINA
Director General of Fish Quarantine & Inspection Agency
Prof. Dr Ir . M. Syamsul Maarif, M.Eng., DipLing., DEA
Secretary for DG. of Fisheries Product Processing & Marketing
Ir. Syahril Fauzi, M.Sc
Director of Product Processing
Dr. Ir. Santoso, M.Phil
Director of Non Consumption Product Development
Dr. Maman Hermawan, M.Sc
Director of Domestic Marketing
Ir. Sadullah Muhdi, MBA
Director of Foreign Market Development
Ir. Saut Parulian Hutagalung, M.Sc.
Director of Business and Investment
Ir. Rahmah Hayati Samik Ibrahim, M.M
Secretary for DG of Marine and Fisheries Resources Surveillance
Ir. Ida Kusuma Wardhaningsih
Director of Fisheries Resources Surveillance
Happy Simanjuntak, SH
Director of Marine Resources Surveillance
Ir. Sere Alina Tampubolon, MPST
Director of Surveillance Vessel
Drs. Yorfatrik Nazda, B.Sc, MM
Director of Marine and Fisheries Resources Monitoring and Surveillance Infrastructure Development
Ir. Ansori Zawawi, M.Si, MM
Director of Law Enforcement
Ir. Nugroho Aji, M.Si
Secretary for Agency for Marine and Fisheries Research & Development
Dr. Ir. Achmad Poernomo, MappSc
Head of Research Center for Fisheries Management & Fish Resources Conservation
Ir. Purwanto, MS., Ph.D
Head of Research & Development Center for Aquaculture
Dr. Ir. I Nyoman Adi Asmara Giri, MS
Head of Research Center for Marine & Fisheries Assessment & Engineering Technology
Dr. Ir. Aryo Hanggono, DEA
Head of Research & Development Center for Marine & Coastal Resources
Dr. Budi Sulistyo, M.Sc.
Secretary for Agency for Marine & Fisheries Human Resource Development
Ir. Djojo Suwardjo S., MM
Head of Center of Marine and Fisheries Education
Dr. Ir. I Nyoman Suyasa, MS
Head of Center of Extension Development
Ir. Herman Suherman, MM
Head of Center of Marine and Fisheries Training
Drs. Mulyoto, MM
Secretary for Director General of Fish Quarantine & Inspection Agency
Ir. Agus Priyono, M.Si
Director of Fish Quarantine
Ir. Muhammad Ridwan, MM
Director of Quality and Safety Certification
Dr. Ir. Nazory Djazuli, M.Sc.
Director of Quality Management
Dra. Budi Susilowati, M.Si

2) SEAWEED SUB-SECTOR

THE MACRO ENVIRONMENT

The total world market for wet seaweed is about 7.5 to 8 million tonnes per year, totalling around USD6 billion. About 90% of the seaweed is cultivated rather than wild stock and 75% of the production comes from China, Japan and the Republic of Korea (FAO and World Bank, 2007). [4]

Seaweeds are classified as green, brown and red. The subject of this literature review will be the red seaweed grown in Indonesia, which is the source of two highly valued hydrocolloids: agar and carrageenan. The source of agar is a species of *Gracilaria* grown in ponds often in polyculture with fish. The source of carrageenan are *Eucheuma cottonii* and *Eucheuma spinosum* cultivated along the sea shore, with the first accounting for 75% and the latter for 25% of the production. Sulawesi produces about 50% of all cottonii and 90% of Gracilaria grown in Indonesia.

Indonesia is currently the world largest producer of cottonii, followed closely by the Philippines. The majority of the production is for exports, with almost 80% exported as raw seaweed. With regard to carrageenin product, Indonesia had controlled around 13% of the world`s market in 2007 and 13.7% in 2008, 14% in 2009 and predictably 15% in 2010 (Government of Indonesia, 2012).

Indonesia is the world`s biggest dried seaweed exporter with its annual exports reaching 145,000 tons, or about 50% of the tropical world's total exports of 290,000 tons. The biggest buyer of Indonesian production is China, accounting for nearly half of the total exports (Government of Indonesia, 2012).

POLITICAL

The Government of Indonesia recognises the importance of seaweed both as a means of promoting poverty alleviation among coastal communities and as a considerable source of export revenue. However, despite tripling the volume of exports, the value of the exports only doubled as a result of exporting mainly raw material prior to any value-adding processing of the commodity. Having recognised these losses, the Government is promoting a new economic policy. Indonesia is striving to produce 10 million tons of seaweed per by 2015, making it the number one producing country, replacing the Philippines. In order to promote expansion, the government has facilitated the expansion of seaweed cultivation areas from 2.1 million hectares into 2.6 million hectares in 2010, he said. For that purpose, Marine Affairs and Fisheries Minister Fadel Muhammad has also urged lenders to provide smallholder credits for seaweed farmers (Government of Indonesia, 2012).

Minister Fadel Muhammad is aiming to make Indonesia the world's biggest seaweed producer encouraged by the vast seaweed cultivating grounds in Indonesia's eastern parts, like East Nusa Tenggara (NTT), West Nusa Tenggara (NTB), South Sulawesi, Southeast Sulawesi, Maluku, and North Maluku.

In line with the planned seaweed production increase, the Government is also calling seaweed processing factories to be built in the next two years in order to increase the value of seaweed exports. The government plans to restrict exports of raw seaweed from 2012 hoping to encourage more domestic processing of the commodity. Currently, Indonesia has around 23 seaweed producing companies.

[4] Figures from 2006

Victor P H Nikijuluw, Director of Business and Investment at the Directorate General of Processing and Marketing of Fishery Products (P2HP), Ministry of Marine Affairs and Fisheries (DKP) in Jakarta said that raw seaweed sells for about $1/kg. However, if the seaweed were processed into seaweed chip it could be sold for around $5.50/kg and if processed into seaweed powder it could be sold for $12/kg (Rison, 2009). In order to stimulate private sector development Government is promising that companies or cooperatives that have domestic processing facilities would have their exports prioritized (Ekawati, 2010b).

DKP is preparing three policy options for the development of domestic seaweed processing. First, the exporters of baled seaweed must be registered and must have a processing plant in the country. Second, the governments will limit the export of baled seaweed and third, authorizing cooperatives to export seaweed. The last policy is targeting to narrow the difference between farm-gate (Rp 5.000/kg) and exporter prices (USD1/kg) and allowing the farmer to participate in the market from a different bargaining position (Rison, 2009).

The Government production target for Indonesia by 2014 is equivalent to 1 million tons of dried seaweed. It is expected that the production of seaweed in Indonesia, including alkali treated cottony (ATC), semi-refined carrageenan (SRC) and refined carrageen (RC) will reach USD1 billion in 2014 (Rison, 2009).

The policy review clearly demonstrates the interest and commitment of Government to promote the development of the seaweed production and processing sectors. The ambitious economic goals set forth clearly show that in the view of Indonesia, the seaweed sector is yet to develop and grow.

ECONOMIC

The economic environment for the development of the Indonesian seaweed sector appears favourable. Indonesia has a number of sources of comparative advantage such as its proximity to the largest markets for red seaweed, especially in the case of China where demand outstrips supply especially for red seaweed. The primary competitor for Indonesia on the global seaweed derivative markets is the Philippines. However, the political unrest in the countryside and the maturity of the sector have allowed for Indonesia to surpass Philippine production levels.

Easy to grow and with an increasing worldwide demand, tropical seaweed has helped fishermen to offset their dependence on the fishing industry. There are five species of seaweed that are of economic importance in Indonesia:

1) *Kappaphycus alvarezii (cottonii of the trade).* Source of kappa carrageenan. Several cultivars known. Chronically in short supply for at least a decade. Prices have ranged from about 600 – 1,000 USD/dry ton.
2) *Kappaphycus striatum (sacol of the trade).* Source of a variant of kappa carrageenan. At least two cultivars known. Grows better than cottonii in shallow waters close to shore but breaks up in exposed at exposed sites. Chronically in short supply since it was recognized as being commercially distinct within the past decade. Price generally the same as for cottonii.
3) *Eucheuma denticulatum (spinosum of the trade).* Source of iota carrageenan. Several cultivars known but only one common in Indonesia. Easily grown. Often planted in areas where Kappaphycus grows poorly seasonally – even when farm gate prices drop below 150 USD/ dry ton.
4) *Gracilaria spp. Source of food-grade agar-agar.* Generally grown in shrimp or milkfish ponds as an alternative or companion crop. Easy to and cheap to grow so production occurs as long as there is a market even when prices drop below 150 USD/ton.
5) *Gelidium spp. or Gelidiella spp. Sources of bacteriological agar.* Obtained from wild stocks. Slow growing small plants that are not yet commercially farmed. In chronic short supply worldwide. Can bring prices in the thousands of USD per dry ton (Neish 2007a).

The five Provinces who are the largest suppliers of seaweed in order of production are: South Sulawesi (648,528 tons), East Nusa Tenggara (606,273 tons), Central Sulawesi (287,263 tons), Bali (150,000 tons), and Southeast Sulawesi (123,486 tons).

Unfortunately, available data does not provide the information needed to determine the specific contribution of seaweed to the Provincial economy.

In order to understand the economic context for the Indonesian seaweed industry one must appreciate the changes that have taken place in the last decade which has affected market structures and pricing of the commodity.

On the world markets sales have almost doubled in a decade showing compound annual growth rate of about 6% (4% annual price increases and 2% volume growth). Price fluctuations have been especially sharp in the last few years responding to rising costs, changes in the industry structure and new emerging markets demand resulting in souring prices of raw material (Harris and Porse, 2010).

In 2007-2008, China increased substantially its demand for seaweed, especially cottonii. This led to unprecedented price increase was exacerbated by period of aggressive buying and stockpiling and then an abrupt end to the 'buying campaign'.

During this period parts of the $14 billion global seaweed market started soaring. The price Indonesian seaweed more then tripled reaching 18.000 rupiah (or $1.80) per kilogram, from about Rp. 5.000. Then, just as quickly, the seaweed bubble burst and came back down to under Rp. 10.000 (Barta, 2008). The price fluctuations have affected mainly the carrageenan-bearing seaweeds produced almost entirely in Indonesia and the Philippines (Table 11). Volatility in cottonii price causes tension between producers and carrageenan buyers. Profit margins in the food processing industry were badly affected as they had already taken a hit with higher energy costs and higher costs of other commodities.

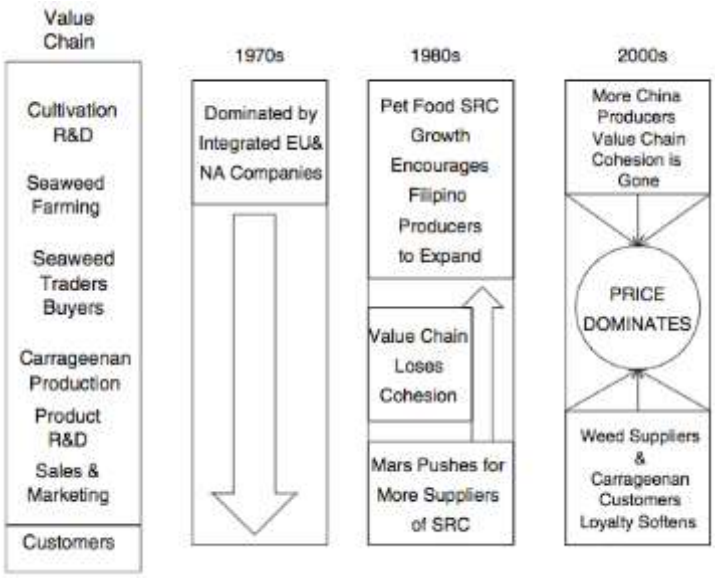
Table 11: Price changes for major seaweeds in the last decade

Seaweed	US$ t^{-1} 1999	US$ t^{-1} 2009	% increase
Gracilaria	1,260	1,300	3
Lessonia	350	950	171
Cottonii	600	1,400	133
Spinosum	350	350	0
Chondrus (NS)	1,800	3,400	89
Chondrus (PEI)	1,000	1,875	88
G. skottsbergii	1,400	3,000	114
S. crispata	1,000	2,300	130

Source: Harris and Porse, 2010

The higher prices have had a dampening effect on sales past 2008, especially in markets where substitution or extension with less expensive ingredients is possible. The global market fluctuations have also affected prices at farmers level, where unpredictability of selling price and associated income have led to discontent and uncertainty among farmers regarding the expansion of their activities and investment in increasing production.

The structure of the industry has undergone many changes since the 1970's. In its early days the industry was largely controlled by three major companies: CP Kelco, FMC and Cargill. The first break came when Mars, the major pet food user of SRC, provided incentives to Filipino entrepreneurs such as Shemberg and Marcel to expand. The most recent break occurred when China producers aggressively entered the carrageenan market without an established source of seaweeds. (Figure 13) (Harris and Porse 2010).



Source: Harris and Porse, 2010

Figure 13: Changes in organization of the carrageenan value chain since the early 1970's

In the Philippines, producers have experienced another type of expansion. Numerous small companies were set up to purchase production and today there are a few fairly strong Filipino-owned companies such as Shemberg Corp, PCI Worldwide, TBK and Marcel Trading Corp. In addition, the market leaders CPKelco, FMC, and Cargill have also established primary production facilities in the Philippines in order to reduce costs by being close to the source of their major raw material.

On the global market the three market leaders continue to dominate through a series of mergers and acquisitions - consolidation began with vertical integration when production capability of Algin Corp. was merged with the strong technical and sales capabilities of Seaplant Corp to form Marine Colloids/FMC. Followed by horizontal integration, such as Hercules marrying its cellulosic gums with Copenhagen Pectin/CPKelco's carrageenan and pectin, and more recently, FMC despite already owning alginate producer Pronova in Norway, also acquired ISP's alginate business to now have 35% to 45% of the western world market (Harris and Porse, 2010; FAO and World Bank, 2007)

So far, consolidation has been mostly limited to Western companies while small to medium size producers keep emerging in Indonesia and China. Due the global structure of the industry and the importance of marketing and technical expertise, except for alginates, in Indonesia, consolidation of these markets is probably also inevitable in Asia (Harris and Porse 2010).

SOCIAL

There are a number of studies looking at the impact of seaweed farming on traditional fishing communities (Blankenhorn, 2007). The introduction of seaweed farming by the private sector and with support from government has

diversified the economic activities and sources of income for coastal communities. It has also impacted on natural resource management practices and gender division of labour.

An important aspect of alternative employment is gender and age distribution among the labour force. Males typically dominate capture fisheries, often leaving alternative livelihoods such as seaweed farming to females and children. Therefore the impact on women and children should also be considered in the promotion and implementation of alternative livelihoods. It is also important to note that where males make up only a fraction of the labour pool in seaweed farming, there is less likelihood that permanent occupational shifts from fishing will occur (Crawford, 2002).

For many fisher families seaweed farming is an attractive alternative as it involves relatively low initial investment and operational costs. Maintenance is not labour intensive and allows for parallel continuation of fishing activities. Finally, albeit seasonal, seaweed farming can bring in higher profits than fishing.

The management of coastal areas is increasingly complex as the number of different activities are introduced that relay on access to the same resources. Fishing and seaweed farming are often practiced in similar areas and an intensification of farming can lead to conflicts with fishers. One of the main issues is idle farms that have a negative effect on the environment with old equipment like ropes and anchors left in the waters and preventing other use of the area. Marine farm tenure is not a legally defined / developed concept. Access to the fields is given by the village heads who make a decision based on the individual economic capacity of the farmer and observations of the natural environment. However, with intensification, farm ownership issues intensify (Zamroni and Yamao, 2011).

Despite the resource multiple-use management issue, there is a natural complementarity between seaweed farming and fishing, which extends to the occupation of men and women, and even children. While men continue to do the fishing women and children often take the bulk of the responsibility for preparation of the farming season, maintenance as well as for the sale of the harvest. The all-year round income from fishing is supplemented by relatively high seasonal earnings from seaweed which are used for household or business investment and other family needs. The only drawback for those families that become more dedicated to seaweed farming than fishing has been the instability of prices and levels of income.

TECHNOLOGICAL

The market for seaweed products is highly segmented and differentiated by quality, final use and market channels. At the bottom end of production, seaweed is a commodity that does not require production training or complex technical knowhow. However, as the seaweed moves up the chain the intellectual and technological component of the product increases dramatically and the commodity characteristics of the product disappear. The extraction of hydrocolloids from the raw material and their refinement is a multifaceted process linking national with international markets.

The industry is composed of three types of hydrocolloids, which are to be examined individually:

AGAR

Gracilaria and Gelidium are the principal seaweeds for commercially producing agar. Gracilaria has become the preferred seaweed for making food grade agar and it has been successfully cultivated primarily in Chile and Indonesia (Table 12).

Table 12: Geographic distribution of agar production

Region	1999 volume (t)	2009 volume (t)
Europe	1,000	700
Africa	900	800
Americas	2,600	2,800
Asia-Pacific	3,000	5,300
Total production	7,500	9,600
Total capacity	9,000	12,500
% Utilization	83%	77%

Gracilaria production is done in large ponds of around 0.5ha, with each farmers normally working with 1 or 2 ponds. In Indonesia, there are over 6,000 families involved in this type of seaweed production (FAO and World Bank, 2007). Gracilaria is grown either as a monoculture or a polyculture with milkfish and prawns who also grow well in brackish water with 20% seawater content. Thus ponds, which are either owned or rented by farmers, are located close to the sea in order to have access to the water. The inputs needed for production seedlings, fertilizer and labour, also an investment in a small boat, tarpaulins and drying mats. The production cycle is of 45 days allowing for a maximum of 7 cycles per year but most commonly 4 due to water shortages in the dry season, unless the farmer invests in pumping. Each productive cycle results in 1,200-1,700kg.

The major limiting factor for the expansion of Gracilaria production is the availability of ponds, access to seawater and access roads.

In the past there was a large number of small processor of agar primarily in the Asia-Pacific area, however many have closed down due to inefficient processes. More recently more modern factories have emerged particularly in Indonesia, Chile and China.

Currently, two companies have emerged as undisputed leaders within the industry: Algas Marinas in Chile and Agarindo Bogatama in Indonesia. Between them, they are producing about 38% of the total current production. Other strong producers are Setexam in Morocco, MSC Co. in Korea, Hispanagar in Spain and Huey Shyang Seaweed Industrial Company in China. These six companies together account for about 57% of current total market (Harris and Porse 2010). The increased availability of competitively priced cultivated Gracilaria has resulted in the increase in Gracilaria agar powder production and decrease in Gelidium powder.

ALGINATES

Production capacity over the last 10 years has expanded by 25%, mainly in China. This is the least studied of the hydrocolloids and the least relevant to Indonesia.

CARRAGEENAN

The seaweeds for production of carrageenan are dominated by the warm water species K. alvarezii (“cottonii”) and Eucheuma denticulatum (“spinosum”). Both are primarily cultivated in the Philippines and Indonesia. From the 160.000 tons of ‘cottonii’ harvested in 2009, 150.000 tons or 94% came from the Philippines and Indonesia (Table 13) (Harris and Porse, 2010).

Cottonii production takes place in the sea along the shoreline in waters under 7m in depth. It is estimated that Indonesia harms over 63,000ha (FAO and World Bank, 2007). Most families farm 0.3-0.7ha, combining fishing activities usually performed by men with seaweed farming usually managed by women. Like Gracilaria, the production cycle of

45 days could allow for up to 7 cycles however due to heat in the dry season and rain in the wet season most farmers manage 4-5 cycles. The start-up inputs required are seedlings, nylon ropes, wooden sticks and a small boat, buoys and drying mats. Each cycle produces about 1,800kg of seaweed.

The two main production techniques used are the long line method or the bamboo raft method. Production in Indonesia has increased mainly as a result of a greater number of farmers opening up new areas for cottonii mariculture. The main constraints for production are lack of working capital (mainly for purchase of seedlings) and lack of technical knowledge to reduce harvest losses.

In the last decade, majority of carrageenan extraction took place in Western Europe and USA. However, the situation has changed considerably especially since the introduction of human food-grade semi-refined carrageenan (PES), which has reconfigured the geographic distribution of production facilities as well as increasing the volume of PES being produced.

Table 13: A decade of production and prices of 'cottonii' in the Philippines and Indonesia

Year	Philippines Production (dry t)	Indonesia Production (dry t)	Total cottonii Production (dry t)	Philippines Price (US$ t^{-1}dry)	Indonesia Price (US$ t^{-1}dry)
2000	113,000	27,000	140,000	$710	$650
2001	97,000	28,000	125,000	$575	$525
2002	91,000	30,000	121,000	$420	$535
2003	90,000	44,000	134,000	$770	$615
2004	97,000	49,000	146,000	$850	$750
2005	89,000	56,000	145,000	$774	$650
2006	84,000	68,000	142,000	$748	$617
2007	81,000	74,000	155,000	$947	$811
2008	73,000	79,000	152,000	$2,342	$2,166
2009	61,000	85,000	146,000	$1,280	$1,208

Source: Harris and Porse, 2010

ENVIRONMENTAL

Seaweed farming has far fewer environmental impacts than other mariculture. However it can have some impacts on sedimentation and water movement or alteration to the natural habitat. Sea grass beds can be negatively impacted by the change in light and water quality due to the introduction of seaweed on the water surface.

Another issue that has become a cause for concern is the use of mangrove for the polls that hold-up the off-bottom lines. Thus, forestry management in mangrove areas is has been negatively impacted by the need for wood stakes for farming.

Finally, the multiple-use of coastal areas can potentially increase the risk for conflicts between different resource users in especially where farming may interfere with other coastal activities such as fishing, transport or tourism.

As in other farming activities, carrying capacity of the cultivation area is an important factor for the long-term sustainability of the activity and farmers need to be able to read environmental signs when their production areas are reaching their ultimate carrying capacity before production levels go down or there are wider impacts on the environment.

Despite the above-mentioned environmental concerns, seaweed can also be beneficial by increasing the production of herbivorous fishes and shellfish. Eucheuma farmers in Bentenan and Tumbak villages in North Sulawesi have reported such effects (Blankenhorn, 2007).

LEGAL

The international regulation of quality and safety of production is mainly focussed on the highly processed Carrageenan based ingredients destined for the human food industry. A list of the main international and national regulations is included below:

- EU - European Union standards for E407a (Processed Eucheuma Seaweed) and E407 (Carrageenan) (e.g. Commission Directive 98/86/EC Nov 1998 & 95/2/EC February 1995)
- JECFA - FAO/WHO Joint Expert Committee on Food Additives (JECFA) standards for Processed Eucheuma Seaweed and Carrageenan.
- Codex FAO Food and Nutrition Papers 52 Add 9, June 2001) JECFA Specifications.
- USFDA – United States Food & Drug Administration standards (USFDA 21 CFR 172:620)
- HACCP Hazard Analytical Control Points requirements
- ISO 9001 : 2000, Quality Management System
- ISO 14001:2004, Environmental Management System
- ISO 22000 : 2005, Food Safety Management, Requirement for any organizations in the Food Chain
- OHSAS 18001 - Occupational Health and Safety Management Systems Requirements.
- PNCS - Philippine National Carrageenan Standard (under development).
- CAC/GL 60-2006 : Principle for Traceability/ Product Tracing as a Tool within a Food Inspection and Certification System
- CAC/GL 38-2001 Rev.1-2005: Guidelines for Generic Official Certificates Formats and the Production and Issuance of Certificates
- EUREPGAP - Euro Retailer Produce Working Group (EUREP) on standards and procedures for the development of Good Aquaculture Practices (GAP) in conventional agriculture.
- FAO Guidelines for Aquaculture Certification (under development).
- Quarantine Protocols for Tropical Seaweeds. Sulu, R., Kumar, L., Hay, C. and Pickering, T. 2004. Kappaphycusseaweed In The Pacific: Review Of Introductions And Field Testing Proposed Quarantine Protocols. Noumea: Secretariat of the Pacific Community. (Aquaculture Technical Papers / Pickering) ISSN 1683-7568. Agdex Pacific Islands 395/609. ISBN 982-00-0041-6

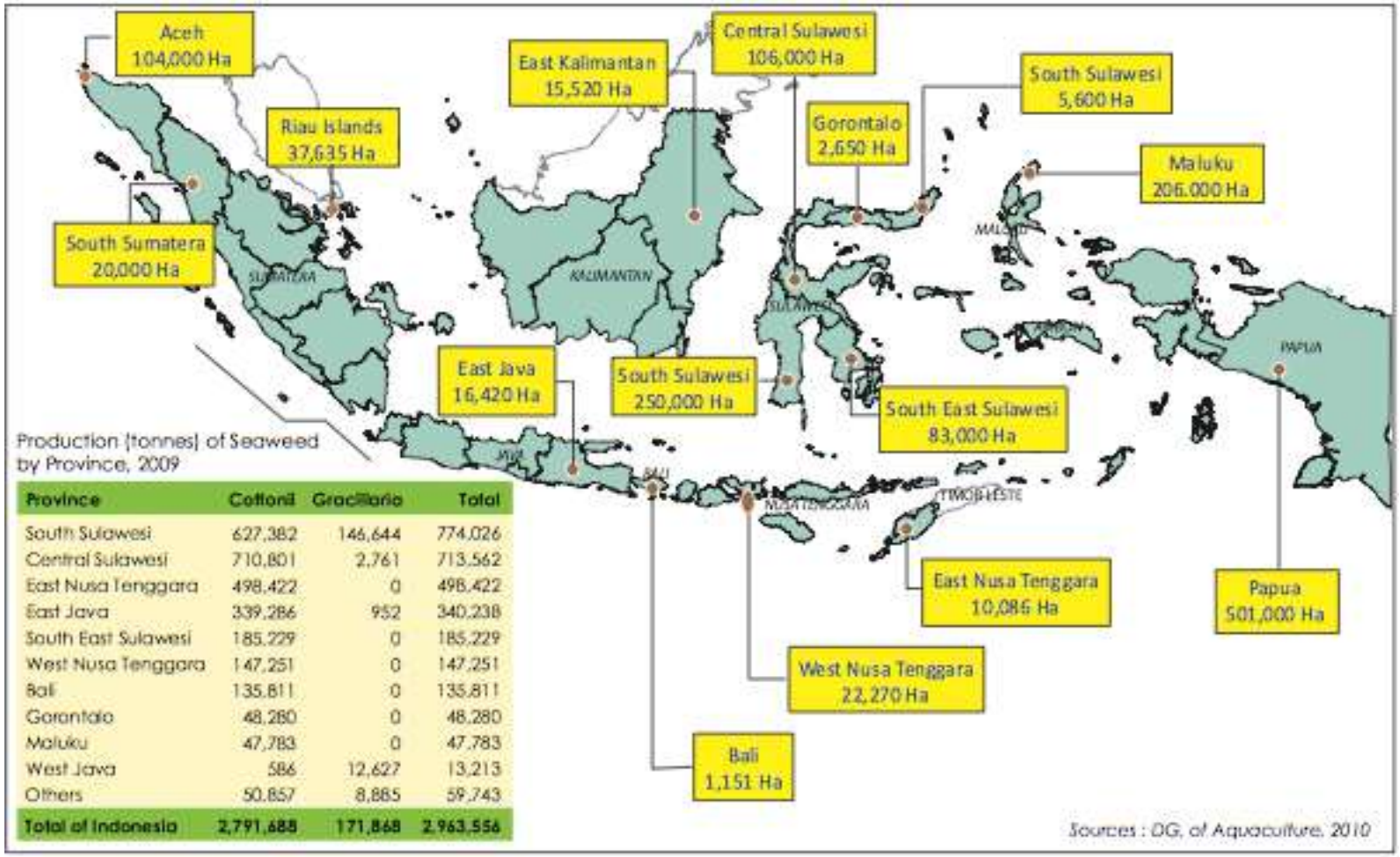
The regulatory framework focuses mainly on seaweed processing and relies on international standards. There is no national level policy or development framework but there are some provincial level policies guiding the development of the sub-sector.

SECTOR POTENTIAL FOR DEVELOPMENT

PRODUCTION

In 2009 Indonesia's seaweed production reached 2,574,000 tons, which increased sharply from the 2005 level of only 910,636 tons (Government of Indonesia, 2012). Cottonii and spinosum are the main types of seaweed produced in Indonesia.

Figure 14 demonstrates the geographical distribution of seaweed aquaculture. NTT and East Java rank third and fourth in terms of production volumes in 2009, and NTB ranks sixth. In all provinces the production is cottonii, with some Gracillaria being produced in East Java. In terms of aquaculture production area, in East Java farmers use a total of 16,420Ha, in NTB 22,270Ha and in NTT 10,086Ha (MAFF and JICA, 2011).



Province	Cottoni	Gracilaria	Total
South Sulawesi	627,382	146,644	774,026
Central Sulawesi	710,801	2,761	713,562
East Nusa Tenggara	498,422	0	498,422
East Java	339,286	952	340,238
South East Sulawesi	185,229	0	185,229
West Nusa Tenggara	147,251	0	147,251
Bali	135,811	0	135,811
Gorontalo	48,280	0	48,280
Maluku	47,783	0	47,783
West Java	586	12,627	13,213
Others	50,857	8,885	59,743
Total of Indonesia	**2,791,688**	**171,868**	**2,963,556**

Figure 14: Map of seaweed aquaculture

The production of cottonii and spinosum is mostly done using an off-bottom monoline system. It requires wood, bamboo, nylon lines/twine and plastic raffia. Plants are tied along the nylon lines, spaced at intervals of about 0.2m and tied to the anchored stakes at 10m along the rows that are 0.5m apart. In addition to this technique, a long line cultivation method can also be used in deeper water of approximately 7 meters depth with floating long cultivation lines (up to 100m), anchored to the bottom. The "floating long-line method" evolved parallel to the raft method (described below) in order to overcome the problems of the off-bottom technique (Blankenhorn, 2007).

Production is also done by the use of the "floating raft method" using rafts of 2,5m x 5m size or even 10x10m in size in calm waters. The rafts are constructed of floating material such as bamboo and the ropes with the seedlings are tied at a density similar to the off-bottom method. The rafts are held in place with ropes tied to large stones or anchors. Farming intensity per unit area is lower than with the off-bottom method, as the rafts cannot be spaced tightly in order to accommodate their movement with waves and currents. However, the farming area is not restricted to a certain water depth, and the total area under farming can be much higher than with shallow-water methods. The crop cycle is on average 45 days (Firdausy and Tisdell, 1991).

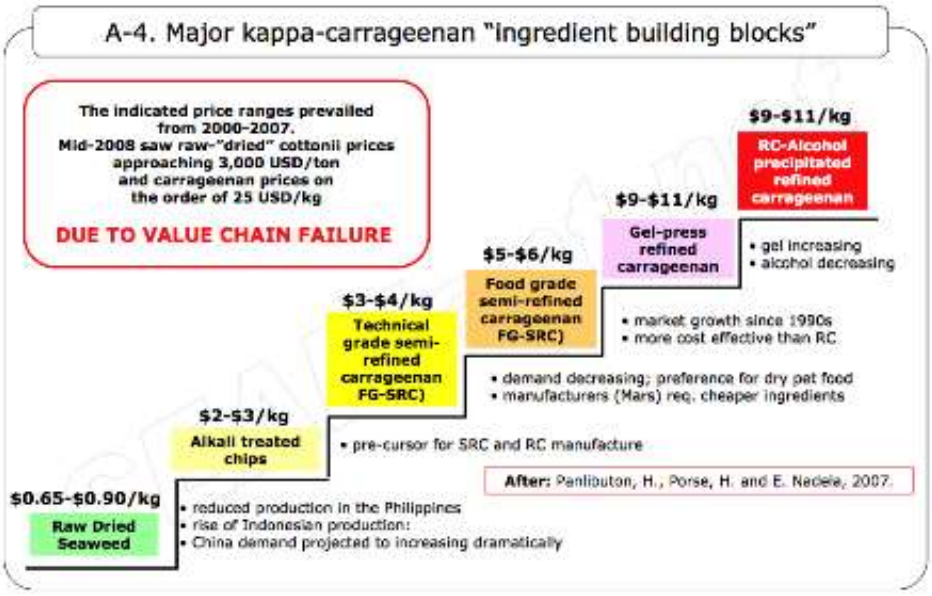
A financial analysis model of smallholder cottonii or Gracilaria producers was produced by FAO/WB (FAO and World Bank, 2007). It looks at the average net benefits for a producer over a 15year period as well the price sensitivity of the production operation. For cottonii the financial model has demonstrated that when considering 5 cycles per year on an average plot of 0.5ha, the NPV of the investment at 12% is USD 16,000 and the average net benefit is USD$2,400. The price sensitivity model reveals that declining prices and yields can significantly reduce farmer's income however at the same time even moderate increases in price can improve significantly income levels. Similar results were obtained for Gracilaria.

Considering the increasing complexity of the product processing and transformation along the value chain before reaching the final consumer, there are only a limited number of options for product value adding at production level, for example processing of semi refined Gracilaria or Cottonii. However, if we are looking at improving the value of the business and returns then there are more alternatives that may be considered that involve alternative supply chain designs and improvements in the operational efficiency of farms. In Indonesia, as in other seaweed producing countries, while a few large international companies purchase the majority of the production, the lower links of the market chain are dominated by small and often informal businesses.

PROCESSING AND TECHNOLOGY

As already discussed in the section on the economic macro-environment, twenty-five years ago almost all carrageenan extraction took place in Western Europe and USA, with only a small proportion of the processing taking place in Asia-Pacific and Latin America. However, the situation has changed considerably with the introduction of human food-grade semi-refined carrageenan (PES) and with the breakdown of the global industry structure and the subsequent reconfiguration of the geographic distribution of production facilities (Harris and Porse, 2010).

Value adding to production involves processing technology and know-how, which entail not only significant investment costs but also a high intellectual property component to the products created. Figure 15 below, gives an indication of the processes following the commodity production and its transformation into a final product.



Source: Neish, 2007b

Figure 15: Indicative price increases and transformation path of the commodity into a final ingredient

Markets for hydrocolloids are globally dispersed and often value chains cross international boundaries. The further up the product transformation chain the higher the need for blending and application skills that transform carrageenan into a 'specialty chemical' or 'ingredient solution'. The ability to process raw material and thus value-add is evident in the value of exports when comparing the volume and value of exports of the Philippines and Indonesia (Figure 16). In 2005, the Philippines processed about 70% of the total of their exports, while Indonesia only processed 20.5%. As a result, while the production of raw material and size of the industry is similar between the two countries, the Philippines industry generated over USD20 million more than Indonesia.

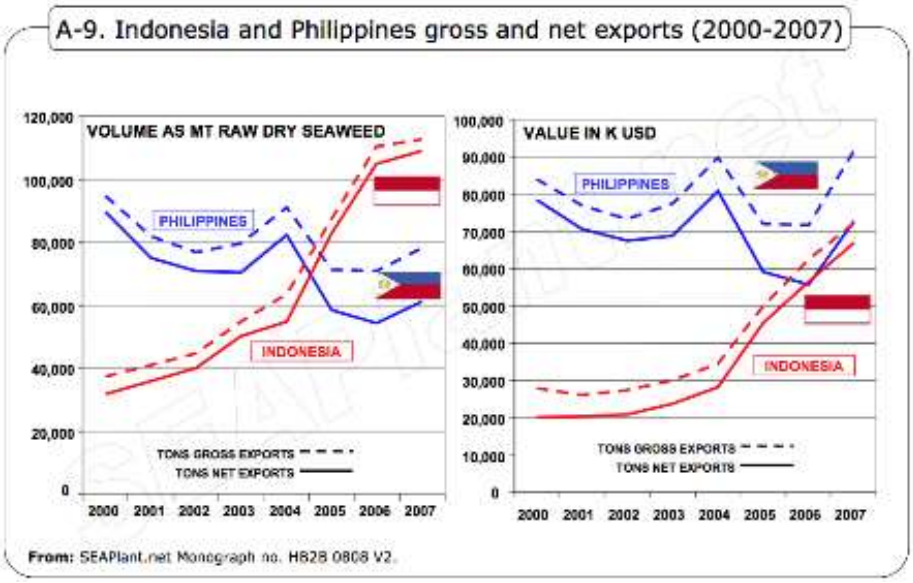


Figure 16: Comparison of Indonesia and Philippines gross and net exports

The chairman of the Indonesian Seaweed Commission, Mr Widodo Farid Ma'ruf, said that if the Government proceeded with the plan to limit exports it would need to increase the capacity of the domestic processing industry. Currently, Indonesia has 34 seaweed processing factories of which only 20 are operational and local seaweed processors have a capacity of about 120,000 tons a year (Ekawati, 2010b).

In order to boost the processing capacity at national level and create the necessary conditions for reaching the production and processing targets set by government, DKP is set out to prepare 60 seaweed production clusters by 2014. Currently, there are 12 clusters of seaweed industries developed by DKP together with local governments (Pemda) and private partners. These cluster are located in Sumenep, East Java (two clusters), Gorontalo (two clusters), one cluster in Pangkep, South Sulawesi, Dompu, West Nusa Tenggara (NTB), Serang Banten, Riau Islands, North Minahasa, Parigi Moutong (Central Sulawesi), Polewalimandar (West Sulawesi), and Bau Bau (Southeast Sulawesi) (Rison, 2009).

The clusters will contain three business layers: 1) community based and managed farming businesses; 2) first stage local or regional collection and processing businesses; 3) advanced stage processing by processing companies and exporters in order to add value.

An example of the upward expansion which is a product of the increasing complexity of the value chain, as it matures, is one of the biggest producers of seaweed chips today - PT Indonusa Algamas. Sasmoyo P Boesari, Director of PT. Indonusa Algamas said that before the company was processing seaweed chips, for 15 years they were involved in seaweed farming. Currently, he said, farming has been handed over to subsidiary companies and seed farmers in NTT's and NTB's seaweed clusters. The company falls into a cluster in East Nusa Tenggara and is now exporting 10 containers per month. The Company Director said that 100% of semi-refined products were exported to various continents and current capacity is of up to 2000 tons per month, while production capacity is up to 1200 tons per month. Seaweed raw materials, according to the Director of PT, originate from seaweed farming groups in NTT and NTB that can produce 3 tons of seaweed per hectare (Rison, 2009).

In addition, to the development of national capacity, the biggest seaweed processor and exporter in the Philippines will spend as much as P1.5 billion to bankroll a partial relocation of its operations to Indonesia as well as to Zamboanga and Carmen, Cebu (Philippines). Shemberg Marketing Corp. will partially relocate its Mandaue plant, as Indonesia will ban the export of their raw material, cottonii seaweed, starting 2012. Noting the gradual decline in its Philippine production, Company President Benson Dakay said the move to Indonesia is part of the company's efforts "to be where the source is." Dakay said the company would relocate its kappa gel — a by-product of seaweed processing press plant to Makassar, Indonesia, a place rich in cottonii seaweed (GMA News, 2011).

One of the main sources of comparative advantage in the seaweed processing industry is to be close to the source of the raw material. The PES process does not have significant economies of scale and closeness to the source of raw material provides a cost saving opportunity. As only 20-35% of raw eucheuma composition reaches the final product stage, shortening the travel distance at least in the initial processing stages can reduce transport cost of voluminous raw material. In addition, being close to the source offers an advantage in being able to exercise and more rigorous and direct quality control over production, as well as to plan inventory better.

The current national policy for the development of the seaweed sector in Indonesia is providing he right policy environment for the stimulation of both production and processing. Value-adding opportunities contained in the processing industry are to be explored further by the encouragement of private sector development and the reduction of value losses due to the export of raw material. Indonesia is strategically stimulating both the vertical expansion of successful producers as well as the relocation of international processors to the country.

QUALITY STANDARDS AND CERTIFICATION

Seaweed is a 'specialty' crop, which means that its production is limited (in terms of geographical coverage) and it is graded and priced on the basis of quality. In many cases seaweed value chains go into markets where the blend of several base products for the food or pharmaceutical industry is subject to extensive international regulations and controls.

Dried seaweed produced often does not meet the standards and the lack of quality control mechanisms at local level in Indonesia exacerbates the problem of low quality of the production. However with the push for vertical integration of production and the industry and the increasing proximity of production and processing, quality controls and standards will improve.

In terms of certification, there is an international FAO led process for the development of international certification standards for aquaculture.

IMPACT POTENTIAL

PRODUCERS AND PROCESSORS

The market can often be described as oligopsony[5] with farmers at village level selling dry seaweed directly to a few buyers (collectors or middlemen). These buyers/collectors then sell to large traders who either sell to exporters or export directly to overseas buyers in the USA, Singapore or Denmark.

At farm level the raw material is almost substitutable and the price reflects only quality of the product and most importantly the confidence and trust. At village level collectors/buyers are often independent and not direct representatives of larger companies. At this level the collectors/buyers are interested in established a good trading relationship with farmers. They would often provide loans to secure a more long-term relationship especially with trustworthy farmers who produce quality product. The structure of these relationships is based on trust with the biggest challenges being to guarantee the regularity and quality of the supply. While production companies are planning to increase capacity they are foremost reliant on identifying reliable suppliers of raw material.

The current market chain emphasizes export of raw seaweed (Figure 17). It is primarily based on a network of producers, collectors and traders with majority of the seaweed being exported prior to value-adding transformation. However, the new government policy for the development to the sub-sector is aiming to create the conditions for value to be adding close to Indonesian sources. It is encouraging private sector to develop the necessary technical capacity to create solutions and end products to satisfy both domestic and overseas market needs.

Such transformation of the value chain would open-up value adding opportunities both at producers and processors levels depending on the availability of investment capital, know-how and market linkages which can develop between primary processors and solution providers further up the chain. The strive for national processing and value adding is however, highly dependent on the new linkages to be forged between exporters and external markets, who will need to be ready to start trading in building blocks and solutions rather than commodities.

[5] Oligopsony is a market characterized by a small number of large buyers controlling the buying-side of a market. Oligopsony is the buying-side equivalent of a selling-side oligopoly. Much as an oligopoly is a market dominated by a few large sellers, oligopsony is a market dominated by a few large buyers. While oligopsony could be analysed for any type of market it tends to be most relevant for factor markets in which a handful of firms control the buying of a factor. Two related buying side market structures are monopsony (equivalent of a selling-side monopoly) and monopsonistic competition.

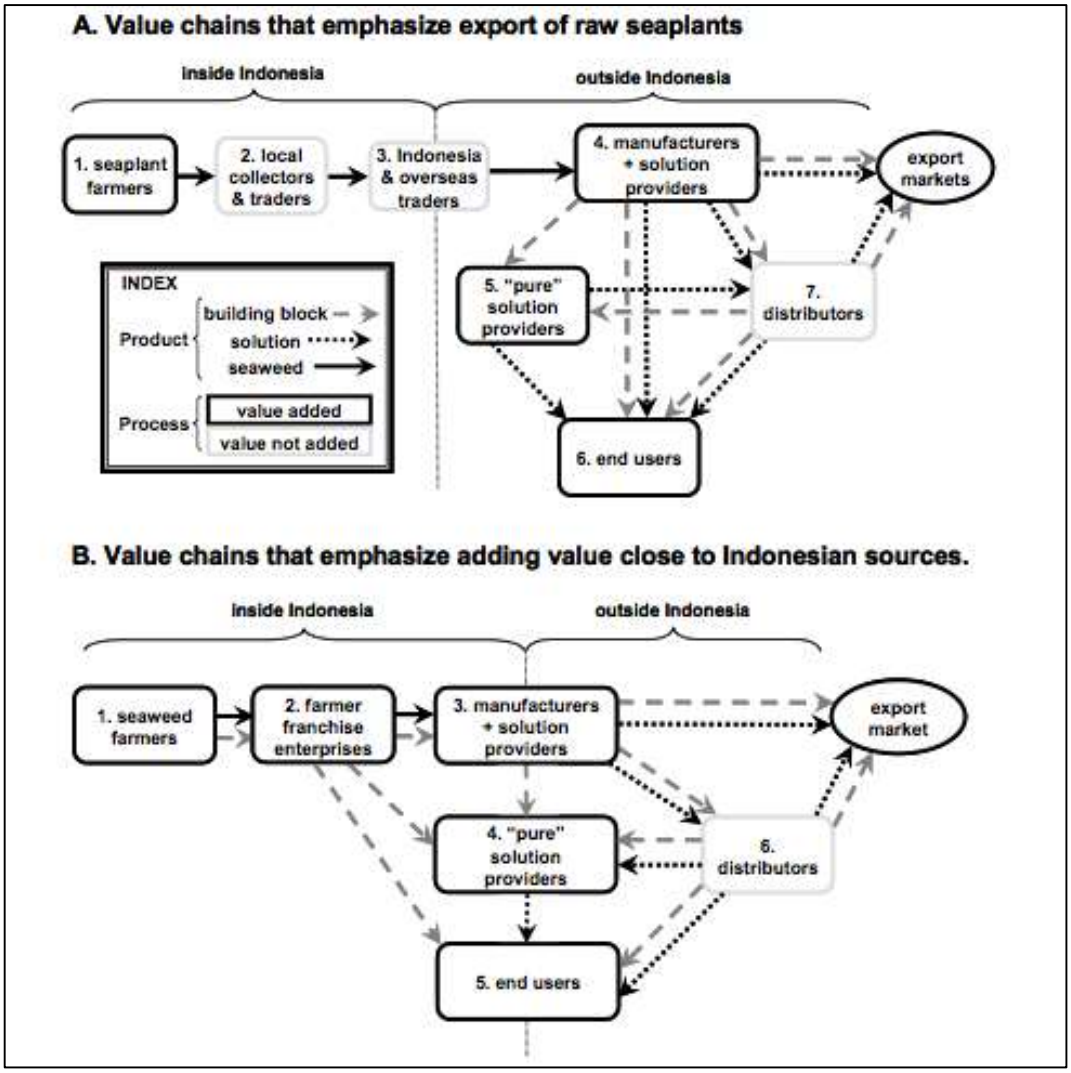


Figure 17: Value chain emphasis

The Indonesian seaweed industry follows a simple structure where processors buy their raw material directly or through third parties. Much of the procurement is geographically dispersed and costly, and it involves the risk of price fluctuation between large volume purchases. This structure, the concentration of processing and export centres near larger ports, as well as the relatively complex nature of the transformation process of the raw material is reflected in the price changes along the chain (Figure 15). Thus, in comparison with the high prices of the hydrocolloids traded in the international market, producers of the raw material receive a low price. In addition, production price fluctuates during the year decreasing by 10% during peak season and increasing by 20% in the low season; the average price is dependent on the demand and fluctuates accordingly.

At farm level traders have a strong influence on price. Market participants (farmers, traders/middlemen, wholesalers, warehouses and processing companies) often have social or economic ties due to debt, kinship or friendship often allowing for monopolization of the market and a dominant force being exerted on the producers (Zamroni and Yamao, 2011).

There are alternatives that have been suggested, which aim to improve production efficiencies, allow for famers to capture additional value by introducing farm level processing and finally change in power relations along the chain involving the review of organizational design, chain governance and power relationships (FAO and World Bank, 2007).

Improvements in farmer operational efficiency may include: production process improvement; logistics process improvements and market institutional improvements. Farmers could benefit from transfer of knowhow from the Philippines and Chile on how to breed, transfer and multiply high yielding species. This is also linked to the need for development of genetic material and a regulatory framework for its certification that can improve quality of farm outputs both in term of volumes and price. Therefore while producers can improve their processes and in order to improve efficiency and quality, it is the Government and larger private sector who have to support the provision of the quality seedling and the legal and regulatory framework to certify the production and increase its value.

In addition to improvements of the primary product, there are technologies for the production of Alkali Treated Cottonii (ATC) and Semi-Refined Carrageenan (SRC) near the production site, which would allow farmers to benefit from value-adding and open the possibility for joint ventures between producers and processors introducing vertical integration of the chain.

Further to this, in the case of Gracilaria, producers can further develop the potential held by poly-culture where milkfish and prawn are grown in the same ponds and diversifying farmer's livelihoods. Such changes will influence the market chain by promoting horizontal integration.

Besides, productivity, processing or diversification of products, some improvements can also be made in relation to transport costs. Currently, the cost of shipping can be as high as 10% of the value of the product, which can be reduced with specialized packaging and containers and be supported by better logistic management.

Currently the Government of Indonesia has put the emphasis for sub-sector development on the ability of producers to increase outputs and processors to improve and expand their processing capacity and skills in order to reduce the exports of raw material and lose out on the potential added value. The extent to which production and processing targets are met will depend on the availability of finance for the development of private businesses at all levels, the consolidation of their relations, improvement of logistics and finally the ability to retain its current export markets after the introduction of national level processing and rise in export value.

MARKET DEMAND

The global demand for seaweed is increasing. The world`s demand for Carrageenan in 2006 reached 40,000 metric tons a year worth US$335 million, while Alginate 12,000 metric tons a year worth US$94 million and Gelatine 10,000 metric tons a year worth US$181 million (Government of Indonesia, 2012).

This increase in market demand is reflected in the production targets set by the Maritime Affairs and Fisheries Ministry. Indonesia is targeting to produce up to 3.5 million tons of seaweed in 2011 and to boost its exports by 58%, expecting to earn revenues of US$190 million following earnings of $138 million from exporting 114,000 tons of seaweeds in 2010.

China alone now has 600 factories processing seaweed that are highly dependent on imports from Indonesia, in 2010 Indonesia supplied 85% of China's seaweed raw material. In addition to the Asian markets, the production of Latin America (Chile) has decreased due to the impacts of La Nina opening new opportunities for Indonesian seaweed exporters. (AseanAffairs, 2012)

In addition to exports there is also expectation by Government that the domestic consumption and demand for seaweed derivatives will also grow. The Government projections are that by 2014 domestically processed Carrageenan would increase to 15% or around 4,000 tons while exports to reach around 22,000 tons. At the same time, expectations are that the absorption of domestically processed gelatine would be 85% or around 4,250 tons and exports around 750 tons (Government of Indonesia, 2012).

With regard to carrageenan product, Indonesia had controlled around 13% of the world`s market in 2007 and 13.7% in 2008, 14% in 2009 and predictably 15% in 2010, according to Martani Huseini, the marine affairs and fisheries ministry's director general of fishery product processing and marketing in Gorontalo, Sulawesi, last April (Government of Indonesia, 2012).

POTENTIAL PITFALLS

There are a number of factors that influence long-term success of the development of the seaweed sub-sector. Some of these include lack of mitigation strategies for potential external risks such as those posed by price and market changes and sector vulnerability. Others pertain to national level planning and policy goals that may not accurately account for local realities and constraints such as shortage of quality and affordable seeds, long-term financing and infrastructure and logistics needs of the business. Other constraints include the technical aspects of production and processing, management and increased understanding the aquatic environment and climate change (changing monsoon season), or social issues – such as land tenure in marine/coastal areas. Some of the potential pitfalls identified in the reviewed literature are briefly examined below.

The long-term success of seaweed farming is directly linked to the fluctuation of market prices. Therefore successes in introduction of the activity can be quickly compromised if prices drop. This has occurred on several occasions over the last couple of decades in the Philippines, Tonga, the Solomon Island and Samoa where production collapsed with the collapse of prices (Crawford, 2002).

Much of the expectations around production expansion for seaweed production are based on the belief that fishers will willingly diversify their sources of income and daily activities or all together dedicate their time to seaweed farming. However research has shown that many fishers will not leave their fishing for an alternative occupation, citing income as the reason. Many rely on the stability of fishery income due to stable prices and more regular production throughout the year. There is significant variability of incomes among fishers in Indonesia as well as variability relative to other sectors. Research has also demonstrated that the difficulties and delays in development of coastal communities is linked to isolation not the percentage of fishers living there. This also suggests that fishers are not always the poorest of the poor and therefore a potential reason for unwillingness to leave the fishery (Crawford, 2002).

In a situation opposite from the one described above, where job satisfaction among fishers prevents seaweed farming to become the dominant activity, there are cases where seaweed farming can lead to a major but temporary occupational shift from fishing to seaweed farming. In these cases seaweed farming may have been seen as a way of taking the pressure off fisheries, but it may produce a 'honey-pot' effect attracting new residents to the area. Yet space for seaweed farming is limited and eventually residents will seek alternative means of livelihood and are therefore likely to (re)enter the fishery, which likely to lead to an increase in fishing effort over the long term since the fishery remains open access (Crawford, 2002).

In addition, farmers' outlook can be short-term and go against long-term environmental interests and tend to keep intensifying production for as long as they can harvest the results. This may lead to negative environmental impacts such as mangrove depletion, reduction in water quality and eventual reduction of the quality of the seaweed.

A potential pitfall for the seaweed production and processing sectors is the tendency for over ambitions production plans. Seaweed farming success is dependent on seasonal changes. The two seasons that are not conducive to production are the rainy season when saline levels drop and water quality declines, and the end of the dry season when water temperature and salinity increase. Therefore farmers who plant all year round are likely to experience crop failures during the unfavourable seasons, while farmers who plant only during favourable periods will have to purchase seed stock which is expensive. If farmer can hold off production during the risky seasons and have access to capital to purchase seed, they can reduce crop losses from 30% to 10% (Neish, 2007b).

CURRENT DONOR ACTIVITIES

Technical Assistance [Ta] To Small And Medium Enterprise [Sme] Clusters - The Canada Indonesia Private Sector Enterprise Development [CIPSED] Project (2012) is delivering specialized technical assistance to SME Clusters in subject areas such as business planning; product design; production systems; manufacturing/harvesting; product quality; market analysis; marketing strategies; logistics; business administration; financial management; sales and market development; exporting; technology and human resource management, etc. Each SME cluster CIPSED works with is also receiving technical assistance pertaining to gender equality and environmental protection. The CIPSED Project in cooperation with its Indonesian partners is currently working with South and East Sulawesi Seaweed SME clusters.

"**Promoting Economic Cooperation in BIMP-EAGA**" (2005-2011) was funded by the Federal Ministry for Economic Cooperation and Development and commissioned for implementation to the German Technical Cooperation (GTZ). It aims to extend cross-border cooperation in the sub-region in order to contribute to employment generation, poverty reduction and the prevention of social conflicts in the sub-region. The Project concentrates predominantly on three interventions areas:

- To strengthen public sector institutions, notably the BIMP-EAGA Facilitation Center (FC) to transform into a joint Secretariat capable of carrying out coordination and promotion tasks effectively and efficiently;
- To facilitate the dialogues at different levels among public and private sector stakeholders, including regional development partners like ASEAN and ADB with the goal to create new strategic options for a more accelerated and extensive development of BIMP-EAGA;
- To support sub-regional cooperation in cross-border value chains through the Value-links Approach, specifically in tourism, seaweeds, palm oil and halal products.

(Richter, 2009)

EAST ASEAN INITIATIVE: BUSINESS DEVELOPMENT SERVICES PILOT PROJECT, supported by the Australian Agency for International Development ("AusAID") - Seaplant.net now links seaweed buyers to farmer groups in the Philippines and Indonesia. Farmer linkages are being facilitated not only through the Seaplant.net JaSuDa™ facility but also through two business development service companies formed by Seaplant.net in collaboration with INI RADEF (The South East Asia Seaplant Network, 2012).

Local and central government have launched projects such as Small-Scale Natural Resource Mangement (SNRM), Economics of coastal Community Empowerment Project (PEMP), IFC's – Program for Eastern Indonesia Small-Medium Enterprise Assistance (PENSA) and Coral Reef Rehabilitation and Management Program (COREMAP) that included training on seaweed processing.

ANNEX 1: SEAWEED PRODUCTS

Processed Eucheuma Seaweed

Processed Eucheuma Seaweed (PES), also known in some countries as seaweed flour, Philippine Natural Grade, or semi-refined carrageenan, is obtained by the treatment of two varieties of red seaweeds belonging to the class of Rhodophyceae (Eucheuma cottonii, Eucheuma spinosum).

The production is primarily located in the Philippines.

Processing of PES consists of an alcali treatment, washing to remove residual salts, followed by purification, drying and milling to a powder. Alcohols may also be used during the purification process.

PES contains a polysaccharide sulfate ester (carrageenan), and 8 to 15% insoluble matters. It is distinguished from carrageenan by its higher content of these insoluble matters and by virtue of the fact that it is not dissolved and precipitated during processing.

PES is now permitted as a food additive, in all countries under INS 407a (E 407a in the E.U.) The joint FAO / WHO Expert Committee on Food Additives allocated to PES a non specified Acceptable Daily Intake (ADI).

In North America, since 1990, the PES has been approved and labelled as carrageenan.

For many years PES has been used in the petfood industry. Now that PES has global approval, it is also used to provide functionality in food applications. Due to the high content of cellulosic matter its applications are those which do not require gel clarity or transparency. PES is predominately used in processed meat products and in some dairy applications.

MARINALG INTERNATIONAL
Avenue Brugmann 12A, Box 12 - 1060 Brussels, BELGIUM
Tel : +32 (0) 2 538 38 25 - Fax : +32 (0) 2 538 38 26. E-MAIL Marinalg

Agar

Discovered in the 17th century in Japan and consumed for 200 years, agars are polysaccahrides consisting of galactose and anhydrogalactose units, partly esterified with sulfate groups (less than 5%).
Agar is extracted from two main species of marine red algae (Gelidium and Gracilariae) growing along the coasts of Japan, Korea, Spain, Chile, Portugal and Morocco.

The farming of agar is also developing with success in Indonesia and the Caribbean.

Total world production amounts to around 6,000 tonnes per year.

Food grade quality agar is obtained by a step-wise process. After careful washing, the product is dissolved in hot water under pressure at pH slightly below neutral to avoid degradation or in alkaline hot water, filtered under pressure at low concentration, recovered by syneresis after cooling and dried.

The interesting properties of agar are its high gel strength and the complete reversibility and stability of the gelation process (above or below 85Â°C) when dissolved in water.

Consumption of agar for several centuries, coupled with many toxicological studies, has confirmed the safety of the product.

Under the code INS 406 (E406 in the EU), agar is a permitted thickening agent/stabiliser for food, authorised in all countries without limitation of daily intake (self limitation following GMP). It is listed as GRAS by the FDA.

MARINALG INTERNATIONAL
Avenue Brugmann 12A, Box 12 - 1060 Brussels, BELGIUM
Tel : +32 (0) 2 538 38 25 - Fax : +32 (0) 2 538 38 26. E-MAIL Marinalg

Carrageenan

There has been a long tradition of using Irish moss as a food in Ireland where seamen used to gel milk by addition of seaweed. The town of Carragheen was at that time the centre of this activity, hence the name carrageenan.
Today, carrageenan is extracted from a wide variety of red seaweeds belonging to the class of Rhodophyceae (e.g. Gigartina, Chondrus, Eucheuma, Furcellaria) growing off the coasts of countries all around the world, e.g. the Philippines, Indonesia, Canada, Denmark, Chile, Spain, Japan, and France.

Food grade quality carrageenan is obtained by a multi-step process avoiding any degradation. After careful washing, the seaweed is dissolved in warm alkaline water and filtered.

The product is then recovered by precipitation with isopropyl alcohol and dried at low temperature. An alternative recovery process consists of dewatering a salt gelled solution by pressing or freeze-thawing.

Carrageenan is a high molecular weight polysaccharide consisting of galactose sulfate and anhydrogalactose sulfate units. Total production amounts to 30, 000 tonnes per year, almost all of which is devoted to the food industry.

There are three types of carrageenan, identified by the number and distribution of sulfate groups on the macromolecule which confer to the gel a large variety of properties in term of solubility and texture.

Carrageenan is a permitted food additive in all countries under INS 407 (E407 in the EU).

Several toxicological reviews by expert committees have confirmed its safety and the Joint FAO/WHO Expert Committee on Food Additives has allocated a non specified Acceptable Daily Intake (ADI).

The thickening and gelling properties of carrageenan are strongly depending on the medium (temperature, pH, and the presence of calcium and potassium ions and proteins.)

Alginates

Cited as algin in some literature, the alginates cover a wide range of products, from the alginic acid to its salts (sodium, potassium, ammonium, magnesium and calcium alginates) and esters (propylene glycol alginate).

Since the discovery of alginates by Edward Stanford in 1883, commercial production which started in 1927 has now expanded to some 40,000 tonnes per year, world-wide. 30% of this tonnage is devoted to the food industry, the rest being used in industrial, pharmaceutical and dental applications. Alginate production is situated in California, the British Isles, Norway, France, Chile, Japan and China.

Alginates are extracted from various species of brown seaweeds (Phaecohyceae) by a multi-step process. A typical extraction process involves first washing and treating seaweed with diluted sulfuric acid (quantitively transforming calcium alginate into alginic acid), extraction by dissolution with alkali, separation of insolubles, then precipitation as the calcium salt, followed by acid washing to recover alginic acid. The salts and esters of alginic acids are obtained by neutralisation and esterification, respectively.

Alginates are polysaccharides consisting of mannuronic and guluronic acid units.

Many toxicological and metabolic studies in both animals and humans have proved their safety as food additives. Food grade quality alginates comply with relevant international and national purity specifications.

Alginic acid, its sodium, potassium, ammonium and calcium salts, and propylene glycol alginate have been given INS numbers of 400 to 405 (E400 to E405 in the EU)

To meet the varied needs of customers a range of product grades are available with differing viscosities, gelling properties and particle sizes.

3) MANGO SUB-SECTOR

THE MACRO ENVIRONMENT FOR THE SECTOR

Mangoes are an important fruit crop in the world market and account for over half of the world's tropical fruit production. Having its origins in South Asia, the mango is one of the oldest cultivated fruits within the tropical regions of the world, having spread through South East Asia in the 4th to 5th centuries and to East Africa in the 10th century with traders (De La Cruz Medina and García, 2002). Today the major centres of production remain in South Asia and South East Asia, with lesser but significant centres in South and Central America and Africa.

Mango species, varieties and cultivars are numerous and diverse. Sixty-nine species of mangoes have been described with estimates suggesting there are over 350 varieties of mangoes in cultivation worldwide with the largest pool of genetics located in South Asia and South East Asia (De La Cruz Medina and García, 2002). Many of the largest producers such as India, Thailand, Philippines and Indonesia have specific varieties that are only grown in those countries and exist as a traditional domestically consumed fruit often not suitable for the international market due to colour, size or taste.

In 2009 world production (mango, mangosteens and guava) was estimated at over 35.6 million tonnes, with India the largest producer at over 13.56 million tonnes (FAOSTAT, 2011). India is also the largest exporter of mangoes yet the exported amount represents only 2.1% of production. World trade in mangoes is limited compared to the actual amounts of fruit produced with less than 4% being traded worldwide. The majority of the lead producers predominantly serve their own domestic markets. An exception is Mexico which is the sixth largest producer but is the second largest exporter of mangoes exporting over 15% of its production predominantly to the United States (FAOSTAT, 2011). Table 14 shows the top five producers, exporters and importers of mangoes, mangosteens and guava. Data is not available for mangoes specifically but it represents the majority component of the FAO statistical data for this fruit cluster.

Table 14: Production, export and import statistics for the top 5 countries in category in 2009

2009	Country	Qty (tonnes)
Production	India	13,557,100
	China	4,140,290
	Thailand	2,469,810
	Indonesia	2,243,440
	Pakistan	1,728,000
Export	India	286,775
	Mexico	232,643
	Thailand	144,079
	Brazil	110,355
	Netherlands*	81,932
Import	USA	287,402
	EU	198,901
	Netherlands	113,894
	UAE	49,040
	UK	48,120

Source: FAOSTAT, 2011

* Netherlands re-exports a significant amount of fruit to other European countries.

POLITICAL

The Indonesian government has clearly highlighted the importance of agriculture to the economy. In the horticultural sector and the mango sector in particular, targets were set to increase the national productivity. Based estimates of poor mango productivity through the 1990's the Directorate General of Horticulture issued a target of 10.6 tonnes per hectare through a program focused on intensification and mango tree replacement (Natawidjaja et al, 2007).

Recently the Minister for Agriculture, Dr. Ir. Suswono stated that Indonesia still has far to go to improve the competitiveness and level of availability and post harvest management of horticultural products. Cooperation has been sought from Japan in relation to the establishment of a vapour heat treatment (VHT) laboratory facility in order to comply with Japanese fruit importation regulations and to target value-added, competitiveness and increase exports of horticultural products (Hort Chain Centre 2011). Facilities focussing on research into horticultural products have been a key component of the horticulture policy environment in Indonesia since the 1990's.

The establishment of the Centre for Tropical Fruit Studies (CETROFS), a research centre under the Institute of Research and Community Empowerment - Bogor Agricultural University, is an indication that the government of Indonesia is investing in improving the competitiveness, productivity, quality, and continuity of its tropical fruits through new varieties development, technology improvement and marketing networks.

In 2010 a bill was introduced to the Indonesian House of Representatives pertaining to horticultural products (Slette and Rahayu, 2010). In summary this legislation is intended to have an impact in the following areas:

- imported products regulated according to food safety; availability of domestic products; government production and consumption target; standards and quarantine requirements
- mandating supermarkets to sell domestic production, does not restrict selling imported production though
- measures to increase production, value and market share for domestically produced products; develop further employment opportunities in the sector
- introduction of regulation of the production, distribution and marketing of horticultural products, including fruit production.

ECONOMIC

Economically mangoes are one of the more important tropical fruits produced and consumed worldwide. Tropical fruits are significant to the food security situation in many developing nations by providing critical nutrition and seasonal income to the vast majority of rural poor. The importance of mangoes to the domestic markets of developing countries in particular is clearly highlighted by export and domestic consumption figures. It is estimated that world production in 2009 of mango, mangosteens and guava[6] was estimated at over 35.6 million tonnes and world export of the same was estimated at 1.26 million tonnes, which however represents only 3.5% of production (FAOSTAT, 2011).

Indonesia should be a large exporter of mangoes due a number of natural advantages:

- Currently a low price domestic market
- A large production base. Indonesia is the fourth largest producer of mangoes.
- Close proximity to the major mango markets in East Asia
- The majority of the harvesting of mangoes occurs out of season to the major mango producers in the Northern hemisphere such as India, Thailand and the Philippines (see Table 15.)

6 FAO statistics do not separate these three commodities. Mango though represents the vast majority of these figures in terms of volume.

Table 15: Mango harvest calendar for select producer countries

Country	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
India												
Thailand												
Indonesia[7]												
Pakistan												
Mexico												
Brazil												
Philippines												

Source: Adapted from PHDEB, 2005

Indonesia is a significant contributor to world production with the country producing over 2,243,440 tonnes of mangoes in 2009. Significantly the 2010 harvest was severely reduced to only 1,287,287 tonnes, mostly likely due to the exceptional rainfall during the flowering period which reduced the fruit bearing potential of many trees (Badan Pusat Statistik, 2011). Each one of Indonesia's provinces grow mangoes to some degree however it is the regions of Java and Nusa Tenggara which account for the most production. Table 16 clearly highlights the high proportion of mangoes produced by only a few regions in Indonesia. In 2009 the island of Java accounted for over 67% of production, with East Java in particular producing the greatest share. The other regions of Nusa Tenggara Barat (NTB) and Nusa Tenggara Timur (NTT), included in this review produced over 11% of total Indonesian production.

Table 16: Mango production Indonesia, showing the major producing regions in 2009

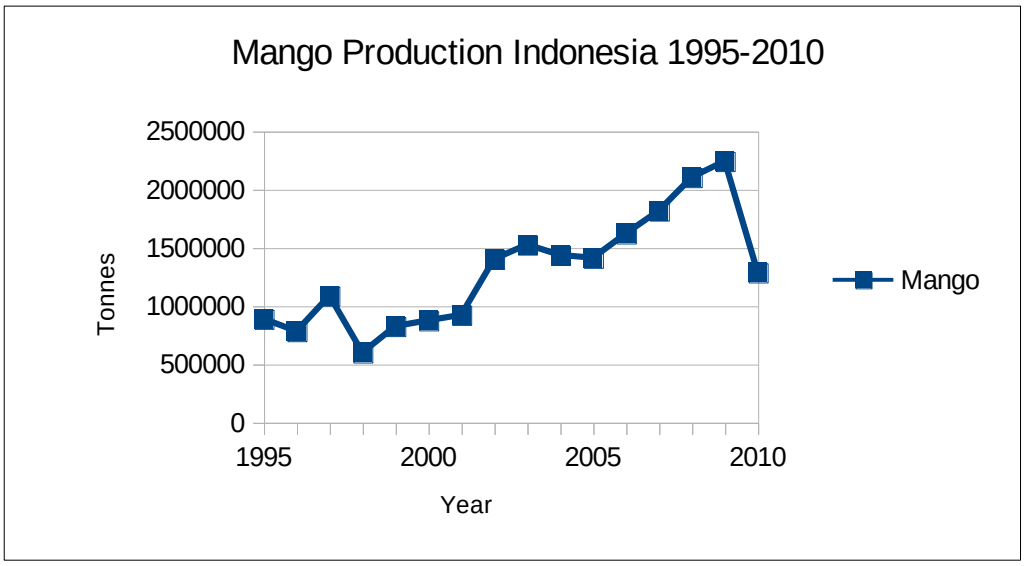
Province	Mango (tonnes)	% production
West Java	398,159	17.74%
Central Java	423,752	18.88%
East Java	**694,314**	**30.94%**
Nusa Tenggara Barat (NTB)	**99,360**	**4.43%**
Nusa Tenggara Timur (NTT)	**155,999**	**6.95%**
South Sulawesi	147,423	6.57%
The Rest	324,433	14.46%
Total	**2,243,440**	

Source: Badan Pusat Statistik 2011

Indonesia has many natural advantages in terms its export potential as described above, yet most of the mangoes produced in Indonesia are consumed domestically. Indonesia's small export market, which in 2009 was only 1,415 tonnes, representing less than 0.06% of production, is testament to the domestically focused trade in this commodity (Badan Pusat Statistik 2011).

Demand in the mango sector has been growing in line with production. Figure 18 shows the rapid increase in the production of mangoes in Indonesia between 1995 and 2010. Mango production increased by over 252% between 1995 and 2009. There was a marked decrease in production in 2010 due presumably to adverse and unseasonal weather conditions at critical stages in flower and fruit development. In 2010 coffee, cocoa and sugarcane yielded significantly lower due to the La Nina weather pattern producing excessive rain across much of Australia and Indonesia (Business Monitor International 2011).

7 Indonesia has a strong seasonal component to its mango sector. In Java the peak season is between July and September while in the eastern island of the archipelago the season is concentrated between October and January.



Source: Badan Pusat Statistik 2011

Figure 18: Mango production in Indonesia 1995 – 2010

The inclusion of 2010 data in this figure is a clear indication that mangoes, like all other commodities are subject to adverse weather conditions at key stages in fruit development. The seasonal nature of current mango production in Indonesia means that most fruit are coming into production and into the market at the same time which renders the market vulnerable to "shocks" and to seasonal price differences.

The vast majority of mango production in Indonesia is by small holder farmers often with only a few trees close to the house. Many farmers produce mangoes opportunistically rather than as a commitment as a main crop, preferring to source income off-farm or through a combination of other crops such as rice or vegetables (Baker 2008). Returns to farmers from the production of mangoes are dictated by the seasonal nature of the crop and the excessive supply in the market. Prices in-season can vary depending on the supply. Reported prices in 2008 ranged from 800 Rupiah/Kg (~0.07 $US/kg) at the farm gate to 1500 Rupiah/Kg (~0.13 $US/kg) in the wet market[8] (Baker, 2008).

Typically the trade in mangoes in Indonesia operates through a simple market chain. Figure 19 outlines the marketing channels common through Indonesia. In this system, most farmers play a passive role in the marketing by engaging collectors and buyers to harvest the crop and market the produce through wholesalers. This has the impact of rendering the farmers to a "price taking" role.

Figure 19: Simple marketing change common to Indonesia

The traditional marketing of mangoes in the domestic market is characterised by the "tebasan" system, which is a harvesting practice in which fruit is sold prior to harvest where the farmers receive 50% of the total sale price when the "tebasan" contract is agreed upon (Herlambang, Batt and McGregor, 2005). This is usually a verbal agreement and the final 50% payment is made upon actual harvest. The trading decision is in the hands of the collectors and traders and an accurate measure of volume of production is limited at the time of harvest which places the farmer in a position of

8 Exchange rate 1 USD = ~11,000 IDR as of 31st December 2008

limited influence and information about the market. In turn the price taking role of the farmers presents little incentive or motivation to invest their limited returns into production technologies to enhance the quality and productivity of their mostly small orchards.

In East Java, the collectors are usually seasonal operators with a high degree of flexibility in their ability to enter and exit the industry. Flexibility in terms of the seasonality of the harvest can discourage major investment by the collector and buyers in the marketing chain. In turn wholesalers are generally of a small size to discourage the investment required in post harvest management of the crop (Herlambang, Batt and McGregor, 2005). In the Manalagi mango supply chain centred on the Probolinggo Regency, East Java, collectors either operate independently or as broker agents. The brokers often finance the collector agents, without interest or collateral and are obligated to deliver fruit within 1 – 2 days (Herlambang, Batt and McGregor, 2005). This credit is used to purchase and to supply fruit.

At the other end of the marketing chain is the wholesaler sector. Wholesalers focussed in the Probolinggo Regency work on a commission basis to link buyers to sellers. Wholesalers provide information on prices regarding the larger markets to agents lower in the chain. The resultant information and "power" arrangement that prevails means that wholesalers share less of the price risk and uncertainty in the market while potentially switching the costs of transactions, disposal of unsold produce to the buyers/traders and collectors (Herlambang, Batt and McGregor, 2005). In this particular region the wholesalers are in a position to control the information flows and the distribution channels. The simplistic marketing chain in evidence in East Java in particular, but most likely representative of the Indonesian marketing chain as a whole, has no or limited value added transformation of the product, which creates a thin and fixed value adding within each actor domain.

There are many points within the current marketing system that can cause significant loss and limit the return to each actor in the chain. Many farmers employ limited management to produce their mangoes. This can often result in non-uniform development of trees which makes harvesting difficult. This can also result in significantly differing levels of productivity within the orchard. Collectors harvest by hand or with long bamboo sticks with a net which invariably results in damaged or dropped fruit. Limited management by farmers also adds difficulties to the harvest. Either collectors or their brokers/traders will sort, wash and pack the produce but with limited or no grading for standardisation. Lack of appropriate infrastructure and standardisation of produce can lead to potentially high losses (Herlambang, Batt and McGregor, 2005). Further losses of up to 10% can occur during the transportation to larger centres or Jakarta. At each stage there is significant potential for economic losses which impacts on the margins of each actor along the marketing chain.

SOCIAL

Due to the highly seasonal nature of the mango market in Indonesia, most farmers have alternative income streams to supplement their returns from mangoes. As identified above farmers tend to be price takers in the market and limited capital is invested in improving the productivity or quality of the crop. Mango farming on the whole is not labour intensive due to the system of seasonal collectors that harvest the crop. The options for alternative income streams vary according to location and range from other agriculture related activities or off-farm activities.

The social issues of mangoes in NTT and NTB in particular are closely related to the environmental constraints of these regions (see Environmental section below). For many farmers mangoes and other tree cropping options such as cashews are the only reliable crop that can be produced from a landscape that suffers from an extended dry season, which in the absence of irrigation excludes the production of higher value perishable annual crops (Baker, 2008). Many of the farmers in NTT and NTB in particular are smallholder opportunistic growers. Generally, low prices and small farms require farmers to source income from multiple sources including off-farm employment (Baker, 2008). East Java has more favourable climatic conditions which allow farmers to manage their orchards in combination with other agricultural activities such as rice or vegetable production.

In NTT, the harvesting season also corresponds with the planting season for dryland and paddy rice. This may serve to act in conflict with the attention required for harvesting mangoes as priority is placed on a successful establishment of the seasonal rice crop (Baker, 2008). Herlambang, Batt and McGregor (2005) point out that much of the mango harvesting is conducted by collector agents for brokers and traders. Yet, these collectors are likely to also be local farmers who themselves grow mangoes and act on a seasonal basis as collectors if the market conditions are conducive to this work. Investigations into the complex social networks and interactions within this sector are needed to understand the income flows and constraints to small holder farmers in the context of mango production.

The informal sector of the economy in the NTT, such as the harvesting, processing and selling of products such as oils, foods, drinks, stimulants, fibres for basketry, or textile dyes which are not recognised in the official Indonesian statistics, is an important alternative income source for many households (Cunningham et al 2011). NTT in particular has a longer dry season than East Java, so the options for "official" alternative incomes are lesser.

TECHNOLOGICAL

The mango sector in Indonesia is characterised by the limited use of technologies to improve the quality and consistency of the fruit. According to Baker (2008), at least in NTB there appears to be very little use of technologies common to the mango sectors in more advanced economies such as irrigation, fertiliser management, canopy or tree shaping, pest control or the manipulation of flowering.

The lack of management is a reflection of the low prices farmers receive through the "tebasan" system which may in fact be a feedback system that discourages management. Farm size also plays a significant role in the limited use or uptake of technologies. With limited capital and limited returns from the sale of their fruit harvest, farmers are less inclined to invest in better production or post harvest technologies. The above is a reflection that the majority of mango growers are opportunistic growers that draw incomes from often many other sources rather than relying on mangoes as the main income.

At the collector trader/broker and wholesaler level, the technology in terms of quality control consists of sorting, washing and packing according to a visual assessment of the product. In the Probolinggo Regency, East Java, there is no specific standard for grading and sorting and is mostly based on the experience of the broker to determine what mangoes are included in a consignment to go to larger markets based on colour and the amount of foreign matter, pest and skin damage (Herlambang, Batt and McGregor, 2005). Because of the focus on domestic wet markets there has been little emphasis placed on grading and standards for mangoes in Indonesia. This is also reflected in the varieties available in the market. Within the majority of smallholder farms there are a variety of different mangoes more suited to domestic markets produced across the three regions of East Java, NTT and NTB.

The highly valued and demanded mango variety such as the Arumanis, also commonly referred to as the Harumanis is the mainstay of the mango production sector in Indonesia. It originates from Indonesia and is widely planted in humid parts of the world where many cultivars of better quality fail to fruit. The small, oval to oblong fruits are yellow with large yellow-white dots and a rounded base. The beak is inconspicuous and the skin is thin and tough. The flesh is firm and juicy with little fibre. It is lemon yellow, sweet, slightly insipid with a strong aroma, but with only poor to fair eating quality. The polyembryonic seed is covered in a thick woody shell. The tree is vigorous and tall with a slightly open canopy. It bears towards low yields and biennial bearing. Its resistance to powdery mildew and anthracnose is only low to fair (International Tropical Fruits Network, 2008).

Other popular mango varieties include the Manalagi, Golek, Gedong gunci, Dodol, Madu, Wangi and Cengkir. Manalagi is common in East Java in the Probolinggo Regency. Gedong gunci is a newer variety recently introduced in a number of small plantings in NTB from West Java where it is more numerous. Much of the selection of varieties has been focused towards the domestic market where taste and aroma are high on the selection criteria rather than visual appearance per se. Figure 20 shows four major varieties of mangoes marketed in Indonesia.

Indonesia's mango market is characterised by local varieties that have great demand on a seasonal basis. There is limited use of techniques to extend the season of mangos. The market is not focused towards international trade even though opportunities exist according to the data discussed earlier. The major varieties such as Harumanis while popular domestically are not suitable for the international market due to its maintenance of a green skin when ripe. The international market has specific mango characteristics that are sought in order to satisfy consumer preferences.

Figure 20: Diversity of common mangoes in Indonesia
1. Harumanis 2. Gedong gunci 3. Manalagi 4. Golek

For example the United States (the largest importer of mangoes) and many other large importers of mangoes follow standards defined by the FAO/WHO – Codex alimentarius for the quality control of mangoes in the marketplace. Mangoes are classified in the market within the following classes (Table 17):

Table 17: Standard for mangoes - CODEX STAN 184-1993

Grade designation	Grade requirements	Grade Tolerances
Extra class	Mangoes must be of superior quality, characteristic of the variety and free of defects	5% by number or weight
Class I	Mangoes must be good quality, characteristic of the variety and may have slight defects (shape, suberized stains due to resin and healed bruises)	10% by number or weight
Class II	Grade includes mangoes which do not qualify for inclusion in the higher grades, but satisfy the minimum requirements	10% by number or weight

As discussed earlier the majority of production in East Java, NTT and NTB is with small holders. The quality control issues are dealt with in a rudimentary fashion by collectors and broker/traders and are often a simple check without reference or attention to the CODEX standards.

Also within the CODEX standards there are provisions according to size of the fruit. Size A fruit can be between 200-350 grams, Size B must be between 351-550 grams and Size C is within 551-800 grams. Each of these size standards have a

maximum permissible tolerance as indicated in Table 17. Modern processing of mangoes adhere to the above standards and generally follow a series of post harvest management steps to ensure quality fruit of a specific size and appearance enters the consumer end of the market. Mangoes are a soft skinned fruit that are sensitive to excessive handling. However to achieve a certain standard of appearance and fruit pulp quality there are specific post harvest steps that assist the storage, transportation and final presentation of the fruit.

These include the following: de-sapping; hot water treatment (HWT) or vapour heat treatment (VHT) to control fungal infections and insect problems such as fruit fly; irradiation of fruit to comply with some international markets such as the US; use of appropriate packaging individually and collectively around the fruit during transport; cool storage to minimise the spoilage of fruit during storage and transportation.

Figure 21 shows the standard techniques and processes involved in a modern mango processing facility.

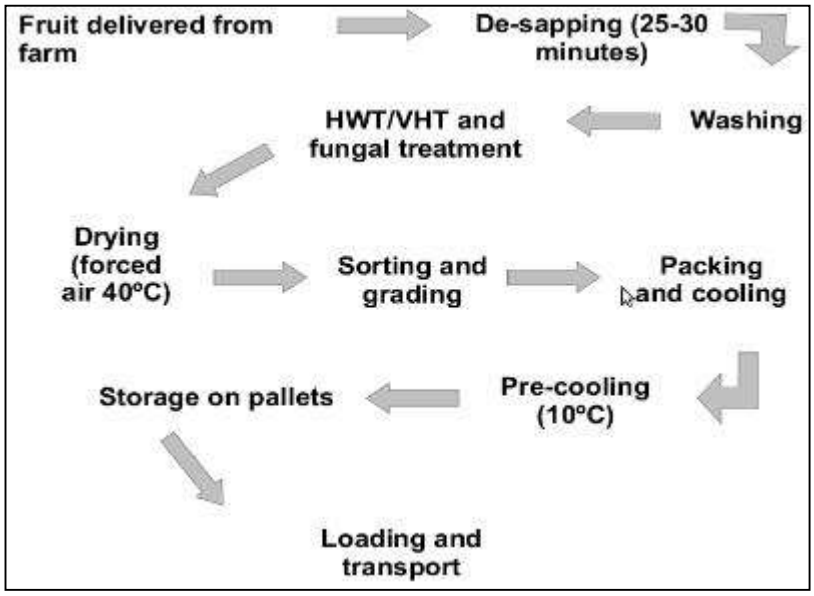


Figure 21: Typical modern flow of processes for post harvest quality control in mangoes

ENVIRONMENTAL

The diversity of geography and weather across the section of the Indonesian archipelago called East Java and Nusa Tenggara is wide. Rainfall tends to be higher in the western provinces of East Java and Nusa Tenggara Baru (NTB), which on average receive up to 2000 mm per year varying according to elevation and over a generally reliable wet season. The Nusa Tenggara Timur (NTT) region is characterised by mountainous areas with dispersed scattered plains. This region is considered to be one of Indonesia's driest with rainfall tending to be concentrated in a wet season of 3 to 4 months.

This landscape is particularly sensitive to environmental degradation due to land clearing for short-term agriculture and for long-term plantation development. Cunningham et al (2011) suggest this particular region is more suited to deep-rooted tree species found in native forests as opposed to annual cropping. Fruit tree species such as mangoes may be a suitable cropping activity given their deep rooted characteristics and their longevity and given the risks associated with climate change and more variable weather patterns, commercially valuable products derived from deep-rooted, longer lived trees may be more suitable. In comparison to other forms of agriculture such as dry land rice cropping and vegetable production, more drought tolerant tree cropping may very well be the only option.

In the NTT region in particular it has been suggested that a more sustainable and economically viable option of market activities may actually point towards less reliance on annual cropping and more reliance of tree crops such as mangoes and the enhancement of non-timber forest products (Cunningham et al, 2011).

LEGAL

Limited information is available on any domestic regulations and legal requirements in the domestic market in Indonesia. There are no domestic standards prescribed by the Indonesian government related to the quality and food safety standards for mangoes. As discussed earlier over 99% of the mangoes produced in Indonesia are consumed domestically, mostly through wet markets with a small but growing trade through supermarkets.

The international standards associated with mangoes while not legally enforceable, are focussed on the exporting mangoes in terms of food safety and quarantine control of fungal infections and pest insects that have potential to disrupt the importing countries own domestic fruit production. If Indonesia is to develop its export sector then national regulations concerning minimum standards for chemical residues may begin to emerge.

SECTOR POTENTIAL FOR DEVELOPMENT

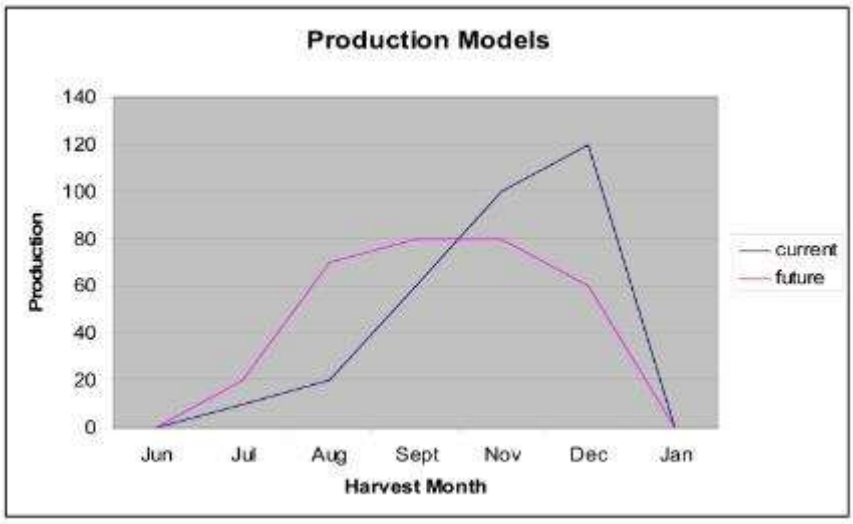
The mango sector has a number of entry points for significant value adding. All parts of the system have potential for improving the return to actors in the supply chain. The following sections will detail the key areas and ways to increase incomes to farmers and provide a more equitable share to actors along the value chain.

PRODUCTION

As discussed earlier the Indonesian mango sector is characterised by many small holder farmers with limited numbers of trees producing traditionally favoured varieties for the domestic market. The mangoes produced in East Java, NTT and NTB are tightly seasonal and often result in a “glut” mango market which reduces prices and subsequent returns to farmers. Internationally major exporters of mangoes utilise techniques to modify the seasonal production of mangoes to spread the harvest across a wider period. Two key aspects for changes to mango production are detailed below.

Initiation of flowering is a technology employed to promote fruiting out of season. This can be achieved a number of ways through either chemical treatment or through cincturing the tree. The proven chemical application is the use of paclobutrazol applied to the soil to encourage early flowering which in turn encourages earlier fruit set. Trials in Lombok have resulted in trees flowering and being harvested up to 2 months earlier than the “normal” season (Baker 2008). Research from the Northern Territory in Australia suggests the use of paclobutrazol increases flowering leading to increased yields; an enhancement of fruit maturity by up to two weeks; and better external colour (Kulkami V, Hamilton D and McMahon G, 2006).

In Indonesia there is the prospect that paclobutrazol can spread the seasonal harvest of mangoes which may result in a benefit to the farmer of higher prices by supplying mangoes to the market out of season. Figure 22 shows a modelled scenario of utilising paclobutrazol to supply mangoes to the market earlier.



Source: Baker 2008

Figure 22: Modelled scenario for current and future mango production utilising paclobutrazol

The use of paclobutrazol is a simple change in management that should fit well into the small holder system. It is applied as a manual soil drench and is not a major variable cost. Baker (2008) suggests that 250cc cost approximately 160,000 Rupiah[9] (USD14.50) with effective application rates of 5-10cc/tree costing 6400 Rupiah (USD0.58). The implications are that from the same trees a farmer can produce fruit for a higher price with the ability to produce out of the traditional season. The effect may be to double the income generated simple through the use of a simple technology to extend the season.

Paclobutrazol, in combination with other techniques and chemicals is widely used in Australia, Thailand and the Philippines to extend the season of mangos and other fruit. Paclobutrazol is a chemical that requires proper health and safety procedures when using. It is harmful if in contact with the skin, inhaled or ingested and proper protective clothing should be worn when applying the chemical to trees (California Environmental Protection Agency, 1993). It is also toxic to aquatic organisms. The use of chemicals by small holder farmers and the potential benefit to be had must be balanced with their limited knowledge of safe application procedures and the risk of environmental problems. Other non chemical measures such as cincturing can also be implemented to extend the harvest season of mangoes.

Cincturing is a narrow, temporary ring-barking of the trunk, which mildly stresses the tree which increases the chances of flowering. Studies by Blakie et al (1999) have shown that cincturing young (3-8 years) mango tree has the effect creating a more intense flowering and a four-fold increase in fruit maturity and a two-fold increase in fruit numbers. Vegetative growth was reduced by between 50-60% compared with untreated trees. Blakie et al (1999) went on to observe that the cinctured trees showed a greater response than the trees treated with paclobutrazol.

Varietal change is necessary if Indonesia is to grow a potentially larger and more lucrative export sector and supermarket sector. Gedong gunci has some strong characteristics that may enable it to be produced out of season or specifically be targeted towards the export and higher value modern supermarket sector.

The Gedong gunci appears to be very suitable to the requirements and climate across East Java, NTT and NTB, with similar characteristics to Arumanis but with the yellow skin colour (see figure 3) when ripe, necessary to develop for international trade. This variety appears to have:

- excellent eating characteristics
- similar resistance to anthracnose when ripe

9 Exchange rate 1 USD = ~11,000 IDR as of 31st December 2008

- yellow when ripe with a very attractive pink blush over a large portion of the fruit
- similar consistent production to Arumanis
- even earlier than Arumanis without the application of paclobutrazol
- fruit size a little smaller than Arumanis

Baker (2008) has stated that sale price in Lombok for the Gedong gunci was approximately 4000 Rupiah/kg (0.36 USD/kg). This variety has significant potential to change the nature of mango production in Indonesia. It represents an access into the higher priced, growing domestic supermarket trade and is probably the best opportunity for mango exports from Indonesia. For this variety to be successful it has to have good agronomic characteristics and perform along the supply chain. This variety or any other introduction would need evaluation by farmers in these regions to ensure it meshes well with the current or any modified supply chain. It is more likely that the domestic supermarket trade would be more suited as the initial focus while the necessary resources are developed for a more significant export market.

It is clear Indonesia will not be able to export Arumanis mangoes, despite its significant advantages in the market, unless it makes a move to a new variety. Existing varieties are not marketable in world mango markets, based on the experience of Jakarta wholesalers. Indonesia needs to embark on a selection program to test varieties that are suitable for the production system and export. The conditions for mango production throughout Indonesia are peculiar in that temperatures at flowering are higher than in most other countries. This will exclude many varieties, as they will fail to flower in the equatorial climate due to a lack of cold to initiate flowering.

The first step in developing a variety will be to prove its agronomic potential, but along side this evaluation there must be support given to ensuring its performance in the supply chain. No variety is perfect; all have problems that have to be managed appropriately. The success of the variety will be determined by the ability of support services to deal with problems as they arise and ensure all in the supply chain perform their roles in managing the variety appropriately.

PROCESSING AND TECHNOLOGY

In Indonesia the majority of smallholder farmers employ limited technologies to produce mangoes. As discussed earlier, the vast majority of mangoes are produced for the domestic local market. Minimal amounts of mangoes are exported to the higher value regional markets. The future development of a high value or export focused mango sector will require the implementation of existing technology to drive product quality and consistency for discerning international consumers. The following technological and production are currently being developed in sporadic fashion in Indonesia:

Vapour heat treatment (VHT): is a technology that serves to combat both fungal infections leading to fruit rot and the incidence of fruit fly larvae. To gain market access to Japan and China in particular, mangoes must be heat treated to control fruit fly. In the case of Kensington mangoes predominant in the North Queensland, Australia market, the VHT uses high humidity air to heat the fruit slowly to a flesh temperature of 47 degrees Celsius (Queensland Government 2009). The fruit must be held at this temperature for 15 minutes to satisfy the quarantine protocols for each country. After heating, the fruit is cooled slowly and then packed into cartons with mesh covering the ventilation spaces to prevent infestation by fruit fly and other quarantine pests. Each variety may have a different response to VHT. Heat protocols have been developed for a wide variety of mangoes including Carabao from the Philippines, Nang Klangwan from Thailand and Kensington from Australia.

Mangoes are susceptible to post harvest disease increases during storage as a result of physiological changes and senescence which favour pathogen development. *Alternaria alternata* and *Botryodiplodia* spp. the causal organisms of black spot disease and stem-end rot, cause high losses and compromise storage life of the fruits (Mansour et al, 2006). Disease control is fundamentally important to the development of an export mango sector in Indonesia. Storage diseases have the capacity to degrade and render a consignment valueless if the fruits are not treated prior to long distance sea or air transport.

Heat treatments such as hot water dipping, vapour heat, hot dry air or combinations of these are increasingly being used as a quarantine treatment to retard post harvest fungal damage to fruits and vegetables. The attraction that it has for export marketing is that the treatment does not involve the use of chemicals. Many countries, such as Japan, China, Korea and Australia require thermal treatment in order to pass strict quarantine regulations in terms of fungal disease and fruit fly management (Hort Chain Centre, 2011). VHT reduces the incidence of fruit fly larvae if present in the fruit to satisfy export regulations. However much can be done to reduce the incidence of fruit flies prior to crop harvest.

Managing fruit flies: The mango fruit fly is a major pest of mango but can be well managed by a combination of pre-harvest and post harvest treatments. Pre-harvest treatments alone ensure a high percentage of control but it can be further subjected to post harvest treatments to satisfy international disinfestation requirements. These strategies are environmentally friendly and residue-free. A study by Verghese, Sreedevi and Nagaraju (2006) suggests that a combination of male annihilation techniques (MAT) using methyl eugenol, sanitation of the orchard by cleaning up dropped or rotting fruit, and a reduced dose of recommended insecticides including botanical treatments was very successful in controlling pre-harvest fruit fly incidence. Research has suggested that the following approach could be adopted by farmers:

- Set up methyl eugenol traps in the orchard @ 10 traps/Ha.
- Trap consist of 1 ml eugenol + 2 ml malathion/l. Males are trapped.
- Racking up of soil below the tree and drenching with chlorpyriphos 20 EC @ 2.5 ml/l
- Collection and destruction of affected fruits
- Spray 2ml malathion + 10 g jaggery/l at ripening stage OR Carabryl 4 g + 10 g jaggery/l at ripening stage

These approaches combined with post harvest VHT would significantly improve the ability to produce fruit to a higher standard.

Development of value added products: such as dried mangoes, juice and pulp is an opportunity to build on the large supply of fruit and to direct otherwise cheap mango fruit into higher value added products.

Ripe mango fruit contains equal amount of sugar, pectin, and carotenoids but due to the short storage life of mango the following products have to be prepared immediately.

A. **Pulp:** Fully ripe mangoes can be washed, peeled and cut into slices. The slices are then homogenized into pulp which is filtered through a sieve to remove the fibres. The pulp is heated to 76-78 degree Celsius and 2 g citric acid and 2 g potassium metabisulphite are added per kg of pulp. It is filled in sterilized glass jars and lids are sealed with wax.
B. **Beverages (Juice and Nectar):** Mango juice may be prepared by mixing 1/3 of fresh or stored pulp with 2/5 of water. Sugar and citric acid are so added that total soluble slides (T.S.S.) and acidity of the product reaches to 15% and 0.3%, respectively. The mixture is heated to 95 degree Celsius, filled hot in clean, sterilized bottles and crown corked. The bottles are sterilized in boiling water for 10-15 minutes, cooled to room temperature and stored. The procedure for nectar preparation is similar to that of juice except that the pulp percentage is reduced to 15%.
C. **Dried Mango sheets:** Homogenized mango pulp is taken and potassium metabisulphite is added to it @ 2 g per kg of pulp. The pulp is then spread on trays smeared without and kept for drying in solar dehydrator or sun. After drying of one layer, another layer is spread over it and kept for drying. The process is repeated as per desired thickness. Finally they are cut into pieces and wrapped in butter paper or polythene cellophane sheet.

MARKETING

Supermarket expansion is increasing in Indonesia. The Indonesian retail sector began its rapid expansion in 1999, when a Presidential Decree allowed Carrefour, a French retailer, to increase its outlet numbers in Jakarta. As other foreign and local retailers followed, the Indonesian retail sector grew and consumers benefited from stronger competition between retailers (Rangkuti and Slette, 2010). Supermarkets are replacing more traditional retail outlets, including wet markets and independent small grocers. Supermarkets demand for product continuity (volume and quality) and price stability will play an important role in the development of off-season mango production as well as expand its market impact. The growing influence of the supermarket sector may become a natural driver of change in the marketing chain in the mango sector.

As described earlier, the marketing of mangoes is predominantly through the "tebasan" system in which the farmer is relegated to a price taker and all the power balance is in favour of the brokers and wholesalers. Mango farmers in the Pemalang Regency for example, have used a traditional, long marketing chain, for either in-season or off-season mango cultivation. In this system, farmers play only a passive role, especially at the marketing level. Although some farmers have employed the technology to produce off-season mango—which made it possible for the mango to be harvested at a time of heavy demand—they continue to use the "tebasan" system in selling their product (Natawidjaja et al, 2007). This system benefits only the buyers, collectors or wholesalers, who have better knowledge of the market. Many farmers realise their weak position, yet they find themselves the price takers in the chain and no other alternative than to accept it. In order to address this, a shorter marketing chain that employs a more transparent margin system may provide a more equitable share of value in the market.

Further to the case study by Natawidjaja et al 2007 in the Central Java region of Indonesia, an alternative marketing system has been shown to provide greater return along the chain and contribute to better quality of fruit. The involvement of the Bimandiri partnership which is a prime example of an alternative marketing system, gave technical assistance and advance funding to farmers. As a dedicated wholesaler to supermarkets, Bimandiri gives farmers direct access to the supermarket sector. Through this system, the farmers are assured a marketing opportunity and the possibility of receiving a higher price than is given by the traditional market. However, in this system, farmers must play an active role in various activities, such as deciding about cultivation techniques, disease control, and post-harvest handling. At harvest time, the farmers do not sell their crop. Instead, they leave the fruit harvest to the care of a farmer cooperative called Aspirasi Bina Usaha.

Bimandiri developed a partnership with mango farmers based on transparent and mutual trust, so that the burden of risk of mango marketing is shared by both the farmers and the partnership as a whole. All parties involved in this system know the margin they earn transparently. Bimandiri received a fee of five percent from the total sale of mangos for the service it renders in assuring supermarket quality, quantity, and all liabilities involved, apart from the service given to the farmers. This service includes the introduction and testing of new mango varieties, provision of agricultural inputs such as soft loans, quality control, accounting, and contract negotiation with buyers. The services of Bimandiri also indirectly affect other mango farmers, as they provide technological information, pricing advice, and marketing opportunities for rural farmers (Natawidjaja et al, 2007).

QUALITY STANDARDS AND CERTIFICATION

Proscribed standards do not exist in the domestic mango market in Indonesia. The fruits are sorted, washed and packed usually at the broker's property by the collectors or the broker. Much of the limited quality control is performed by the collectors and the broker/traders, which consists of a visual inspection and a rudimentary grading according to size of fruit. If Indonesia is to develop an export sector on a larger scale then quality standards and certification for specific markets need to be considered and developed. Most importing countries have strict quarantine controls to ensure quality, food safety and minimisation of pest infestations.

International standards have been developed to proscribe a maximum and minimum standard of fruit quality and handling procedures (CODEX Alimentarius, 2011). CODEX standards cover specific quality control and maximum residue limits to guard against food safety concerns. The following standards are for mangoes:

- CODEX standard for Mangoes: CODEX STAN 184-1993
- CODEX standard for Canned Mangoes: CODEX STAN 159-1987
- CODEX standard for Mango Chutney: CODEX STAN 160-1987
- CODEX standard for Pesticide Residues in Food and Feed – Mango: CODEX STAN FI0345

In terms of exporting to high value markets such as Japan, fruit is required to have been vapour heat treated to ensure fungal infections have been eliminated and fruit fly is not present. Australia and many other countries also have strict quarantine regulations which currently cannot be addressed by the Indonesian mango sector.

Indonesia does not appear to have the capacity to successfully negotiate access protocols nor are officials aware of the issues required to successfully develop access protocols. There are six issues for negotiating quarantine protocols:

1. Having good records of pest incidence.
2. Having the capability to conduct pest surveys by crop to create accurate pest lists.
3. Having a disinfestation research capability.
4. Having an inspection and monitoring capability to supervise protocols which foreign countries can trust.
5. Having insect rearing facilities especially in the case of fruit flies.
6. Having a legislative/regulatory power to enforce protocols.

The creation of these new export market supply chains would assist farmers in a number of ways such as:

1. selling a proportion of their crop at higher prices i.e. an average higher price for the crop
2. making it attractive to develop systems that are useful domestically particularly the growing supermarket sector
3. taking fruit off the domestic market
4. providing a price stimulus to allow the introduction of new production technology
5. attracting new investment.

Hazard Analysis Critical Control Point (HACCP): as Indonesia develops its export market more appropriate attention will need to be given to HACCP as part of an overall food safety strategy. The standards for HACCP were developed through the Food and Agriculture Organisation of the United Nations (FAO, 1997).

GLOBALG.A.P: Future export markets, particularly European markets, may also begin expecting mangos to be produced according to Good Agricultural Practices (GAP). The GLOBALG.A.P standard is primarily designed to reassure consumers about how food is produced on the farm by minimising detrimental environmental impacts of farming operations, reducing the use of chemical inputs and ensuring a responsible approach to worker health and safety as well as animal welfare (GlobalG.A.P, n.d)

IMPACT POTENTIAL

PRODUCERS AND PROCESSORS

The impact potential particularly for farmers with the technical ability to produce off-season mangoes for the burgeoning supermarket and potential export market has great promise. The system of marketing described by Natawidjaja et al (2007) has contributed to increased income, market guarantees for their product, higher prices than from the traditional markets, faster payment, and better access to market information. The impact of a transparent

margin innovation can be placed in terms of five kinds of flow changes in the mango supply chain: physical product, information, knowledge, capital flow and changes to market governance. A change in the mango marketing supply chain can have the following impacts for producers and processors:

1. **Product flow:** a change in the physical flow of mangoes can occur. Mangoes conventionally flow through the traditional marketing chains. Under a new approach by dealing directly through a wholesaler connected to the domestic supermarket trade or export the farmer can benefit from a shorter marketing chain.
2. **Information flow:** under the traditional "tebasan" system information flowed to farmers from collectors and brokers. Limited feedback was provide to farmers regarding price, quality and quantity. Under a shorter marketing chain, information on marketing opportunities such as quality issues is more apparent.
3. **Knowledge flow:** a closer relationship with wholesalers with direct access to large buyers such as Carrefour retail outlets in Indonesia provides for a change in the flow of knowledge about quality requirements. This can allow farmers to quickly respond to changes in the market.
4. **Capital flow:** money can flow differently in a changed system. In the traditional marketing system, money flows from the brokers to the collectors so they are able to provide money to the farmers up front. In a system where there is close collaboration with a wholesaler, the wholesaler can provide funding to allow for innovation in the production of mangoes to adhere to a system that requires higher quality and consistency.
5. **Change of market governance:** an arrangement where there is closer association with wholesalers and a shortening of the marketing chain results in a shift of the governance of the supply chain to a more shared arrangement between farmer groups, wholesalers and retailers.

These changes have been observed by Natawidjaja et al (2007) in terms of the innovative system of marketing of off-season mangoes in the Pemalang Regency, Central Java where farmer associations, wholesalers and large retail organisations collaborated to achieve a change in the traditional marketing chain.

MARKET DEMAND

Indonesian mango production is intended to meet domestic consumption. In 2006 it stood at 60.9% of FAO recommendation, namely 65.75kg per capita per year (Natawidjaja et al, 2007). There remains considerable opportunity to increase mango production, even if only to satisfy domestic consumption, in response to an increase and improvement of distribution in income. Mangoes are in great demand worldwide and the demand continues to grow year on year.

In 2010 over 998 tonnes of mangoes were exported internationally. However this represents a small proportion of the production of mangoes throughout Indonesia, which in 2010 produced over 1,287,287 tonnes. It may reflect the trade in speciality market mangoes for supermarkets internationally, which require a specific quality and appearance more suited to the high value trade. As mentioned earlier the majority of the mangoes grown in the major production areas of Indonesia are the Arumanis variety. This variety stays green upon ripening and is more suited to domestic markets rather than an international export market that demands different characteristics.

Indonesia has lagged behind other regional mango growers such as Philippines and Thailand in terms of developing its export sector. Most of Indonesia's market demand for mangoes is domestically within local markets and inter-provincial trade. Interestingly Indonesia imported a small quantity of mangoes in the 2010 period most likely for the domestic supermarket and higher value out of season demand for mangoes.

Mango imports indicate good prospects for high quality mangos in the domestic market, as well as challenges for developing Indonesia's own mango production. In 2009 the two major exporters of mangoes to Indonesia were Thailand 568 tonnes and Malaysia 167 tonnes out of a total of 821 tonnes. Since the major Indonesian mango harvest period occurs from October to January, imported mangos fulfil a domestic demand gap from February to September. One factor that permits a year-round mango supply is the development of supermarket demand, which relies on a

modern supply chain for fresh agricultural products. When there is a lag in domestic supply, the supermarket procurement system drives an increase in import volume, as supermarkets have good access the international market networks, either directly or through regional hubs.

Supermarket growth in Indonesia has occurred in parallel with urban residential clusters, with their increased demands for comfort and better food service provision. These have become the main drivers of the retail revolution in fresh and processed foods in developing countries (Natawidjaja et al, 2007). In the period of 1997- 2003, supermarket turnover increased faster than that of traditional market (15 versus 5%), while modern retail segment escalated to be 29.6% in 2004, and was expected to become 35% in 2007 (Rangkuti 2004). Most urban consumers (85%) prefer to buy fresh fruit (including mangos) at traditional markets because of their cheaper price. Figure 23 shows the increasing share of modern retail outlets in the food purchasing patterns in Indonesia where modern outlets are were approaching 40% of the retail segment.

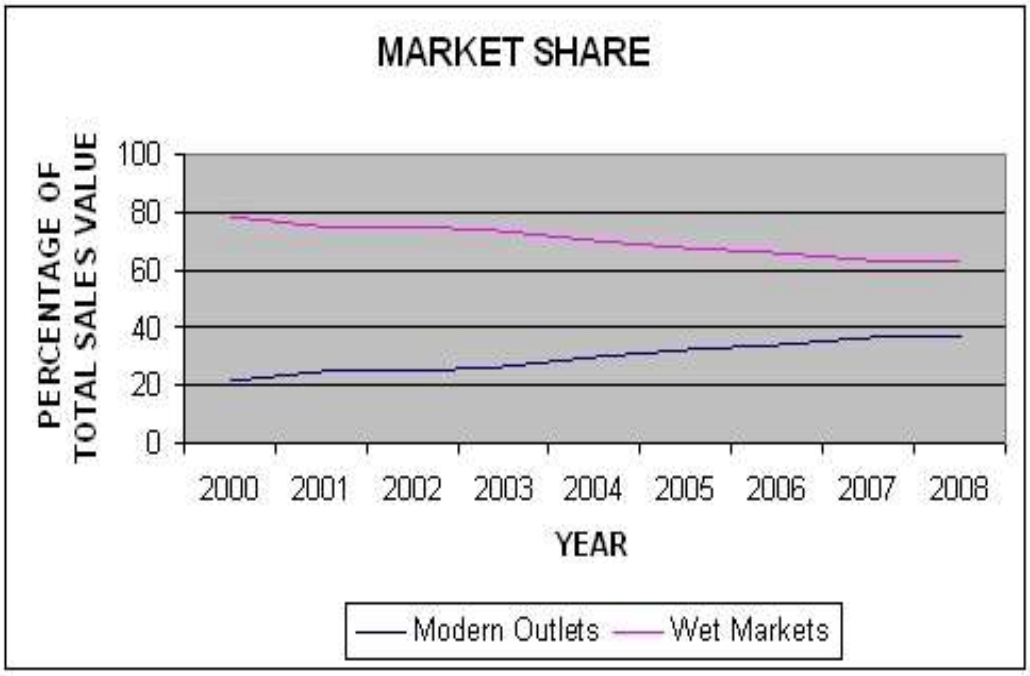


Figure 23: Market share of modern and traditional retail outlets: Indonesia

POTENTIAL PITFALLS

- **Adverse weather conditions**: mangoes are particularly sensitive to adverse weather at flowering and harvesting time. Flowering generally occurs between July and August, which is usually the dry season across the regions of East Java, NTB and NTT. Within the smallholder sectors the harvesting of mangoes is mostly carried out by collectors for wholesalers over the October to January period.
- Limited access or availability of chemical in the market.
- Limited spread of knowledge regarding IPM
- Infrastructure and transport is a major limiting factor across the NTB and NTB string of island. The multiple forms of transport to move mangoes to the high value supermarket or export market from some of the outer island will be challenging.

CURRENT DONOR ACTIVITIES

The **Australian Centre for International Agricultural Research (ACIAR)** has a number of current and recent past projects related to mangoes in Indonesia:

- Project ADP/2005/066 – Markets for high-value commodities in Indonesia: Promoting competitiveness and inclusiveness
- Project HORT/2008/041 – Area-wide management of pest fruit flies in an Indonesian mango production system
- Project HORT/2003/036 – Managing pest fruit flies to enhance quarantine services and upgrade fruit and vegetable production in Indonesia
- Project HORT/2006/146 – Management of fruit quality and pest infestation on mango and mangosteen to meet technical market access requirements

Japan International Cooperation Agency (JICA)

- Implementation of a Vapour Heat Treatment (VHT) laboratory and technical assistance in Jatisari, Karawang, West Java.

MicroAid

Small-scale projects aimed at value adding to mangoes through the production of mango jelly for the domestic market - http://www.microaid.org

4) CASHEW SUB-SECTOR

THE MACRO ENVIRONMENT FOR THE SECTOR

Cashew is an important tree nut traded worldwide. Production of all tree nuts in raw form (Cashew, almond, walnut, pistachio, hazelnut, macadamia, Brazil nut, pecans and pine nuts) at global level accounted for nearly 6.74 million tons in 2008. Cashew accounts for about 32% of all tree nut production followed by almond (26.2%), hazelnut (14.26%), walnut (13.5%), pistachio (8.55%) and pecans (3.7%). Other nuts such as brazil nut, macadamia and pine nut contribute a relatively minor share to the total tree nut production.

Cashew experienced a production growth of 8.9% per annum in the decade leading up to 1996-97 (Nimmo-Bell et al, 2007). Between 1999 and 2007 this slowed to a 6%[10] annual. India is the leading producer, followed by West Africa and Vietnam. Indonesia is ranked as the fifth largest producer. Most cashew growing countries have potential for further growth, with their industries being characterised by small holder production from highly variable plant varieties, with low inputs and minimal management, resulting in generally low and widely fluctuating productivity and quality.

Though India and Vietnam are large producers of cashew nuts, they import a significant quantity of raw cashew nut (RCN) to meet their increased processing capacity. African countries process only 12-14% of their output and export the rest in raw form to India and Vietnam (Foretell Business Solutions, 2008).

The commercial cultivation of cashew in Indonesia is quite recent. The first extensive plantings began in the mid-1970s, with exports of commercial quantities emerging in the 1980s. Initially, cashew was planted in south east Sulawesi as part of a soil-stabilisation and reforestation program. Subsequently other areas in the eastern islands have also planted cashew, and four provinces South East Sulawesi, South Sulawesi, West Nusa Tenggara and East Nusa Tenggara have significant production, while cashew is found in a further five provinces in commercial quantities and several others with minor harvests (Jaegar and Fitzpatrick, 2008).

Indonesia produces 130,000 tons of raw cashew nut (RCN) every year. The Sulawesi and East Nusa Tenggara regions of Indonesia together produce almost 45% of the total and an estimated 450,000 smallholder farmers depend on cashew farming for their regular income (Swisscontact, 2009). The total Indonesian production volume is about 6% of global output out of which 80% goes into the export market and supplies 5% of the world market for in-shell cashews. In the global market, the prices of in-shell cashews are volatile, and as such are always fluctuating, which increases the risk for the Indonesian farmers.

POLITICAL

Jaegar and Fitzpatrick (2008) reports that the approach to government investment in Indonesia varies from province to province. The South East Sulawasi Government actively encourages investment through a one-stop service operated by the Dinas Perkebunan. The law allows for a tax exemption up to five years for investments in cashew (compared to two years in cocoa) and the government is willing to underwrite the capital investment for a period.

The only tax currently levied directly on cashew is the local government tax collected in each Kebupaten by the Dinas Pendapatan Daerah (DISPENDA). This is a district tax that is set locally by each administration and so varies from district to district. The tariff is significant, for example IDR480/kg (USD0.05/kg) in Buton Island, South East Sulawesi (Jaegar and Fitzpatrick, 2008), and may become more important if the product needs to cross more than one regency en route to Surabaya for export. Currently there is no export tax on cashews in Indonesia.

[10]Red River own estimates of World Raw Cashew Production, Metric tonnes, By region, By country, 1999 - 2007

ECONOMIC

Jaegar (2007) reports that the global cashew market is likely to experience continued growth in demand over the next 10 to 15 years. Cashews are a luxury non-essential food product and as such susceptible to changes in consumer preferences. Although there are indications that in some markets, such as Western Europe, population growth is slowing, the rising wealth and the increasing number of younger people joining the working population should provide an increasing market for non-essential foods.

Cashew consumption per head in Western Europe is less than one third that of the United States. This suggests that there is a substantial opportunity for growth in consumption. While there are price based fluctuations in demand in the European and North American markets there is underlying growth.

In India cashew consumption is growing rapidly. The Indian economy recorded 9.4% growth in 2006/07 and according to some observers the middle class in India is set increase four-fold in a decade (Foretell Business Solutions, 2008). On this trend, some predict that incomes will almost triple over the next 20 years, and the country will become the world's fifth largest consumer market by 2025. While the import restrictions on kernel may yet persist such growth will have inevitable effects on the global supply and demand balance.

Cashew is now well established in Indonesia, albeit with a limited and discontinuous geographical range. The growth in national exports over the last 20 years is beginning to stabilise and there are signs of a decline in output in some important areas. Further, there are indications that households, as well as actors along the marketing chain, are finding it increasingly difficult due to low incomes generated from cashew cultivation and export (Jaegar and Fitzpatrick, 2008)

Given the state and structure of the international market, the critical success factors affecting smallholder cashew returns are:

- Timing of sale
- Higher yields through good tree management such as pruning, thinning, and tree replacement.

Nimmo-Bell et al (2007) undertook some preliminary economic analysis in 2007 with smallholders in West Nusa Tenggara (see Appendix 1), which indicates that even doubling production will not lift the family from poverty.

World cashew supply and demand.

According to Jaegar and Fitzpatrick (2008), supply and demand are closely balanced. In 2007 the surplus fell from 19 days to only 5 days, due to the steady growth of demand and expected reduction in the Brazilian and Indonesian crops. It appears that the "just in time" inventory management system in destination countries results in little slack in the chain to cover short term supply disruption.

Supply also continues to grow, though at a diminishing rate. In this position the market is likely to become volatile in response to any crop declines, failures, rumours or speculation. This is a change from the 2001-2006 period when oversupply and the geographical diversity of the producing countries meant that minor supply disruptions could be managed without prices shooting upwards.

Trade

Led by the need to keep the large processing factories in India and Vietnam well supplied throughout the year, a huge trade has developed resulting in an industry characterised by widely fluctuating prices, speculative activities, and contract defaults. Despite this volatility, the price differential between grades remains relatively constant over a long period of time (pers comms Smith, 2012). There are two types of cashew traded, Raw Cashew Nut (RCN) and kernel. Source: *Jaegar and Fitzpatrick, 2008*

Figure 24 highlights the predominant flow of cashews into India and increasingly Vietnam.

Raw Cashew Nut

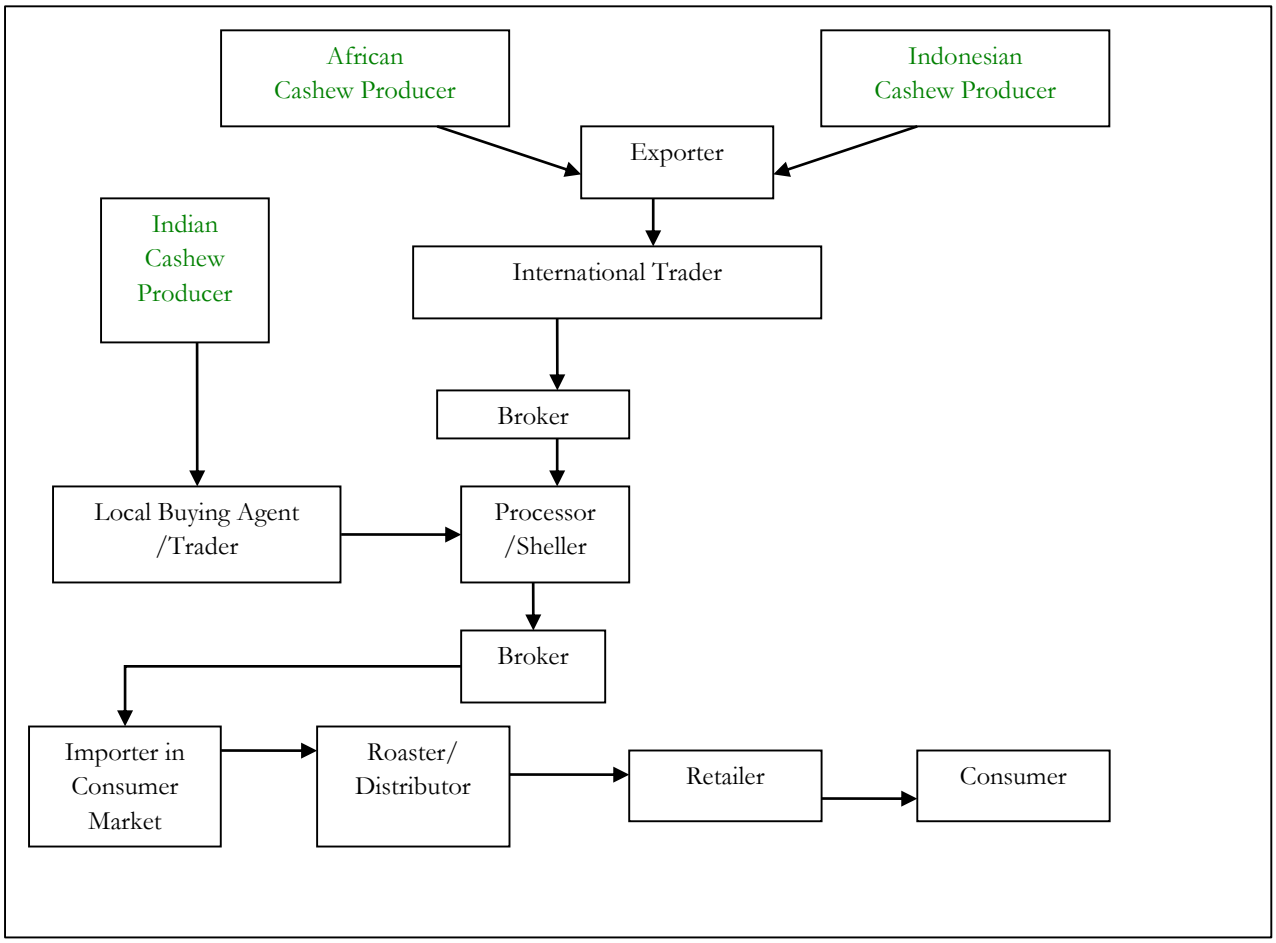
Almost 40% of world cashew production is shelled outside of the country where it is grown, and this is trending upwards. India is by far the largest importer of RCN, and has cost and efficiency advantages over other countries in shelling cashews. India also has a rapidly developing domestic market, which has been highlighted as a key factor in the development of a shelling industry. Vietnam is also rapidly establishing itself as a significant processor of cashews.

Source: Jaegar and Fitzpatrick, 2008

Figure 24: World cashew RCN trade flow

The RCN trade is characterised by opportunism, high risk, unreliable partners, unenforceable contracts and quality standards which move up and down with the market price (Jaegar and Fitzpatrick, 2008). For many years the trade in cashews was controlled by European traders to be eventually replaced by Singapore based traders. In recent years the number of Singapore based traders has fallen.

The number of traders has fallen to the point where individual Indian processors are sourcing at origin through brokers and agents. The Indian processors do this unwillingly as it significantly draws on their financial resources whilst they still pay prices set by the traders. They have, in effect, taken on the risk previously assumed by the traders with little reward. Figure 25 highlights the typical cashew supply chain operating internationally.



Source: Jaeger and Fitzpatrick, 2008

Figure 25: Cashew supply chain

Indonesian farmers get a high percentage of the world market price as a result of lower freight costs to destination markets and the timing of the Indonesian season. As Indonesia is the only in-shell supplier harvesting between September to November, competition amongst international and export traders is intense. The entire focus of buyers of RCN is on Indonesia during that time (Table 18).

Table 18: World cashew harvest calendar

Country	Season Length	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Indonesia	7	■	■						■	■	■	■	■
Tanzania	4	■									■	■	■
Mozambique	6	■	■	■	■							■	■
Kenya	4	■	■									■	■
Brazil	4	■	■									■	■
Benin	5	■	■	■	■								■
Nigeria	4		■	■	■	■							
Ghana	4		■	■	■	■							
Ivory Coast	4			■	■	■	■						
Vietnam	4			■	■	■	■						
Cambodia	4			■	■	■	■						
India	4			■	■	■	■						
Guinea Bissau	4					■	■						
Senegal	4					■	■						

Source: Foretell Business Solutions Private Limited, 2012

According to Jaegar and Fitzpatrick (2008) the RCN market lacks transparency where it is possible on any given day to encounter vastly differing trade prices in the world market. Price is determined by quality but default of contract is common; rejection or renegotiation by the Indian packers on presentation of documents or arrival of goods is a regular occurrence. However profit margins can be high, as would be expected in an industry where risk is high.

Unlike the kernel trade there are no international quality standards for RCN. RCN are graded and offered to the market and paid for on the outturn[11] figure. Individual parcels are assessed by the buyer or representative agent at pre-shipment. There is little involvement of independent inspection agencies in the industry. Quality is assessed by yield, the outturn of kernels by weight, damaged nuts and nut size. The higher the yield and size of nut, the higher the value.

Kernel

Cashew kernel consumption is also growing, both in new markets and in the traditional markets. For many years consumption was limited to the developed countries. In recent years there has been growth over a range of destinations and the Indian domestic market in particular has experienced extraordinary growth. The developed countries continue to show steady growth rates in the range 6-8%. Northern America remains the largest market followed by India and the EU, see Figure 26.

[11] Outturn means how many pounds of good kernels with skin in an 80kg bag of RCN

Source: Jaegar and Fitzpatrick, 2008

Figure 26: World cashew kernel trade flow

The fast growing markets are the Middle East, India (domestic consumption) and Japan. High potential markets are Eastern Europe, China and Mediterranean Europe. (Jaegar and Fitzpatrick, 2008) However in these markets cashew suppliers face strong competition both from other tree nuts, especially almonds. The healthy profile of nuts as a snack continues to be a major driver; however the more organised trades of almonds and hazelnuts offer significant competition to cashews.

Cashews are used primarily as snacks simply roasted and salted or coated in honey. Efforts to diversify kernel consumer products have for the most part been unsuccessful. The use of cashew nuts in bakery and confectionary is limited outside India and the product has a limited role in association with chocolate or ice cream in the way hazelnuts, almonds or pistachio do. One of the problems the trade faces is the sale and usage of the small pieces produced during shelling. India has developed its competitiveness in this sector by developing a strong domestic market for these products.

The trade works on international quality grading and standards. The standards have been laid down by the following organisations:

- AFI (Association of Food Industries of New York
- TCVN 4850 1998 - Vietnam Cashew Nuts Kernel and Technical Request
- CENTA
- Grade Specification for Indian cashew Nuts kernel

Kernels are graded in the process as *wholes* or *pieces*. Grading then continues by colour and size. The larger the kernel the higher the price. The *pieces* are graded according to type of breakage and size which translates as the smaller the broken piece the lower the price.

Quality standards are rigorously enforced and exporters are informally ranked by traders on their quality and performance.

SOCIAL

The rising importance of the cashew nut in modern diets and consumption can be associated with increased incomes and more recently, increased health awareness and the benefits of including nuts in a balanced diet. A comparison of nutrient contents of important nuts has shown that nutrient realization per dollar is more in cashew nuts than in other nuts such as almond, brazil nut, hazelnut, macadamia nut, pistachio and walnut (Jaegar, 2007)

Cashew has a low rainfall requirement and is able to yield on nutritionally quite poor soils to give an income in areas that might otherwise be considered somewhat marginal for cash crop agriculture. Jaegar and Fitzpatrick (2008) estimate that the production of cashews in Indonesia returns over US$60 million annually into rural economies that, in many cases, have few options beyond subsistence agriculture. The development of the cashew economy is therefore considered important in tackling rural poverty.

Cashew production in Indonesia is relatively straightforward and few inputs are used. For the most part the cashew is produced on family farms by smallholders, and labour is not usually required for farm maintenance or for harvesting. This is not unusual in the cashew producing countries, and only Brazil has a cashew harvest based on plantation production.

The industry is an important contributor to the GDP of some of the poorest areas of the country. In addition to the estimated US$60 million in export earnings annually, there is another $US2-3 million in domestic consumption. In excess of 70% of the earnings are generated by growers with the balance split between service providers and middlemen.

TECHNOLOGICAL

The cashew nut is not easy to shell. The sheller is confronted by three intrinsic difficulties:

- The nut has an irregular shape,
- There is a tough leathery shell which fits the brittle kernel closely, and
- The shell contains a caustic phenolic liquid (cashew nut shell liquid - CNSL) which is unpleasant to handle and must not be allowed to contaminate the kernel.

Cashew kernels are graded internationally on the size, integrity (whole, split, broken) and flavour of the cashew kernel. Extraction of a whole and undamaged kernel from the shell is the key to maximisation of product value and the most efficient conversion of unshelled cashews into high grade kernels has historically been done in India and Vietnam with their large pool of highly skilled and cheap labour (Nimmo-Bell et al, 2007). The irregularity of the cashew nut and the tight attachment of the testa to the kernel present some challenges to efficient mechanical processing. However the lack of labour in recent years in Vietnam has driven companies based there to develop very efficient large scale mechanical processing and grading systems (D Smith, 2012, pers. comm.).

Having been separated from the fruit, (which in Indonesia has little market demand) washed, dried and sorted after harvest; the raw cashew nut is boiled or steamed to soften the shell. The lacca oil can be collected and used in the manufacture of brake linings, but is caustic and harmful to human skin. Care is needed to protect workers from this oil and to ensure no contamination of the kernel.

Indonesian village shelling omits the roasting and “cold-cracks”, possibly because the shell is thinner. Opening the shell can be done with a variety of manual instruments and knives, all requiring human dexterity to work the blade around the kernel which is held tightly inside. The kernel which is covered by a skin (testa) is then manually extracted. Removal of the testa also defies mechanical intervention, as it adheres firmly to the irregular shaped kernel. Sun drying

for 2 – 3 days or light roasting of the kernel makes the testa more susceptible to hand peeling, achieved with the aid of small blades, utensils and finger nails.

There are variations of all these steps and most can be mechanised with varying degrees of success. India, with its largely manual systems, continues to dominate the cashew shelling industry. Elsewhere, it has proved difficult to achieve similar skill levels or productivity levels which might allow competition (Jaegar and Fitzpatrick, 2008).

The major cashew nut processing countries at global level are India, Vietnam and Brazil. Each of these countries have distinct advantage in processing i.e., India able to process more of best quality cashew nuts right from the inception. Vietnam is expanding the processing capacity to meet its rising output (due to higher yield) besides to process the imported raw nut. Brazil is also practicing their mechanical method of processing, which compensates for the lack of labour in the country. Overall, the processing capacities of these major processing countries have been increasing year after year with respect to size and operational efficiency (Foretell Business Solutions, 2008).

Exporting cashew kernels requires volume and consequently a large investment in factory, equipment, and raw material. The international market buys predominantly full container loads of cashew kernels. In order for a processor to consistently sell cashew kernels throughout the year, significant capacity is needed. For example, capacity to process 1,000 MT of raw seed per annum is the minimum needed for a processor to fill just one container per month (USAID, 2007).

ENVIRONMENTAL

Environmental issues have gained importance as a trend in European food consumption, notably in the northern markets of Scandinavia, Germany, Holland and the UK. There is increased consumer awareness of a range of environmental issues from carbon footprints (now appearing on some food labelling) to organic farming.

Among consumers in general there is increasing awareness of social and environmental issues and the demand for foods certified to have been grown to “organic” standards has grown rapidly over the last 10 years (Jaegar, 2007). The growth has not been even across food products and while some such as baby foods have a substantial organic sub-sector, others show limited interest.

Organic demand is not yet significant in cashews. While most of the world’s production of cashew is organic by default as the smallholders are unable to afford chemical inputs, little has been certified as such. Thus any premiums that might be available tend to be short-lived and there is limited advantage in the niche. (Jaegar and Fitzpatrick, 2008)

It is important here to note that while consumer concerns may be developing gradually, the large scale retailers use the ethical concerns of the consumers to differentiate themselves and achieve a premium margin, and the move to organic by a chain of stores can have a more immediate effect.

In terms of the farming system, cashews are often grown with minimal inputs and as a consequence are relatively benign to the environment. Long lived deep rooted trees also have a stabilising impact on the soil and a relatively sustainable farming system in a monsoonal wet dry environment such as the eastern provinces on Indonesia.

LEGAL

Food and import authorities in the major markets of Europe and North America are paying increasing attention to food safety and standards of hygiene (Jaegar, 2007).

Traceability has been introduced into EU regulations[12]: currently the requirement for traceability of imported foods is limited to ensuring that businesses are at least able to identify the immediate supplier of the product in question and the immediate subsequent recipient, with the exemption of retailers to final consumers. This principle is referred to as one step back-one step forward (Jaegar, 2007). Jaegar and Fitzpatrick (2008) however report that this is regarded as an interim measure until full traceability is introduced. Requirement for full traceability would present all sorts of difficult issues for the cashew industry. It would mean that a sheller would have to be able to identify which farm each and every carton of kernels came from. This would be difficult in Indonesia but especially difficult for the 80% of cashew production which is exported before shelling every year.

Tests for adulterants, contaminants such as pesticide residues and mycotoxins, are increasingly sophisticated and precise. Where this is disrupting the patterns of supply in some nuts and other food imports, cashews are generally free from complaint. Pesticide use is comparatively rare in the industry globally; the nut is shelled before export and the further roasting in the consuming markets deals with any microbial problems (Jaegar, 2007).

In summary, developments in national regulations in the import markets are not currently influencing the cashew trade. Where national regulations provide the minimum standards for imported foods, food industries and retailers have increasingly stringent requirements. These not only concern standards of hygiene but also complex questions of social and environmental responsibility. European food businesses and UK-based companies in particular, have developed ever more severe requirements for their suppliers. This is not the case in the North American markets.

SECTOR POTENTIAL FOR DEVELOPMENT

A study conducted in East Nusa Tenggara in 2009 identified three levels of operators in the cashew value chain. In the first level are the producers or farmers of cashew; second is the collectors or small traders; and the third, comprises of the traders and exporters (Swisscontact, 2009).

Opportunity exists in terms of assimilation of cashew production with processing. Transport, transaction and processing costs, cause much of the value to migrate to the processing countries. There is an opportunity to develop shelling and collection centres locally so that the money is retained in Indonesia and in the hands of the local operators.

While the bulk (approx. 80%) of Indonesian cashews are exported as RCN to India and Vietnam for shelling (this is not unusual in the cashew trade with 40% of world production being exported from the country of production for shelling), there appear to be some opportunities for the growth of the existing Indonesian shelling industry. Indonesia's commercial shelling industry currently accounts for approx 12,600 tonnes of in-shell (Jaegar and Fitzpatrick, 2008).

Cashew is a high value item with a short season requiring trade finance and working capital if it is to develop as a shelling industry. Finance for capital costs of shelling is expensive and difficult to obtain. The industry has developed across a wide geographical and cultural scope. This may have discouraged a unified approach. In addition the remote and dispersed nature of the industry is likely to discourage investors in the shelling industry.

In the 1980s there were 18 shelling plants established in Indonesia. This had declined to eight by the mid-1990s. By 2008 there were only three significant factories producing export quality cashews, plus a handful that processed small quantities for the domestic market. The commercialised domestic consumption is estimated at less than 500 tonnes kernels equivalent to about 2,000 tonnes of RCN.

There has been an upsurge in small scale and village based shelling in recent years. Jaegar and Fitzpatrick (2008) estimate that shelling for domestic consumption, which includes village and local shelling, accounts for 4,000 tonnes RCN. Local village based shelling is an integral part of the Indonesian cashew industry. It is not only a source of income for poor rural communities it is also a valuable resource that can be harnessed as an integral element in the

[12] (EC/178/2002)

development of cashew shelling. The failure to develop a viable shelling industry is primarily due to the inability of Indonesian companies to compete with the Indian, and latterly Vietnamese, shellers for raw material.

The competitive advantages that Indonesia possesses for the export of RCN are exactly the factors that make it difficult for an Indonesian shelling industry to develop successfully. Low freight, short transit and lack of seasonal competition bring all the Indian and Vietnamese buyers to Indonesian during the cashew season. Appendix 2 outlines factors implicated in the success of shelling operations.

An increase in this sector would require the local industry to compete with overseas buyers for product to ensure sufficient volume of raw product was available.

Cashew shelling is a labour intensive process so much of the value added through efforts to grow a shelling industry would be added by labour, generating jobs and incomes in rural communities. In areas where there is little other employment opportunity, all members of a family can process kernel as a reasonable strategy to increase total family income (Baker, 2008). In order to establish a viable industry this workforce needs to be integrated into a processing system that does not require high capital investment as in Brazil or Vietnam or 40 years of development as in Kerala, India (Jaegar and Fitzpatrick, 2008). This could be done by integrating the village based shelling into a system of regional grading and packing centres who will produce product to international standards. In addition, competition from a local shelling industry could increase value of export RCN cashews.

India's local shelling industry developed on the back of a domestic market. The absence of a developed domestic market in Indonesia inhibits the growth of shelling and value addition. Currently, a sheller must export the kernels which must be stored until a full container load is ready. There is the additional difficulty of developing sales for lower yielding grades (Jaegar and Fitzpatrick, 2008).

Whilst an increase in capacity in this sector is certainly possible, it is highly unlikely that Indonesia can develop a highly efficient or competitive processing industry based on household or community based shelling (Smith, 2012, pers. comm.). There is evidence that an increased level of capacity of household or community based shelling activities will certainly be an important source of income for poor rural communities and provide the opportunity to supplement income from other cropping activities. Women in particular are heavily involved in local cashew shelling activities, and shelling provides an avenue for them to contribute to the household income.

Other than shelling, value adding opportunities from the cashew nut appear limited. Jaegar (2007) reports that:

- The concept of adding value to cashew kernels prior to import has little interest in the near term for Europe. The distributors and retailers appreciate the quality control that is provided by the roasters in Europe, and the roasting in hot oil adds a measure of security against microbiological issues.
- In Germany and the UK the main development in cashew retailing has been the sale of raw, un-roasted, kernels and these are now sold with other raw nuts alongside fresh produce as a healthy snacking alternative. This development fits well with the increasing emphasis on healthy eating, but demands the highest level of hygiene from the sheller onwards.
- Cashews kernels are mostly eaten after roasting in oil and salting. Since oil and the salt are known contributors to human vascular problems there is an increasing demand for unroasted, 'raw' kernels.
- In Australia the opportunities for adding value at origin have not yet been demonstrated, and manufacturers continue to import the raw kernel for the typical roasting and salting.

In terms of value adding down the supply chain:

- One of the problems in using cashew kernels in other preparations is the mild flavour which is easily lost by the uptake of other flavours in the high oil content.

- The opportunities for substitution between nuts appear to be quite limited. Cashews are included in products such as trail mixes for the snack market and the relative proportion of nut types can be varied to some extent. However, the dominant use of cashews is as a snack or cocktail nut to be eaten out of hand and the flavour and physical characteristics of the cashew are not appropriate for the products that use other nuts such as hazelnuts in chocolate or breakfast cereals.
- Innovation in the nut market has been uneven with nuts such as hazelnuts appearing as ingredients in a range of food products, while cashews have seen little advance. There have been attempts at different flavouring (eg. chilli) and different roasting methods (honey) but these have had limited appeal to date.
- The innovative uses of cashews tend to use the cashews as ingredients in bakery products, cakes, cookies, cereal bars and the like. Covering with chocolate and roasting with honey have been tried with only limited success, as has its use in breakfast cereals.

Innovation in cashews has been focussed on packaging, grades and sales promotion (Jaeger, 2007).

Cashew By-Products

In other cashew growing regions of the world the cashew fruit and its products, such as juice, wine or liquor, are profitably exploited. Despite the low income from the sale of raw nuts in Indonesia, the fruits are almost never used. Occasionally, the fruit maybe eaten, but the possibility of selling the fruit or the juice in the market is currently unexplored. The fermented products, of course, will not be acceptable in the Muslim areas of production in Indonesia (Jaegar, 2007).

There are several alternative uses for the cashew tree, some of which have important commercial applications. Swisscontact (2009) reported that during phase 1 of their cashew project in East Nusa Tenggara (2004-2008), some farmers had experimented with the processing of cashew side products such as cashew apple chips and composting of the cashew nut shell.

Fruits and Fruit Products

The cashew apple is used in many producing regions. Jaegar and Fitzpatrick (2008) surveyed the Guinea Bissau region in Africa and found that farmers often realised a greater income from fruit sales than from the in-shell cashew nut. Nimmo-Bell et al (2007) report that the cashew fruit is not considered of much economic value in Indonesia. The fruit is a false fruit formed by the swollen fruit stalk. The pulp is juicy but usually rather tannic and can be eaten raw, pressed for juice or cooked to jams and chutney.

The juice is an important industry in Brazil. The juice does not store well and there is no international trade in the juice. In West Africa the juice is collected and either consumed almost immediately or allowed to ferment to an alcoholic fruit drink. This is sometimes distilled and the practice is also common in parts of India, notably Goa, to produce the spirit feni.

Some exports to Europe and North America of the cashew fruit spirit are made from India and West Africa, but the market for this is very small and competition from the more usual spirits is intense.

Cashew shell

The cashew shell could be used locally as a fuel for power plants based on biomass. Cashew shelling plants generate high volumes of shell, which could generate power for the plant or as fuel for the steam boiler or roasters.

Cashew Nut Shell Liquid

The shell of the cashew nut is 3-4mm thick with a tough outer and inner surface that sandwiches a honeycomb lattice. Within the lattice is a phenolic resin, the cashew nut shell liquid (CNSL), that comprises about 30-35% of the weight the

shell. The resin is quite caustic, irritating to the skin and toxic. It must not contaminate the kernel. The CNSL can be extracted from the shell by heating and the primary step in shelling cashews is a roasting or steam bath that extracts the CNSL and alters its chemical composition.

The CNSL can be fractionated and treated and to give a resin that is useful in the manufacture of friction resistant components, such as clutch and brake linings for the automotive industry, or in the production of surface coatings, varnishes, adhesives and paints. There is a significant market for technical CNSL. The demand is largely focussed on the US company, Cardolite and one or two Japanese enterprises such as Sumitomo (Jaegar, 2007).

Supply of CNSL is dominated by India and Brazil. Here the hot oil bath method of roasting the nuts before shelling is used and this allows the collection of the CNSL. By contract, in West Africa a steam bath is used, and the CNSL is not collected. India and Brazil do not collect all the CNSL that they produce in shelling and some that is collected is used as fuel in power production. There is in effect surplus capacity for production. The CNSL is therefore not a high priced product as it is a by-product and can be produced as needed (Jaegar, 2007).

PRODUCTION

Indonesia is unusual amongst cashew producing countries in that production is dispersed across several geographically separated and difficult to access areas. The plantings on a number of islands present logistical challenges not seen elsewhere.

Indonesian cashew production is dominated by smallholders in the more difficult farming areas where few other more profitable crops will grow (Nimmo-Bell et al, 2007). They are grown widely on the drier hilly areas of the Eastern Provinces and Sulawesi, which accounts for approximately 75% of total Indonesian production. South East Sulawesi has been the dominant producer of cashew, but East Nusa Tenggara (NTT) cashew output has been growing and may now be of an equivalent size. There is also significant production in South Sulawesi and West Nusa Tenggara (NTB), see Table 19. Among the minor producing regions Maluku, Central Sulawesi, Bali and East and Central Java all report cashew harvests. There are scattered plantings in many other provinces contributing less than 5% of national production.

Table 19: Estimated provincial cashew production

Province	Estimated Current level of Cashew Production (tonnes)
SE Sulawesi	28,500
S Sulawesi	9,000
NTT	27,500
NTB	10,000
E Java + Bali	10,000
Others	10,000
TOTAL	95,000

Source: Jaegar and Fitzpatrick, 2008

Cashew production in Indonesia is only at the beginning of the type of development seen in other cashew economies, and is not without challenges or opportunities for development. Jaegar and Fitzpatrick (2008) report that the yield per hectare on existing farms is low and the potential for new plantings has not been assessed or addressed. There are opportunities to improve yield and extend the plantings.

- A 10% increase in yield would increase rural earnings by US$6 million per year
- A 10% increase in plantings would add US$6 million per year

Given the state and structure of the international market, the critical success factors affecting smallholder cashew returns are:

- Timing of sale
- Higher yields through good tree management (i.e., pruning, thinning, replacing ageing stock), and matching varieties with growing conditions when replaced.

With widely fluctuating market prices can vary the price to smallholders daily (and within the day), there is currently little a smallholder can do with regards to price and reward for quality. Poor farmers seeking quick cash returns are weak sellers, unable to avoid supplying the market at its peak supply periods. It would seem that the emphasis should be on improving production and quality as far as possible with low cost inputs, a program of gradual replacement of the older trees, and to supplement family incomes through the production of other crops and activities. As mentioned earlier, even with a doubling of production it is likely that cashew production alone will not provide sufficient income to lift these families above the poverty line. Smith (2012) supports this view, indicating that cashew production (and processing) should be considered as a crop that provides supplementary income to smallholders and the opportunity to spread the risk across multiple crops. Apart from buyers and collectors, there are few other supports to smallholder cashew production activities.

Nimmo-Bell et al (2007) reports that the barriers to further smallholder development include:

- The widely fluctuating market and generally inadequate price level which discourages investment and inputs that could significantly improve production and quality.
- A lack of access by farmers to development and working capital for the purchase and timely application of agriculture inputs and the rejuvenation of run down orchards.
- Lack of access to improved genetic materials which should be provided by way of grafted seedlings from selected trees.
- Little support from government research and extension services with regards to best production practices to improve the supply and quality of local production and little interest by smallholders who are not adequately rewarded for additional efforts.

There seems to be mixed opinions on whether certification to organic production will provide significant income advantages to producers in Indonesia. As outlined earlier, Jaegar and Fitzpatrick (2008) report that it offers a limited niche market that will not last, as very few inputs are used in cashew production in general. They do contend that at present not many growers actually pursue certification, which involves some cost and requires processes and procedures to be in place. Swisscontact (2009) however, report that from phase 1 of their project (2004 – 2008), increased incomes were achieved for their farmers who were certified. Certification offered them a new market channel. The price of organic cashew is relatively stable compared to the price of conventional cashew nuts which shows daily fluctuations. Swisscontact (2009) reports that in 2008, the cashew RCN price reached an average of IDR 6,000 per kg during the harvest period (August until December), compared to IDR 4,500 in other areas in Indonesia. For organic nuts the average price was IDR 11,200. The project does report that only 58% of the certified nuts have found an outlet through the organic market channel, the remaining ones are still sold via the conventional channel.

PROCESSING AND TECHNOLOGY

As mentioned previously, the majority of Indonesia's cashew crop is exported as RCN. With respect to shelling, for maximum value the kernel must be extracted whole from the shell. Any breakages or split kernels receive a substantially lower price in the global market. While there have been various attempts at mechanising the shelling process, these have generally met with limited success as the yield of whole kernels is too low. Only the Brazilian industry operates large scale mechanised shelling; there has been an increased mechanisation in the Vietnamese factories but mostly the world's output of cashew is shelled by hand.

MARKETING

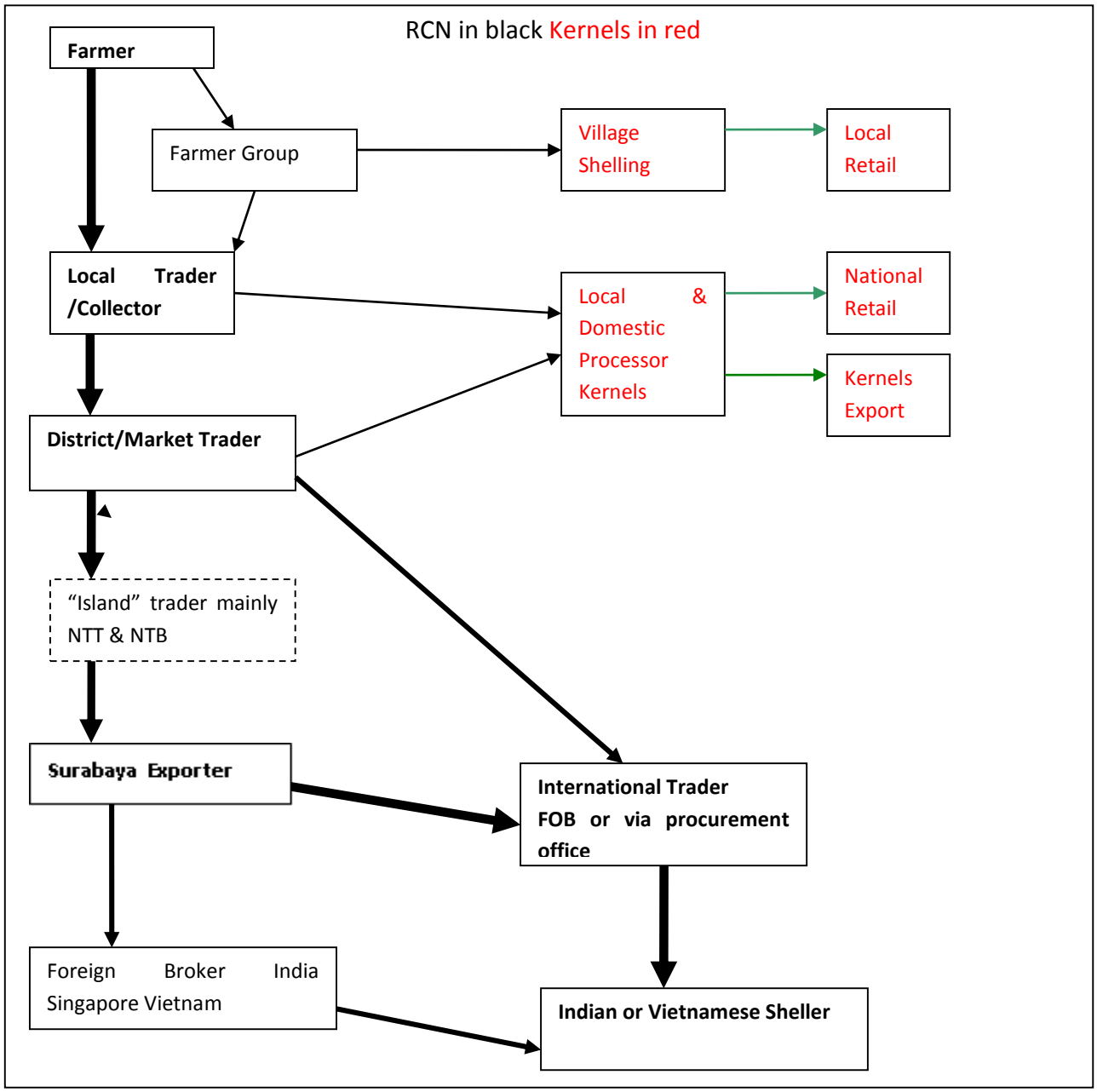
The geography of eastern Indonesia has impacted the marketing chain (Jaegar, 2007). Cashews come from a range of islands: Sulawesi (South and South East), Flores, Flores Timor, Sumba, Sumbawa and Lombok. Cashews from all the eastern areas are moved to Surabaya for export of in-shell and in part for shelling. In 2006 83% of cashew exports were through the port of Surabaya (Jaegar and Fitzpatrick, 2008). The remaining 17% comprises small quantities from other regions of Indonesia and product exported via Jakarta.

The geography together with the social structure has created a long, though relatively efficient, marketing chain, which brings the nuts from the grower to the export market in Surabaya. In Sulawesi the chain is efficient with one or two traders between the grower and the exporter. In East Nusa Tenggara and Flores in particular the chain may comprise three or four middlemen before leaving the island. The chain is competitive and middleman margins are thin (Jaegar and Fitzpatrick, 2008). Transport/consolidation costs however are high as the product has to be moved from eight different areas to Surabaya for export.

The export trade in RCN is dominated by traders who are either Surabaya based or internationals who send representatives to source cashews during the season.

Figure 27 below outlines the marketing chain for cashews in Indonesia.

Jaegar and Fitzpatrick (2008) report that market knowledge and know-how is limited. Even current exporters readily agree that they lack quality and timely information about the world market. In order to increase returns at every level of the chain it is important that stakeholders understand who their customer is, what their customer needs and what their product is worth. This presents an opportunity for development.



Source: Jaegar and Fitzpatrick, 2008

Figure 27: Marketing chain for Indonesian cashews

Indonesia has a competitive advantage in the timing of its crop. There are two distinct production cycles, north and south. The last northern crop ends in May/June in western Africa (Guinea Bissau). Indonesia is the first of the southern crops. The harvest season in Sulawesi starts in July and goes through to November. In NTT and NTB the harvest starts in late August and ends in December. Indonesia is the only southern crop which can be used during the peak. This period is characterised by three of the major events of the calendar - Ramadan, Diwali (Hindu/Indian festival) and Christmas. From total annual consumption, 60% of cashew nut kernels are consumed in the September/December period (Jaegar 2007). By the arrival of the first shipments from Indonesia raw material inventories in India and Vietnam are drained as the domestic crops are long ago shelled and the West African nuts have been imported and sold. Indonesia growers

and exporters would be in a very strong position if they had the ability to hold their cargo or if, at some time in the future, they had an opportunity to sell to a domestic shelling industry.

The disjunctive nature of cashew growing in Eastern Indonesia has advantages and disadvantages. On the negative side are the logistical challenges and costs discussed earlier. On the positive side, the slightly different harvest times between the islands due to micro climatic differences means that the crop does not all arrive at once which might cause "harvest pressure" on prices. There is also the opportunity to brand the cashews from each island and highlight the advantages of each separately. Flores might become the organic island whereas Sulawesi might be promoted as offering the best yield outturns in the world for example (Jaegar, 2007).

In terms of market potential, the Australian market for cashew kernels is significant and still growing, and in view of the geographical proximity this should be an interesting target market for Indonesian suppliers.

QUALITY STANDARDS AND CERTIFICATION

Cashew kernels are sold by grade with specifications developed by the Indian and Brazilian trades. The superior grades are the whole kernels and these are classified firstly by whether or not they have been scorched in the shelling process and secondly by size.

The US import demand for cashew is quite different from other markets: not only is it by a long way the largest import market but it has the greatest demand for variety of grades. The US is said to buy cashew kernels on price, and, as the Brazilian industry developed with mechanized shelling, which gave a higher proportion of broken and scorched grades as well as the larger whole grades, so the nut industry in the USA adapted to using the more plentiful material from Brazil at a lower price than the traditional Indian supplies (Jaegar, 2007).

The single most popular grade remains the W320 but the proportion used in the USA is lower than elsewhere as there is a wider acceptance of the inferior grades. Industry commentators do not talk of trends towards particular grade, but more of adaptability towards the grades that represent the best value. The major use of cashews however is as roasted salted snacks eaten out of hand.

The consequence of the ability to use a range of pieces in, for example, breakfast bars or bakery products is a need for accurate grading. It has been this capability, together with competitive pricing, that has given the Vietnamese suppliers the opportunity to penetrate the US market (Jaegar, 2007).

Overall, certification and compliance to specifications are not as important in the USA as they are in the EU (Jaegar 2007). Provided that the price is acceptable and that the product matches expectations there is significantly less emphasis on standards in this market.

The issues of food safety and security are becoming more important. Imported items are perceived as a risk by the authorities and imports are more regulated than they were 10 years ago.

Labelling of consumer packs can be a barrier to market penetration for new suppliers since the country of origin must be specified. Unless the processor/packer is prepared to change labels there is reluctance to dealing with smaller origins.

Organic food has a passionate and loyal following but has yet to cross-over into the mainstream. The healthy lifestyle is an important trend in the US food market for certain consumer sectors, and it seems likely that this "more mindful eating" will result in a greater demand for organic products. However, there is difficulty in finding sufficient supplies. Within cashews, brokers report difficulty in matching supply and demand since any new demand can easily provoke oversupply and premiums are not predictable. In markets such as Australia, import laws requiring fumigation mean that organic certification is difficult.

Traceability is becoming an increasing issue for food in general, and is unlikely to disappear. While food manufacturers and retailers would like to see greater traceability in nuts, it is also understood that under the present supply conditions the Indian factories will not be able to provide details of their supplies. Although cashews have a very low level of customer complaint, one serious scare, possibly in the raw nuts, may provoke retailers into demanding significantly improved traceability and any factory capable of identifying origin details for each consignment will be at an advantage.

Fully certified 'Fair Trade' is not available, partly because of the difficulties of certifying the product back to the farmer. While the market is supplied by Indian factories buying from a number of different producing countries, this cannot be achieved, but where processing that takes place at origin is offered, there may be some opportunity to offer certification. Whilst the Fair Trade concept has not yet had a significant impact in US retailing, there is a high awareness of ethical issues in trade among the Australian consumers and Fair Trade certification in some form is likely to be of interest in cashew kernels (Jaegar, 2007). However the protocol for certification is considered strict and not easy to achieve in practice.

Certification is increasing in importance in the United Kingdom. Cashew shelling, which for the most part demands repetitive manual labour with the added complication of caustic cashew nut shell liquid (CNSL), has had a poor reputation for hygiene and social responsibility. An increasing number of processors are gaining accreditation to standards such as HACCP and ISO[13] and it is likely that these will become mandatory. Any factory hoping to sell to the UK will need to have certification of standards in order to gain and maintain a position in the market. There is a strong move from the Australian manufacturers and retailers towards food grade standards in their nut supplies. In order to penetrate this market, factories must invest in the highest standards of production. They should be prepared to conform to individual supermarket requirements and to develop standards similar to the AFI. Competition with Vietnam for market share will not be possible without a high standard of performance. In continental Europe certification is not as important but the requirement is growing in some areas. Some of the larger buyers will at the least carry out their own audit of a factory. Certification has become very important in Australia. The ability of the Vietnamese factories to achieve standards of HACCP and BRC and to provide elements of traceability has given them a competitive advantage over the Indian suppliers (Jaegar, 2007).

IMPACT POTENTIAL

PRODUCERS AND PROCESSORS

Despite the long chain (especially in NTT) Jaegar (2007) reports that commercialisation and export of RCN is relatively efficient. Prices paid to farmers will not necessarily change if costs of shipment drop or a shortening of the marketing chain occurs. Market volatility appears to be a much bigger factor than differences in shipping costs.

India is by far the largest RCN importer. Vietnam is growing quickly but remains small by comparison. India has a shelling capacity of 1.2m tonnes per year. Given a domestic crop of less than 400,000 tonnes and current imports of 585,000 tonnes there is significant shelling capacity to handle increased imports. Vietnam has a shelling capacity of 550,000 tonnes and a crop in the range 300,000 tonnes. In short these two countries with current shelling capability have capacity to increase imports by 425,000 tonnes in-shell. Producers of RCN cashews can be sure there will be a market for their product for the foreseeable future.

13 The ISO standards were not specified in the literature available. It is understood that these would likely be ISO 9001 (quality management systems) and/or ISO 22000 (an international standard that defines the requirements of a food safety management system covering all organizations in the food chain), however could easily extend to ISO 14001 (environmental management) or OHSAS 18001 (worker health and safety).

Farmers lack support from institutions in areas such as farming methods, extension of production, training, technology, innovation and finance. There are in place programs focused on developing agriculture but these do not appear to be delivering at the grassroots level (Jaegar & Fitzgerald, 2008).

Whether effort on cashews alone will be enough to lift families above the poverty line, however, is in question. A 2007 study completed for the International Finance Corporation looking at the cashew industry in South East Sulawesi (Sulawesi Tenggara) (Nimmo-Bell et al, 2007) concluded that "*The Sultra Cashew industry cannot support the livelihood requirements of its farmers, and as a result has run down due to neglect and inability of farmers to be rewarded for their efforts and external inputs. Widely and constantly fluctuating prices remove incentives for improving quality and further investment. Much could be done to improve yields through improving the genetic quality of the tree stocks, a rigorous replacement program, and through improved tree management (pruning/thinning), however there is unlikely to be ever enough improvement in production to lift cashew farmers out of poverty through cashews alone. They need also the technical, management and financial skills to diversify and add to their income from other sources, such as the introduction of more livestock (beef and goats) and possibly further local processing of the cashews*."

MARKET DEMAND

It is clear that market demand for cashews, both RCN and kernel, will continue to grow. Traditional consumers are the wealthy countries of North America and Western Europe. Continued growth is expected in these two markets at least in line with in line with demographic and economic expansion. It is important to note that growth in consumption of 3% will require an extra 6,000 tonnes per year of kernels from 30,000-35,000 tonnes of RCN cashews. India is a more recent market, with high population, increase in purchasing capacity and a taste for the product. The potential of the Chinese market is immense by sheer weight of population alone.

RCN demand must be developed to encourage competition between Indian and Vietnamese buyers for RCN. Demand for kernels should be stimulated with particular attention to markets where Indonesia has an advantage - China, Australia or large kernels for example.

Indonesia has low levels of domestic consumption of cashews. The development of a domestic market is essential for the development of a local shelling industry and as a step toward export.

POTENTIAL PITFALLS

If Indonesia is to embark on developing its cashew shelling industry, it needs to be done with the increasing worldwide focus on quality control and traceability front of mind. Any new facilities would need to be developed with the capacity / ability to deliver on:

- International quality standards.
- International packaging standards.
- Increasing traceability and food safety standards.

If village based shelling is supported, packing and grading centres would need to be established to take the pre-processed kernels from the village shellers and dry, grade and pack to international standards for export or for the domestic market. These facilities will require drying, packing and fumigation equipment. Cashew areas in Indonesia are remote and as such are not immediately attractive to investors. Without support for these areas, necessary investment may be difficult to find.

The economic benefits of shelling cashews in the country of origin are quite clear. The opportunity to add value and provide employment and the increased foreign exchange earnings are used as arguments to encourage shelling. The financial viability however is not always understood. Fundamentally, the establishment of a shelling industry needs a

domestic market. The Indonesian domestic snack nut and confectionary market would need to be assessed and then developed to ensure that the shelling industry has an outlet for smaller quantities in the beginning and in the longer term small pieces or wholes that do not find an export market.

Comments have been made previously on whether cashew producers, even with support, will be able to rise above the poverty line. Farmed to International best practice standards in suitable environments, cashew yields of over 2 tonnes per hectare are possible, but even at these levels, the returns to smallholders will still be insufficient to raise family incomes sufficiently (Nimmo-Bell et al, 2007). The need remains to locate alternative and supplemental sources of income such as the introduction of livestock and other crops.

CURRENT DONOR ACTIVITIES

Swisscontact (2009) ran phase 1 of a project for cashews on Flores from 2004 – 2008. They established the Cashew Consulting Centre at Ende which offers support to growers. Their primary intervention in the sector has been to promote and develop certified organic production of cashew nut in cooperation with farmer groups. They have achieved certification to a level of production of 450 tonnes RCN. This is a small percentage of the production on Flores but the farmers involved were achieving a premium in the region for their product.

In addition and complimentary to the organic initiative Swisscontact was supporting growers in forming village based shelling units. Jaegar and Fitzpatrick (2007) made the following observation of the Swisscontact shelling work: 'Overall this is a small project which gives excellent support to small scale value addition activity'.

The Swisscontact (2009) report details a change of strategy for phase 2 of their project in Indonesia:

'In general, the project strategy changed from an overall local economic development approach to developing the competitiveness of selected sectors. Instead of having three sectors that were supported through horizontal interventions for access to finance, media coverage and business environment, in the new phase the Project facilitates the development of four sectors, three commodity sectors (cashew, cocoa and seaweed) and one service sector (Enabling Business Environment). The overall goal of the Project remains the same: reduced poverty in the area through increased income for producers and the creation of new jobs. More specifically for the cashew sector the project will concentrate on three generic interventions:

1. Organizational strengthening of (organic) cashew farmers' groups:
    a. Making available management capacity development training to farmers' groups and support those to develop inter-group activities such as joint ICS.
    b. Facilitate the set-up of a formal Cashew Forum with representation from all level of stakeholders including farmers, processors, local traders, exporters, government bodies and supporting agencies such as Swisscontact.
2. Increasing productivity through LEISA:
    a. Emphasize improvement on farm productivity through better farm management.
3. Adding value through organic certification, processing and developing new market channels:
    a. Continue efforts to further strengthen the system of organic certification.
    b. Work on expanding the scope of local-level processing for forward integration of the farmers and local processors ensuring higher incomes through value addition.
    c. Identify and support providers to deliver quality assurance services and market linkages
    d. Look for alternatives to help the farmers and local enterprises link up with financial institutions to address their cash needs by innovative and flexible schemes.

The CIPSED Project is a Canadian International Development Agency [CIDA] bi-lateral funded private sector development project being delivered in Indonesia from February 22, 2008 until April 30, 2012.

The overall goal of the Project is to assist Indonesia in the creation of economic opportunities for men and women who are vulnerable to poverty, through the promotion and development of the Small and Medium Enterprise [SME] sector.

The CIPSED Project is comprised of three main program components: (1) Technical Assistance [TA] to Small and Medium Enterprise [SME] clusters; (2) the Institutional Strengthening to Business Development Service Providers [BDSPs]; and, (3) Micro Finance.

The geographic focus of the CIPSED Project is the Island of Sulawesi, and more specifically in four [4] provinces located on Sulawesi Island, being: South, North, South East Sulawesi and Gorontalo (CIPSED, 2012a).

TECHNICAL ASSISTANCE [TA] TO SMALL AND MEDIUM ENTERPRISE [SME] CLUSTERS

The Project is delivering specialized technical assistance to SME Clusters in subject areas such as business planning; product design; production systems; manufacturing/harvesting; product quality; market analysis; marketing strategies; logistics; business administration; financial management; sales and market development; exporting; technology and human resource management, etc. Each SME cluster CIPSED works with is also receiving technical assistance pertaining to gender equality and environmental protection.

The CIPSED Project in cooperation with its Indonesian partners is currently working with cashew nuts SME clusters in South Sulawesi (CIPSED, 2012b).

APPENDIX 1

SMALLHOLDER RETURNS

Smallholder 1.5ha - Supplying Local Collector /Trader

	Unit	Volume	IRD/Unit	IRD	USD	
Income:						
Unshelled, Raw Cashew Nuts @850kgs/ha	kg	1,275	3,500	4,462,500	496	
Total Income				**4,462,500**	**496**	
Production Costs						
Fertiliser / Agri- Chemicals				-	-	
Weeding	mandays	30	30,000	900,000	100	
Harvesting (family labour valued as hired)	mandays	30	20,000	600,000	67	
Total Production Costs				1,500,000	167	
Gross Profit / Margin per 1.5 hectares				2,962,500	329	66%
Gross Profit / Margin per hectare				1,975,000	219	
Gross Profit / Margin per Kg sold				2,324	146	

The above gross margin analysis is based on the current low level of production from "active" farmers in South East Sulawesi selling raw cashew nuts at the farm gate. Here family labour is included as an opportunity cost. In reality, the family will receive the entire Rp4.4m for their crop, which is insufficient as a sole source of family income. Their input is not great and there is time available for other activities. Production and prices would probably both have to double to inspire this family to put greater effort into their cashew operation.

Source: Nimmo-Bell and Company Ltd and Indonesian Center for Agriculture Socio Economic and Policy Studies (Department of Agriculture, Republic of Indonesia); IFC SADI Agri Sectors Value Chain Analysis for the Sultra Cashew Industry. May 2007

APPENDIX 2

FACTORS IMPLICATED IN THE SUCCESS OF SHELLING OPERATIONS

Factor	Explanation	Mitigation	Indonesia
Low operating costs	Cashew shelling is generally labour based and requires low labour costs. Mechanical shelling requires a high throughput rate to reduce the fixed costs per unit.	Indian shelling technology is primitive but the labour force highly skilled and working for low wages. As labour rates have increased in Kerala, so the shellers have explored the low labour rates in other states.	Village based shelling is a communal activity where the return is not wages but a higher selling price. It is possibly a means of providing more employment.
Cost of financing raw material	The cashew harvest season in any one region is only a few weeks long but a factory, to be efficient, should operate all year. The manager must therefore buy, hold and finance stock. High interest rates damage the viability.	The Indian, and latterly, Vietnamese, shellers overcome this by importing throughout the year. In Brazil the production is more dispersed, and the season is longer. Further the in-shell price is artificially low.	No extended season. Using village based shelling overcomes the need for large stocks
Outturn of whole kernels	Broken kernels trade at a significant discount to the wholes. The ability to achieve a good percentage of wholes (80% is a frequently quoted target) determines the profitability of the enterprise.	Hand shelling is skilled, but it is a skill that can be learned. Indian shellers can achieve an 80% outturn of whole kernels. In Brazil, with its mechanical shelling there are more broken pieces, but the US market has proved to be adaptable and able to absorb a range of kernel pieces. Vietnamese shellers can sell to China or must find demand in the World market. There is evidence that as their kernel output has increased so the price of pieces relative to wholes has fallen	The cold cracking seems to result in a very high percentage outturn of whole kernels.
Outturn of small kernels	Small kernels trade at a discount to the W320 standard. When prices fall, inferior grade prices fall faster.	Brazilian factories benefit from supplies of large nuts. India has a strong domestic demand for all grades	The Indonesian percentage of W240s and 320s is very high.
Attention to Grading	The grading schemes, whether AFI or Indian, recognise a large number of grades and importers expect each to be	Established shellers pay strict attention to the grading as their reputation relies on this capability.	Grading is simply a skill that must be acquired.

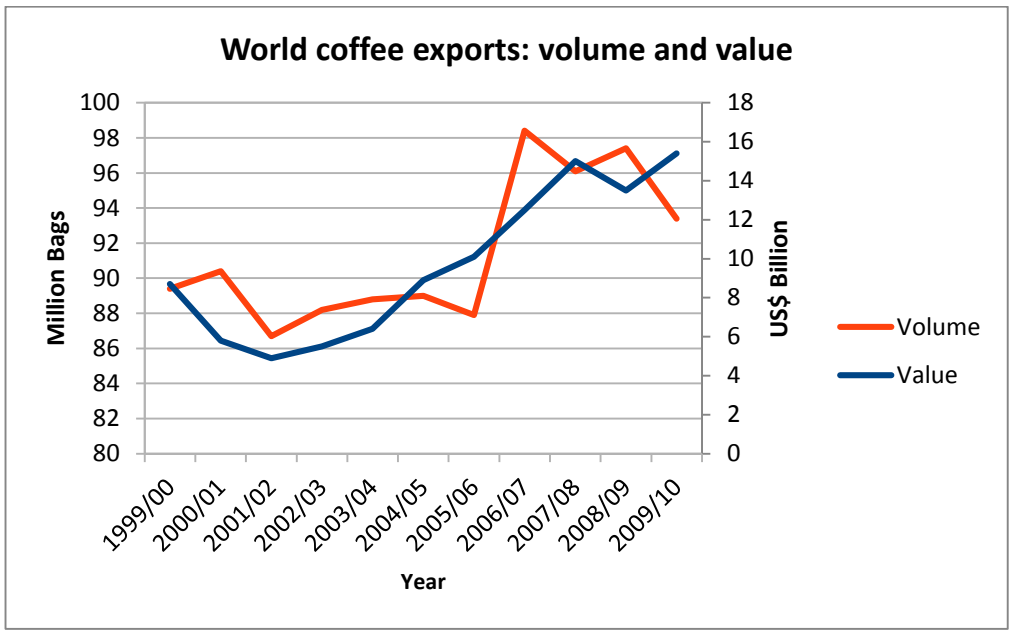
Factor	Explanation	Mitigation	Indonesia
	homogeneous with no mixing. The full price can only be achieved by single grades. Any mixing forces the price down to the level of the lowest grade in the parcel.		
Market for inferior grades	Inevitably, shelling results in a range of grades. All must be sold. The major markets prefer the standard grades of and the demand for the inferior grades is more limited	The ability of the American market to use a range of grades has benefited the Brazilian shellers. The Indian shellers are able to market all domestically. Vietnamese shellers must sell to the Chinese market or on the World market.	The domestic market in Indonesia is tiny, compared to the size of the population. The demand needs to be quantified and promotion considered.
Critical Mass	Importers prefer to buy full containers with a single grade. Mixed containers must be more actively marketed and may achieve a lower price. A small shelling unit, producing a range of grades will not have sufficient of any one or few grades to fill a container.	The Brazilian factories are large scale. An Indian packer will buy from a number of shellers and consolidate loads. Similarly with the African village based shelling a central enterprise is responsible for sourcing, grading and packing the kernels.	PT Comextra operates on a similar basis to the Indian/African model, acquiring kernels with the testa still in place in order to maintain hygiene and the integrity of the kernel. The kernel is then peeled and graded and packed in food grade factory conditions.

Source: Jaegar and Fitzpatrick, 2008

5) COFFEE SUB-SECTOR

THE MACRO ENVIRONMENT

Coffee is the world's most widely traded tropical agricultural commodity, accounting for exports worth an estimated US$ 15.4 billion in 2009/10, when about 93.4 million bags were shipped. Figure 28 shows the volume and value of coffee exports between 1999/2000 to 2009/2010.



Source: www.ico.org

Figure 28: World coffee export, value and volume 1999/2000 to 2009/2010

Over 70 countries produce coffee, of which the Exporting Members of the International Coffee Organization are responsible for over 97 percent of world output. In 2010 total coffee sector employment was estimated at about 26 million people in 52 producing countries.

For many countries, coffee exports are not only a vital contributor to foreign exchange earnings but also account for a significant proportion of tax income and gross domestic product. For seven countries the average share of coffee exports in total export earnings exceeded 10 percent in the period 2000–2010, although the importance of coffee for many countries is diminishing over time as their economies diversify. This can be demonstrated by the fact that during the period 1996 to 2000, there were 15 countries which fell into this category, i.e. the average share of coffee exports in their total export earnings exceeded 10 percent[14].

Global consumption of coffee in 2009/10 totaled around 133.9 million bags, of which 72 million bags were consumed in Importing Member countries, 21.2 million in non-member countries and 40.7 million in producing countries.

[14] See International Coffee Organization – www.ico.org

PRODUCTION

After registering an 11% reduction in production in market year (MY) 2010/2011, the USDA/Foreign Agriculture Service predicts that Indonesian coffee production will decline again by an estimated 20 percent to 7.5 million 60-kg bags in MY 2011/2012. This prediction reflects an adjustment over the previous production estimate of 7.9 million bags. The 20 percent drop in coffee production is caused by higher-than-average levels of rainfall during the following critical stages: blossoming period (April-September 2010); cherry ripening period (December 2010-January 2011); the first harvest period (March-May 2011). Disturbances in coffee production have also resulted in coffee exporters competing with domestic coffee processors in procuring green coffee beans. One exporter in Medan reported that the supply of green coffee from farmers is down 40 percent in MY 2011/2012. Some exporters are importing beans from other countries, Vietnam in particular, to honour already-signed sales contracts with foreign buyers. Generally speaking, bean quality is also lower than in the previous marketing year. Medium quality coffee beans normally account for 65% of total bean exports. Due to lower quality, the share of medium quality beans in East Java this year has decreased by 25%. Farm-gate Robusta coffee prices have increased from 9,000-12,000 rupiah to 22,000-24,000 rupiah. Moreover, Arabica coffee prices experienced even stronger growth, increasing from 22,000-24,000 rupiah to 50,000-60,000 rupiah.

TRADE

Weather related disturbances in coffee production have resulted in reduced export growth over the last two marketing years. Indonesian coffee exports decreased by 500,000 bags to 8.25 million bags in MY 2010/2011. Exports are expected to further decline to 6.35 million bags in MY 2011/2012. Disturbances in production have slashed coffee supplies to exporters, leading to the imports from Vietnam and other coffee producing countries. Coffee import data show that Indonesia has imported 309,000 bags of coffee during the first five months of MY 2011/2012. The import volume is equal to 87 percent of total coffee imports over the entire previous marketing year. Business Monitor International (2012) predicts that Indonesian coffee imports will increase to 735,000 bags in MY 2011/2012.

STOCKS

The decrease in production amidst positive growth of export and domestic demand resulted in significantly lower ending stocks. Indonesian coffee stocks are expected to decline from 33,000 bags in MY 2010/2011 to 18,000 bags in MY 2011/2012. (USDA/FAS, 2011).

Business Monitor International (Business Monitor International, 2012) reports in their latest analysis of the coffee sector in Indonesia that they are sceptical towards the Government of Indonesia's (GOI's) ambitious goal to make Indonesia the world's second largest coffee producer within the next five years. The main reason for their scepticism is due to erratic weather which causes yields to fluctuate dramatically. They say the latest export figures support their view with Robusta exports from Sumatra dipping 25% month-on-month and 64% year-on-year to 6,306 tonnes. In December, exports had already fallen by 68% on the year to 8,415 tonnes. The Indonesia Coffee Exporters and Industries Association President Suyanto Hussein commented recently that predicting export volumes is 'difficult' due to unpredictable weather conditions. Business Monitor International's (2012) projection of coffee exports for 2012 is 400,000 tonnes – higher than 350,000 tonnes exported in 2011, but still lower than 2010's export volume of 450,000 tonnes

Table 20 and Table 21 below show Indonesia's 4th ranked position in the global coffee market, both in terms of production and exports. Both Brazil and Colombia are primarily Arabica producing countries whilst Vietnam and Indonesia are primarily Robusta producers.

Table 20: Top coffee producing countries 2007-2011

('000 60 kg bags)	Type	Crop year	2007	2008	2009	2010	2011
Brazil	A/R	April/Mar	36070	45992	39470	48095	43484
Vietnam	R	Oct/Sept	16467	18500	18200	19467	18500
Ethiopia	A	Oct/Sept	5967	4949	6931	7500	9804
Indonesia	**R/A**	**Apr/Mar**	**4474**	**9612**	**11380**	**9129**	**8750**
Colombia	A	Oct/Sept	12504	8664	8098	8523	8500

Source: FAOSTAT 2011

Table 21: Top coffee exporters 2010-2011

('000 60 kg bags)	Type	2010	2011
Brazil	A/R	33028	33456
Vietnam	R	14229	17675
Colombia	A	7821	7733
Indonesia	**R/A**	**5489**	**6264**
India	A/R	4577	5839

Source: FAOSTAT 2011

The majority of coffee produced and exported from Indonesia is of the Robusta variety, and is currently of little interest to international specialty buyers. Much of this production of low-value Robusta coffee takes place in southern Sumatra, and is exported via the Panjang port in Lampung. However, Indonesia is also the largest Arabica producer in the Asia-Pacific region and is a well-known producer of specialty origins such as Aceh-Gayo, Mandheling, Java and Toraja-Kalosi. Approximately 80 percent of Indonesia's Arabica coffee is produced by smallholders, while the remainder comes from large estates and state-owned plantations, the latter of which are located exclusively in East Java. Most of these smallholders engage in low-input agriculture, sometimes integrated into traditional swidden systems at the forest frontier, with low per hectare productivity. Sulawesi is already well-regarded as a quality coffee origin by international buyers, with Arabica exports routinely attaining significant price premiums above the New York Terminal. The total volume of Arabica exports from Sulawesi, however, is relatively low, with exports of between 3000 and 4000 tonnes annually between 2002 and 2007. Flores is a less well-known origin, with total annual Arabica production estimated at about 2500 tonnes. Flores coffee is exported predominately through the Surabaya port in East Java. A number of quality-improvement programs have been initiated by both government and industry in Flores over the last five years. As a result, a small portion of the island's production is now marketed as a specialty coffee, although the majority is processed using rudimentary techniques and sold as a standard commercial coffee (Neilson et. al. 2010).

NB: See additional production and export figures in Appendix 1

POLITICAL

"We are optimistic that in five years, Indonesia will be the second-largest coffee producer in the world with coffee production of 1.3-1.4 million tons," Pranoto Soenarto, Vice Chairman of the Association of Indonesian Coffee Exporters and Industries (AEKI) told reporters recently (The Jakarta Globe, 2011). This is far from an industry consensus but does signify the GOI's interest in expanding coffee production and exports. "We have been starting the coffee genetic

selection to be cultivated in two certain areas in Java Island," Pranoto said, adding that this could double yields to between 700 and 800 kg per hectare each year.

Business Monitor International (2011) claims that plans by the GOI to include coffee as one of the agricultural commodities to undergo a plantation revitalisation program could, along with other efforts significantly boost production over the long term. The priority program aims to increase coffee farmers' earnings and overall foreign exchange earnings through crop renovation as well as overseas market expansion. Business Monitor International (2011) cites an example of this latter aim - a recent agreement with Germany to cooperate in developing a common market for crops such as palm oil, coffee and cocoa.

Increased private investment seems to be reviving the ailing industry in Indonesia. In April 2011, the Islamic Development Bank agreed to provide as much as US$3.3bn of loans through to 2014 to speed up Indonesia's economic growth, including about US$120mn for small-scale coffee farmers in Sumatra. There is some expectation that this investment (and others) will boost the overall capacity of these small farmers and lead to increased quality and yields. Some of these investments are made in partnership with the GOI. For example, the agriculture ministry is now working with the Indonesian Coffee and Cocoa Research Institute (ICCRI) and Nestlé Indonesia to try and improve the productivity of local coffee growers. Nestlé has conducted research on coffee trees in Indonesia and has selected a range of the highest yielding varieties. The company will now work with the agriculture ministry to distribute seedlings to farmers in the main coffee growing regions in Sumatra and Java. It will be a number of years before this program yields results, as the trees need time to mature, but some see these investments to be positive developments for the sector (Business Monitor International 2012; Nestle PPT n.d).

The coffee sector in Indonesia has been represented by AEKI (Coffee Exporters Association of Indonesia), a para-statal organization under the Ministry of Trade. As the title of the organization suggests, AEKI represents only exporters. In this context, AEKI's mandates are limited and do not cover the interest and needs of the farming and primary processing sectors where the bulk of the supply side bottlenecks are found (Global Development Solutions, 2007). In addition, there is a general consensus among both industry and public sector sources directly engaged in the coffee sector that AEKI has not performed well in representing the interests of the sector, particularly in promoting premium coffee in the international market (Global Development Solutions, 2007; Ottaway, 2007). Although there was discussion of dissolving AEKI, it seems to be still functioning. However, with support from the AMARTA project and others, a Specialty Coffee Association of Indonesia was establish in 2007 for the Arabica coffee industry largely to address the short-comings of AEKI (now AEKI-AICE).

The Ministry of Agriculture has extension offices at the provincial level, but between the lack of funds, capacity and know-how, effective and meaningful extension services have not been available to coffee farmers (VECO 2008; GDS 2007; Giera and Struthers 2007a). Local governments in the districts of Manggarai and Ngada in Flores give a high priority – including significant budget allocations made - to the coffee sector. However, partly due to changes brought by regional autonomy and partly due to inappropriate training and support, government field officers rarely have the appropriate skills for assisting within the coffee sector (Marsh and Neilson, 2007a).

A comprehensive coffee value chain analysis done for the World Bank also cited the need for an umbrella organization to *"facilitate a public-private dialogue between key stakeholders along the entire farm-to-export supply chain. Such an organization is essential for formulating a chain wide strategy to help tackle the range of policy and market based distortions along the coffee value chain"* (Global Development Solutions, 2007). This study reiterates other observers' opinions that on-farm technical support from public and private extension services is inadequate, and that there is a potential role for government to support R&D efforts including to develop appropriate varieties of coffee.

Ochratoxin A (OTA) contamination in coffee is linked to mould growth at various stages of coffee production, handling and processing, and is potentially dangerous to human health. There is an extended discussion of all the different options for reducing the incidence of OTA through interventions in the value chain, including potential involvement of government entities. Some of the scenarios for reducing mould formation may lead to higher prices to consumers and/or higher costs to farmers which makes the selection of options controversial. Most industry participants remain sceptical about the ability of the authorities in producing countries to enforce such legislation (LMC International with Proforest 2006).

ECONOMIC

Indonesia exports 7% of world coffee production. Coffee represents 0.6% of total GNP and 17% of all agricultural products exports in Indonesia. Planted on 1.3 million hectares of land, coffee plantings yield approximately 600,000 tons of green coffees which are broken down as follows: 85 – 90% Robusta (65% coming from Southern Sumatra), 10 – 13% Arabica, and 1 – 2% others such as Liberica. Coffee is produced by a total of 2.33 million household smallholder farmers cultivating an average holding of 1.0 to 1.5 hectares and deriving approximately $ 910.00/year per hectare (Robusta) and $ 1680.00/year per hectare (Arabica). Coffee represents 50 – 70% of coffee farmer's income. It is estimated that Aceh is the largest Arabica production area in the Asia Pacific region. Exports of North Sumatran coffee (Aceh 60% and North Sumatra 40%) receive a premium of 30% over similar coffees grown in Indonesia. Owing to the unique character and body, coffee of Northern Sumatra is in high demand from major specialty coffee buyers (USAID 2010).

An estimated 2,500 tons of Arabica, and 4,000 tons of Robusta, is produced annually on Flores, almost all of which is traded through the East Javanese port of Surabaya. Green coffee beans are either transported overland in trucks and ferries, or shipped via the Reo Harbour on Flores' north coast direct to Surabaya. While demand for Flores Robusta coffee appears to be good, Flores Arabica coffee is relatively undeveloped and does not currently possess an established market identity (The primary end-use for Flores Arabica appears to be as a cheap substitute for blending by the exporters in Surabaya.). The local price differential between the two commodities is small. This is in contrast to many other growing regions where Arabica prices are often 30% to 50% higher than Robusta. A number of Arabica quality improvement initiatives have already commenced in Flores, funded by government agencies, international development agencies and the private sector. While these initiatives are still embryonic, international specialty coffee buyers are already showing an increased interest in coffee originating in Indonesia. Considerable potential exists for developing heightened quality consciousness along the value chain and establishing Flores as a specialty coffee origin, which would raise rural incomes in coffee-growing villages.

The majority of the 2500 tonnes of Flores Arabica is either processed as a 'natural' or a 'semi-washed' coffee, with few quality incentives and of relatively low quality. Confirmation of the low quality of Arabica being produced on Flores is indicated by the 2006 season maximum local factory door price (for Asalan – unsorted/ungraded) of only Rp16,000/kg. This is only slightly higher than the Robusta price at Rp 14,000/kg. Price discussions with local traders and quality comparisons with other recently developed specialty coffee origins, such as East Timor, suggest that existing Flores Arabica coffee, if offered on the world market, would be priced at 20 to 25 cents below the NY 'C' price. To check this price assumption, NY 'C' price averaged roughly 120cents/lb over the last six months of 2006. Discounting 20cents/lb gives a potential export price of Flores coffee of 100 cents/lb or around Rp 20,020/kg FOB Surabaya (at Rp 9,100/USD). A Ruteng purchase price in 2006 of Rp 16,000/kg leaves just over Rp 4,000/kg to cover inter-island shipping, sorting, grading and export preparation in Surabaya, as well as a reasonable profit margin for the Surabaya trader.

From experiences in origins such as East Timor, it is likely that improved Flores Arabica could, however, be sold at prices of plus 10 to plus 15 cents/lb to the NY 'C'. Toraja and Mandheling coffees are at prices of plus 40c/lb over the NY 'C',

which in a 120c/lb market equates to an FOB price of $3.52/kg. There are indications that for a small increase in processing costs and a focus on quality management in the processing and marketing chain, FOB prices could increase by Rp 5,500/kg or 25%. In turn, much of this could be translated to significantly improved farm-gate prices (Marsh and Neilson, 2007a). The East Timorese coffee industry is a case where a poor quality filler coffee was transformed in the 1990s into a recognised quality origin by the deliberate efforts of donor agencies and value chain leaders. Indonesian Arabicas are sought after origins in the global speciality coffee market, providing an important platform for acceptance of Flores coffee (Ibid.).

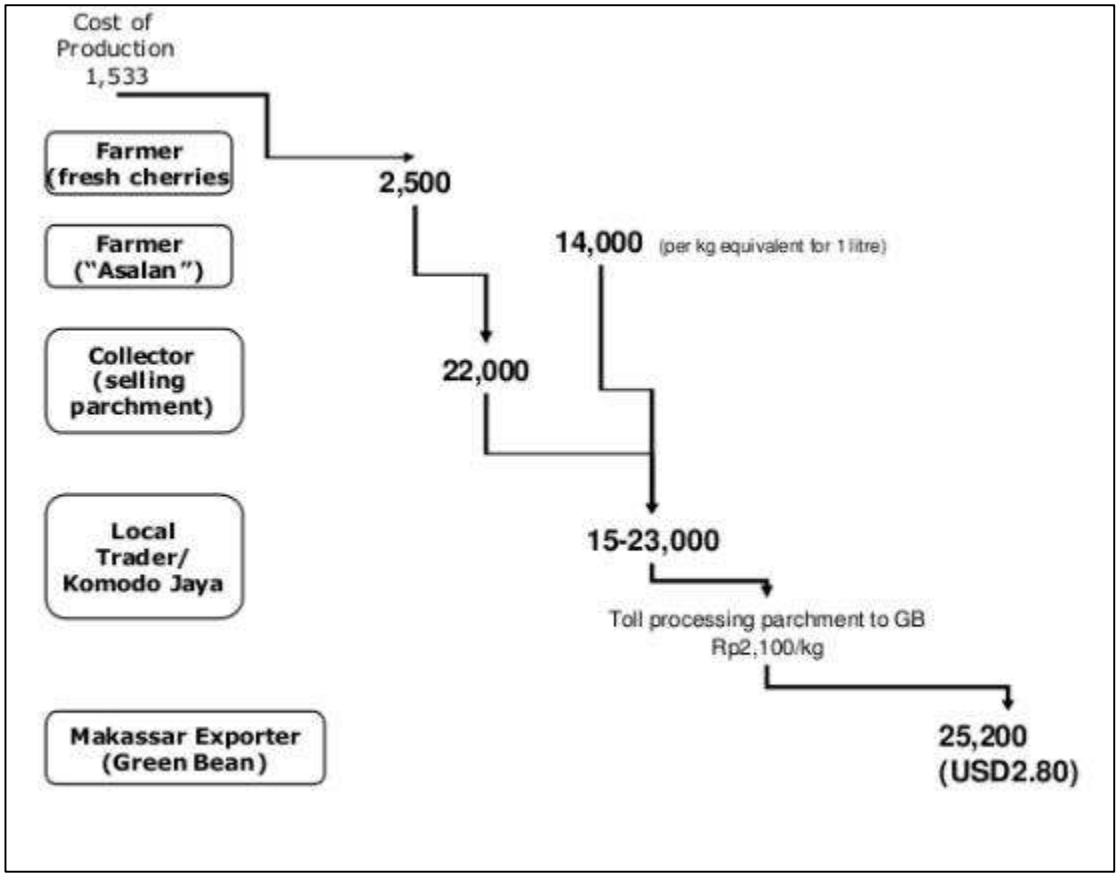
Discussion with traders indicate that Flores Robusta is a sought after coffee and is exported under the 'Flores' name or under the name of the Port, 'Reo', although little is known about the coffee or end-uses. It appears to be traded at about a $100 to $200 premium per tonne over the London market for Robusta, which is much higher than Lampung Robusta which commonly sells at a discount to the London price. Japan is reported to be the key market for Flores Robusta.

It is not clear what characteristics set Flores Robusta apart from other Robusta origins. Most of the other processes in the chain are rudimentary, such as hulling by traditional pounding. Robusta is sold by farmers as Asalan (before selecting and grading). Flores Robusta is reported as being a small, hard, dense bean. It is also reported that Flores Robusta is selectively picked when ripe and not strip-picked, which would have a clear impact on quality. Higher altitude growing areas will also play a part in creating a distinct flavour character. Even though Flores Robusta appears to be a known coffee, it is by no means a Speciality Robusta. There is scope to help improve value of Flores Robusta by technical, quality and marketing interventions (Ibid.).

Coffee prices are heavily influenced by futures contracts in world markets and fluctuate depending on weather and production of dominant producing countries. After abolition of the International Coffee Agreement in 1989, which had set the export quotas on member countries for ensuring producers profit, coffee production increased worldwide, resulting in decline of prices in early 1990s and 2001[15]. The main causes of steep decline of coffee prices in 2001-02 were: 1) increase of Robusta coffee production in Vietnam; 2) roasters' adoption of cheap Robusta for industrial processing; 3) improved efficiency in coffee production at large scale plantations in Brazil; 4) large yields of coffee worldwide in the year; 5) a standstill of the export quota agreement to sustain coffee prices and; 6) multinational companies' pressure on lowering prices (Yoshida and Rampisala 2011).

Roasters and retailers in consuming countries can add their costs to prices to secure profits. On the contrary, coffee growers have to sell coffee at the internationally equalized prices regardless their production costs. Coffee growers in many countries suffer from low prices that cannot cover production costs. Having been accused by civil society organizations in developed countries, many retailers and coffee chain stores responded by dealing in fair trade products to some extent and engage in Corporate Social Responsibility (CSR) activities such as providing funds to community development projects in coffee growing areas (Ibid.). Figure 29 shows an example of the prices received by the various value chain actors through Komodo Jaya buying group in Flores (*Price (Rp/kg) or kg equivalent)*.

[15] Prices of Arabica are led by the futures contract at the Intercontinental Exchange (NYSE: ICE) in New York. Prices of Robusta are mainly dealt at the London International Financial Futures and Options Exchange (LIFFE).



Source: Yoshida and Rampisala 2011

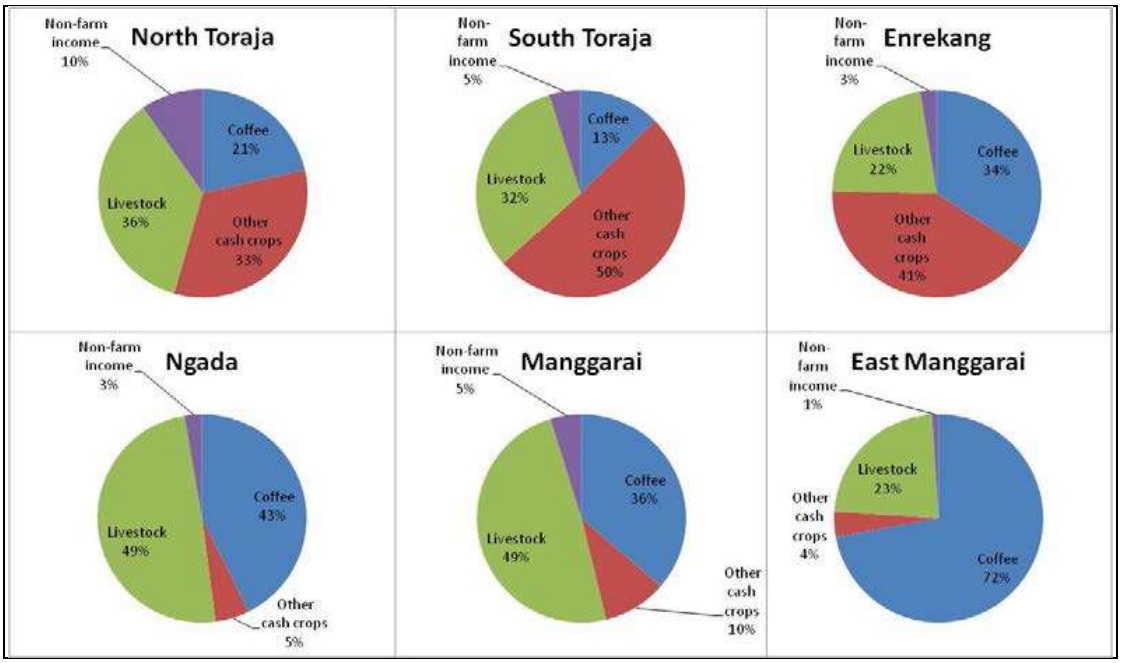
Figure 29: Coffee value chain showing value additions at points in the chain

The buying and trading of coffee within the industry has undergone significant changes over the past fifteen years. These changes have in general improved the transparency of coffee purchases and helped to improve farm-gate prices. During the late 1990s, quality concerns of green bean shipments resulted in major coffee buyers in the United States and Europe only sourcing coffee from large traders. The major concern was that if a container was rejected by a major US buyer small traders would inevitably attempt to reship the container at a later date.

For Indonesian coffee exporters, changes to buying and exporting occurred in a dramatic way as the country's largest buyer and traditional trader of coffee was found to be: concealing farm gate prices; forcing smallholders to supply on credit; mixing good quality Arabica with inferior grade coffee and Robusta; and tampering with shipment samples. These practices kept farm gate prices down for the entire industry in Indonesia. As a result of corrupt trading practices some traders and exporters were able to earn profits of USD$5,000 – $10,000 per container shipment or around 50 cents per kilo of green bean. Established industry stakeholders report that lead coffee buying firms made changes to the way they sourced coffee. Since the introduction of improved transparency systems average margins are around USD 10 cents per kilo (Giera and Struthers, 2007a). Starbucks and the traceability requirements in their CAFE standards were instrumental in increasing the transparency of pricing along the value chain. Interestingly, Starbucks currently purchases about 60 – 80% of all Arabica coffee exports from Indonesia (USAID, 2010).

The implicit assumption behind many value chain interventions for rural development is that farmers are reliant solely on the chosen product for their livelihood. Across the different sites of Eastern Indonesia, however, coffee constitutes one element within a complex, and highly varied strategy that farmers employ to secure their livelihoods (see Figure

30). While reliance on coffee for cash-income is higher in the Flores Districts than in Sulawesi, farmers in these districts are also intensively engaged in primary food production. The way coffee is inserted within varied livelihood strategies will inevitably determine the effectiveness of any initiatives to upgrade farmers through the value chain. The dominant livelihood strategies employed by farmers across three case-study districts across Sulawesi and Flores highlight this variability. (Neilson et. al., 2010)



Source: Neilson et. al., 2010

Figure 30: Sources of household income across the six case-study districts in Sulawesi and Flores

CURRENT PRICES

Early harvest coffee rallied slightly in October 2011, as production concerns in Colombia helped prices recover from a severe September sell off. However, BMI believes that prices peaked in quarter 1 of 2011 and they anticipate further moderation as Brazil enters the up-year of its biennial production cycle in 2012/13. Moreover, despite current issues, they forecast Colombian production to finally break out of its three-season lull in 2011/12 thanks to tree rejuvenation programs. This underpins their view for supply on the coffee market to improve in 2012/13, where they forecast a 5.3 million bag global market surplus after three years of deficit. Finally, they forecast global coffee prices to average lower at US cents 200/lb in 2012 (BMI, 2012).

SOCIAL

In both of the coffee producing districts of Manggarai and Ngada in Flores, there appear to be strong cultural traditions closely interwoven with farm practices. Livestock is commonly reared for ceremonial use and participation in these ceremonies is a major financial commitment for many families. Distinctive Flores architecture and traditional culture (Bajawa) appears to be especially pervasive in Ngada. The high resource and labour requirements of a traditional society is probably a major factor discouraging intensification within coffee production systems in Flores (Neilson et. al. 2010; Hartatri et. al. 2010).

Closely linked to the traditional culture in Flores is the widespread influence of Catholicism, reportedly adhered to by 97% of the population. The Catholic Church plays a dominant role in the lives of people in these parts of Flores, with

churches dominating both rural and urban landscapes. The church provides spiritual guidance, but is also actively involved in economic and development activities in the area. In Ngada, the Church owns some large coffee estates and there is an 'Economic Commission' active within the Archdiocese of Ende. It is important to understand the Catholic Church's role in the daily life of farmers and to engage the Church as a stakeholder in any development activity in the area (Ibid.).

Farmers practice a broad based, mixed farming system growing a range of food and cash crops, and raising livestock. In recent years, serious drought and failed harvests have led to widespread food shortages in eastern Flores, particularly in Sikka, Ende and Flores Timur, and this diversified farm system is an attempt to mitigate risks to food security. In 2006, floods in Ngada destroyed large areas of food crops, while a large landslide in 2007 in Manggarai destroyed wet rice and dry fields, again threatening food supplies. Since existing institutions and government agencies in Flores seem unable to adequately respond to these localised food shortages, farmers are (understandably) hesitant to intensify cash crop production. Government programs to stimulate export crop production (such as coffee and cocoa) in Flores have also been targeted by several local NGOs as contributing to food shortages and starvation (Ibid.).

As noted above, cash income from coffee for farmers in Eastern Indonesia may only be a minor contributor to their total income/livelihood. These farmers effectively participate in a range of distinct value chains. The value chain development approach tends to ignore this diversity of farmers' livelihoods and their strategies, and frames rural development issues in terms of a single-commodity logic. This contradiction may help explain the apparent unwillingness of farmers to engage in coffee improvement initiatives. External funded projects often fail to consider the full range of constraints that farmers face, and fail to embed their commodity-specific initiatives in ways that are relevant to such highly diverse livelihoods. Neilson acknowledges that one organization/company cannot do it all, and suggests that one possible solution is to ensure that the government (and by implication other organizations) work to address those other areas of rural development that are not being addressed through a value chain approach (Neilson et. al. 2010).

Another social issue that may also reduce farmers' interest in intensifying their coffee operations is land tenure uncertainty and clashes with forestry officials. In 2002 and 2003, local government officials commenced a campaign to evict coffee farmers who, it was claimed, were illegally occupying forest lands in Manggarai (near Colol village). The ensuing conflict came to a head in 2004 and included the chain-sawing of smallholder coffee trees, arrests and protests. (Ibid.). Similar land conflict (sometimes involving clashes between local well-established procucers and immigrants) exists in the coffee growing regions of Sulawesi (VECO, 2008).

The promotion of farmer groups / cooperatives is widely advocated as a means for improving the bargaining position of farmers along the value chain. In Eastern Indonesia, coffee farmers are not widely organised into producer groups or cooperatives. Instead, the organisation of production currently occurs at the family, and sometimes clan, level. Coffee is commonly sold individually into traditional, privately coordinated trade networks. Indonesia, however, does have a long history of government support for producer cooperatives (Koperasi Unit Desa-KUD, or Koperasi Pertanian-KOPTAN) in various commodity contexts, and there have been several attempts to organise farmers into producer groups across Sulawesi. The capacity and performance of such groups tends to be weak and uncompetitive in the market place, and the reasons for their poor performance not yet well-understood (Marsh and Neilson 2007b).

A primary driving force for the formation of farmer groups and cooperatives is actually from the buyers themselves due to traceability demands. Thus, there is renewed interest in investigating effective modes of farmer organisation, and how groups can contribute to enhanced traceability, effective technology transfer, development of social capital, and improved market access (Ibid).

There is currently a frustration (among buyers) that coffee farmers in Eastern Indonesia do not appear motivated to upgrade their coffee farms and improve post-harvest processing. Neilson and others suggest that the socio-institutional environment within which farmers produce and sell coffee determines incentive structures, which in turn drive farmer decision-making processes, and that there is a lack of knowledge regarding these issues across Eastern Indonesia. They say high quality socio-economic research is needed to complement other industry initiatives in order to better understand constraints that farmers face regarding availability of labor, credit, land, information, prices, and to subsequently position initiatives more effectively. (Marsh & Neilson, 2007a; Hartatri et. al., 2010).

The authors continue by pointing out that farmer decision-making processes for all commodities in Eastern Indonesia are poorly understood, and that this suggested research activity could be applied to cocoa and cashews for example, in addition to coffee. They suggest the following focus areas for this research: farmer groups; tied credit; access to technical knowledge; risk management (including an understanding of price movements); applying a farming systems approach to understanding farm systems, livelihoods and remittances; quality incentives, grades and standards. (For complete discussion see Marsh and Neilson 2007a; Hartatri et. al. 2010).

Within the documents reviewed there appears to be limited information about gender roles in the coffee sector in Indonesia. Only one document that summarized a baseline study conducted in Toraja in 2008 mentions the division of roles between women and men coffee farmers. Women farmers tend to be more involved in harvesting and selling while men tend to be more involved in the preparation of the land, planting, and management. Maintenance is carried out by both men and women. In a newly formed coffee association, few women were very active in the management and strategic decision making (VECO, 2008).

It is unknown if the division of gender roles in Toraja is similar to NTT and NTB. Surely, any initiative needs to understand the division of roles and responsibilities in the local context, and ensure their program targets capacity building accordingly. For example, if both men and women are pruning and capping coffee trees then both should participate in trainings on those topics. If men only are setting broca traps then perhaps training on that topic only needs to be provided for men.

TECHNOLOGICAL

SPECIES AND VARIETIES

Only two out of the more than eighty species of coffee are grown commercially around the world - Arabica (Coffea arabica) and Robusta (Coffea canephora). Each requires different agro-climatic conditions (with some overlap). Arabica is grown at cooler, higher altitudes of 1000 to 2000 metres while Robusta grows from sea level to 1000m. Good rainfall of at least 1600mm per annum is required for both species. In general, Arabica is a more complex crop to grow and process. Both Arabica and Robusta can be grown either intensively (200 man-days and one tonne of fertiliser per hectare) or passively (where farmers simply harvest the cherries with little crop maintenance). The system adopted by farmers depends on a range of social and economic factors. If good production, processing and marketing requirements are met, Arabica generally achieves a higher farm-gate price than Robusta. While Robusta is generally lower priced, it can yield up to twice as much coffee per hectare than a comparable Arabica production system (Marsh and Neilson 2007a).

Production and post-harvest processing activities that improve quality is the main factor for improving profitability of Arabica, while high productivity and cost reduction is the key to Robusta profitability. Arabica and Robusta tend to have their own specific markets and uses. Robusta is generally considered a lower quality coffee compared to Arabica. The export price normally reflects this, with Robusta prices being approximately half to two thirds that of Arabica. Robusta flavours are harsher and do not have the fine and delicate flavours associated with Arabica. Robusta also has twice the

caffeine of Arabica. For these reasons, Robustas are normally used in the cheaper blends for less discerning markets and for instant coffees, or mixed in small proportions with Arabicas. Robusta, however, was traditionally a key component within Italian espresso blends, and higher altitude and well processed Robusta are sometimes used in quality blends. Robusta can be said to be used as a 'base' in coffees providing the 'body' or 'mouth feel', while Arabica provides acidity, aroma, and a range of subtle flavours. For this reason, both Flores Robusta and Arabica have good value adding and marketing potential (Ibid.).

ICCRI researchers believe that the dominant Arabica variety in Flores is S795, with localised concentrations of Typica, Catimor and Hybrido de Timor. A high concentration of an old local Arabica variety called 'Juria' was observed, which is a much larger form than normal Arabica. These trees are obviously Arabica, but the actual variety is not known and needs further investigation. The unique size of these trees may provide additional marketing potential. Even less is known about the Robusta varieties found in Flores. Varieties are normally of little interest to buyers in the large-volume commoditised Robusta market, and varietal interest in Robustas is normally limited to issues such as disease resistance, productivity and bean size. However, Robusta varieties may become a topic of interest if the Flores coffee does move to build upon its existing Robusta quality reputation (Ibid.).

HARVESTING AND PROCESSING

All Arabica coffee in Indonesia is picked by hand, whether it is grown by small-holders or on medium-sized estates. Because coffee cherries do not all ripen at the same time, farmers harvest every 10 days, over a period of 5 to 6 months. This allows them to pick only red, ripe cherries, to achieve best quality in appearance, aroma, and taste. When 'strip picking' or mechanical harvesting is used, under-ripe cherries can give the coffee a thin aroma and harsh cupping profile.

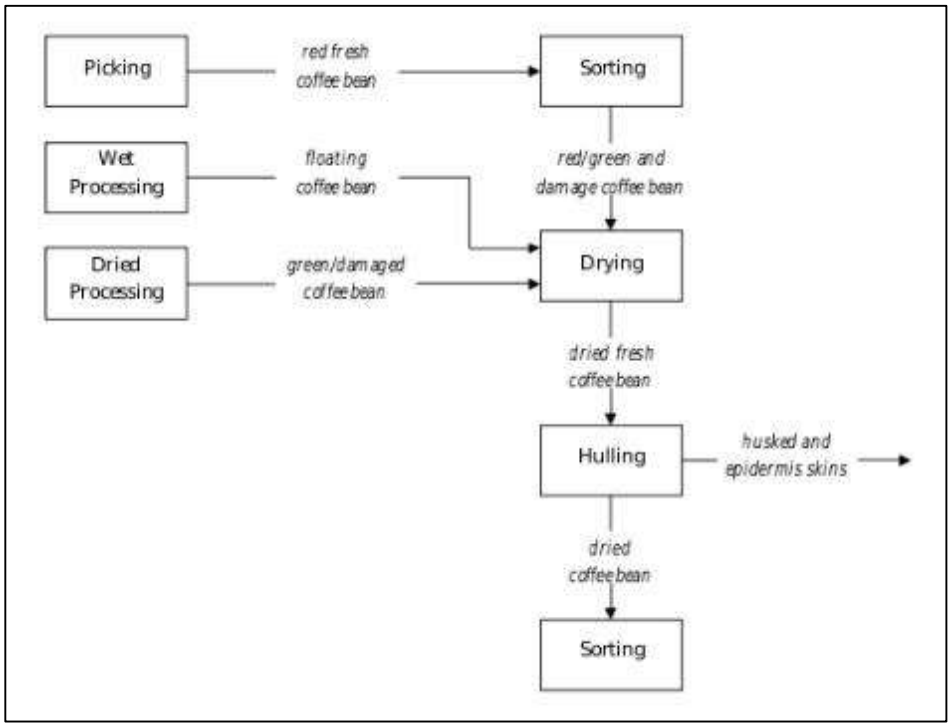
After harvest, Indonesia's specialty coffees are processed in a variety of ways, each imparting its own flavors and aromas to the final product. In general, these characteristics improve the quality of the coffee. However, poor or uneven processing can result in off-flavors and taints. Three main processes are used – the dry, wet hulled, (semi washed) and washed methods.

A small number of farmers in Sulawesi, Flores and Bali use the most traditional method of all, dry processing. These farmers simply dry their coffee cherries in the sun. This method imparts fruity, fermented or sweet earthy flavors to the beans as they dry. After drying, the dried cherries are hulled by mechanically removing the dried outer fruit layer and the parchment that covers the bean.

Most small-scale farmers on Sulawesi, Sumatra, Flores, and Papua use a unique process, called "giling basah", which literally means "wet grinding" in Bahasa Indonesia. The industry also uses the terms wet hulling semi washed and semi dried for this method. In this technique, farmers remove the outer skin from the cherries mechanically, using rustic pulping machines, called "luwak". The coffee beans, still coated with mucilage, are then stored for up to a day. Following this waiting period, the mucilage is washed off and the coffee is partially dried to between 30% to 35% moisture for sale.

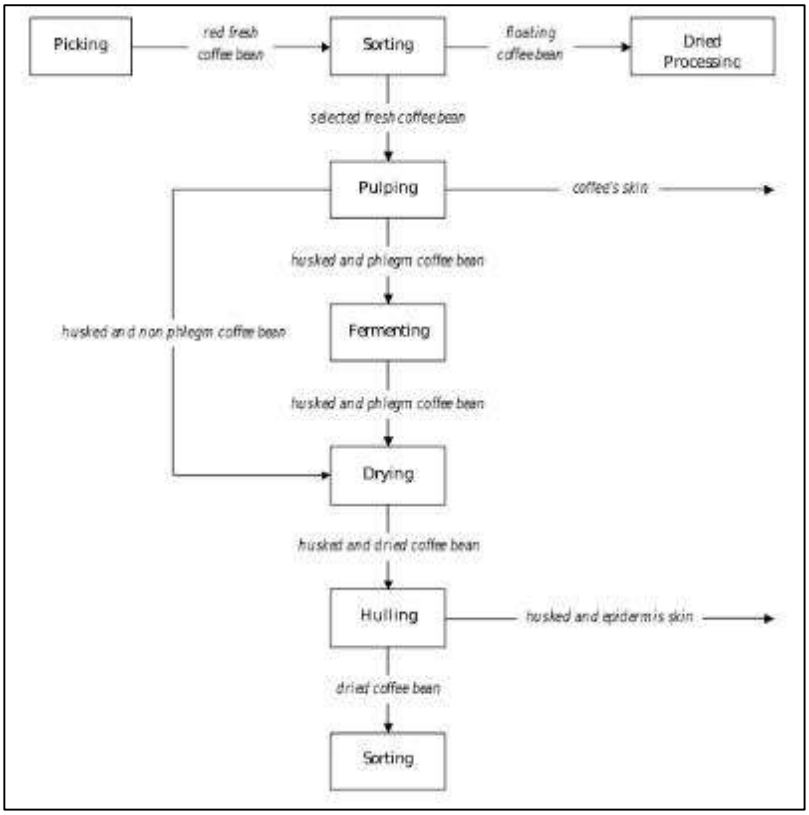
Processors then hull the coffee in a semi-wet state, which gives the beans a unique bluish green appearance. This process reduces acidity and increases body, resulting in the classic Indonesian cup profile. Larger processing mills, estates and some farmers' cooperatives on Sumatra, Java, Sulawesi and Bali produce "fully washed" coffee. First, ripe cherries are milled to remove the outer skin. The de-hulled coffee is then placed in tanks or barrels to ferment for 12 to 36 hours. After fermenting, the beans are washed and spread out to dry on cement patios or drying tables. After drying, the parchment skin or pergamino becomes loose and crumbly. At this point, the beans are dry hulled and ready for

machine and hand sorting, before being packed and exported. Figure 31 and Figure 32 highlight the dry and wet coffee processing steps.



Source: Giera and Struthers (2007a)

Figure 31: Dry coffee bean processing



Source: Ibid

Figure 32: Wet coffee bean processing

After hulling, the coffee is then sorted by size, weight and colour, first mechanically and then by hand. Finally, the green coffee is then packed in 60 kilogram, food grade bags for export. Test cupping may be performed throughout the process for higher quality Arabicas to ensure the coffee is "specialty grade". After sorting, some producers age their coffee for one to three years before marketing. This process can develop woody and cinnamon flavours, with a very mild and warm character. The green beans change colour, becoming dark yellow to brown. Roasters like to use this coffee in special blends, at Christmas time, for example, where warm cinnamon flavours are desired (Specialty Coffee Association of Indonesia, n.d).

It is reported that Robusta cherry is selectively harvested like Arabica in Flores, which would be very unusual in Robusta production systems where strip-picking usually dominates. This could explain why Flores Robusta is a relatively sought after origin. It was reported that Flores farmers believe that strip picking can damage the coffee tree. However, due to the wide range and inappropriate processing methods (eg. hulling with stone mortars and/or inadequate drying), both Arabica and Robusta coming from Flores is generally considered to be of poor quality (Marsh and Neilson, 2007a).

MARKETING

Internal traders purchase coffee from producers in either cherry, sun-dried or green bean form, usually at the farm gate or a local buying depot. Inadequately dried coffee is often re-dried prior to milling and preparation for export. Internal traders may be required to store significant quantities of coffee and transport it over long distances prior to sale to exporters. Apart from private traders, co-operatives are a common means of buying and processing coffee from growers.

Exporters are often closely associated with internal traders, providing them with pre-financing to enable the specific coffees required by their overseas clients to be sourced. They may have to carry out some of the secondary processing stages for the coffee they receive (where they have not been performed by the internal traders) including hulling, sorting and grading. In some cases, they may even have to re-dry coffee to meet minimum export requirements. Following this, they are usually required to blend coffee into marketable quantities of homogenous quality, often to specifications previously agreed with their overseas clients. The remaining exporter functions typically involve organising shipping to overseas markets, storage and handling of coffee prior to export, and maintaining close contact with buyers as the coffee moves along the marketing chain.

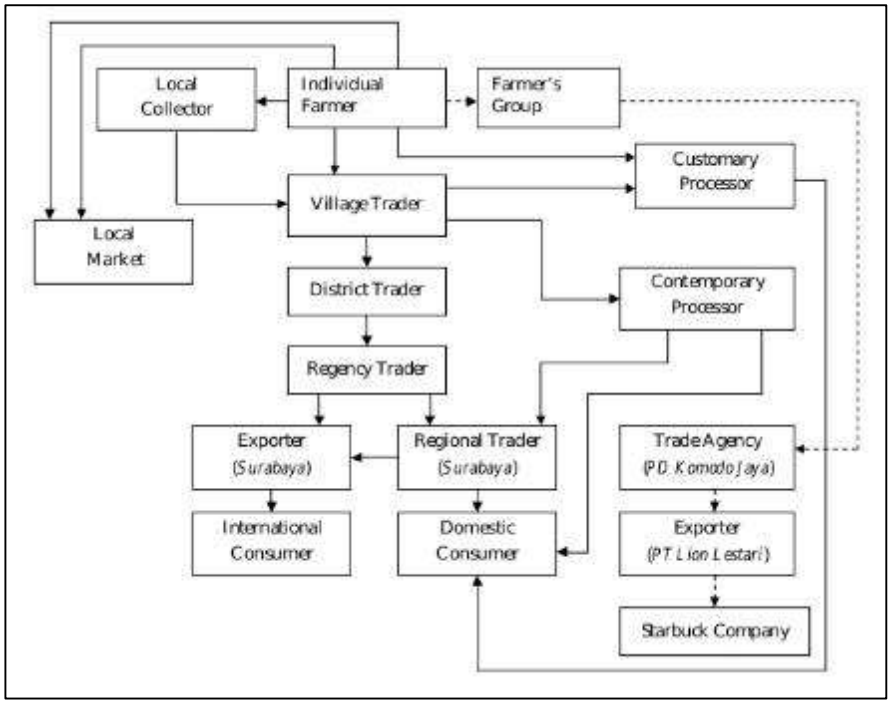
International traders source green bean coffees from the various producing countries for roasters mainly located in the consuming countries; they are typically responsible for logistics, financing, risk management and ensuring just-in-time deliveries. In order to be assured of securing the specific coffees roasters require at any particular point in time, the international traders are closely associated with exporters in producing countries, often supplying the pre-finance that is channelled up the marketing chain to the internal traders. In some cases, the exporters are subsidiary companies of international traders.

Roasters/soluble manufacturers blend and roast the green beans delivered to their plants by the international traders. In recent years, improvements in roasting technologies that make it possible to alter the components of a blend without changing its taste, while technical innovations such as the steam washing of robusta have allowed roasters to minimise their raw material costs by substituting cheaper beans in their blends. Around 10% of robusta exports are treated in this way. The mainstream market, which accounts for over 90% of the coffee consumed in the importing countries, is comprises of three market segments:

- Premium Brands/Blends: Among the major roasters, a number produce premium blends for the top end of the market; in some markets, these products compete with specialty coffee. These products can be single origin products, or products of a few named origins. With oversupply in the market and roasters able to pick and choose between products, single origin products are reducing as roasters choose to market premium blends according to brand rather than origin name.
- Major Brands/Blends: This is the largest category of sales and refers to the roasters' standard blends. These are almost exclusively marketed according to brand name rather than the individual components of the blend. The brand is typically linked to consumer perceptions and the degree of roasting and accounts for the bulk of consumption in coffee importing countries.
- Own Label Products: These are products marketed by individual supermarket chains or outlets. Prices tend to be at the bottom end of the market. These products primarily compete on price with the major blends.

(LMC International with Proforest, 2006)

Consolidation in the retail sector is a factor driving the concentration seen taking place in earlier segments of the coffee marketing chain, notably roasting and trading. Figure 33 shows an example of the marketing value chain in the Manggarai Regency in Nusa Tenggara Timur.



Source: LMC International with Proforest (2006)

Figure 33: Marketing channel of coffee in the Manggarai Regency, NTT

ENVIRONMENTAL

There is limited information available on environmental issues regarding coffee in Indonesia, apart from the links to certification initiatives. In the SMAR study for Sulawesi there was a short summary of the degrading practices in one region (Mamasa Valley). Practices included poor land management leading to extreme soil erosion, forcing farmers to abandon their farms after 5 years of production, who then clear additional primary forest to plant more coffee (see Figure 34). The authors of that report say that forest clearing for coffee production is an ongoing concern in the Sulawesi highlands, reflecting an extensive, rather than an intensive approach to agriculture. They go on to argue that while degrading practices in Sulawesi have not yet been targeted by environmental organizations, this is likely to change soon. Global coffee companies' fear of being associated with large scale environmental degradation is the main impetus for the fast expansion of certification schemes for coffee and other commodities. The authors suggest implementing effective farmer extension programs that will make coffee farming more productive and more sustainable (Marsh and Neilson, 2007b).

Figure 34: Forest clearing for coffee planting in Mamasa

The precise environmental issues in other parts of Eastern Indonesia are unknown. However, the following summary of the issues globally provided by WWF highlight some of the major concerns. Certainly forest clearing and potential soil and water degradation at least, are issues likely to emerge in Flores and other parts of Eastern Indonesia.

Full-sun coffee (common in Latin America and less common in Indonesia, except for maybe East Java) is implicated in large-scale destruction of natural ecosystems for planting coffee. Complete clearing means near total loss of biodiversity. Studies in Colombia and Mexico indicate that full-sun coffee plantations support 90% fewer bird species than shade-grown coffee.

The severe thinning or clearing of forests for planting shade-grown coffee is also a major concern. Considerable biodiversity is lost both above and below ground. Microorganisms in particular are affected through clearing, soil disturbance, and exposure. Even with shade coffee the number of tree species can be reduced by 80% or more. Mammals and reptiles show declines in populations and species diversity relative to natural forests. Bat species are reduced by half or more in agro forestry systems such as shade-grown coffee. Furthermore, species that do better in disturbed ecosystems tend to dominate areas of shade-grown coffee.

Overpopulation in agricultural areas can cause the migration of poor farmers or landless people to frontier areas where they plant coffee (e.g., in the outer islands of Indonesia and in central Vietnam). The production of coffee contributes to serious declines in both biodiversity and ecosystem functions.

Another driving force of habitat conversion is the increasing market for high-grade specialty coffees. These coffees tend to be produced in new, out-of-the-way areas with unique soils and topographies that give the beans unusual flavor profiles. Such coffee is often produced in areas that are too steep or otherwise of too poor quality for the production of other food and cash crops. These are precisely the types of areas that are rich in biodiversity or, at the very least, have become local biodiversity refuges in the face of the expansion of other forms of agricultural production. They are also typically the types of areas that are most prone to erosion. Consequently, the demand for higher-quality arabica coffee may exacerbate environmental degradation.

Lands that have been set aside for preservation in Mexico, Vietnam, Kenya, Nicaragua, and Indonesia have reportedly been invaded illegally by coffee producers. Indonesian coffee growers are illegally clearing an important nature reserve, according to conservation group WWF. The Bukit Barisan Selatan reserve, on the southern tip of Sumatra, has already lost nearly 20% of its area to illegal coffee growing. The park is one of the few areas where endangered Sumatran

tigers, elephants and rhinos still co-exist. According to Nazir Foead, from WWF Indonesia, "about 17% of the national park area is being cultivated for coffee. If this trend of clearing park land for coffee isn't halted, the rhinos and tigers will be locally extinct in less than a decade".

Coffee production has tended to migrate across the landscape, as plantations are abandoned and new ones started on fresh soil. Such migration left behind lands that were suitable first for short-term agriculture, then for extensive cattle grazing (primarily an issue in Latin America), and finally were often abandoned once soil degradation and erosion left them unproductive.

Use of herbicides to clean fields of brush and weeds, which is especially degrading when applied on slopes, is a major cause of soil exposure and erosion, along with leaching of the herbicides into drinking water sources.

In some countries there is a high use of chemicals to combat pests and diseases, but this is less so in Indonesia. Many cases of chemical poisoning associated with coffee farming have been reported amongst workers. Little investigation has been done on the impact of these chemicals on other species or residual chemicals in the coffee itself.

Coffee processing often degrades freshwater ecosystems. Now that processing often occurs farther from the fields, pulp produced from wet pulping operations (which is the preferred and most common processing technique) is increasingly dumped in rivers. This is potentially a source of pollution because the decomposition of the pulp can lower oxygen levels in water leading to fish kills.

LEGAL

1. Ochratoxin A (OTA) in Coffee: Within Europe, the EU set maximum levels for OTA in roasted and soluble coffee of 5.0 ppb and 10 ppb, respectively, through EC Regulation 123/2005. Member states that already had maximum levels in place were expected to align with the new EU limits. A decision on whether to establish limits for green bean was expected in June 2006. (Susila, 2005) The latest European Commission Regulation (EC) No. 1881/2006 of 19 December 2006, as a result of this process, and which entered into force on 1 March 2007, did not set limits on green coffee, and made no changes to the maximum limits for OTA in roasted coffee and soluble coffee of 5 ppb and 10 ppb respectively. However, green coffee remains under review and there is provision for annual reporting on OTA occurrence and prevention measures. And, most European countries have their own established allowed limits of OTA for imported green bean (FAO 2012).
2. Supporting the creation of Geographical Indications: A Geographical Indication (GI) assures consumers that the product they are buying is authentic and comes from a specific geographic region. Indonesia developed regulations to support the creation of GIs for Indonesian products (Government Regulation GR-51) and supported by the 2001 Trademark Law which followed TRIPS. And, Law Number 18/2004 mentions protection of producing area of GI plantation products. The "Book of Requirements for GI" details geographic limits, processing methods, monitoring systems, and use of logos (Mawardi, 2007; Neilson, 2010).
3. Domestic coffee trade in Indonesia is regulated by the Indonesian Ministry of Trade who sets requirements and guidance for local and international exporters. Other industry organizations include Dinas Perkebunan (Estate Crops Office), Perkebunan Besar Swasta (Private Estate Crops Enterprise), and PTPN (Perkebunan Negara/State Owned Estate Crops Company). The AEKI (Asosiasi Eksportir Kopi Indonesia/Indonesian Coffee) Exporter Association) is a para-statal association that assists the industry by organising exporters and providing market development and research services. Membership for exporters to AEKI-AICE is mandatory as is a 30 Rp per kg fee for all exports (Asosiasi Eksportir and Industri Kopi Indonesia, 2011).

4. In 2001 coffee export taxes were removed to enhance market competitiveness and foreign exchange earnings. There are still significant port charges including terminal handling charges, and export certification and documentation costs (Giera and Struthers, 2007a).
5. The newly released Regulation of Minister Of Trade Of The Republic Of Indonesia Number 10/M-Dag/Per/5/2011 On The Export of Coffee which came into force since May 3, 2011. The regulation is the Ammendment to the Regulation Of The Minister Of Trade Number 41/M-Dag/Per/9/2009 On The Export Of Coffee and reportedly simplifies exportation procedures.
6. Ministry of Trade requirement to export at least 200 tons of coffee per year before getting the ETK (Permanent Coffee Export) status. Its regulated in the Minister of Trade Regulation 41/M-DAG/PER/9/2009 on Coffee Export Requirement, which is a revision of Minister of Trade Regulation (Permendag) 27/M-DAG/ PER/7/2008. (http://www.coffeevn.asia).
7. Codex Alimentarius (Latin for "Book of Food") is a collection of internationally recognized standards, codes of practice, guidelines and other recommendations relating to foods, food production and food safety. Was established in 1963 by the UNFAO and the UNWHO. For Codex limits for chemical residues in coffee see: http://www.codexalimentarius.net/pestres/data/commodities/details.html?id=240
8. ISO Standards for Coffee (TC 34/SC 15) (see http://www.iso.org)
9. Hazard Analysis and Critical Control Points Standards: http://www.haccpalliance.org/
10. GlobalGAP (Green) Coffee: http://www2.globalgap.org/coffee. More on Global GAP (Good Agricultural Practices): http://www.fao.org/prods/GAP/index_en.htm
11. Quotas for coffee exports were abolished in 1989.

SECTOR POTENTIAL FOR DEVELOPMENT

PRODUCTION

Understanding farmer incentive structures and motivations are necessary in order to improve coffee yields. Among other challenges, there may be limitations on the availability of investment capital or high opportunity costs involved in crop improvement. Up until now, there have not been many constraints on coffee farmers for clearing forest and expanding coffee growing area. However, between land pressures, government enforcement, and the requirements for certification programs, the need to emphasize intensification over expansion of production area is imminent (Marsh and Neilson, 2007b).

Apart from the limitations discussed above, there is a lot of consensus in the literature reviewed on what coffee farmers can and should do in order to increase yields, which include the following:

1. Increase access to coffee seedlings in order to replace large proportion of mature, senile and/or damaged trees (especially true for Flores).
2. Improve understanding and selection of varieties that are better suited for local agroecological context and markets. A rigorous comparison of the varieties dominant in Flores was conducted focussing on cupping characteristics. The majority preferred the S795 variety over Hybrid of Timor (HdT) and Juria. HdT was the second choice, but may be preferred in areas with poor soils (Mawardi et al, 2010).
3. Recommendations made to IFC by international consultants included suggesting that farmers in Flores have a mix of Robusta and Arabica trees. This, they say, could help to manage market (price fluctuations) and production risks that can result from unseasonably wet or dry weather at flowering. An unseasonably wet flowering season has the opposite effect on Robusta as it does on Arabica. Having a mix of Arabica and Robusta coffee can be a good way for farmers to manage this risk (Giera and Struthers, 2007a).
4. Improve selection, density and access of/to shade trees.

5. Improve agronomic practices including land preparation, tree husbandry (especially pruning and capping), soil fertility management, and integrated pest management (primarily for coffee berry borer and stem borer).
6. Improve sustainability of agronomic practices including those issues highlighted in section on environment (land selection and management, soil fertility management, soil erosion control, reducing/eliminating chemical usage, and waste disposal).
7. Eliminate strip harvesting of coffee cherry by encouraging selectively picked ripe cherries.
8. Build capacity of government and other institutions in order to deliver the above listed extension services to farmers.

PROCESSING AND TECHNOLOGY

At least three types of upgrading are identified in the value chain literature: product, process and functional upgrading. According to this framework, process upgrading is where improvements are made to the production process to generate outputs more efficiently, usually through technology improvements such as mechanisation. Product upgrading is where suppliers move into higher value product lines to achieve increased unit values (eg. organic or specialty production). Functional upgrading is where suppliers acquire new functions in the chain such as engaging in downstream processing of raw materials. To different extents, all three types of upgrading are evident in Eastern Indonesia (Neilson et al, 2010).

The dominant industry approach is to promote functional upgrading, generally through the provision of small-scale processing equipment such as hulling machines, graders, and even roasting machines. This approach assumes that downstream processing will deliver 'value-added' to rural communities. Downstream processing, however, does not always lead to overall 'value-adding'. Coffee farmers in the Sulawesi districts, for example, generally sell wet parchment to traders, whereas farmers in Flores sell green beans. Neilson et al (2010) demonstrates that farm-gate prices in Sulawesi are noticeably higher due primarily to the ability of centralised mills to manage quality effectively.

Up until now there has been very little knowledge in the industry about the role that coffee processing plays in influencing taste profiles. For that reason an experiment was conducted that compared the three dominant varieties of coffee in Flores vis a vis the three main methods for processing. The three processing methods consisted of wet process by dry hulling (WPDH - 'full-washed'); wet process by wet hulling (WPWH - 'wet-hulled'); and 'descascado' or pulped natural (PN). Both FW and WH require relatively large amounts of water (up to 5 litres per kg of cherry) for the washing stage of the process with equivalent amounts of waste water being produced. WH is an Indonesian variation of the FW process where fully washed parchment is hulled while still at 30% to 40% moisture content to produce a green bean ready for drying. PN is the drying of coffee with the mucilage intact on the parchment after the skin of the fresh cherry is removed by a pulper, with no washing (Marsh et al, 2010).

This research demonstrated that under Flores conditions and for the 3 varieties evaluated, PN processing creates a highly preferred coffee compared to FW and WH, indicating that processing does have an identifiable influence on cup taste. PN processing is often viewed as an inferior form of processing, perhaps because of its relative low technology and is often inconsistent due to poor quality control by smallholders. If consistent quality control is applied to PN processing this research shows that the resulting coffee is highly preferred by the specialty coffee industry.

The demonstrated quality results for PN, coupled with the low water use, low waste output and minimal processing equipment requirement indicates that PN processing in the Flores coffee industry warrants further investigation (Ibid.). Reinforcing these results, its reported that a number of international buyers in Europe and the United States believe that the technically superior, fully washed method now most commonly promoted has actually contributed to a gradual decline in quality, and would prefer a return to more traditional methods (Neilson, 2007).

One consultant to the IFC SADI project suggested that current post harvest practices mean that parchment must be dried and sold within a few days otherwise beans developed a "musty" taint. Improved drying practices (drying parchment down to 12% moisture) can reduce the need for farmers to immediately sell coffee and may provide farmers with more flexible marketing options (Giera and Struthers, 2007a).

A very thorough global study with case studies was conducted looking at processing of coffee, with emphasis on reducing existence of OTA (Ochratoxin A). To produce coffee with less OTA primarily means managing moisture content, and thus incurs higher costs, such as picking and drying costs. There were several scenarios identified and analysed for achieving lower rates of OTA and the outcomes were not perfectly conclusive. According to the survey and within the Indonesia case study, the cost to farmers of producing asalan (typical quality, non sorted/graded) was $0.23 per kg while the margin earned was $0.20 per kg. Producing improved quality coffee (ie. less OTA) cost $0.31 per kg; however, due to the higher price earned (for that scenario) the farmer's margin increased to $0.27 per kg. Further along the marketing chain, exporter's costs were reduced from $0.02 per kg in the base case to $0.01 per kg for improved quality coffee. Two scenarios in the Indonesia case study resulted in similarly positive economic outcomes, while one scenario gave a negative economic outcome (LMC International with Proforest, 2006).

Coffee is almost exclusively exported as green beans. There have been very few successful cases of domestic roasting prior to export worldwide, and it is not realistic to contemplate a large-scale local roasting industry for the export market. Successful roasting requires deep understanding of local consumer demand, usually proximity to urban markets, and aggressive marketing. Roasting for the growing Indonesian domestic market, however, offers some potential, and could potentially be developed in either the growing regions themselves or nearby urban centres (eg. in Makassar). The value of food tourism (for example, roasting and packaging Toraja coffee for tourists) for regional branding has been demonstrated in various contexts, and could potentially be important however at this stage it is not significant (Marsh and Neilson, 2007b)

QUALITY STANDARDS AND CERTIFICATION

An important standard mentioned in the literature affecting exports of coffee from Indonesia were those related to OTA (Ochratoxin A) as described earlier. There are limits in terms of parts per billion (ppb) allowed in roasted coffee in the EU as a whole. The EU has not yet set limits for OTA for imported green bean, but most countries in the EU have their own limits established and published.

Coffees from Indonesia are graded (1 through 6 with 1 being the highest quality) prior to export based on numbers of different types of defects. Additional Indonesian coffee export requirements are:

- Moisture: maximum 12%/13% (wet processed/dry processed);
- Extraneous matter: maximum 0.5%;
- Free of live insects, stinker beans, mouldy odour and mouldy beans;
- Bean size not specified for Arabica. For Robusta:
  - Large – if retained by a 7.5 mm screen
  - Medium – if pass through a 7.5 mm screen and retained by a 6.5 mm screen
  - Small – if pass through a 6.5 mm screen and retained by a 5.5 mm screen

Over half of Indonesia's green Robusta exports are Grade 4, with Grade 3 accounting for a further 25% of exports; Grade 6 exports, containing over 150 defects per 300g sample, represented 12% of total green Robusta exports on average between 1998/99 and 2003/04 (LMC International with Proforest, 2006).

Certification and verification schemes can be powerful tools for value addition, access to a fast-growing market segment and the dissemination of good agricultural, environmental and social practices. Consumers are demonstrating

an increasing interest in the economic, social and environmental aspects of coffee production. As a result, coffee covered by the various initiatives is estimated to constitute 8 percent of world exports of green and is the fastest growing market segment in traditional (developed country) markets (International Coffee Organisation, n.d.).

The main sustainability programmes are:

Fairtrade Certified - Fairtrade Labelling is an international system of standards for producers and terms of trade for their goods that ensure the world's most marginalised farmers, workers and their families in 59 developing countries are adequately protected and can build a more sustainable future. The FAIRTRADE Mark gives assurance to retailers and consumers that Fairtrade producers in the developing world are getting a fair deal for their work. Fairtrade certification also ensures adherence to strict social standards that foster healthy working conditions and prohibit child labour. Their environmental standards ensure that natural ecosystems are not degraded and cultivated land is used sustainably.

Organic certification - International Federation of Organic Agriculture Movements (IFOAM). IFOAM's basic standards should be considered as a baseline reference standard for organic agriculture worldwide. Although many people understand organic agriculture as the prohibition of synthetic agrochemicals, the organic standards also include nature conservation through the prohibition of clearing primary ecosystems, biodiversity preservation, soil and water conservation, a prohibition on the use of genetically modified organisms, diversity in crop production, maintenance of soil fertility and biological activity, among others. Since 1996 there has also been a basic chapter on social justice, which is implemented by IFOAM accredited certification bodies.

Rainforest Alliance Certified - Many coffee farms are in areas regarded as high priorities for conservation. The Rainforest Alliance and its partner groups in the Sustainable Agriculture Network (SAN) have demonstrated that traditional, forested coffee farms are havens for wildlife. Rainforest Alliance certification aims to maintain biodiversity in the production areas, while at the same time striving for sustainable living conditions for farmers, plantation workers and the local population. The certification also guarantees that farmers are assisted with improved farm management, negotiation leverage and access to premium markets; farm workers are treated with respect, paid fair wages, are properly equipped and given access to education and Medicare. By implementing the SAN sustainable farm-management system, farmers can control costs, gain efficiencies and improve crop quality.

SMBC "Bird friendly" - The Smithsonian Migratory Bird Center's shade-grown coffee certification program promotes the growth of coffee that is economically, environmentally and socio-culturally viable. Coffee grown in the shade of tree canopies, rather than on land cleared of other vegetation, provides a habitat for a number of species, including not only migratory birds but also orchids, insects, mammals such as bats, reptiles and amphibians. Shade trees protect the coffee plants from rain and sun, help maintain soil quality, reduce the need for weeding and aid in pest control, while organic matter from shade trees reduces erosion, contributes nutrients to the soil, and prevents metal toxicities. Shade-grown coffee is given the Smithsonian's Bird Friendly label if the growing conditions meet organic standards, as well as other criteria such as canopy height, foliage cover and number of bird species. The Smithsonian trains certification agencies to recognize these criteria and carry out Bird Friendly evaluations at the same time as they inspect farms for organic standards. Farmers volunteer for the inspection and pay nothing to the Center.

UTZ Certified - The UTZ CERTIFIED Code of Conduct establishes a set of social and environmental criteria for responsible coffee growing practices and efficient farm management, including standards for recordkeeping, minimized and documented use of agrochemicals for crop protection, protection of labour rights and access to health care and education for employees and their families. Coffee producers who are UTZ CERTIFIED are subject to annual inspections by independent certifiers to ensure they comply with the requirements of the Code of Conduct. A web-based Track and

Trace system follows the UTZ CERTIFIED coffee through the chain from grower to roaster. This gives buyers insight into where their coffee really comes from.

The Common Code for the Coffee Community (4C) - The 4C Association is an open and inclusive membership association involving coffee producers, trade and industry and civil society. The 4C Code of Conduct embraces 28 social, environmental and economic principles for all players in the green coffee supply chain - farmers, plantations, producer organizations, estates, mills, exporters and traders - establishing baseline requirements for the sustainable production, processing and trading of coffee and eliminating unacceptable practices. The code facilitates a dynamic improvement process by providing guidance for and commitment to continuous improvement. 4C helps growers, especially small-holders, and their Business Partners to step up from the sustainability baseline to more demanding standards.

CORPORATE PROGRAMS

Nespresso ecolaboration - Nespresso has been working to protect coffee ecosystems by promoting sustainable agricultural best practices in ecosystem conservation, wildlife protection and water conservation. Sustainable agricultural training for farmers is provided by Nespresso agronomists, coffee suppliers and experts from the Sustainable Agriculture Network (SAN) - a coalition of leading conservation groups. The Nespresso AAA Sustainable Quality Coffee Program sets out to ensure the cultivation of highest quality coffee in ways that are environmentally sustainable and beneficial to farming communities.

Starbucks C.A.F.E Practices - Starbucks defines sustainability as an economically viable model that addresses the social and environmental needs of all the participants in the supply chain from farmer to consumer. The Starbucks C.A.F.E. program evaluates the sustainable production of coffee according to four categories: Product Quality, Economic Accountability, Social Responsibility, and Environmental Leadership. The program was designed to establish quality criteria for growers, processors, and vendors in order to encourage cooperation and shared responsibility throughout the supply chain. It addresses critical issues such as water conservation, worker conditions, including hiring practices and policies, and conservation of biodiversity amongst others matters (Ibid.).

Certification for coffee is a rapidly growing industry, although it is unclear whether this will increase farmer income and who will ultimately bear the costs. International coffee trading companies, rather than traditional Indonesian exporters, have greater experience in implementing such schemes and will probably gain a further market advantage as a result. Certification requires farmer organisation, which is poorly developed across Eastern Indonesia. “Attention needs to be given to ensure that certification does not lead to farmer capture by single buyers. A key test for certification programs is whether they benefit farmers and not merely trading companies” (Marsh and Neilson, 2007a)

For a critical view of certification programs Neilson (2008) states “An unintended consequence of these changes [brought about by sustainability and certification initiatives] in the future may be to increase transaction costs along the value chain and to exert an overall downward pressure on farm-gate prices.” For an even more critical view especially of industry initiatives such as Kraft, Nestle, Sara Lee and others, see the Oxfam America (2002).

A survey by the International Institute for Sustainable Development’s Committee on Sustainability Assessment found the impact of sustainability initiatives for the coffee sector to be mostly positive, but not completely. Based on their observations:

1. Farm performance along social, economic and environmental indicators is highly variable. This appears to confirm that the effectiveness of sustainability initiatives is heavily influenced by local conditions in terms of the manner in which they are implemented and enforced. In some cases they may be a boon and in others a bane.

2. Certified farms observed in the testing process generally appear to be better off economically (assessed by net income) than their conventional counterparts, but the gap can be narrow.

3. With respect to many of the environmental parameters measured (such as biodiversity and shade coverage), there is little evidence that certification had a significant effect on the environment over the first two years of certification—possibly due to the lag time between implementation of practices and environmental impact (e.g., planting of shade trees or creating erosion barriers).

4. With respect to social parameters, certified farms appear to have distinctly better occupational health and safety, employee relations and labour rights performance (Giovannucci and Potts, 2008).

IMPACT POTENTIAL

PRODUCERS AND PROCESSORS

Most of the documents reviewed, particularly those that address issues in East Nusa Tenggara (NTT), Indonesia, are five or six years old. Any organization planning to develop a coffee initiative in that region should conduct an intensive field level assessment beforehand that analyzes the current situation, opportunities and constraints. The key finding mentioned earlier identified that distinct livelihood strategies affect both the willingness of farmers to participate in value chain upgrading as well as their potential to gain tangible benefits from enhanced value chain integration (Neilson et. al. 2010). Assuming that an organization can effectively implement a program that complements these unique livelihood and decision-making strategies, and assuming the situation has not changed dramatically since those 2006 and 2007 studies, the following is a summary of interventions that would likely lead to improved outcomes for producers and processors.

1. Promote good agronomic practices and environmental sustainability:
    a. Implement a farmer training and extension program that address challenges identified in the 'Production' section above, namely: access to and choice of appropriate varieties; replacing mature/senile/damaged trees; improving types and densities of shade trees; soil fertility management; integrated pest and disease management; improved tree husbandry (especially pruning and capping); selective harvest of cherries rather than strip picking; and composting and/or disposal of pulp. Additionally, farmer-led experimentation on integrating additional economic and food crops into a coffee-based mixed farming system. The results of those efforts could help address farmers' needs for more resilient livelihood strategies including for food security, and thus increase the likelihood of adoption of the coffee components to that new mixed farming system that emerges.
    b. Most value chain studies suggest establishing a demonstration farm to use for training. This reviewer suggests that on-farm training is far more effective and recommends applying either the Farmer Field School approach or an innovative farmer to farmer extension system. A Farmer Field School approach could be implemented together with a NGO and local government field officers with the former building the capacity of the latter in order to sustain achievements beyond the life of a discreet project. Training collectors (who are often coffee farmers themselves) on improved agronomic practice may be considered as well. Collectors presumably have an interest in seeing yields and quality increase and are very present (more so than government field officers) in the remote communities where coffee farmers live. This would essentially be a farmer to farmer training approach.

c. The World Bank Value Chain Analysis suggests that with just simple agronomic practice improvement yields can be increased by 35%, even more if the effort includes support to replace mature/senile trees (Global Development Solutions 2007). The AMARTA project claimed 30% increases from the adoption of integrated pest management practices only (USAID, 2010).

2. Understanding quality coffee determinants in NTT:
    a. More research should be done on the varieties of coffee that grow well in NTT, that cup well, and thus are in high demand by buyers, as well as preferred processing methods for individual varieties. It may be that S795 will become dominant in the region as it performs well and so far seems to be the preferred variety by professional cuppers.
    b. As quality determinants are understood and developed through varietal choice and processing methods, a marketing strategy can be refined to promote the unique attributes of Flores coffees. Strict quality control will need to be implemented in order to avoid the mixing of qualities (and thus bringing down the average price offered) that has been common until now.
    c. Support the creation of a Geographic Indication (GI) for Flores coffee (if this hasn't been done already). The development of a strong GI for Flores coffee will prevent blending of origins, false labelling, and potentially lead to increased demand and prices (especially if combined with an effective marketing and quality improvement strategy). Farm-gate prices for Arabica coffee in Flores are currently low by Indonesian standards. "The industry, however, possesses a number of favourable conditions which would support the establishment of 'Flores' as a recognised origin within the international specialty coffee sector. If managed appropriately, quality improvement and integration into speciality marketing chains would significantly increase the rural incomes of an estimated 75,000 farm families in Flores." (Marsh and Neilson, 2007a).
    d. According to the 2007 SMAR study, Flores farmers could benefit from price increases of 25% (and possibly up to 40%) for specialty coffee over farm-gate prices for traditionally processed and marketed coffee. This potential price increase may be a trigger to increase generally low farm productivity (Ibid.).
3. Post-harvest practices:
    a. Pulped natural and semi-washed processing both have their advocates as do dry and wet-hulling, and perhaps there is a role to play for various combinations in the region with certain buyers preferring one or the other. At the village level, the introduction of wet-processing systems requires reliable access to water supply during the harvest period (which frequently coincides with the dry season). In many villages, access to such a water supply is not currently available, particularly in Ngada district. (Marsh & Neilson, 2007a)
    b. Current post harvest practices mean that parchment must be dried and sold within a few days otherwise beans developed a "musty" taint. Improved drying practices (drying parchment down to 12% moisture) reduce the need for farmers to immediately sell coffee and provide farmers with more flexible marketing options. (Giera and Struthers, 2007a). Increasing drying and storage capacity will likely require investment. There appears to be no price-related incentives for farmers to hull (remove parchment) beans prior to selling to traders/exporters.
    c. Cooperative and farmer group development: A primary driving force for the formation of farmer groups and cooperatives is actually from the buyers themselves due to traceability demands. Establishing and/or supporting already-existing cooperatives or farmer groups can enable traceability, as well as provide effective conduits for farmer and processor training, and improve market access. These groupings can help to increase the bargaining power of farmers leading to increased price capture.

4. Providing the type of farmer extension services described above and establishing or supporting already-existing cooperatives will make the process of obtaining a certification with one or more of the increasingly popular sustainability initiatives (Organic, Fair Trade, Utz Certified, Rainforest Alliance, CAFÉ for Starbucks only, etc.) much easier. Achieving certification will usually (although not always guaranteed) lead to a price premium for producers and processors/traders, and will generally help to ensure continued improvement in agronomic and environmental practice. It is recommended that the farmer groups/cooperatives themselves receive and hold the certification so that they have some autonomy in terms of sales. If the trader pays for and holds the certification, in order to obtain the price premium producers must sell to those traders. And, even then, some traders/exporters have been known to renege on the price premium at the time of delivery.
5. Although it may be beyond the scope of this review, there are significant infrastructure challenges in NTT that could restrain any coffee sector initiative. The current inability to containerise coffee at a port in Flores severely limits the development of a distinct market identity for Flores coffee, and contributes to the isolation of Ruteng traders from international markets. The administrative requirements for Flores based export activities are considerable, involving coordination with both Kupang and Surabaya. Insufficient formal credit appears to be available in the coffee districts for agricultural investment and upgrading. Road construction to remote coffee-growing villages is likely to be an issue, limiting accessibility and the ability of coffee value chains to transfer price incentives to farmers. (Ibid.)
6. Given the production areas and numbers of farmers involved, there is likely to be potential in other parts of NTT (e.g., Sumba), NTB (Lombok especially), and East Java to develop the coffee sector. Unfortunately, there was almost no mention in the literature about the coffee sector in Eastern Indonesia other than Flores and Sulawesi. East Java has more than 78,000 small scale producers of Arabica and 133,000 for Robust according to Badan Pusat Statistik data. East Java yields a bit higher for Arabica than NTT (about 589 kgs versus 567 kgs per hectare), has very fertile volcanic soils, and benefits from close proximity to the port in Surabaya. There are also quite a few large government-operated coffee estates in East Java. NTB has over 15,000 Robusta farmers that produced over 5,600 tonnes in 2010 (no data for Arabica producers in NTB could be found).

MARKET DEMAND

International consumption has increased on average by around 1.2 percent annually since the early 1980s, rising to more than 2 percent in recent years. Probably the most spectacular growth of a major market occurred in Japan, where it initially averaged some 3.5% a year until appearing to have reached a plateau over the last ten years. Japan is now the third largest importer of coffee in the world. Over the last five years market growth in Europe has been weak, with consumption showing signs of stagnation and possibly even decline. The situation is only slightly better in the United States, where overall consumption, despite the boom in the specialty sector, has grown at a low rate. The figures for consumption in some producing countries and in non-member countries point to a surprisingly large upsurge since the turn of the century, growing on average by over 6 percent per annum, although the economic turmoil of recent years has stifled growth (International Coffee Organisation n.d.).

Indonesian domestic coffee consumption has grown from 1.78 million bags in MY 2009/2010 to 1.9 million bags in MY 2011/2012. Continued consumption growth has resulted from the growth of traditional coffee shops in major secondary cities such as Medan, Aceh, Lampung, Pontianak, Bangka Belitung and in other cities in Sulawesi, Sumatra, and Kalimantan Islands. Fast food chain restaurants such as Kentucky Fried Chicken and McDonalds have integrated coffee shops into their outlets throughout Indonesia. In addition to Starbucks and Dunkin Donuts, other international and domestic chains are opening outlets throughout the country. This includes Excelso, Coffee Bean, Bengawan Solo Coffee, J.Co, Bakoel Koffie, Coffee Club, and Oh La La Café. This reflects a wider macro-trend of a growing middle class and a greater interest in a coffee culture. Figure 35 shows the expected trends in production and consumption in Indonesia over the following 5 years.

	2011f	2012f	2013f	2014f	2015f	2016f
Coffee Production, '000 60kg bags [1]	9,323.9	7,948.4	8,157.9	8,367.4	8,576.9	8,786.4
Coffee Consumption, '000 60kg bags [2]	2,695.6	2,830.4	2,971.9	3,120.5	3,276.5	3,440.4

Source: Business Monitor International 10 Feb 2012

Figure 35: Five year projections production and consumption in Indonesia

The number of large domestic coffee processors has increased from 77 establishments in 2007 to 81 establishments in 2011. Small and medium sized coffee roasters have also experienced strong growth over the same period. Instant coffee producers in Indonesia have consistently developed new products to promote higher sales. Initially, the Indonesian coffee industry just produced classic instant coffee (coffee only). These industries evolved to produce more 3-in-1 instant coffee products (instant coffee combines with sugar and non dairy creamer). Current trends are for developing lines of higher quality products that include 3-in-1 cappuccino, mocha-latte, espresso, cafe latte, vanilla latte and others (Business Monitor International, 2012).

Overall world consumption of coffee has increased only slightly in recent years. However, the specialty coffee market sector has seen dramatic growth over the last five to ten years, driven by demand from companies like Starbucks and a range of medium-size companies, eager to source specialty coffees from all over the world. There are consistent market signals suggesting that there would be a demand for an improved Flores origin in this growing market. Whilst the demand exists, a successful reputation as a specialty coffee must be built through consistent delivery of a unique specialty coffee with the key attributes of quality, consistency, low risk and reliability over at least a five year period. International specialty roasters have been supportive of initial attempts to develop a specialty origin in Flores (Marsh and Neilson, 2007a).

Moreover, this interest extends to improving on-farm and post harvest practices to improve bean and parchment quality. Being the largest buyer for the specialty coffee market (USA) Starbucks can pay up to three times the current average prices in Flores. Indonesian coffee has natural low acidity and high body flavour due to the soils and climate. This style is different to the natural high acidity-low body coffee produced in Brazil and Central America. Consumers in the largest export market (USA) prefer the Indonesian style putting the industry in a favourable position. Anecdotal evidence indicates that there is very high demand (and 30% premium) for Fairtrade organic coffee in the USA, Japan and Europe. A leading exporter of Flores coffee (ECom Ltd) is using Fair Trade Organic and Starbucks certification to build the reputation of the region (Giera and Struthers, 2007a).

As mentioned earlier, there was no discussion in the literature about the demand for coffees from other parts of Eastern Indonesia. East Java is likely to be competitive due to higher productivity, geographic recognition (the term 'Java' often being equated with coffee), and lower transport costs due to proximity to the port in Surabaya. Lombok and parts of NTT such as Sumba have relatively low production so it is unknown if there would be enough economies of scale to attract investors to develop the coffee sector in the same ways as they are attempting in Toraja and Flores currently. Presumably, transport from West Lombok could go overland by truck through Bali to Surabaya in East Java, and not be constrained by the lack of port, as is the case in Flores and Sumba.

POTENTIAL PITFALLS

If future initiatives in the coffee sector continue to ignore the complexity of farmer livelihoods and decision-making strategies, and interventions don't clearly provide incentives for engagement by all stakeholders, then those initiatives are likely to fail. To the extent that upgrading coffee production and processing requires shifting of focus, effort and

resources away from other livelihood activities (including for food security) initiatives will likely continually to see low motivation for involvement by farmers.

There is a risk that many farmers plant additional coffee due to the promise of high prices in the future. When large volumes of coffee are harvested at the same time, prices plummet, as has happened several times over the past few decades. Likewise, if the value chain is unable to address the constraints described previously (including not being able to demonstrate improved quality and geographic sourcing) then buyers will not be willing to pay price premiums, reducing incentives again to participate in value upgrading activities.

If roasters and traders continue to capture the larger share of margins, and farmers (especially) do not achieve additional gains, this will act as a disincentive to participate. The improvements in the value chain must continue uninterrupted for a number of years in order for buyers to be willing to commit to price premiums that would also continue to flow; and farmers must receive those price upgrades, if the system is to succeed for the long term. Likewise, for farmers to engage in certification initiatives they must clearly experience the benefits. If buyers pay for and hold the certifications, and farmers must sell to those buyers only, there is a risk that farmers will opt out either for higher prices offered elsewhere, or when they perceive that the buyer is no longer offering price incentives.

Washing coffee requires large amounts of water which may not be accessible in certain areas, especially given that processing often coincides with the dry season. Climate change could further deepen or extend the dry season further exacerbating this problem. Climate change could contribute to occasional catastrophic pest and disease problems wiping out large percentages of plantations.

Often when there are value-adding initiatives in the agriculture sector men disproportionately benefit over women. There is a risk to further marginalize women with a coffee value-adding project, as the anecdote in the 'Social' section describes.

Expanding coffee farms can lead to additional deforestation. Shade grown coffee can provide environmental benefits, but when not managed well can cause serious degradation. When coffee is harvested nutrients are removed from the system. Pulp can also cause significant pollution in water ways if not managed properly.

Continued lack of a containerised port, bad roads, high port fees and other export fees, in coffee growing areas will likely continue to frustrate the potential benefits of these initiatives. Land conflicts can derail efforts as has occurred in Sulawesi in the past, with the current conflict over land between the Watuata community and the local government in Ngada, Flores (VECO 2011a).

CURRENT DONOR ACTIVITIES

1. Australia-Indonesia Partnership for Rural Economic Development (AIPD-Rural). Large-scale Australian Agency for International Development (AusAID)- funded program meant to replace the previous Rural Small-holder Agribusiness Development Initiative (SADI). Will be funded for five years with possible additional five years second stage to be decided.
2. The International Finance Corporation (IFC) Program for Eastern Indonesia Small-Medium Enterprise Assistance (PENSA). They have an agricultural finance activity beginning for cocoa in Sulawesi which in later stages may include coffee and other parts of Eastern Indonesia.
3. Vredeseilanden (VECO): Have a coffee value chain improvement project that will run to 2013 (likely to have a second phase going to 2016 which expands earlier work) in Flores (Ngada and Manggarai only) and Sulawesi. The Flores project worked with 1,763 farmers in 2010 and targets 2,663 farmers by 2013.

4. Agricultural Market and Support Activity (AMARTA) Phase II – USAID-funded and implemented by ACDI/VOCA. Agribusiness project, US $20 million from 2011 through mid 2016. It will work in horticulture, cocoa and coffee sectors in West Java, North Sumatra, South Sulawesi, and Bali. According to the USAID website the project will not work in the other provinces of Eastern Indonesia. The first phase of AMARTA (completed in 2010), worked on value chains of coffee and other products in Sumatera, Java, Sulawesi, Flores, Bali and Papua (in Wamena and Moanemani in West Papua).

APPENDIX 1

VALUE CHAINS COFFEE IN FLORES AND COFFEE DATA

Table 22: The returns for best practice growing, harvesting and marketing through the Komodo Jaya company shows the returns achievable by improving post harvest practices and establishing direct links with coffee buyers

Income (per hectare)	Unit	Volume	IDR/Unit		IDR	USD
Trees per hectare		250				
Harvested cherries/tree	kg	21				
Harvested cherries	kg	5,250				
Conversion of cherries to parchment			kg/l	1.8		
Parchment		2,917				
Conversion of parchment to Asalan GB			litre/kg A	4.0		
Dry fermented bean "Asalan" 12%WC		729	14,000		10,208,333	
Total Income					**10,208,333**	**1,134**
Production Costs (per hectare)						
Labour pruning + weeding	lbr days	13	15,000		195,000	22
Labour harvest	days	250	15,000		3,750,000	417
Trad pulping process (luvak)	kg	729	100		72,917	8
Fermentation and drying		5,250	100		525,000	
Total Production Costs					**4,542,917**	**446**
Gross Profit/Margin per hectare					**5,665,417**	**688**

Source: Giera and Struthers, 2007a

Table 23: Collecting and processing incomes and costs of fresh cherries

Income (per hectare)	Unit	Volume	IDR/Unit		IDR	USD
Trees per hectare		250				
Harvested cherries/tree	kg	21				
Harvested cherries	kg	5,250				
Conversion of cherries to parchment			kg/l	1.8		
Parchment	litre	2,917	5,500		16,041,667	1,782
Total Income					**16,041,667**	**1,782**
Production Costs (per hectare)						
Labour pruning	lbr days	13	15,000		195,000	22
Labour harvest	days	250	15,000		3,750,000	417
Pulping	kg	5,250	100		525,000	58
Fermentation, drying & handling	kg	5,250	100		525,000	58
			1,533	Rp/l		
Total Production Costs					**4,470,000**	**497**
Gross Profit/Margin per hectare					**11,571,667**	**1,286**

Source: Ibid

The table above shows the estimated returns for a local collector buying fresh cherries undertaking pulping, fermentation and drying to parchment stage and selling to local buyers. Some farmers with better access to labour and capital (such as a head of farmer group) also fulfil the collector role for their local villages as a means of improving their income.

Table 24: Coffee processing costs and income for Flores coffee- parchment to green bean for export

Income (per tonne)	Unit	Volume	IDR/Unit		IDR	USD
Fresh cherries collected	tonnes	60				
Harvested cherries	kg	60,000				
Conversion of cherries to parchment			kg/l	1.8		
Parchment		33,333	5,500		183,333,333	
Waste from fermentation		1,538	13,000		19,994,000	
Total Income					**203,327,333**	**22,591.93**
Production Costs (per tonne)						
Fresh cherry	kg	60,000	2,500		150,000,000	16,666.67
Transport from farms	kg	60,000	50		3,000,000	333.33
Pulping cherries	kg	60,000	100		6,000,000	666.67
Fermenation, wash and dry	kg	15,000	500		7,500,000	833.33
Transport and handling	kg	15,000	150		2,250,000	250.00
Restribution	kg	15,000	100		1,500,000	166.67
Total Costs					**170,250,000**	**18,916.67**
Gross Profit/Margin (per tonne)					**33,077,333**	**3,675.26**

Source: Ibid

The table above shows indicative returns for processors undertaking contract processing for an exporter. Profitability for this intermediary is based on the quality of parchment (i.e., defects and waste material), transport costs and volumes.

Table 25: Coffee exporter buying parchment and exporting green bean

Income	Unit	Volume	IDR/Unit	IDR	USD
Yield from parchment to kilos (grade 1)		3.25			
Processing fee (grade 1 G Bean)	kg	1.00	2,300	2,300	0.26
Total Income				**2,300**	
Production Costs					
Processing	kg	1	2,100		-
Densmtris testing	kg	1	40	40	
Hulling	kg	1	50	50	
Drying	kg	1	131	131	
Sorting	kg	1	300	300	
Other processing costs	kg	1	79	79	
Total Processing Costs	kg			-	
Tranpsort (Flores-Makassar)	kg		480	480	
Overheads (e.g., wharehouse)	kg		1,000	1,000	
Other costs					
Total Production Costs				**2,080**	**0.23**
Gross Profit/Margin per kilo green bean				**220**	**0.02**

Source: Ibid

The table above shows indicative returns for exporters buying parchment direct from farmers and paying collectors and a contract processor to process from parchment to green form and exporting on international markets.

Table 26: Value distribution along the coffee value chain – production costs

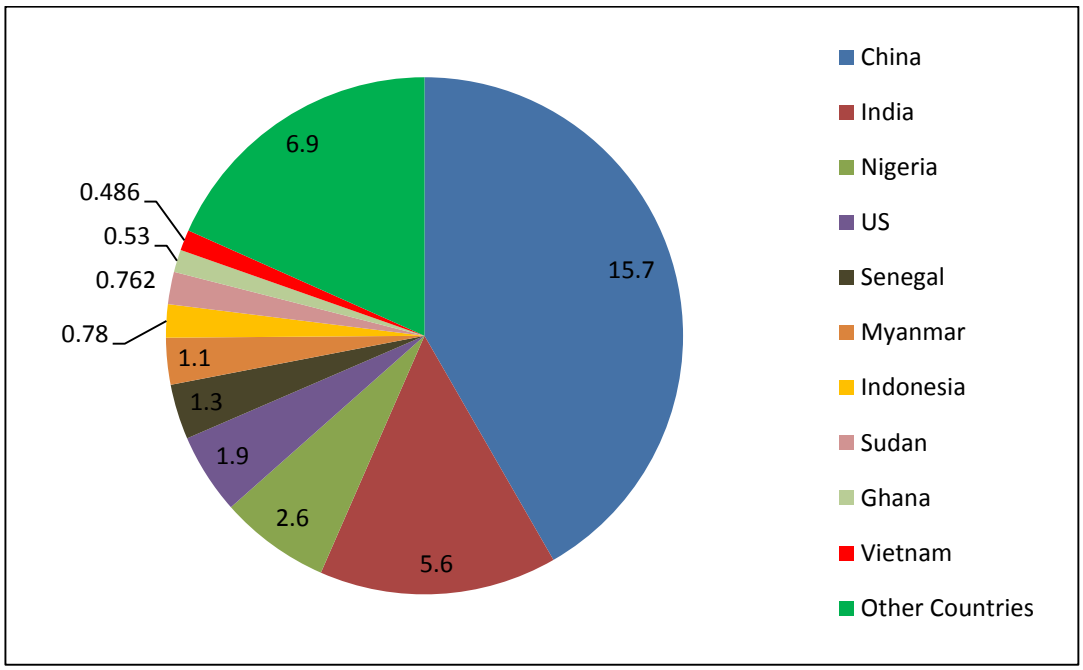
Income	Unit	Volume	IDR/Unit	IDR	USD
Export sales of Green Bean	kg	1.00	25,200		
Total Income				**25,200**	**2.80**
Production Costs					
Raw materials (parchment)	litre	3.25	5,500	17,875	1.99
10% loss- hand grading	litre	0.33	5,500	1,788	0.20
Operational Cost Collector	litre	3.58	600	2,145	0.24
Processing fee	kg	1	2,100	2,100	0.23
Other costs	kg	1		-	-
Total Production Costs				**23,908**	**2.66**
Gross Profit/Margin per kilo green bean				**1,293**	**0.14**

Table 26 illustrates how value is distributed along the coffee value chain from the farmer to the exporter. This diagram, in combination with the estimate of economic returns made in the tables above, show that farmers are able to capture a higher proportion of the final export price by selling parchment as opposed to selling fresh cherries. This value-added activity can be achieved without significant increases in total costs (see tables above). What is not shown in the figure above are the margins made by roasters and coffee retailers (selling coffee drinks) in the US market. Indonesian coffee industry experts believe that roasting adds a further (USD) $23 dollars per kilo and processing into finished coffee drinks adds a further $45 per kilo (Giera and Struthers, 2007a).

6) PEANUT SUB-SECTOR

THE MACRO ENVIRONMENT FOR THE SECTOR

Worldwide production of shelled peanuts was 37.6 million metric tonnes ("MT") on 24 million hectares ("HA") generating yields of up to 1.56 tonnes/Ha (FAOStat 2011). Figure 36 shows the top 10 peanut producing countries in 2010.



Source: FAOStat 2010

Figure 36: World peanut production (million tons)

Peanuts contain an average 40.1% of fat and 25.3% protein and are a rich source of calcium, iron and vitamin B complex like thiamine, riboflavin, niacin and vitamin A. Peanut (Arachis hypogaea L.) is a leguminous tropical plant of the family Fabaceae and is the second most important legume cash crop after soybean in Indonesia. Peanuts are grown in clumps as high as 30 to 50 cm producing a cluster of nuts below ground (Thamaraikannan, Palaniappan and Dharmalingam, n.d.).

The most favorable climatic conditions for peanuts feature a well-distributed rainfall of a minimum of 500 millimeters during the growing season; an abundance of sunshine and; relatively warm temperatures during the growing period where mean temperature is 21°C to 26.5°C. Lower temperatures are not suitable for its proper development. During the ripening period, peanuts requires about a month of warm, dry weather. Being a rainy-season crop, groundnut does not require irrigation. However, if dry spell occurs, irrigation may become necessary.

Almost every part of the peanut has some type of commercial value. The following products are commonly used:

- **Peanut oil:** is mainly used as cooking oil and for making soap, fuel, cosmetics, shaving cream, leather dressings, furniture cream, and lubricants. Peanut oil is also used in making *ghee* and in fatty acids

manufacturing. It is also used as a medium of preservation for pickles, *chutney*, sauces and for making different types of medicated ointments, plasters, syrups and emulsion. It can also be used to make various food preparations like butter, milk, candy and chocolate, chutney, laddu, barfi (chukii) and much more.

- **Peanut kernels:** used in a variety of processing steps that might include frying, soaking, roasting and boiling and in different types of namkeens. Roasted peanuts are an extremely popular snack food in Indonesia. Peanut kernels are also used as a spice in vegetables and as sprouts for salad.
- **Peanut cake:** recognized as a good feed for animals and poultry due to its nutritional value and solubility.
- **Peanut shell:** great potential for commercial use as a fuel and filler material in cattlefeed, hard particleboard, cork substitute, and activated carbon.
- **Peanut straw** is mainly used as animal feed and fuel and in the preparation of compost. The green leaves and stems of plants are used as animal feed. The shells of pods obtained during threshing are also used as cattle feed.

Overall, crushing of peanuts for oil extraction and meal remains as the most important use for groundnuts but its share has decreased while the share of groundnuts used for food products has steadily increased over time.

Specific growth drivers have contributed to increased global consumption of peanuts. Peanuts are perceived as having positive health properties and are a regular feature of global diets. There are health benefits derived from eating peanuts such reduction in risk of chronic disease. Peanut consumption in Asian countries, particularly Indonesia, is attributed to their use as sauces and gravies. Consumers in the United States and Europe consume peanuts as salted, dry-roasted and specialty nuts (such as honey roasted, hickory smoked or chilli-flavored), snacks or peanut butter, confectionery and chocolate.

POLITICAL

The government of Indonesia has consistently subsidized agriculture since 1990, although not uniformly across all commodities. Domestic rice and sugar producers have been protected the most from import competition. Support was interrupted briefly during the financial crisis but subsequently reverted to pre-crisis levels and even increased during 2000–02 for some crops and overall. Peanut producers have not been subsidized.

However, peanut producers have benefitted from government programs that supported contract farming. Contract farming for peanut production and marketing largely evolved after the Asian Financial Crisis of 1998 followed by the fall of Suharto's regime in 1998 which pushed Indonesia to accept the austere terms of the IMF's Structural Adjustment Program (SAP). The SAP pushed about 40 million people into sudden poverty which created an immediate need to implement poverty alleviation programs that had an emphasis on rural livelihood development to act as 'the safety net' to addressing massive unemployment. Indonesian policy makers and multilateral institutions began to view contract farming as part of the solution to addressing poverty in Indonesia.

Indonesia agriculture policy makers have viewed contract farming not only for its potential to increase incomes of the contracting smallholders but also for its multiplier effects in the rural and broader economy. Direct benefits from contracting include improved access to market, credit, and technology, better management of risk and improved farm family employment. While indirect benefits are the improved business enabling environment in contract locations as the prerequisite of the success of contract which

includes both physical (infrastructures and facilities) and non physical (policies and regulations) environment and improved social aspects, such as the empowerment of women.

In the Indonesian context, the likeliness of contract farming to take the lead in agricultural reform is also supported by the changes of government policies in providing services to farmers such as extension services and in making agriculture as a sector more market driven. Various donors' programs in Indonesia have encouraged peanut product and market specialization.

The Indonesian Legume and Tuber Crops Research Institute has been working with the Queensland Department of Employment, Economic Development a Innovation on a peanut improvement program as part of the ACIAR–Smallholder Agribusiness Development Initiative (SADI) is funded as part of the Australia Indonesia Partnership (AIP), a collaboration between research providers and private companies aimed at developing a more commercial approach to agricultural development among poor rural communities. AIP uses "market pull" as opposed to "research push" approach to lift smallholder farming from traditional subsistence level to a commercialized farming approach that is more productive and sustainable because it embodies an income incentive.

AIP leverages existing work by Garuda Foods with peanut farmers in NTB to scale up adoption of a model for enhanced peanut productivity that included improved varieties for product quality; improved farming systems practices to increase productivity and sustainability; and staggered plantings to regulate production and increase farm-gate prices all of which represents a significant departure from traditional farming practices that undermined the productive potential of rural farmers in Indonesia. Research support from AIP contributed to yield increases of 25-67% – resulting in widespread and repeated adoption by farmers. By 2009 more than 7,500 farmers were implementing this model, more than 5,500 of whom were repeat farmers.[16]

ECONOMIC

Peanuts have become a staple of Indonesian cuisine with peanut sauces (kacang sambal) being an integral part of many meals. Peanut sauce is produced by crushing and roasting them with other Indonesian spices and foods. Indonesia's main centres of peanut production are Cirebon and Semarang in Java and Sulawesi in the eastern islands. Peanuts are a major food legume in Indonesia that is produced almost entirely for direct human consumption and provide farmers with their greatest non-rice-crop cash return. East Java is the single major groundnut producing province in Indonesia producing 69% of the national groundnut production from 27% of the total area under the crop in the country. The majority of the East Java crop is planted on dryland Alfisols. In central East Java production area, 65% of the farmer's total income comes from peanuts in Tuban district. As Table 27, Table 28 and Table 29 below illustrate, the harvested areas, production, and productivity of peanuts have grown the most in NTB (2001-2004).

Table 27: Peanut Harvested Area (Ha)

Province	2007	2008	2009	2010	2011
Indonesia	660,480	633,922	622,616	620,563	540,489
East Java	167,324	170,437	180,557	172,550	165,573
West Nusa Tenggara	25,488	25,541	28,750	25,044	26,860
East Nusa Tenggara	18,517	21,894	18,396	16,574	19,123

Source: Badan Pusat Statistik 2011

[16]"Smallholder Agribusiness Development Initiative" prepared by John Fargher and Yasuo Konishi with inputs from Erinch Sahan 15 July 2010

Table 28: Peanut Production (Ton)

Province	2007	2008	2009	2010	2011
Indonesia	789,089	770,054	777,888	779,228	676,899
East Java	196,886	202,345	216,474	207,796	203,493
West Nusa Tenggara	32,913	32,348	38,615	33,666	37,331
East Nusa Tenggara	21,353	25,678	22,465	20,069	23,402

Source: Badan Pusat Statistik 2011

Table 29: Peanut Productivity (t/Ha)

Province	2007	2008	2009	2010	2011
Indonesia	1.19	1.21	1.25	1.26	1.25
East Java	1.18	1.19	1.20	1.20	1.23
West Nusa Tenggara	1.29	1.27	1.34	1.34	1.39
East Nusa Tenggara	1.15	1.17	1.22	1.21	1.22

Source Badan Pusat Statistik 2011

Indonesia's peanut production is dominated by smallholders growing peanuts in rotation with other crops such as rice. The size of most peanut cropping areas are 1 HA or less. It is estimated that 30% (220,000 hectares) of the national peanut crop area is grown in irrigated paddy fields, usually following rice. As a legume, the peanut is cultivated to restore soil structure and fertility through nitrogen fixation. Indonesia's peanut yields range from 0.8 – 2.6 tons from dryland to irrigated paddy fields (Nimmo-Bell and Company Ltd 2007). The large spread in yields reflects a range and diversity of farming techniques, soil and climate types as well as access to technology, irrigation and quality seed. Lower yields are mainly caused by poor crop husbandry and low technology farming systems, premature harvesting and difficulties in controlling pest and disease. Indonesia's peanut oil production was 21,000 MT and peanut meal was 24,000 MT in 2011 (Index Mundi, 2011).

The peanut value chain for Nusa Tenggara Barat (NTB), the largest peanut producing region in Indonesia is outlined in Figure 37. Farmers have three options in selling their production. The farmer's first option is to sell the peanuts to the local collector who, in turn, sells to a larger regional trader that has number of other potential customers both locally and regionally. The second option is for the farmer to sell to a local processor who sells exclusively to the local markets. Finally, the third option is the contract farming option as represented by the contractual arrangement with Garuda Foods.

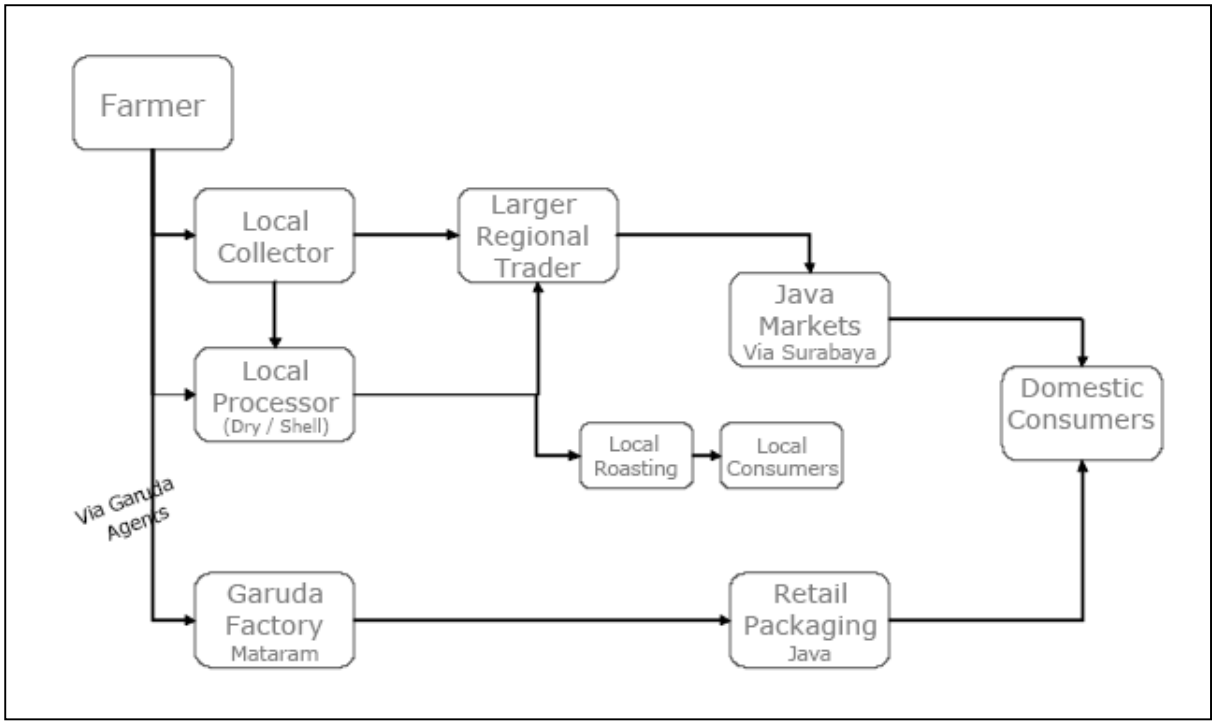
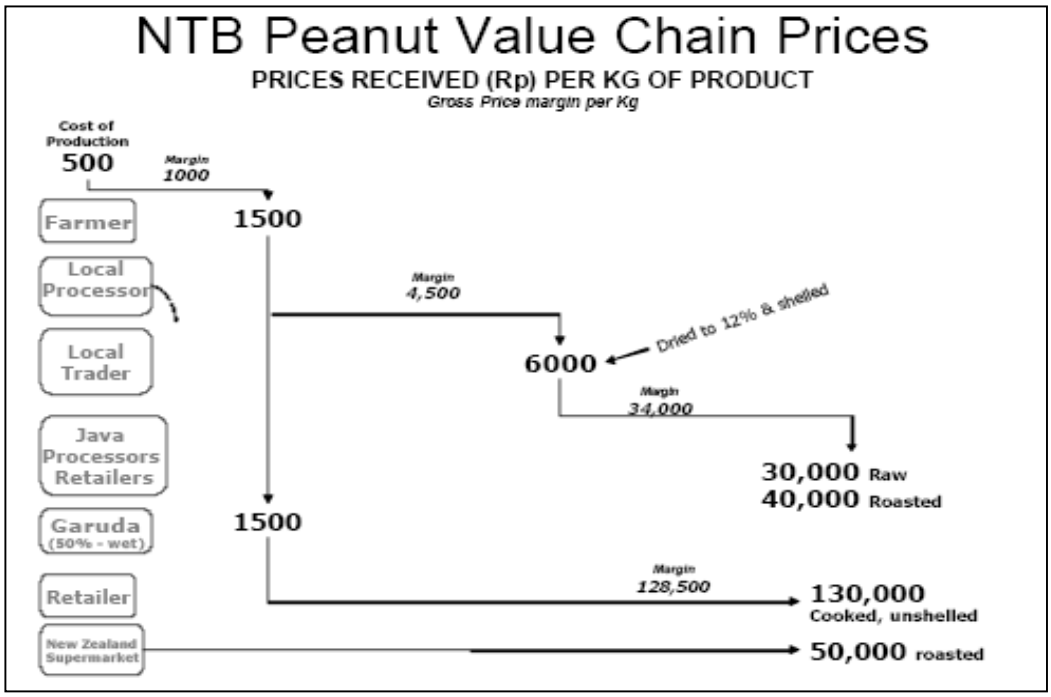


Figure 37: Peanut supply chain map

Under the contract terms, Garuda supplies quality seeds, technical advice, and a guaranteed market for participating farmers and buys approximately 10% of the crop produced (by number of farmers). Garuda buys wet peanuts within 24 hours of harvest so that it can maintain quality by their own post-harvest control. Buying wet peanuts enables the Garuda processing factory to capture the full processing margin, leaving little opportunity for the farmer to share in any value added activity. Participating farmers in the contract generate gross margins of 3,238 IRD/Ha in 2007. (Nimmo-Bell and Company Ltd 2007).

For the 90% of NTB farmers who do not sell to Garuda, local processing capacity appears under-developed with most product sold to traders via collectors in unshelled form where they are graded into three main grades before being shipped generally to Java via Surabaya for final grading. These farmers sell to local collectors and processors and generate gross margins of 753,000-1,063,000 IRD/HA for non-irrigated and irrigated land respectively (Nimmo-Bell and Company Ltd, 2007).

In NTB the traders and processors make, by far, the largest gross profit margins by assuming the responsibility for post-harvest processing which is mostly de-shelling, drying, storage, and transportation. Additional processing is performed depending on the end-use market.



Source: Nimmo-Bell and Company Ltd (2007)

Figure 38: Gross margins of value chain actors

SOCIAL

Peanut cultivation and marketing has demonstrated its effectiveness as a profitable rotation crop in the eastern provinces of Indonesia. It supplements rice production incomes and can help alleviate poverty. Although poverty incidence has fallen in both rural and urban areas, it remains considerably higher in rural than in urban areas. For example, rural poverty rates in Eastern Indonesia were approximately 42% in 2010 which is the highest in Indonesia and exceeds overall poverty rates that include urban and rural areas (Rajah, Roland and McCulloch, 2012). The fact that poverty is rampant in areas with low unemployment rates means that those who work often do not earn enough to lift themselves out of poverty. According to International Labor Organization (ILO) (2011) estimates, there are around 3 million working poor in East Java. The majority of the working poor are employed in agriculture. More than 60% of the poorest households as opposed to less than 10% of the wealthiest households make their living from agriculture. In contrast, more than 75% of the richest households work in the services sectors while only 25% of the poorest households work in services. At the same time, the growth of agriculture reached a ceiling as it became increasingly difficult to increase yields of rice which is the most politically sensitive and supported crop in Indonesia. The absence of structural change and the lack of dynamism in agriculture and manufacturing sectors seem to be the main factors behind the slowdown in growth after the financial crisis (Ibid.).

The need to make agriculture sub-sectors like peanuts more profitable has been more urgent as the shift of labour out of agriculture to the non-agricultural sectors in NTT and NTB has come to a halt, even though productivity in agriculture is still much lower than in other sectors of the economy. Agriculture remains the main source of employment absorbing 42% of the working population but producing only 15% of GDP in 2010. Agriculture is characterised by the highest absorption of employment, but also the lowest contribution to the

province GDP. The main products are rice and other food crops. Land shortages limit the expansion of the sector while agriculture intensification has reached a ceiling under the current modes of production and cropping mix. The profitability of crop production is low due to high production costs and low market prices. The productivity of the workers is further depressed by low levels of skills and a farming system characterised by low technology.

East Java already has policies to improve the overall quality of its human resources. Most government offices have training centres -- Disnaker (the manpower office) have vocational training centres; the Agriculture Department has a training centre for farm extension officers (Balai Latihan Penyuluh Pertanian) as well as an information centre to promote their activities (Balai Informasi Penyuluh Pertanian). The youth office training centres but are not well-coordinated from an organizational and geographic perspective because each centre has its own program and are overlapping. The programs are designed according to the availability of resources rather than aligned with actual market demand. There also appears to be strictly assigned gender roles where men are the major income earners and women are homemakers.

East Nusa Tenggara (Nusa Tenggara Timur, NTT) is one of the poorest and least developed of Indonesia's provinces. The province has an environment characterized by shallow soils, a long dry season, variable rainfall, poor physical and social infrastructure, geographic isolation and low literacy levels. Poverty is widespread amongst rural households, with around 60% of the population living in poverty. While the majority of the population is dependent on agriculture, the province has not been able to achieve food security and self sufficiency. Employment in agriculture in 2000 was 79.35%, and in 2004 was 73.66%, indicating agriculture's overwhelming dominance as an employer. The majority of NTT's population (80%) relies on primary production. Other agribusiness systems along the value chain and supporting institutions are less well developed (Djoeroemana et al, 2006).

TECHNOLOGICAL

Peanut farmers in East Java, NTT, and NTB rely, with a few exceptions, on traditional peanut growing practices with crops being planted at narrow plant spacing (20 cm · 20 cm) intervals without the application of fertilizer and little pest and disease control. Most farmers use local varieties of seeds and rely on immediate post-harvest sales and do little, if any, processing on their own unless they are part of the contract farming scheme with Garuda. Most farmers have limited to access to providers of research and development services to address these production/quality issues. Moreover, most farmers do not have access to timely market information. This all has an impact as yields remain quite low and product quality is not optimized with the result that farmers' incomes are not realized to the fullest extent possible (Djoeroemana et al, 2006).

In order to keep costs low and revenues high, many farmers in Eastern Indonesia, for example, will sell their crop prior to harvest and let the buyer organize and perform the harvest with contract labor. This is a weak trading position for smallholders as buyers will naturally discount for the many risks involved in estimating the quantity and quality of a crop, leaving opportunity for some buyers to take advantage of their market knowledge and financial strength.

Peanuts are primarily graded on size. Larger kernel sizes will fetch higher offered prices. Immature peanuts as a result of premature harvest and inadequate inputs results in small sized nuts, lighter yields, poorer grading and prices offered. Table 30 shows the price difference between three grades of peanut and the average percentage of each grade that growers in NTB can achieve in terms of increased yield and farming practices based on average and best practices (Nimmo-Bell and Company Ltd, 2007).

Table 30: Price grades for NTB shelled peanuts

Indicative Grade Prices for NTB Shelled Peanuts (15% moisture)				
Grade		IRD/Kg	Average Sample	Best Practice Sample
1 – Best	(Large nut)	9,000	20%	60%
2 – Better	(Medium size)	8,750	60%	30%
3 - Fair	(Small Nut)	8,500	15%	8%
Reject	(For local Lombok trade)	3,000	5%	2%

Table 30 is an example of indicative pricing of what is possible given the right combination of good farming practices and post harvest processing. However, current technological practices by farmers in the region but most specifically in NTB has created a different reality regarding the types/quality of product delivered to a range of different types of buyers and prices paid to farmers as illustrated below in Table 31:

Table 31: Peanut product types sold

Product Types	Moisture %	IRD/KG	Customer
Unshelled wet	50	1,500	Garuda
Unshelled wet	50	1,600	Other traders
Unshelled dried	20	3,750	Small collectors
Unshelled dried	15	4,250	Small collectors
Shelled dried	<12	6,500	Misc

The preferred method of marketing peanut ex Lombok to Java, location of main end-user markets, is in the shelled dried form. The price for dried unshelled peanut is heavily dependent on the supply of peanut from growers. The peak supply period occurs from July to November from the irrigated areas and from Feb - May from the dry land areas. Prices to farmers are generally lowest at this time (Nimmo-Bell and Company Ltd, 2007).

ENVIRONMENTAL

In general, peanut production is environmentally friendly as long as farmers control yield-increasing processes such as the use of possibly harmful crop protection chemicals and fertilizers. Cultivation and processing of peanuts typically involves very limited or no wastage because all parts of the peanut can be used for human and livestock consumption; for example, nuts are used as food for people or animals; the pods, leaves and roots are used for animal feed.

Peanut production does not harm the environment. However, farmers sometimes use nylon in the growing process to increase yield, and this has the potential for minor environmental impact.

LEGAL

Groundnut pods are highly susceptible to aflatoxin contamination due to the soil-borne fungi. Studies have shown that about 20 to 25% of the groundnuts produced in Asia and Sub-Saharan Africa contains aflatoxin in excess of statutory limits, thereby exposing people to uncontrolled amounts of aflatoxin. Aflatoxin may enter the food chain directly, by consuming groundnuts, or indirectly, for example in milk from animals that

consume groundnut haulms. Studies in West Africa and elsewhere have shown strong links between aflatoxin levels and health risks for humans, especially children (Center for Agricultural Policy, 2008).

Indonesia has food safety rules such as the 2004 law issued by the Indonesian Food and Drug Control Agency which set the maximum level of aflatoxins in food at 35 parts per billion (ppb) and SNI 7385-2009 directive issued by the Indonesia National Standardization Agency that set the maximum mycotoxin level of peanuts and their products at 15-20 PPB (Raharjo, 2010).

Indonesia is a net importer of peanuts as the country cannot produce enough peanuts to satisfy domestic demand. Therefore, legal requirements of overseas markets are not applicable. Imports of peanuts are encouraged as demonstrated by the recent elimination of the 10% Value-Added Tax ("VAT") on imports of "certain strategic taxable goods" such as dry peanuts in order to accelerate the improvement and to increase the competitiveness of the domestic agricultural business industry (USDA, 2009).

SECTOR POTENTIAL FOR DEVELOPMENT

PRODUCTION

At 1.0 ton per hectare, average peanut yields in Indonesia are lower than the global average of 1.1 tons per hectare (unshelled). The highest average yields are achieved in the major producing countries of the USA, China and Argentina (2 tons/hectare). Although the USA had been third largest producer in the world until mid - 1990s, Nigeria is the third largest producer in the world now. Israel ranked the top in yield per unit area with an average yield of 5,401 Kg/Ha in 2003.

Certain parts of Indonesia (including NTB), possess fertile volcanic soils where national agricultural research trials have shown that with improved crop management 3-4 tons per hectare is achievable. Recent studies by the AIP identify two approaches which may increase peanut production in Indonesia. The first involves an intensification program designed to increase productivity and cropping intensity in Java in the major production areas, which are largely based on latosols. The second involves an expansion program aimed to develop the crop in new areas outside Java, including newly opened farmlands, largely on podzolic soils in Sumatra, Kalimantan, Sulawesi and Irian Jaya.

Although current commercial yields for peanuts are relatively low, experimental plot yields demonstrate potential pod yield in excess of 3 tons/HA provided if there is adequate fertilizer, water and fungicides. The large gap between experimental and actual yields indicates the scope for peanut productivity improvement in Indonesia. There is, however, a commonly held perception amongst farmers in the region towards the peanut crop as a low yielding and low return proposition, thus, it is given relatively low inputs while greater emphasis is given to rice growing. This perception does not reflect the high crop value added (up to 2500 IRD/kg) and potential for high profits of peanuts.

The productivity and profitability of peanuts is severely constrained by lack of access to good quality seed and management practices. For farmers to boost yield and their livelihood, they need better-adapted varieties, improved management practices and timely access to irrigation water. Other needed production/cultivation improvements is the introduction and application of peanut planting technology, ranging from the design of cropping patterns and maintenance to post harvest management.

PROCESSING AND TECHNOLOGY

Generally, peanuts are produced and processed into a wide number of ways and forms. At the initial stages, peanuts are grown in the form of the nut-in-shell and sold as raw, boiled or roasted. Peanut kernels are available for sale in raw, roasted, blanched or salted forms but can be further processed into peanut butter or used in confectionery. Peanut can also be pulverized and crushed into oil to be used for home cooking, food processing and margarine. The peanut meal remaining after oil extraction is a high protein stock feed. Peanut shells also have applications for use in stock feed, potting mix and soil conditioners. The types of processing methods and manufacture of peanut kernel will influence the offered prices and quality of the peanut required. Large and dried high fat unshelled peanut kernels are preferred in the processed snack industry.

Most downstream processing of peanuts in Indonesia is done by the snack food and cooking oil processing firms. Raw peanuts are purchased by various types of traders in most parts of Eastern Indonesia and sold to the processors. Under the contract farming arrangement in NBT with Garuda, a very specific varietal preference for its NIS (nut-in-shell) market and therefore buys only a few selected varieties (mostly Bima variety or known as BIGA). While this variety is local in Sumbawa (particularly in Bima), but in Lombok it is not popular. Local production in Lombok is dominated by 2 seeded varieties, such as Kelinci, Panther, Kidang and Singa. The difficulty in supplying the required variety has forced Garuda to accept whatever varieties available in the market to fulfill its daily production quota. The non-Bima varieties are used as mixtures in the production process. However, in the long run, Garuda expects to secure its supply of the preferred varietal at the desired quality and quantity.

The company only accepts fresh wet peanut within 24 hours of harvest which can be attributed to the lack of adequate storage and drying facilities. This strict approach is being followed because of the perishable characteristic of peanut, which is very susceptible for aflatoxin contamination in post harvest management at farmer level. However, the company still applies separate arrangement (not mentioned in the contract) to accept non fresh un-shelled peanuts to protect their farmers from greater loss. Prices for non fresh unshelled peanuts are below the basic price and determined based on negotiation between the farmers' representative and Garuda. These peanuts are used as raw materials for coated peanuts product. In general, the process of weighing, sorting and grading of peanut is conducted transparently in front of farmers' by Garuda.

MARKETING

There is substantial scope for action in the marketing function for all actors in the peanut value chain. Small-holders which dominate peanut cultivation lack the requisite understanding of linkages between farm practices and market returns. Most farmers lack appreciation of market grading requirements and are often forced to sell before optimum maturity in order to meet pressing financial commitments. Selling unshelled, immature (small) and insufficiently dried peanuts for quick sale does not generate sufficient profits and is not a sustainable course of action. The benefits of at least drying and sorting locally, then shelling of mature peanuts for maximum return would be an option to increase the marketability of produce.

Smallholders also lack access to market information which leads to unfair advantage of buyers over smallholders who remain in a weak bargaining position. Improved technology and methods are required to provide appropriate market information to smallholders through extension services. Finally, farmers have difficulty obtaining correct market signals. Producers supply products relative to the rewards received. Consistent and achievable rewards for quality will encourage quality production. There should be

opportunities to expand the level of collaboration with more peanut buyers and processors to improve market signals that favor best practices for the supply of the highest quality product.

These efforts can be supplemented through the development of government policies that may have the following effects:

1. Provide the appropriate credit for small holders and businesses;
2. Create conditions conducive to the development of food crops a year are classified as strategic because it supplies the raw material processing industry; and
3. Guarantee the success of development projects through the application of peanut cultivation as pursued through the implementation of Integrated Partnership Program (CCP).

QUALITY STANDARDS AND CERTIFICATION

There are no enforced quality standards and certifications governing peanuts in Indonesia. There are regulations governing the maximum aflatoxin levels that are allowed in peanuts, however, these do not seem to have a bearing on the products being sold in the supply chain. Lower grade peanuts are still sold, albeit, at lower prices to processors that are willing to up buy all of the available production.

IMPACT POTENTIAL

PRODUCERS AND PROCESSORS

Peanuts are a major part of Indonesia cuisine and have become an important ingredient in the snack food market. Producers at every level of the peanut value chain can develop the right mix of products and services in order to produce a quality product for both human and animal consumption. Fortunately, farmers have the opportunity to sell to a relatively large number of local, regional, and national food processors. There are opportunities for farmers to secure higher profits by doing more of the post-harvest processing. However, farmers must be willing to change current growing methods and adopt better techniques that allow for timely harvesting before they can realize the gains from better post-harvest handling.

MARKET DEMAND

Peanuts are an important source of protein for Indonesians and it is used in traditional cooking. As stated earlier, the most common uses for peanut and peanut derived products in Indonesia are as a traditional cooking ingredient, peanut oil and butter and increasingly as an ingredient in processed snack foods such as chocolate bars. Indonesia's growing processed snack foods market reached a value of USD 450 million in 2002, 35% of this market is made from peanut and other nut products. The value of Indonesia's processed snack food market is expected to reach USD 723 million by 2007 or the equivalent of USD 253 million for peanut and nut products (FAO).

Domestic peanut producers are not able to meet the growing national demand and significant volumes of peanut are imported each year. In 2004, Indonesia imported a total of 160,000 tons of peanut at an average value of USD285/ton. Despite this situation, Indonesia is able to export a small volume (15 – 20,000 tons) for comparatively higher prices. Imported product volumes fluctuate each year to cover seasonal supply lows and are used mainly by the snack foods industry. The main exporting countries to Indonesia are China, India, Vietnam and, recently, Australia.

There is potential to develop a number of different peanut value chains that include processed peanut kernels, oil, and meal for different markets. Different buyers are looking for specific products depending on the end-use market so connecting the right product to the right buyer and basic improvements in cultivation techniques could be major future activities to develop and satisfy market demand.

POTENTIAL PITFALLS

As is the case with so many agriculture sub-sectors in other countries, the peanut value chain in Eastern Indonesia is marked by the unequal power relationship that seems to exist between the smallholder farmers on one side and the traders and processors on the other side. The latter groups enjoy the bulk of the profits and can afford to take the risks. Peanut farmers often have a short-term outlook and might not be willing to fully implement the most modern planting, harvesting, and post harvest processing techniques that are needed to secure higher prices in the marketplace. Processors and traders are important actors in the value chain. Measures to enhance the knowledge of farmers and provide incentives for association formation will help deliver a fairer return to farmers.

Attracting government support will be challenging because policy goals are focused more heavily on other food and cash crops with almost no attention or support being directed towards the peanut sub-sector. The standard constraints faced by smallholder farmers that other agriculture sub-sectors face such as shortage of quality and affordable seeds, long-term financing, infrastructure and logistics needs, are the same for the peanut sub-sector. Other common constraints include the technical aspects of production, processing, and management

Increases in peanut production are largely market-driven according to the needs of the processors who are responding to real domestic market demands. Unfortunately, smallholders involved in peanut production in Eastern Indonesia devote most of their land and resources to rice cultivation and consider peanuts to be of secondary importance despite the promising results in NBT and East Java.

CURRENT DONOR ACTIVITIES

Although there is limited support from the Government of Indonesia for peanuts, there have been other sources of support. Researchers from the Indonesian Tuber and Legume Research Institute, Assessment Institute for Agricultural Technologies (BPTPs), University of Mataram, University of Nusa Cendana and the Department of Primary Industries, Fisheries and Rural and Regional Queensland in Australia, along with provincial and district extension staff and grower groups, are involved in an ACIAR-SADI project to improve peanut and mungbean production.

They are developing and implementing strategies to enhance productivity of peanut and mungbean using adaptive research in NTB and NTT. Furthermore, SADI Subprogram 2 (IFC) had partnered with a major peanut buyer and processor in eastern Indonesia, Garuda Food, to improve farmers' access to markets, finance and technical support. The ACIAR-SADI research team is working directly with farmers linked to this Garuda Food supply chain. Garuda Food currently sources peanuts from 3,500 farmers. Through the ACIAR-SADI partnership, it plans to expand the scheme to 18,000 farmers—likely with the support of block grants delivered through SADI Subprogram 1 (PNPM-AP).

Ongoing research partnerships will involve NTB farmers in assessing the optimal planting time for lowland and upland peanut production. Smallholders will also be involved in assessing the cost effectiveness and

acceptability of promising varieties and management practices. Following a request from the Indonesian Government, the ACIAR-SADI team plans to identify the potential for applying the approaches being used on peanut and mungbean to improving productivity and profitability of soybean in eastern Indonesia.

7) COCOA SUB-SECTOR

THE MACRO ENVIRONMENT FOR THE SECTOR

Cocoa is produced in countries within 10°N and 10°S of the Equator. The optimal habitat the cocoa tree is within the lower storey the evergreen rainforests where climatic factors, particularly temperature and rainfall, are appropriate for growth. The largest producing countries are Ivory Coast, Ghana and Indonesia with the latter accounting for approximately 15% of the total world cocoa bean production.

In Indonesia, cocoa is cultivated on over 1.5 million hectares, providing the main source of income for 1,400,000 smallholder farmers and generating USD 1.2 billion in exports annually (VECO, 2011b). The country's cocoa plantations are ranked among the most productive in the world, with each hectare able to produce between 400 and 800 kilograms of cocoa (USAID 2006). Up to now, smallholders contributed 93% of national production; the remainder comes from state plantations and private estates.

More than half of Indonesia's cocoa producers are in eastern Indonesia. The Sulawesi province now produces around 80 percent of Indonesia's dry bean production, mainly through smallholders. The remaining cocoa production areas are situated in North Sumatra, West Java, and Papua, with some small production areas in Bali, Flores, and other islands.

Indonesia's biggest competitive advantages include its low cost, high production capacity (availability of supply), efficient infrastructure and open trading/marketing system. (USAID, 2006)

POLITICAL

The cocoa sector has been well supported in Indonesia. Cocoa is a key strategic crop for Indonesia and its long term sustainability is of vital interest to the country. A Cocoa Sustainability Partnership[17] was established in 2006. In mid 2008, the Indonesian Government announced a large national program for the revitalisation of the cocoa industry known as Gernas Pro Kakao. The program aims to replace up to 70,000 hectares of cocoa, rehabilitate another 140,000 hectares and intensify farming on 300,000 hectares, bringing the total planted area to around 900,000 hectares of productive cocoa.

The Government announced an export tax as high as 15 percent on cocoa beans in 2010. The tax fluctuates depending on the average monthly cocoa futures price on the US market. It was aimed at encouraging more domestic processing of cocoa beans in Indonesia so the country would benefit from marketing value-added products. The tax is not supported by the Indonesian Cocoa Association however, which claims the levies will reduce the total income of cocoa farmers by Rp 1.5 trillion ($165 million) a year (Ekawati 2010). The concerns focus around the exporters covering losses by paying less to the farmers for the cocoa beans.

The Indonesian cocoa value chain is generally unregulated with limited government policy interventions to date. Unlike other export commodities in Indonesia, cocoa has not been affected by price controls, trade licensing requirements or direct involvement of government-sponsored procurement or logistics agencies. In fact, limited government involvement in the cocoa bean value chain has been a factor in its growth and competitiveness. The "hands off" approach of the government, combined with vibrant marketing channels, have allowed cocoa farmers to receive a higher percentage of the international price (approximately 75-85

17 http://www.cspindonesia.org/index.php

percent of the prevailing export price versus 50-65 percent for farmers in West Africa) albeit for a lower quality product (USAID 2006).

ECONOMIC

The International Cocoa Organization (ICCO) is a global organization, composed of both cocoa producing and cocoa consuming countries with a membership. The mandate of the International Cocoa Organization is to work towards a sustainable world cocoa economy. The concept of "sustainability" encompasses social, economic and environmental dimensions in both production and consumption. This includes work on customs tariffs on cocoa bean imports, cocoa semi-products and chocolate; (indirect) taxes related to cocoa consumption and processing; production costs in different countries and regions; market information for cocoa farmers; and Price Risk Management for farmers through co-operatives.

MARKETING

During the past decade, ICCO has initiated and supervised a number of projects in the cocoa sector with emphasis on the development of cocoa production and trade, as well as on the improvement of the income position of smallholder cocoa farmers. The Common Fund for Commodities (CFC) has been the major source of external financing for these projects.

Market transparency has been a vital concern for the ICCO for more than 30 years. It is important for the efficient functioning of the world cocoa market, mitigating price fluctuations, optimizing decisions by all market participants and improving the incomes of small cocoa farmers. Since its establishment in 1973, one of ICCO's major activities in this area has been the collection, processing and publication of cocoa statistics (production, prices, stocks, consumption, etc.).

The world cocoa market distinguishes between two broad categories of cocoa beans: "fine or flavour" cocoa beans, and "bulk" or "ordinary" cocoa beans. As a generalisation, fine or flavour cocoa beans are produced from *Criollo* or *Trinitario* cocoa-tree varieties, while bulk cocoa beans come from *Forastero* trees. There are, however, known exceptions to this generalisation. The share of fine or flavour cocoa in the total world production of cocoa beans is just under 5% per annum. Virtually all major activity over the past five decades has involved bulk cocoa.

The terminal markets for cocoa in London and New York play a vital role in the formation of prices for physical cocoa throughout the world. Indeed, in this respect, London and New York function as the benchmark for prices paid. Hence when prices in the two terminal markets increase, prices paid to farmers increase. When prices in the terminal markets fall, traders immediately react by paying lower prices to farmers. In addition, the terminal markets provide a mechanism for market participants to hedge against price risks, when they are long or short in the physical market (ICCO 2006).

SOCIAL

An Indonesian Cocoa Sustainability Partnership (CSP) was established in 2006, with a vision of achieving a sustainable and competitive national cocoa industry by 2014. In order to do this, the CSP's mission is as follows:

a. Developing coordination and communication among all stakeholders to maintain a sustainable cocoa program
b. Identifying and prioritizing problems in cocoa and supporting research for sustainable cocoa production
c. Empowering cocoa farmers and their institutions along with other cocoa stakeholders
d. Endorsing healthy (fair) and transparent trading procedures and policies that support sustainable cocoa

Guiding the certification process on sustainable cocoa and the implementation of good on-farm and best practices for the benefit of all stakeholders. These broad guidelines are intended to help guide current and future development of the Indonesian cocoa sector to meet the needs of present stakeholders without compromising the ability of future generations to meet their own needs. The CSP promotes that a sustainable cocoa sector should be based on transparency, legal compliance, economic viability, sound environmental management and social responsibility.

With world cocoa prices rising to around $2660/tonne, and Sulawesi cocoa growers receiving around 80% of that price in their pockets, growing cocoa offers the opportunity to improve farm family incomes and enhance local economies.

TECHNOLOGICAL

Cocoa processing, or grinding, entails the transformation of dried cocoa beans into a variety of processed products including cocoa paste or liquor, cake, powder and butter. Processors have strict quality standards and expect their suppliers to meet these standards. Only 10 percent of Sulawesi cocoa bean production is processed locally, the rest is exported as raw beans.

ENVIRONMENTAL

Cocoa is a globally marketed commodity and consumers around the world are becoming increasingly concerned that the cocoa they consume is produced with due consideration for the economic wellbeing of cocoa farmers and both environmental and social responsibility. This global trend has become an important consideration for all cocoa producing countries, including Indonesia.

Cocoa production is highly sensitive to changes in weather conditions including duration and intensity of sunshine and rainfall as well as soil moisture and temperature. Climate change may significantly affect cocoa production has shown sharp year-on-year changes. Statistical and econometric analyses reveal that El Niño events have a significant negative impact on cocoa production. It is estimated that El Niño reduces cocoa production, on average, by 2.4% at the world level. Indeed, cocoa output falls, on average, by 2.4% in Indonesia (ICCO 2010).

Promotion and marketing strategies of retailers and supermarkets worldwide have stimulated the demand for organic chocolate products. Food-retailing chains also promote organic foods as a tool to improve their public image. Europe is by far the major market for imports of organic cocoa beans, as well as for processing and manufacturing activities to obtain certified cocoa and chocolate products. Part of the organic cocoa and chocolate produced in Europe is exported, mainly to the United States.

Organic cocoa commands a higher price than conventional cocoa. Despite strong growth over the past 10 years, the share or organic cocoa remains small in the cocoa market. A significant share (approximately 10%)

of organic certified cocoa beans in the market is "fair trade" certified (ICCO 2005). The differential in the price of cocoa beans between the conventional market and the fair-trade market represents the consumers' willingness to pay for a certified product. Producing countries face many constraints, such as the high costs of certification and a lack of knowledge about organic channels. Trade channels will have to allow for increased volumes of organic cocoa, for instance through the entry of bigger buyers in the market for this to be successful.

LEGAL

Indonesia signed the United Nations International Cocoa Agreement 2010 on 12 September, 2011.

SECTOR POTENTIAL FOR DEVELOPMENT

PRODUCTION

Despite the importance of cocoa cultivation in Indonesia's economy, productivity, bean quality and farm profitability have declined in the recent decade due to aging of tree stocks and farming practices such as inadequate use of fertilizers or premature pod harvesting that led to declining soil fertility, pest and disease pressure and poor product quality. This declining trend is being reversed the last few years with on-farm investments in tree rejuvenation, replanting and sustainable farming practices (VECO, 2011b). Such investment did not happen earlier due to the limited access to credit, knowledge of sustainable farming practices and poor transmission of price signals to farmers. This latter failure is due to the fragmentation in Indonesia's cocoa supply chain, with over 90% of the cocoa production on smallholder farms that sell into poorly regulated and highly competitive marketing chains.

USAID (2006) reports that Indonesia's continued competitiveness in the cocoa sector is threatened by inconsistent and poor quality production. It indicated that Indonesian farmers tended to rush into cashing in their crop for beans rather than waiting for the pods to ferment, which improves the cocoa quality and increases the premium they get paid.

Cocoa is affected by a range of pests and diseases, with some estimates putting losses as high as 30 to 40% of global production. Controlling these is therefore a key part of efficient management of a cocoa farm. Resistant planting material can greatly reduce crop losses, as can best practice in farming techniques. Widespread pest infestation, especially from the cocoa pod borer, is a primary cause of poor cocoa bean quality in Indonesia. To be able to better control diseases on their farms, growers need to be able to recognize the symptoms, understand the causes of the diseases and know how the disease organisms operate.

Smallholder farmers must also have the capacity (skills and knowledge) to access and adopt improved practices and be able to respond to opportunities to increase their returns.

The ICCO promotes diversification for cocoa farmers. Diversification may take the form of intercropping with other cash crops, or with suitable timber/fruit species as shade trees, or with other tree crops in adjacent plots or as hedge plantings. By diversifying into high value products, farmers are able to offset any decline in income by relying on a single crop as their main source of livelihood.

PROCESSING AND TECHNOLOGY

Cocoa processing, or grinding, entails the transformation of dried cocoa beans into a variety of processed products including cocoa paste, liquor, cake, powder and butter. Processors have strict quality standards and expect their suppliers to meet these standards. Only 10 percent of Sulawesi cocoa bean production is processed locally, the rest is exported as raw beans.

A number of multinational processors now exist in Indonesia, with established markets and recognised products. Further opportunities do exist in this sector, and the Government's export tax of 2010 was designed to encourage further growth in this sector.

MARKETING

A 2011 Indonesian cocoa value chain study (VECO, 2011b) found that farmers sell to local collectors at farm-gate or directly to local traders. There are few examples of cooperative-type horizontal linkages or group marketing among smallholder farmers in Sulawesi; most smallholder farmers prefer to deal independently with private collectors and traders.

Local collectors are usually cocoa farmers themselves or rural entrepreneurs with a motorbike (or truck) who purchase cocoa beans directly from farmers. The scale of these purchases is small and turnover is rapid. Local traders purchase cocoa beans from local collectors or, to a lesser extent, directly from farmers, and are usually engaged in a variety of other businesses (e.g., general merchants, vehicle hire, etc.). These traders sell most of their cocoa beans to local exporters although a smaller amount flows to local processors. Collectors and traders do not need licenses or permits to operate so competition is strong with few barriers to entry.

Local exporters buy from collectors and traders who deliver beans to their storage facilities. Many of these local exporters have found it increasingly difficult to compete with the large-scale international exporters and have begun to sell to them rather than continue to export independently. Approximately 80 percent of Indonesian cocoa beans are sold by the five main multinational affiliate exporters in Sulawesi: EDF & Man, Olam, Cargill, ADM and Continaf.

With multiple levels of local and international cocoa bean buyers fiercely competing on price, a smallholder cocoa farmer in Indonesia has many selling options and market channels for his/her production. USAID in 2006 reported that within such a market-based environment that differentiates little for quality, Indonesian smallholder cocoa bean farmers have little incentive to upgrade or adopt more labour-intensive (and costly) production and post-harvest practices. Similarly, cocoa bean collectors and traders have few incentives to invest in upgrading their supply channels.

There appears to be clear incentives for processors and/or manufacturers to establish closer, more directed supplier relationships in order to improve the quality and consistency of their raw materials. However, these incentives are not yet strong enough for them to transform their procurement operations, especially when faced with opposition from local traders.

Quality control is mostly carried out by officials from cooperatives and buyers. It is highly desirable that, in the context of sustainable and more modern cocoa production and marketing, farmers would play a larger role in the marketing of their cocoa.

QUALITY STANDARDS AND CERTIFICATION

In the case of cocoa, "quality" is used in the broadest sense to include not just the all-important aspects of flavour and purity, but also the physical characteristics that have a direct bearing on manufacturing performance, especially yield of the cocoa nib. The different aspects or specifications of quality in cocoa therefore include:

- Flavour
- Purity or wholesomeness
- Consistency
- Yield of edible material
- Cocoa butter characteristics

These are the key criteria affecting a manufacturer's assessment of "value" of a particular parcel of beans and the price he is willing to pay for it. Farmers, through good husbandry of the cocoa farm, including pest and disease control and harvest and post-harvest handling, can ensure the production of good quality cocoa.

IMPACT POTENTIAL

PRODUCERS AND PROCESSORS

There are incentives for some actors in the cocoa bean value chain, especially processors and manufacturers, to invest in improving supply channels, but in Indonesia, these incentives are not yet strong enough for them to transform their procurement operations and expand into more directed buying relationships with their suppliers (USAID 2006).

In April 2010, Mars Inc. announced that by 2020, all of their cocoa beans would be from sources certified as sustainable. They have already partnered with Rainforest Alliance (an inter-national non-profit organization dedicated to the conservation of tropical forests) and UTZ Good Inside (one of the world's largest sustainability certification systems for coffee, cocoa and tea) to meet 200,000 tons of the projected annual cocoa bean supply by that time. If these voluntary targets are met, then it is estimated that over 25% of Sulawesi's cocoa crop, or about 100,000 tons, will need to be traceable and certified as sustainable by 2020. This represents a new and growing market opportunity for farmers.

At the farm level in order to make certification and traceability feasible, organization into associations would enhance efforts to attain certification.

MARKET DEMAND

The governance of cocoa bean trading is generally price-driven and market-based. The Indonesian cocoa bean value chain is globally competitive due to its ability to provide large volumes of a low cost filler bean in a relatively efficient manner. With a large number of smallholder farmers and multiple levels of local and international cocoa bean buyers fiercely competing on price, a smallholder cocoa farmer in Indonesia has many selling options and market channels for their production.

The overall structure of the cocoa value chain in Indonesia continues to be driven by volume and price-based transactions (USAID 2006). Conformance to quality specifications is not important since a market exists for almost all levels of quality. Although global buyers (multinational traders, processors and manufacturers) have expressed frustration with the inconsistent quality of Sulawesi beans, most of them continue to source from Indonesia.

POTENTIAL PITFALLS

Variations in the yield of cocoa trees from year to year are affected more by rainfall than by any other climatic factor. Climate change may have the largest impact on productivity of cocoa from Indonesia. This factor must be taken into consideration in any expansion of the industry.

Any programs to improve the profitability of the cocoa sector in Indonesia need to address the problem of poor quality of beans and low productivity of the trees. The following are the major issues to address:

- Low productivity is mainly caused by limited credit (for buying inputs like pesticides, organic fertilizer, good seedlings) and limited knowledge on improved technologies such as fertilizer use, pruning, plant rehabilitation and pest management.
- Related to quality, farmers have little knowledge of the right processing techniques, such as fermentation of the beans and conditions for storage of beans. This results in low quality of the beans.

Another problem to be addressed is the weak bargaining position of the farmer in the chain. This is caused by the limited capacity of farmers groups (small groups that exist in most of the villages) to organize collective marketing. Farmers have limited market information and have minimal influence on price.

CURRENT DONOR ACTIVITIES

There have been a number of projects to support this sector over the past two decades. ACIAR and AusAID have contributed funds to the national program for revitalisation of the cocoa industry, and the cocoa improvement program is part of the Smallholder Agribusiness Development Initiative (SADI) in eastern Indonesia, under the Australian Indonesia Partnership (AIP). The following groups have a past or current presence in the cocoa sub-sector in Indonesia:

- ACIAR has a current project - 'Improving the sustainability of cocoa production in eastern Indonesia through integrated pest, disease and soil management in an effective extension and policy environment.'
- VECO Indonesia[18] is the Indonesian branch of the Belgian NGO Vredeseilanden working on Sustainable Agriculture Chain Development (SACD). Its mission is to enhance the position of the organized family farmers. VECO Indonesia is now in the process of developing modules and training manuals for the strengthening and capacity building of farmer organizations in Indonesia.Cocoa is one of the sectors of activity.
- Tana Nua: is a professional service NGO, being a partner of VECO Indonesia since 1998. The specific objective of the organization is to improve the capacity of (Cocoa) farmers' communities in improving their livelihoods through low external input cocoa sector.

[18] VECO Indonesia started in 2001 with the cooperation with Ayu Tani, in 2009 with the funding and strengthening of the organizational capacity of JANTAN and in 2010 with the partnership with PT. Mars.

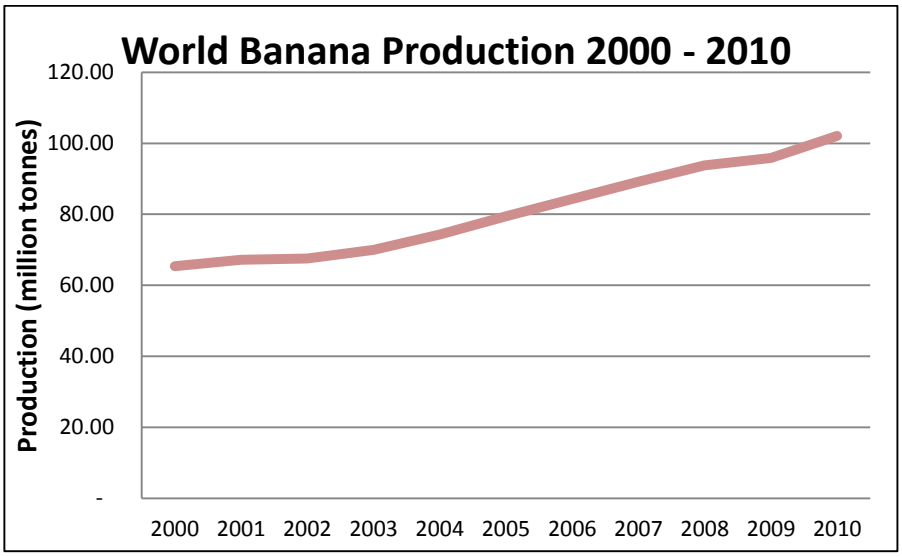
- Ayu Tani is a professional service NGO, arisen in 1998, committed to the development and implementation of innovative and sustainable farming practices, taking into account environmental issues in East Flores. The focus of their work is improving the livelihood of small-holder farmers. It strengthens JANTAN as a farmer organization and provides professional services to other farmer organizations in the district or province. Ayu Tani has professional staff with expertise in cocoa development.

8) BANANA SUB-SECTOR

THE MACRO ENVIRONMENT FOR THE SECTOR

Bananas are the world's most popular fruit, and with a market of nearly $US5 billion a year is the most important food crop after rice, wheat and maize. (Rainforest Alliance, 2012) They are an economic pillar in many tropical countries, providing millions of jobs for rural residents. Export bananas, mostly of the Cavendish variety, are also called "dessert" bananas. There is a multitude of recipes that include bananas as a basic element. However, in many developing countries, bananas of the different varieties are also a staple commodity, an essential component of many cooking dishes.

Bananas are grown in more than 150 countries, producing 105 million tonnes of fruit per year. Today, bananas are the world's fifth most traded crop commodity by volume (Australian Bananas, n.d). Figure 39 shows world banana production has increased by 64% in the decade to 2010.



Source: FAOSTAT 2011

Figure 39: World banana production 2000 – 2010

India is by far the largest world producer of bananas, followed by China and the Philippines. In 2010, Indonesia ranked 6th in both production quantity and value (Table 32).

Table 32: Top banana producing countries 2010

Rank	Country	Production Value (Int $1000)	Production Quantity (MT)
1	India	8,983,437	31,897,900
2	China	2,773,754	9,848,895
3	Philippines	2,306,897	9,101,340
4	Ecuador	2,233,632	7,931,060
5	Brazil	1,965,308	6,978,310
6	**Indonesia**	**1,637,565**	**5,814,580**
7	United Republic of Tanzania	823,686	2,924,700
8	Guatemala	724,214	2,621,500
9	Mexico	592,371	2,103,360
10	Colombia	572,933	2,034,340

Source: FAOSTAT 2011

Bananas are globally one of the most commonly eaten fruit, not just in the tropics where they are usually grown, but in regions like North America and Europe. Many tropical countries produce bananas as a staple food and approximately 20% of all bananas that are produced are actually exported. Bananas play a major role in terms of food security.

Horticulture is an important component of the Indonesian agriculture sector and economy. Bananas represent around 35% of tropical fruit produced in Indonesia. Fresh fruit and vegetable (FFV) production in Indonesia is still concentrated in the islands of Java and Sumatra, respectively contributing 63 percent and 23 percent of the national production. There has been no significant change in these islands' shares over the past decade (Larsen, Kim & Theus 2009). FFV production growth is helped by the favorable natural resources in the two islands, including the rich volcanic soils and high rainfall.

In 1994, the top four Indonesian fruit commodities were banana (41%), mango (12%), citrus/oranges (10%), and durian (9%). In 2004, banana was still the highest share but dropped to 30% with other increases, citrus/oranges to 16%, durian to 15%, and mango to 12%. This represents a possible shift in the agricultural value ladder model where more high value fruit is grown with low-value fruit in a decline (Larsen, Kim & Theus 2009).

Bananas are very vulnerable to the existence of pests and diseases. The banana industry in Indonesia has been plagued with disease problems since the mid-1990s. In the province of Lampung alone, Fusarium wilt caused farmers US $9.1–10.6 million in yield losses between 1993 and 2002 (Nurhadi et al, 1994). Around 5,000 ha of export Cavendish bananas established in the early 1990s by Del Monte and Chiquita were totally abandoned because of fusarium wilt.

POLITICAL

The Directorate General of Agricultural Processing and Marketing plays a key role in the marketing along with the Directorate General of Domestic Trade, Ministry of Trade. The DG Horticulture is aware of production and marketing problems in the banana sector and has formulated a strategy and policy for horticultural sector development, focused on output, quality, institutions, and human resource development, and more market

access for farmers. However, this strategy which has a very production-oriented bias is now being revised to include a more market-driven approach (Larsen, Kim & Theus 2009).

One of the key elements of this program is supporting measures to increase production. Efforts to improve production are focused on the premier commodities that have high market demand and high economic value. The premier commodities for FFV included in the program are banana, mango, mangosteen, orange, durian, potatoes, chilli peppers, and shallots. A policy of expansion of production area is carried out through development of a regional complex of production zones. The development of these zones is done through initiation of commodity zoning, aimed at developing commercial production activities that create scale economies. The main key to the establishment of the zone is with the implementation of advanced technology aimed at increasing productivity, creating safe, high-quality products as well as guaranteeing product continuity.

In late 2010, a new Horticulture Bill was introduced in Indonesia (USDA 2010). Under the new bill, imported horticultural products are regulated according to food safety, the availability of domestically produced horticultural products, governmental production and consumption targets, packaging and labeling, quality standards, and quarantine requirements. The bill further states that horticultural products can only be imported after importers obtain permission from the Minister of Trade and a recommendation from the Ministry of Agriculture. The implementing regulations will specify procedures related to the Minister Agriculture's recommendation issuance, the determination ports of entry for imported products, quality standards and/or food safety, and guidelines for determining whether an imported product can enter based on the availability of domestic products. The bill also mandates that supermarket and other modern market retailers must sell domestically produced horticultural products. However, the bill stops short of restricting retailers from also selling imported horticultural products.

Furthermore, the bill restricts levels of foreign ownership in horticulture related businesses to a maximum of 30%. Currently the bill does not specify any timeframe that will be provided to foreign investors to scale back their respective levels of ownership. However, the Head of Commission IV stated in the House of Representatives that any foreign investors with more than 30% ownership in any Indonesian horticultural enterprise would be provided with a four year grace period to adjust their level of ownership for compliance with the new horticultural bill (USDA, 2010).

ECONOMIC

Policy changes in major importing countries have had major impacts on the world banana economy. The most complex of these seems to be the European Union (EU) banana regime.

A variety of import regimes existed in Europe prior to the introduction of a Common Market Organisation (CMO) for bananas on 1 July 1993. Prior to this date, EU members adopted their own import arrangements for bananas – there were special arrangements with countries, various quantitative restrictions and licensing requirements, preferential access and a 20% tariff by some. On 1 July 1993, the (then) European Economic Community (EEC) introduced a common market organisation for bananas (Council Regulation (EEC) 404/93, hereinafter "the Regulation"), replacing the various national banana import systems in place in the member States previously. There were several negotiations with the new regulation and a subsequent Banana Framework Agreement was also put in place.

In 1996 a complaint by the United States, Ecuador, Guatemala, Honduras, and Mexico against the EC regime for the importation, sale and distribution of bananas (Council Regulation (EEC) No. 404/93 of 13 February

1993, and subsequent EC legislation, regulations and administrative measures) was heard by the World Trade Organisation. The EU's 1993 banana regime was found to be discriminatory in a number of areas and as a result a new EC banana import regime was conceived as a two-step process towards a tariff-only regime (to be implemented no later than 1 January 2006). Since 1 January 2006, the EU has been operating a new banana import regime. This imposes a single tariff of 176 Euros per tonne on imports from third countries. ACP countries are allowed duty-free entry for a limited quota of 775,000 tonnes (but will be subject to the full duty rate outside that quota).

Food is an important part of the economy of Indonesia. In 2004, 55 percent of household expenditures went to food. Changes in the food economy thus have a major impact on the overall development of Indonesia and the well-being of its people. While food has traditionally meant "rice" for most policymakers and researchers in the food economy in Indonesia, there is a rapidly growing interest in the horticultural products economy (Larsen, Kim & Theus 2009). This is partly because horticulture is the main agricultural diversification option (outside of dairy and aquaculture) for most Indonesian farmers trying to move out of low-value rice cropping. This is also because the horticultural food economy is important to consumers – while the average Indonesian consumer spent 49 rupiah on FFV in 1999 for each 100 rupiah he/she spent on rice, by 2004 that ratio was 74 to 100 on average; that average disguises the fact that the ratio was 95 on FFV to 100 on rice for the urban Indonesian (versus 59 to 100 for the rural consumer). Thus, for the half of the Indonesian population that lives in cities, FFV now stands equal to rice in importance in the food economy.

An important change in that food economy is the recent rapid growth in the supermarket sector. Supermarkets occupied a niche in the food market through the 1980s. They were still confined to an urban upper income sector by the mid-1990s, but after 1998 supermarkets have spread very quickly to now occupy about 30 percent of overall food retail (Larsen, Kim & Theus 2009).

The traditional wet markets still dominate fresh food trade but there is a trend to shopping at modern retail outlets. Modern retail growth in Indonesia is being driven by an expansion of hypermarkets and minimarkets. While the majority of the modern supermarkets and hypermarkets are located in cities on the island of Java, there are now a number of modern retailers located in provinces on the islands of Sumatra, Kalimantan and Sulawesi. The increasing wealth in these provinces offers an opportunity for further investment in the fruit and vegetable supply chain (Morey 2009).

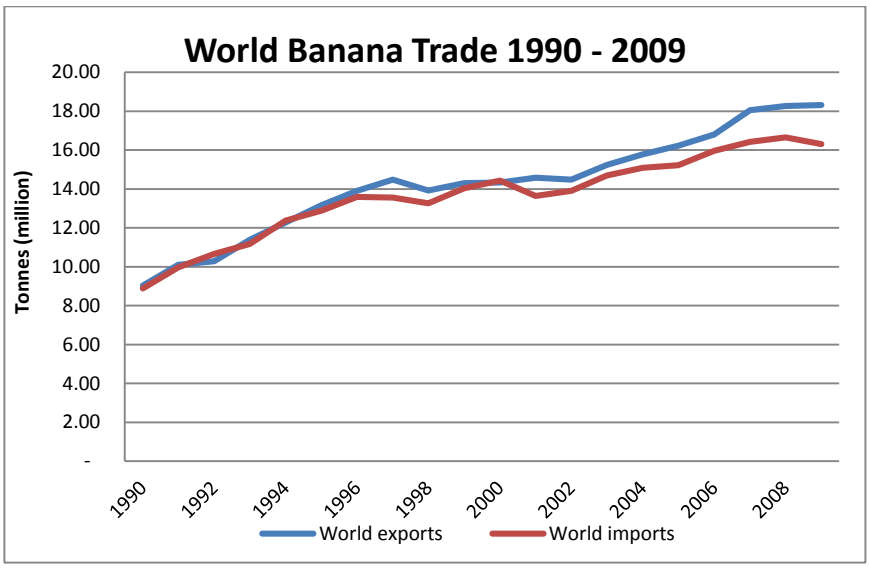
Over the last four years total investment in food crops and plantations was about US$ 2.2 billion compared to total investment in food industries of US$ 5.2 billion; approximately 50 percent was foreign investment (Morey 2009).

TRADE

Bananas are a very important staple commodity for many developing countries. Some of the main banana producing countries, such as India and Brazil, have limited international trade. In fact, only about one fifth of total banana production is internationally traded (UNCTAD n.d.).

An important factor related to banana trade is the issue of banana market access. The divergent banana import regimes have fragmented the international market into open market areas and preferential market areas. Many banana importing countries maintain different forms of banana import regimes. According to FAO, there is a direct relationship between high import barriers of a tariff, TRQ (Tariff Rate Quotas) and low per capita consumption of bananas.

Persley & George (1996) reports that the international banana export trade was based almost exclusively on the efficient production of very similar clones of Cavendish varieties. '*These triploid AAA clones are agronomically excellent, highly stable across environments, and produce fruit of high quality that is accepted as "the banana" by the purchasing public in most temperate countries*.' There is no recent data to suggest the current situation has changed. Figure 40 outlines the upwards trend in both world exports and imports of bananas.



Source: FAOSTAT 2011

Figure 40: World banana trade 1990 -2009

FAO statistics value worldwide banana exports at $US8.1 billion in 2009, up from $US4.2 billion in 2000. Similarly, worldwide banana imports were valued at $US11.2 billion in 2009, up from $US6.1 billion in 2000.

Just a handful of multinational fruit companies control 75 percent of the international banana trade - Dole, Del Monte, Chiquita, Fyffes and Noboa - but supermarkets are now the most powerful actors along the banana supply chain, according to BananaLink (2012), a UK-based organization campaigning for fairer and sustainable banana trade.

Indonesia's role in the world banana trade is insignificant. Although there are extensive plantings of banana in Indonesia, Subandiyah, in a 2011 speech, stated that production is limited with low yields due to non-intensive cultivation conducted by small-holder farmers. From what was developing into a reasonable export quantity in the Indonesian banana industry, outlined in the mid-1990s, the industry was exporting only 402 tonnes in 2009. The rapid decline seen in Figure 41 below, has largely been at the hands of uncontrolled spread of banana diseases across the country.

Source: FAOSTAT 2011

Figure 41: Indonesian banana exports 1990-2009

Indonesia's share of the world export market has returned to 1990 levels and is not a significant component of the trade balance. Banana imports are also not significant in terms of world trade. Imports peaked in 2003 at over 450 tonnes. This highlights that domestic demand is fulfilled by domestic production.

SOCIAL

Indonesia, with a population of over 230 million, is a large consumer market. Consumption of fruit and vegetables is an important component of Indonesia's diet and consumers spend a higher proportion of their food budget on fruit and vegetables compared to other Asian countries (Morey, 2009). Fruit consumption in Indonesia is increasing as local production expands and imported fruit continues to grow.

Urbanization is becoming widespread in Indonesia with people moving to the cities for better education and employment. Urban consumers are becoming more health conscious and this has opened up opportunities for the modern retail sector to offer more variety such as hydroponically and organically produced fruit and vegetables.

The majority of the population live on the island of Java (58 percent) and Sumatra (21%) where the majority of fruits and vegetables are grown (Morey, 2009).

Citrus and banana are the most important fruits grown in Indonesia for both domestic consumption and for export. Fruit production is sufficient for domestic requirements; however, the consumption per capita is only 40 kg, which is less than that recommended by the FAO (65.75 kg/capita/year). Several strategies are needed to increase the quantity of fruit consumption per capita in Indonesia including improvements in fruit quality and better supply chain management.

Banana growing is generally labour intensive because each plant requires intensive, individual care in order to obtain the required quality of fruit. Clearing away of jungle growth, propping to counter bending from the weight of the growing fruit and irrigation during the dry season promotes productivity. Banana bunches are

covered with polyethylene bags in order to protect them from wind and attacks of insects or birds, as well as to maintain optimum temperatures, creating a micro-climate.

Bananas are harvested green and hard, before they mature. Two types of workers are required to harvest bananas: a "cutter" and a "backer". The cutter cuts down the plant with his machete while the backer waits for the cut stem to settle on a thick cushion on his shoulder. The cutter then chops the stem to enable the daughter plant to take over as the main stalk. The backer carries the fruit and attaches it to a nearby overhead cableway where the stem is transported to the packing shed. It can also be transported in carts. In the packing shed, the bananas are removed by hand by skilled workers and washed. They also go through quality control, before being packed in cardboard boxes.

TECHNOLOGICAL

Research and development in the banana sector is needed to increase productivity and yields as well as to improve resistance of bananas to diseases and pests in order to reduce dependence on chemical use. This would have positive effects for smallholders and consumers, improving workers health and reducing the impacts of banana cultivation on the environment (UNCTAD n.d.). Several initiatives have been started, such as the Banana Improvement Project launched in 1993 by the Common Fund for Commodities, the FAO Intergovernmental Group on Bananas and the World Bank, with the objective of making a significant contribution toward the improvement and productivity of bananas by using higher-yielding, disease-resistant varieties, and seeking ways to reduce the cost of production.

Advances in refrigerating technologies are very important for the development of banana reefer transport and allow for bananas to reach the consuming centres faster and in better quality. New methods for transporting perishable technologies control better the cold chain and allow for tracing the process through computerized systems. When transported by sea the amount of oxygen in the storage area is reduced, to extend their shipping life. Some of the technologies used are: controlled atmosphere, controlled humidity, remote access monitoring, enhanced air flow, better insulation materials and techniques and internal monitoring controls.

Indonesia with over 17,000 islands provides a major challenge to distribute fruit and vegetables to major urban centres. A lack of refrigeration and infrastructure investment in many provinces is still a major distribution problem for companies in Indonesia. Most of Indonesia's locally produced fresh fruit and vegetables are distributed throughout Indonesia in non-refrigerated trucks and destined for the wholesale markets like Kramat Jati in Jakarta (Morey 2009).

There is increased use of airfreight for select high value fresh fruit and vegetables for inter-island trading where there is shortage of local supplies. There is also some use of small refrigerated trucks by producers supplying high value hydroponic and organic vegetables to the modern retail and food service markets in Jakarta (Morey 2009).

ENVIRONMENTAL

Historically the banana industry has been plagued with a poor environmental track record. Banana plantations were infamous for their environmental and social abuses, which included the use of dangerous pesticides, poor working conditions, water pollution and deforestation. Pesticide-impregnated plastic bags, which protect bananas as they grow, often littered riverbanks and beaches near banana farms, while agrochemical runoff and erosion killed fish, clogged rivers and choked coral reefs. The proximity of housing to banana fields,

coupled with lax regulations for pesticide handling, led to frequent health problems among workers and people who lived near farms (Rainforest Alliance 2012).

In order to achieve higher productivity levels, intensive banana production in large-scale plantations needs high quantities of external inputs as pesticides, fungicides and other agrochemicals to fight diseases and pests and maintain or increase fertility of the land, with the consequence potentially damaging effects on the environment. These banana production practices may lead to deforestation, water pollution in rivers as well as under the ground, biodiversity damage and soil deterioration, as well as important health damages for banana workers. In addition, in certain countries working conditions in banana plantations may not be the minimum ones, wages for banana workers are very low while smallholders banana farmers do not receive a fair remuneration. In some cases the rights to unionise and collective bargaining are limited.

Banana consumers are increasingly concerned about banana production conditions both on the environmental and the social side. They are increasingly aware of the environmental damage caused by intensive production methods in plantations and the use of agrochemicals and pesticides. At the same time they are asking for better working conditions for banana producers, such as the payment of fair wages to banana workers, and the guarantee of fair prices to small produces. They are therefore demanding the presence of more organic and fair-trade bananas, in a general context of expansion of organically produced food products.

Some consumers in the United States, Europe (in particular Switzerland) and Japan are willing to buy fair-trade and organic bananas even at 30% to 80% above the normal banana price. Following these consumer demands, supermarkets are orientating their banana business in this direction, with an increasing presence of this kind of products in their outlets. The banana industry is moving into fair-trade and organic banana production. The Rainforest Alliance first began working with banana farms in 1990, when production of the fruit was increasing in the American tropics and rainforests were being cut down to expand cropland. Today, more than 15 percent of all the bananas in international trade come from Rainforest Alliance Certified farms. All of Favorita's banana farms in Ecuador and all of Chiquita's farms in Guatemala, Honduras, Costa Rica and Panama are Rainforest Alliance Certified (Rainforest Alliance 2012).

LEGAL

There appears to be limited specific information available on the legal environment within Indonesia for bananas. The Indonesian Directorate General for Horticulture's policy for horticultural sector development includes strategies to increase the product quality of bananas one of the premier commodities. Farmers engaged by the program are encouraged to implement Good Agriculture Practices (GAP), including integrated pest management (IPM), the determination of correct harvest time, implementation of HACCP and application of post-harvest handling and grading. Other measures include the control of horticulture pests to meet Sanitary and Phytosanitary Standards (SPS) and product safety requirements.

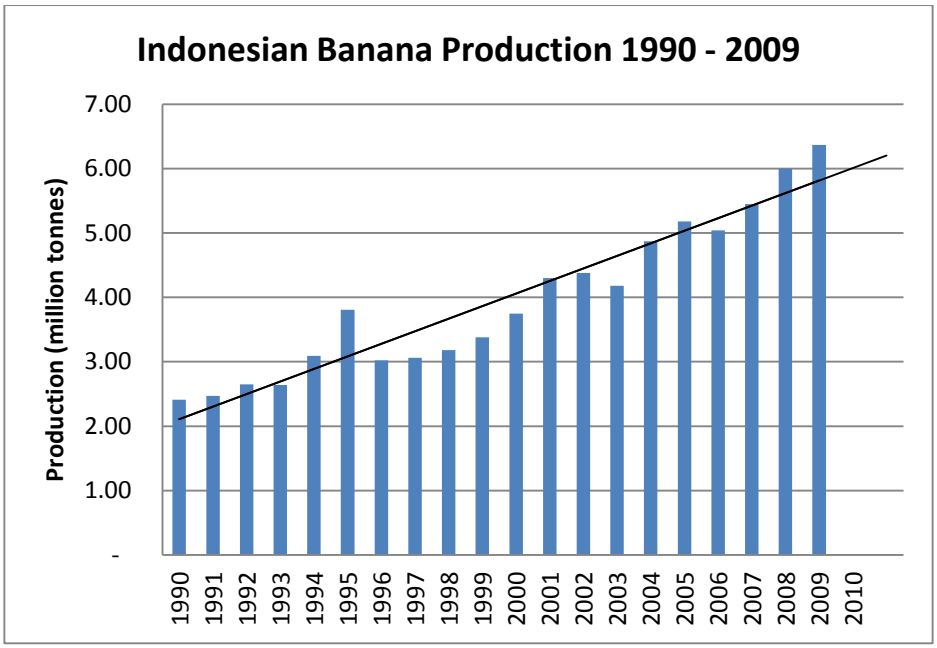
SECTOR POTENTIAL FOR DEVELOPMENT

PRODUCTION

Bananas represent around 35% of tropical fruit production in Indonesia. There are extensive plantings of bananas in Indonesia. Dessert and cooking bananas of many varieties are grown everywhere, mostly by smallholders. Bananas are mainly consumed as a fresh fruit. Horticulture in Indonesia is undertaken by part time small farmers who usually have other agriculture enterprises as a source of income. Bananas are not a

high value crop that landholders are investing in. Literature available indicates that there has been little investment in large-scale banana plantations as far back as 1996 (Subandiyah 2011).

Subandiyah (2011) reports that despite the increase production of bananas, the yield in Indonesia is limited due to non-intensive cultivation conducted by small-holder farmers. Figure 42 highlights the rapidly increasing production of bananas in Indonesia over a twenty year period.



Source: FAOSTAT 2011

Figure 42: Indonesian banana production 1990-2009

Research in 2009 by Morey indicates that there are 31 provinces in Indonesia that produce 19 types of fruit, with 80% of all fruit grown on the islands of Java and Sumatra. A summary of the major fruit producing provinces and the percentage of the fruit that is bananas is provided in Table 33 below.

Table 33: Major fruit producing provinces of Indonesia and percent of production that is bananas

Region	Production	Main fruits as % of regional production	Main fruits as a % of Indonesian production
West Java	20% of Indonesia's fruit (3.3 million tonnes)	Banana – 44% Pineapple – 16% Mango – 13%	Mangosteen – 54% Avocado – 37% Guava – 36%
East Java	16% of Indonesia's fruit (2.7 million tonnes)	Banana – 30% Orange – 23% Mango – 22%	Mango – 33% Papaya – 24% Orange – 23%
Lampung	12.5% of Indonesia's fruit (2.1 million tonnes)	Pineapple - 59% Banana - 30%	Pineapple - 55% Banana - 12%
North Sumatra	11.3% of Indonesia's fruit (1.9 million tonnes)	Orange – 51% Snake fruit - 13% Banana - 11%	Orange – 37% Snake fruit - 30% Durian - 21%
Central Java	8.9% of Indonesia's fruit (1.5 million tonnes)	Banana – 43% Mango - 18% Snake fruit - 12%	Snake fruit – 21% Star fruit - 20% Jack fruit - 13%
South Sulawesi	2.9% of Indonesia's fruit (0.5 million tonnes)	Banana – 31% Mango - 20% Orange - 8%	Duku – 17% Avocado - 6% Passionfruit - 6%

Source: Morey 2009

The most severe constraints on the production of banana in Indonesia are due to plant pathogens, especially devastating banana wilts and blood disease bacterium (Subandiyah et al. 2005). The spread of wilt diseases in small-holder farms and neglected banana mats[19] in Indonesia has significantly reduced the numbers of commercial bananas plants. Both diseases are found in almost all provinces of Indonesia with variable disease incidence. The epidemic of wilt diseases is moving from one province to another and it is difficult to find disease-free land for new plantings. Subandiyah (2011) reported that fusarium wilt and blood disease remain as the most two important diseases of banana in Indonesia followed by sigatoka and bunchy top.

This is supported by the findings of an ACIAR (2009) survey completed as part of an ACIAR project across 16 major banana producing regions/provinces of Indonesia. This survey provided some useful insight into the practices of smallholders with regard to disease management:

- 58% farmers responded that diseases are the major constraint for banana production. The two most important are Fusarium wilt and Blood Disease. Farmers rarely distinguish the two wilt diseases. It was found that banana wilts are the main causes of low banana productivity.
- Most of the respondents do not apply any control measures due to limited knowledge.
- More than 90% of the banana farmers are men; the farmers were found to have an average of 7yrs education, less than 10% of the respondents had formal training on banana production.
- For banana production and management, none of the farmers use tissue-cultured planting materials and chemical treatments. Most of the planting materials used in the areas were derived from suckers from their own plants and also from neighboring fields.
- Farmers rarely employ any disease management measures against diseases.
- Due to farmers' practice on distribution and dispersion of planting materials; banana bunchy top virus (BBTV) and weevil borer are considered to be the next potential threat after blood disease and

[19] A banana mat – a parent stem with one bunch and several lateral shoots

Fusarium wilt. Actual results of the survey indicated that BBTV is spreading rapidly in many provinces in Indonesia, making it a potential serious problem like fusariam wilt and Blood Disease

An integrated, area-wide management approach to disease management is needed. Disease control systems need highly integrated and well-coordinated management, since Indonesia has so many small-holder farmers that are scattered throughout production areas. Incentives or subsidised systems for small-holder groups could be applied to strengthen integrated disease management. More farmer field schools for horticulture will also support better disease management and increase farmer income (Subandiyah 2011).

The availability of clean, disease resistant banana seedlings is an important component of disease management. The surveys completed by ACIAR showed that smallholders were getting their cuttings from their own crops or neighbours, which can exacerbate the spread of disease. While the use of clean banana seedlings were an important component of the disease management-crop production system, their availability and affordability at farm level is very important. Where resistant varieties are available, they have proved effective in reducing the incidence of infections and also were higher yielding. Market acceptance is a very important consideration for their adoption.

Higher biosecurity standards will be required for any fruit targeted for export. Most farmers considered banana production in a mixed-cropping system. Where crops have been abandoned in the past due to disease, any reintegration of bananas in the cropping system of farmers will be affected by their profitability relative to other crop options.

PROCESSING AND TECHNOLOGY

Most of the bananas produced go directly from the field to market. Value added opportunities in bananas come from processing banana chips, banana puree, banana flour, banana juice or brewing a spirit known as waragi.

Apart from being a very important food product, banana products and by-products have other many different uses and applications:

- Banana fiber - is used for handicraft and art in baskets and carpets. The fiber is also used in the manufacture of banana paper
- Animal feed - bananas which do not arrive to fulfill quality requirements for export and banana waste may be used for animal feeding.
- Banana leaves - used for wrapping food when cooking in many countries.
- Intercropping - in limited cases, banana cultivation is used to give shade to other crops such as coffee or cocoa.

There is very little literature available to determine the extent of any banana value adding that may be occurring in Indonesia. However, given that bananas are an important factor in food security and the different varieties are integral components of many cooking dishes in developing countries, there is likely to always be a strong demand for fresh bananas, particularly in rural areas where many families live below or close to the poverty line.

A brief article on the USAID website (written November 2007) indicates that two banana packing houses were developed in Deli Serdang through the USAID/ARMARTA grants program. The packing houses were developed to improve the quality of delivery of fruit to markets. There may be opportunities in this area for development.

In his 2009 report, Morey (2009) identified that 'Indonesia has poor infrastructure and a scattered fruit *industry resulting in high internal distribution costs. There is a lack of regional wholesale markets and coolstore / packing facilities for local fresh produce. In regional Indonesia there is a need for investment in sea ports to reduce cost of transshipment and post harvest facilities*.'

MARKETING

A few major transnational banana marketing corporations dominate international banana marketing and trade, being able to exercise their market power at several or all the stages of the banana marketing chain. Bananas, require the careful control of the growing, packaging, transport, handling, ripening and distribution process. This leads to a highly vertically integrated banana sector, where large transnational companies tend to control from direct growing of bananas in producing countries, through ownership of specialized refrigerated shipping and ripening facilities, to even distribution networks in importing countries. The high investment of capital required in this export oriented banana business later enables these companies to profit from economies of scale. Even though production and export of bananas are highly concentrated in developing countries, it is mainly developed countries who tend to capture the benefits of banana trade. Figure 43 is an example of the international banana marketing chain.

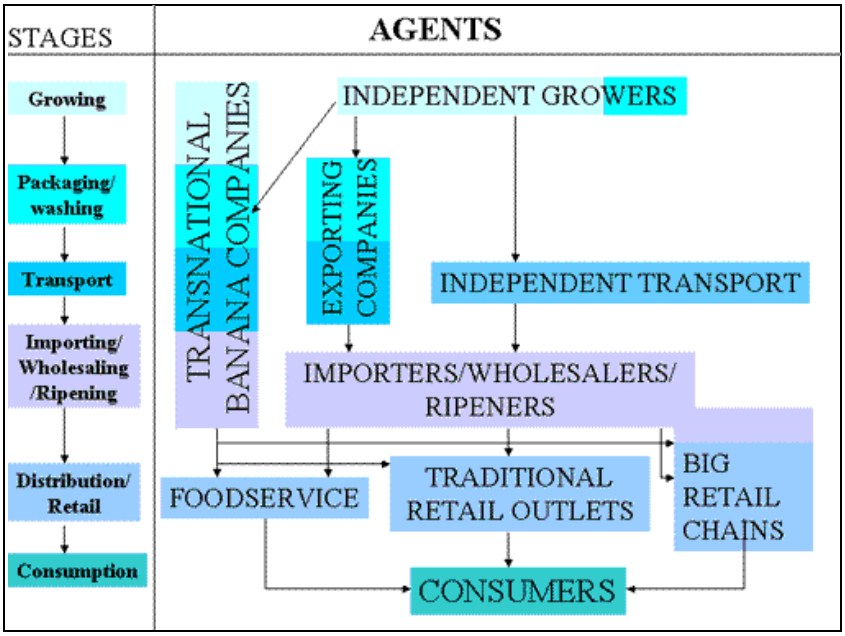


Figure 43: International banana marketing chain

Until the 1970s transnational banana corporations were present at every stage of the banana marketing chain, from growing to final consumers. They owned plantations, transport infrastructures and ripening facilities. However, in the last 20 years there has been a move away of multinationals from direct growing in order to focus on more specific marketing and distribution activities. Multinationals tend now to establish long term supply contracts with independent local banana growers, specifying shape, quantity, standards of quality and packaging and so on. In many cases multinationals also provide inputs in order to control the quality.

Following this strategy, multinationals avoid production risks, such as natural disasters as well as environmental and social costs of production. It is the local producer absorbing these costs and the compliance with environmental and social standards. Most of the value adding in bananas comes from transport and

distribution activities. Independent producers are often organized into associations in order to negotiate their contracts with multinationals. However, there have been some attempts from independent producers to internationally commercialise their bananas, with diverging results. In some cases, such as Comunbana, a multinational banana marketing company launched by the Union of Banana Exporting Countries, failed because it lacked the required scale and capital, as well as the coordinated work of several producing countries. However, there have been some examples of success, such as Uniban. The retreat of multinationals may open new opportunities for local growers in developing countries, looking for more direct negotiation with Europe.

Traditionally the international banana market has been producer driven, where transnational banana marketing companies played a prominent role in setting the rules. However, during the last decades, this situation has changed. Banana companies are challenged by the increasing role that is being played by supermarkets and retail chains in the distribution of bananas in developed countries, mainly in the EU and USA. The downstream shift of power in the banana marketing chain, and for produce in general, is leading to increasing vertical coordination, mainly through supply chain management practices used by the retail chains. Supermarkets tend to build long-term relationships with preferred suppliers in order to guarantee a continuous supply at the required levels of quality. The aim is streamlining operations by eliminating non value adding transactions.

QUALITY STANDARDS AND CERTIFICATION

The quality of the bananas is determined by size (length of fingers and thickness), evenness of ripening, absence of blemishes and defects and the arrangement of the clusters. Quality standards may vary in the different markets.

Minimum quality requirements for bananas are set by Codex Alimentarius, according to which there are three classes of bananas:

"Extra" Class Bananas - In this class must be of superior quality. They must be characteristic of the variety and/or commercial type. The fingers must be free of defects, with the exception of very slight superficial defects, provided these do not affect the general appearance of the produce, the quality, the keeping quality, and presentation in the package

Class I Bananas - In this class must be of good quality. They must be characteristic of the variety. The following slight defects of the fingers, however, may be allowed, provided these do not affect the general appearance of the produce, the quality, the keeping quality and presentation in the package:

- slight defects in shape and colour;
- slight skin defects due to rubbing and other superficial defects not exceeding 2 cm^2 of the total surface area;

The defects must not, in any case, affect the flesh of the fruit.

Class II - This class includes bananas which do not qualify for inclusion in the higher classes, but satisfy the minimum requirements specified above. The following defects may be allowed, provided the bananas retain their essential characteristics as regards the quality, the keeping quality and presentation:

- defects in shape and colour, provided the product retains the normal characteristics of bananas

- skin defects due to scraping, scabs, rubbing, blemishes or other causes not exceeding 4 cm2 of the total surface area
- The defects must not, in any case, affect the flesh of the fruit.

The limited information available indicates that producing export quality fruit in any significant volume is not likely in the short term, as the majority of production is undertaken by smallholders under non-intensive production with limited agronomic support. Only a small percentage of fresh fruit is suitable for export. The extensive disease problems are also a concern, particularly for export markets.

IMPACT POTENTIAL

PRODUCERS AND PROCESSORS

Whilst representing 35% of all tropical fruit grown in Indonesia, evidence both in Indonesia and other developing countries suggests that it is unlikely that bananas will move from being a staple food crop grown by many smallholders, who usually have other agricultural enterprises as a source of income.

Given the extent of plantings and smallholders involved in banana production at some level, any activity with the Indonesian banana industry is likely to 'touch' a very large number of people in rural regions. Table 5 indicates the extent of plantings and local importance of bananas in regions across Indonesia.

Indonesia could be a major producer and exporter (like Thailand) of high value fresh produce to meet "high end" markets (eg processed ginger to Japan; fresh mango to the Middle East; fresh strawberries to Singapore). Unfortunately, bananas are not one of these high value products (Morey 2009).

MARKET DEMAND

Bananas are an important staple food source for Indonesians and are used extensively in traditional cooking. Whether Indonesian producers can develop a number of viable banana value chains for bananas is doubtful.

POTENTIAL PITFALLS

Given the extent of the disease spread within bananas in regional Indonesia, a concerted area wide approach to management would be required. This could include education and training on better agronomic practices, biosecurity measures on plant and people movement and even removing some areas from production. The literature available suggests there is little incentive for smallholders to act to this extent, as bananas are not considered a high value crop.

Bananas suffer from a shortage of sound technical advice to support production, access to long-term finance and infrastructure and logistics to support increased marketing activities through to export.

CURRENT DONOR ACTIVITIES

There has been a number of research projects conducted with Indonesia on the banana industry, including some by ACIAR, largely focussed on seeking solutions to managing the disease problems of the industry in the country.

9) DAIRY SUB-SECTOR

THE MACRO ENVIRONMENT FOR THE SECTOR

In 2008 the milk market in Indonesia was worth more than Rp. 26 trillion (US$2.6 billion) with milk powders (US$1.5 billion) comprising almost 60% market share followed by sweet condensed milk (US$760 million) and liquid milk (US$400 million)(Morey 2011).

In 2010, there were almost 500,000 dairy cows in Indonesia producing about 930,000 tonnes of milk. Ninety seven percent of all of Indonesia's dairy cows are located on the island of Java in the provinces of East Java, Central Java and West Java. East Java is the largest milk producer, accounting for 57% of Indonesia's milk production Morey 2011). Table 34 shows the location, number and production of the national herd.

Table 34: Dairy cows population and milk output by main provinces, 2010

	Dairy Cows Number	Dairy Cows percent	Milk Production Tonnes	Milk Production percent
East Java	232,001	46.8	531,797	57.3
Central Java	123,091	24.9	106,040	11.4
West Java	124,797	25.2	270,616	29.2
Other	15,342	3.1	19,385	2.1
TOTAL	495,231	100	927,838	100

Source: Morey 2011

Morey (2011) also reports that in 2010, over 57% of Indonesia's dairy cows accounting for 50% of milk production (50%) were located in only five districts (Table 35):

Table 35: Regions, numbers and productivity of the major dairy regions in Indonesia.

Region	Number of cows	Volume of milk
Malang, East Java	63,066	146,121 tonnes
Pasuruan, East Java	64,394	114,014 tonnes
Boyolali, Central Java	62,038	42.5 million litres
Semarang, Central Java	35,541	34.6 million litres
Bandung/West Bandung, West Java	58,001	126,221 tonnes

Source: Morey 2011

Over the last five years, Indonesia's dairy cow population and milk production has increased annually by an average of 7.4% and 14.6% respectively. The province of East Java has shown the largest growth over the last five years with dairy cow population and milk production increasing annually by an average of 14.6% and 24.3% respectively (Morey 2011).

Dairy farm size is generally small, with most farms having up to three to four head of milking cows. The dairy farms are based on confined rearing of cattle with forage grasses being gathered from outside the farm in a "cut and carry" system. This involves the farmer, or agricultural labourers (some of whom may be farmers), cutting and collecting grasses from the farmer's land, or from along the sides of roads, irrigation ditches, forests or common lands.

The majority of dairy cows in Indonesia are owned by individual farmers. For example, in East Java 94 percent of cows are owned by individuals. Corporate dairy farmers are now playing a bigger role in this province, with total milk production from cows owned by corporations increasing at a faster rate than that of individual farmers. Over the last five years corporate milk production has increased annually by an average of 42 percent compared to an average increase of just 19 percent by individual farmers.

The industry is dominated by smallholder farms grouped into co-operatives. Most individual farmers are members of a local dairy centre known as the primary village cooperative of GKSI - Koperasi Unit Desa (KUD). There are about 220 KUDs in Indonesia with almost 100,000 dairy farmers as members (Morey 2011). A dairy KUD provides a range of services to farmers including collecting the milk, checking quality and paying the farmer. As local milk collection centres, KUDs are a key link between the farmer and milk processors. Price incentives are used to encourage better farm management practices and higher quality milk.

POLITICAL

The Indonesian government is keen to encourage the development of the dairy and beef industries in Indonesia and is providing Rp. 145 billion (US $15 million) of subsidy for the purchasing of dairy cows and beef cattle. Four major Indonesian banks are responsible for managing this subsidy scheme. In 2009, Australia sent 14,835 dairy cows to Indonesia.

The Indonesian Government has a target of achieving up to 50 percent self-sufficiency in milk supply by 2014, up from about 30% in 2010. To achieve this target, the Government is developing a blue print for dairy industry development in Indonesia with aims to:

1. increase milk consumption from 10 litres per capita to 15 litres
2. improve farmer income
3. increase local milk production to 50 percent of supply needs

Tariffs on most dairy products are five percent. The exceptions include some processed products, such as yogurt, and some concentrated milk and cream, which are subject to a higher applied tariff of 10 percent.

Dairy imports face a number of regulations in Indonesia. Finished milk products can only be imported by companies approved by the government.

ECONOMIC

Over the last six years investment in the Indonesian livestock industry has totalled US$216.6 million; with 67% from foreign investment. In 2009, investment in the livestock industries was less than 1% of total domestic and foreign investment in Indonesia. The average foreign and domestic investment per project was US$5.6 million and US$3.5 million respectively. Most of the investment in the livestock industry is in beef fattening operations. There has been minimal new investment in dairying over the last five years. However two major dairy processors are planning to expand operations into North Sumatra in 2011 / 2012.

TRADE

In 2010 Indonesia imported 302,158 tonnes of bulk dairy products (worth US$925 million); this was an increase from 2009 of 12% in volume. The main products imported in 2010 were Skim Milk Powder (SMP),

Whole Milk Powder (WMP) and whey. The EU, NZ and USA were the main dairy exporters to Indonesia in 2010 with a volume market share of 32%, 23% and 21% respectively.

Indonesian dairy exports have fluctuated over the last five years from a low of 37,000 tonnes in 2007 to a high of almost 61,500 tonnes in 2008. Indonesia exported 48,229 tonnes of dairy products in 2010 worth US$89 million. About two-thirds of the value of exports was sweetened condensed milk. However, the biggest growth in exports is the fresh milk category which has increased by an average of 50% per year. In 2010 Indonesia exported 16,144 tonnes of fresh milk mainly to Singapore and Hong Kong. Franchise coffee shops such as Starbucks in Singapore and Hong Kong now use Greenfields fresh milk from Indonesia replacing supplies from Australia.

SOCIAL

In East Java, where 94% of cows are owned by individual farmers, dairying is a part time business for many farmers. The break-even price for milk to farmers varies depending on the farmer's business approach and farm size. According to GKSI a break-even price for milk from a typical small farmer is about Rp. 3,500 per litre and therefore prices paid to farmers are considered to be too low. However, some farmers can return a cash flow profit of Rp 1,000 per litre based on a milk payment of Rp 3,000 per litre. Given that most dairy farmers are only part time dairying this is considered to be a good additional income (Morey 2011).

Liquid milk consumption has increased with growing awareness of the people of the importance of milk for their health. Over the last six years the volume and value of the liquid milk consumption market has grown by 16.3 percent and 20.6 percent respectively (Ibid.).

The modern retail market throughout Indonesia continues to expand rapidly but it is still dominated by traditional grocery stores, according to data from The Nielsen Company (n.d.). This trend is likely to continue as more consumers choose to shop for their daily needs at hypermarkets and other modern retail outlets.

Modern retailers are a major outlet in the distribution of milk powder products, targeting the middle to higher income households. Traditional shops/kiosks are more popular for the middle to lower income households. These traditional shops rely on wholesalers for their produce supplies while the larger supermarket and hypermarket chains may buy direct from processors or from distributors.

TECHNOLOGICAL

In total, there are over 30 companies involved in milk processing in Indonesia producing over 870,000 tonnes of dairy products in 2009 (Morey 2011). The majority of the small dairy processing companies have their factories located in Jakarta.

Most of the milk produced in Indonesia (90%) is absorbed as raw material by the major milk processing industries under the Indonesia Association of Milk Processors and the remaining 10% is sold direct by KUDs to consumers as fresh liquid milk or yoghurt drinks. In general, the milk processors buy fresh milk from the cooperatives.

The major dairy processors by type of dairy product manufactured are:

- Liquid – 13 companies e.g. Ultra Jaya, Indomilk, Frisian Flag, Nestle, Greenfield
- SCM – 4 companies e.g. Frisian Flag, Indolakto
- Powdered – 12 companies e.g. Nestle, Sari Husada, Indomilk and Frisian Flag

- Ice – Cream – 4 companies e.g. Unilever, Indomilk, Campina, Diamond
- Yoghurt – 6 companies e.g. Yakult, Yummy, Danone, Diamond, Cimory

In contrast to the small scale of dairy farming, the dairy processing industry comprises major local companies (Indomilk and Ultra Jaya) and multinational companies (Danone, Frisian Flag and Nestle). The Indonesian Association of Milk Processors (IPS) represents the milk processing sector and its five largest members (Frisian Flag, Nestle, Sari Husada / Danone, Ultra Jaya and Indolakto / Indomilk) absorb about 85% of Indonesia's milk production.

ENVIRONMENTAL

Limited information is available on the environmental impacts of small holder dairy farming in Indonesia. It is expected that smallholder units with stalled cattle are reasonably sustainable in terms of nutrient recycling of manure and minimal processing waste being expelled to the local environment.

LEGAL

Imports of dairy products, like all food imports, are tested by the Agency for Drug and Food Control called Badan Pengawas Obat dan Makanan (BPOM), a process that is reported to be complex, time consuming and costly. Tests require foreign suppliers to provide detailed information on ingredients and processing. The testing fees are expensive, ranging from US$120 to US$1,200 per product, and may be borne by foreign food suppliers.

Other Certification/Accreditation Requirements:

a. Importers must obtain an import permit from the Director General of Livestock and Animal Health Services (DGLAHS), Ministry of Agriculture prior to importing.
b. Must be accompanied by a Certificate of Origin stating that the animals, materials of animal origin, products of made materials of animal origin came from an area known to be free from quarantine disease in Category I and acknowledged by a Government of Indonesia (GOI) authorized official if originating from abroad.
c. Importation must be made through designated points of entry.

Export Certificates Required by Government for Dairy Products:

a. Sanitary Certificate from Ministry of Agriculture
b. Health Certificate & Certificate of Free Sale from National Agency of Drug & Food Control (BPOM). Attestation required on Certificate:
    - Fit/safe for human consumption
    - Freely sold in the exporting country
c. Halal Certificate from Indonesia Council of Ulama (MUI). Attestation required on certificate:
    - product produced according to halal standards

Processed food product labelling requirements also exist. Label requirements are designed to ensure that the consumer can be accurately informed about the ingredients in processed food and its status as halal or non-halal.

The milk industry is also required to follow additional regulations as follows:

1. Metal Pollution - Maximum limits for metal content in powder milk as follows: Arsenic (As) 0.1 mg/kg, lead (Pb) 0.3 mg/kg, copper (Cu) 20 mg/kg, zinc (Zn) 40 mg/kg, tin (Zn) 40 and mercury (Mg) 0.03 mg/kg
2. Microbe Pollution - Maximum limits for microbe content for powdered milk are MPN Coliform 10^2 per gram/ml. Salmonela Negative, and Staphylococcus aerius $10^2$and Flat Figure 5.10^5 per gram/ml
3. Vitamin K not Allowed in Milk Products
4. Addition of Nutrients (Regulation of the Drug and Food Watchdog No. HK 00.05.1.52.3572)
5. Reference for Nutrition Label (The Decision of head of the BPOM No. HK. 00.05.52.6291)
6. ASI (Mothers Milk) Substitutes (Regulation of the Health Minister No. 240/Men.Kes/Per/V)

SECTOR POTENTIAL FOR DEVELOPMENT

PRODUCTION

Dairy cow productivity in Indonesia is low by world standards at an average of 3,069 litres of milk per cow per annum (less than 10 litres of milk per cow per day). Average yield is between 10 and 12 litres per cow per day. Some large scale corporate farms are however reporting up to 26 litres of milk per cow per day, in comparison.

Morey (2011) reports that the main challenges facing dairy farmers in Indonesia to improve farm income are:

1. Low milk production per cow; average of 10 litres per cow per day.
2. Scarcity of forage and high price of dairy cattle feed and concentrates; most farmers cannot afford to pay for higher quality feed as the price paid for milk is too low.
3. Small farm size and scarcity of land at suitable elevation for dairy cattle farming.
4. Low farm profitability due partly to low milk yields.
5. Low milk quality due to poor handling practices and lack of cooling units.
6. Poor farm and herd management practices.
7. Lack of technology for milking and processing of fresh milk.
8. Limited access to high-quality genetics.
9. Limited access to finance and bank loans.
10. Limited farmer education.
11. Low milk prices paid by the major milk processors.

Milk production is dependent upon access to an abundant supply of feed for dairy cows. During the dry season (April to September) there is limited availability of feed for dairy cows and the supply of milk from the major production centres on the island of Java declines. Central Java has a more severe dry season compared to West and East Java and in turn its milk production declines more dramatically.

Milk output per cow can be increased with provision of better quality feed. Inferior quality and limited availability of feed can be addressed through:

- Identification of better forage species (e.g. legumes)
- provision of information on basic silage making and concentrate usage
- utilisation marginal land for forages

Price incentives are used to encourage better farm management practices and higher quality milk. However, milk quality from local cows is still far below the National Quality Standard (SNI) with only 12 percent of milk production meeting the minimum quality standard for milk.

Semen for artificial insemination in cattle is domestically produced by two agencies located in Malang, East Java and Lembang, West Java. Obtaining a licence to import semen is complex. Morey (2011) suggests that the dairy industry needs to improve the genetic base by importing the best semen and that this may require a review of the importation policies in order for this to occur.

Corporate dairy farming plays only a small but expanding role in Indonesia; it represents only six percent of dairy cows and milk production in East Java. In Indonesia there are five corporate dairy farms with four located in West Java and one in East Java. Corporate farming is set to expand into North Sumatra with two major liquid milk companies planning to establish dairy farms and milk processing plants near Medan in North Sumatra in 2011 / 2012 with a focus on export to regional markets.

PROCESSING AND TECHNOLOGY

With over 17,000 islands, Indonesia faces a major challenge distributing perishable produce to major urban centres. Most of the distribution of local products is based around seaports and regional depots. A major distribution problem for companies is the lack of refrigeration and an inferior distribution system resulting in problems maintaining a cold chain system for perishable products made from milk.

While price incentives exist in an attempt to encourage better farm management practices and higher quality milk, a lack of infrastructure is contributing to the very low percentage of production meeting the minimum quality standard for milk. While KUDs have hundreds of milk collection centres distributed within villages, only some of these have cooling units. More milk cooling units need to be placed as close as possible to farmers at collection centres in the farmer villages to address the poor quality standards.

The main issues of concern to milk processors are high TPC levels (higher than the SNI level of one million) and warm milk (need for more milk cooling units). High TPC levels are a concern for milk processors as it impacts on the usage of the milk and it is costly (more energy required) to reduce the milk temperature. Some processors such as Nestle are funding the installation of cooling units within KUDs that supply to them.

MARKETING

Traditional retailers still dominate retailing in Indonesia out-numbering modern retailers by over 200 to 1. The sector is very fragmented, competitive and price sensitive. But modern retailers (supermarkets, hypermarkets and convenience stores), both international and domestic, such as Carrefour, the Dairy Farm Group, Makro, Matahari plus a range of high end retailers such as Ranch Market, Sogo and Food Hall are expanding rapidly. In general they are located in urban areas with high quality cool chain management, storage and distribution and provide considerable opportunities (Victorian DPI 2012).

The milk processors buy fresh milk from the dairy farmers via the cooperatives (KUDs) or direct with some large dairy farmers. The common need of milk producers is to obtain a fair price for their milk. The main constraint that milk producers seek to overcome by acting collectively is the marketing of their product. Milk is considered to be one of the most sensitive agricultural commodities, requiring special and timely care, and this can be provided through the collective operation of cooperative dairy societies (Uotila & Dhanapala 1994).

Fresh milk quality is measured by the bacteria content (TPC=Total Plate Count), which ranges from 500,000 to 1 million. Indonesian fresh milk production with the lower bacteria content is combined with imported skim milk to produce liquid milk and powdered milk. Fresh milk with higher bacteria content is processed into sweetened condensed milk.

As dairy consumption increases and consumers demand more variety in local dairy products there is an opportunity to increase the value along the supply market chain by linking producers more closely with customers.

QUALITY STANDARDS AND CERTIFICATION

The Milk Processing Industry, with input from the industry (GKSI) and Government (DGLAHS), sets the basic price of milk paid to farmers. The price varies across milk processing companies, districts and milk quality. There can be up to six grades of milk quality based on the total plate count (TPC) and total solids (TS) in the milk. The difference between Grade 1 (best quality) and Grade 6 (worst quality) can be between 30% and 60%.

The Government has a milk quality standard (SNI) which stipulates the quality parameters for fresh milk. There is a new SNI being developed for milk products by the end of 2011. According to industry sources, only 12% of all dairy farmers meet the SNI standard while 75% of Nestlé's farmers meet the standard (Morey, 2011). The main problem with milk quality is very high TPC above the SNI level of one million.

IMPACT POTENTIAL

PRODUCERS AND PROCESSORS

Since farmers get paid on quality and output, efforts to improve these factors will likely result in increased income for producers. A 2011 report identifies that farmers could earn on average at least Rp. 500–600 per litre more for milk with low total solids and TPC. Low milk quality is due to poor management practices and cool chain logistics. Access to better genetics will also improve herd productivity, and the provision of better quality feed will also increase milk output per cow.

With an average of 3 - 4 cows each, dairying is likely to be best considered as one of a number of activities undertaken by a smallholder, rather than the sole focus of activity.

MARKET DEMAND

The milk supply chain in Indonesia is quite developed, with many companies and multinationals investing and looking to invest further (New Zealand Herald 2012). The market is large and is expected to continue growing, so an increase in production will supply this expected demand. There is also potential to grow Indonesia's milk export market, particularly into the Asian market.

POTENTIAL PITFALLS

The Indonesian Government supports the expansion of the dairy industry and provides loans to farmers to buy dairy cows. However access to money is difficult as many farmers don't have collateral to meet bank requirements. A fundamental issue to address if both output and quality of milk is going to improve is the feed situation. Milk production is dependent on access to an abundant supply of feed for dairy cows. During the dry season (April to September) there is limited availability of feed for dairy cows and hence the supply of milk from major production centres on the island of Java declines. If the feed issue can be addressed, the sector potential for improvement is significant.

CURRENT DONOR ACTIVITIES

A wide range of support is provided to dairy farmers by the cooperatives and milk processors. In addition some training and extension to dairy farmers is also provided by various international aid organisations in cooperation with local research institutes; private companies that supply equipment and products to dairy farmers; the DGLAHS and Regional Government and large milk processors.

The sector is not project crowded from an NGO perspective. ACIAR currently have one project: 'Improving milk supply, competitiveness and livelihoods in smallholder dairy chains in Indonesia.'

The IFC recently funded a detailed value chain study (completed May 2011) of the dairy sector in Indonesia, which had an overall objective to profile the Indonesian dairy farming and dairy processing industry and to identify opportunities and roles for IFC to promote a sustainable and inclusive dairy industry in Indonesia. The research identified an opportunity for IFC to provide advisory services to support the development of Indonesia's dairy sector with a focus on small holder dairy farmers.

10) MAIZE SUB-SECTOR

THE MACRO ENVIRONMENT FOR THE SECTOR

Maize is a cereal crop that is grown widely throughout the world in a range of agro-ecological environments. In industrialized countries, maize is largely used as livestock feed and as a raw material for industrial products. In developing countries, maize is often considered an important staple food.

In 2010, Indonesia was the sixth largest maize producer with 18,364,400 MT, behind the USA, China, Brazil, Mexico and Argentina (FAOSTAT 2011). In Indonesia, maize is the second most important cereal crop after rice, in terms of the percentage area planted to maize relative to the total area for all food crops (Swastika et al, 2004). Maize is cultivated for domestic market for human and animal feed consumption. Many people in Indonesia especially in the eastern part of Indonesia (NTT) consume maize as one of main staples for daily consumption. Total harvested area in 2011 was 3,869,855 Ha (Indonesian Ministry of Agriculture, n.d.). Major producing provinces were – East Java (31%), Central Java (13.4%), Lampung (9.8%) and South Sulawesi (7.6%). North Sumatra, East Nusa Tenggara, Gorontalo are also important production areas. Maize production in Indonesia is dominated by supply from Java. Since the last decade, most of maize grown in Java (57%) and contributed for about 61% to national maize production. Maize is the most important food crop in East Nusa Tenggara Province (Benu et al, 2011).

Depending on the location, maize in Indonesia is grown in a variety of production systems – dryland, irrigated, rainfed lowlands, and irrigated lowlands.

An IFC (2011) report states that maize production in Indonesia continues to grow. A growth in average productivity of 25% was achieved between 2003 and 2009. Table 36 highlights the reasonably static area under harvest nationally and it is interesting to note the doubling of production area in West Nusa Tenggara over the 4 year period to 2011. In the same period production in West Nusa Tenggara increased by over 350%. Table 37 however shows the increase in volume of production, particularly from East Java (30%), over this same period.

Table 36: Maize harvested area 2007-2011

Province	2007	2008	2009	2010	2011
Indonesia	3,630,324	4,001,724	4,160,659	4,131,676	3,869,855
East Java	1,153,496	1,235,933	1,295,070	1,257,721	1,198,159
West Nusa Tenggara	42,955	59,078	81,543	61,593	89,406
East Nusa Tenggara	217,478	270,717	250,536	244,583	247,687

Source: Badan Pursat Statistik, 2011

Table 37: Maize production 2007-2011

Province	2007	2008	2009	2010	2011
Indonesia	-13,287,527	16,317,252	17,629,748	18,327,636	17,230,172
East Java	4,252,182	5,053,107	5,266,720	5,587,318	5,010,626
West Nusa Tenggara	120,612	196,263	308,863	249,005	442,426
East Nusa Tenggara	51,436	673,112	638,899	653,620	522,970

Source: Badan Pursat Statistik, 2011

In Indonesia maize is mainly used for animal feed although there are some alternative uses in the biochemical industry. The share of maize used for human consumption is approximately 10% (IFC, 2011).

Maize yields are particularly sensitive to rainfall during the tasselling stage and cob formation. Rainfall during the later phase determines the size of the maize grain. Depending on the location and rainfall, either one or two crops are grown per year. In the NTB province, maize cultivation is carried out in the rainy season between November and March, when local producers rely on seasonal in-crop rain to grow crops on non-irrigated land (IFC, 2011). On non-irrigated land, the second cycle is at greater risk since it straddles the drier season, during which time lack of rainfall may cause yields to drop--or even total crop failure.

POLITICAL

Djauhari, Djulin and Soejono (1988) reported that, after successes in rice production, the Government of Indonesia started to pay more attention to increasing production of secondary crops, including maize, and to promote crop diversification. Benu et al (2011) reports that during the period of 1970 – 2000, area of cultivation of maize outside Java increased at a rate of 1.97% per year. This increase was caused by the expansion of land cultivation created by the government extensification program of maize as well as market development. One of East Nusa Tenggara provincial government's commodity development priorities since 2008 has been maize and livestock.

ECONOMIC

In the global maize market, maize is bought and sold by investors and price speculators as a tradable commodity using corn futures contracts. These "futures" are traded on the Chicago Board of Trade (CBOT). They are delivered every year in March, May, July, September, and December.

Indonesia is a net importer of maize with minimal exports flows. Maize imports fluctuate according to the needs of the internal market. During 1969 – 1975, Indonesia was self-sufficient in maize production. However the considerable production growth over this time has failed to meet the domestic demand, causing a rapid increase in net imports since 1976. Since this time net imports has increased from 50,000 tonnes in 1976 to 600,000 tonnes in 1996, and reached a peak of 1,200,000 tonnes in 2000. Today Indonesia still has net imports of maize of more than 1 million tons (Benu et al, 2011). Argentina and Thailand are the two largest suppliers of corn to Indonesia. An increased demand from the feed industry, coupled with lower quality and supplies of domestic corn, have largely driven this import demand.

SOCIAL

Maize farming is typically undertaken by smallholders with less than 1 ha of land. The availability of labour has an impact on the area planted and harvested. Rapid urbanisation is creating labour pressures in rural communities. This has an impact on the possible planting area and slows the agronomic operations, which in turn further reduces area planted (Benu et al, 2011). In relation to cultivation practices of maize in all districts of Timor Island, Benu et al (2011) reported that weed infestation has become one of the prominent factors that deter farmers from planting large acreages of maize. Lateness of weeding also contributes much to the decline of yield and is related to the availability of labour.

In some provinces, such as East Java, East Nusa Tenggara (NTT), North Sulawesi, South-East Sulawesi, and Irian Jaya, maize is consumed as a staple food. In those areas, only a small percentage of farmers sell their crop to

markets. The community has a priority to keep maize at their home to maintain food security or other needs (seed, feed, social function, etc) during the year. This habit has caused low supply of maize to markets, particularly for the lower producing districts. This has caused a big gap in the maize price between centre and non-centre of production, especially at non harvest time (Benu et al, 2011). Maize is of medium economic value and well known as a preferred food crop to consume in all social levels.

TECHNOLOGICAL

During the period 1980-2001, Indonesia introduced about 66 high yielding varieties. Out of these, 47 were hybrids and only 19 were open pollinated varieties (OPVs) (Nugraha and Subandi 2002 cited in Swastika et al 2004). From 47 hybrid cultivars, only 9 were bred by public research institutes, while another 36 cultivars were bred by private companies.

The sector appears to suffer from a low adoption of technology. Low adoption of improved technology is, to some extent, related to poor technology dissemination and distribution mechanisms (Swastika, 2004). This is particularly true for publicly generated technologies. The Indonesian Cereal Research Institute (ICERI) has released a number of OPVs and hybrid cultivars. ICERI is responsible for producing breeder's seeds (coming directly from research programs) of the released cultivars. Foundation seed (coming from breeder's seed) is handled by provincial seed centres, and seed growers commonly do the mass production of extension (or commercial) seed. Most commonly, the seed growers sell seed directly to farmers or cooperatives. But sometimes their seed is packaged and marketed by public corporations such as Sang Hyang Seri and Pertani.

Despite hybrid varieties being available, it appears that farmers are not consistently adopting them. Benu et al (2011) reports that the predominant varieties cultivated by farmers in Timor (NTT) are local varieties with low productivity. However, Java producers consistently produce higher quality crops due to the higher adoption of hybrid varieties.

The system appears to lack effective promotion of quality seed, and uncertainties exist about the timely distribution of seed. No organization is yet available or fully committed to regular management and promotion of the ICERI germplasm products (Swastika, 2004). There have been occasional links between ICERI and the two public corporations but the desired and sustainable partnerships between the companies and the public research institute have not yet been well established. Swastika (2004) reports there have been a growing interest among national private sector companies to become ICERI partners in promoting maize cultivars. Presently the national Agricultural Agency for Research and Development (AARD) does not have a strong or clear policy on releasing or commercializing hybrid cultivars.

Lack of promotion of appropriate technology is also associated with weak research and extension linkages. During the last two decades there has been a decline in the role and impact of public extension agencies (Swastika, 2004). Agricultural extension workers have not received enough effective training, and contacts with research institutes from where they could acquire new technology and information are weak. Greater access to herbicides has begun to address the problem of weeds that many farmers encounter in their farming system.

An increasing share of hybrids in the Indonesian seed industry has also been observed. Total seed production in 2000 was 41,600 tons, and about 29,850 tons (72%) of it was hybrid seed (Nugraha and Subandi 2002 cited in Swastika et al 2004). In terms of the institutions that produce hybrid seed, about 95.5% of hybrid seeds were produced by private companies, namely P.T. Bisi, Pioneer, and Monagro Kimia. The government-owned companies, namely Sang Hyang Seri and Pertani, only produced about 1,350 tons (4.52%).

In line with the increasing share of hybrid seed used in maize production systems, the figures indicate that the seed industry is an attractive business proposition. This condition should encourage more participation of the private sector in maize agribusiness and, therefore, maize production could continue to increase at a rapid rate.

Benu et al (2011) reported that in NTT, most farmers have limited access to tractors and other modern inputs such as fertilizers or pesticides for their crops and that is why the actual productivity of maize in this region is lower than the potential productivity of maize.

ENVIRONMENTAL

Indonesian maize production is highly dependent upon rainfall. Indonesia is considered one of the more vulnerable countries to hydro-meteorological risks in Asia. In some agricultural areas, harvest and production dip significantly during ENSO (El Niño Southern Oscillation) events due to below normal rainfall. Only 17% of the country's cultivated area has access to irrigation infrastructure, and only 10% of this land is effectively irrigated. More than 80% of agricultural activity depends on rainfall for irrigation. Out of a population of 235 million, 57% earn their living from the agricultural sector and 90% of them are farmers who are susceptible to climate variability (IFC, 2011).

There is little reported in the literature regarding the environmental concerns associated with maize production in Indonesia.

LEGAL

There were no specific legal issues identified in the reviewed literature.

SECTOR POTENTIAL FOR DEVELOPMENT

PRODUCTION

The production system adopted by maize farmers in Indonesia depends on the geographical area, the cropping system, and management choices. Due to significant variation between the different agro-ecological zones that make up the country's maize growing areas, there is a broad spectrum of production constraints (Swastika et al, 2004). Total production of maize is affected by agronomic, climatic, and edaphic, as well as social factors. No single factor is dominant; instead, all these factors are interrelated in determining maize production (Benu et al, 2011).

The agronomic, climatic and edaphic factors affecting the low production of maize are seed quality, weed infestation, availability water and rainfall and –pre and post harvest pest destruction (Benu et al, 2011). Maize is planted as either a monocrop or an intercrop. In drier areas, soil moisture content limits the production of secondary crops and necessitates the use of local varieties of short-maturing maize. Low seed viabilities and high shoot fly incidence are common problems in such traditional farming systems and frequently lead to high seeding rates of three or more seeds per hill.

Even though Indonesia is a large maize producer, productivity compared to world levels remains low (4.2 ton/ha compared to 5.8 ton/ha). Benu et al (2011) reports that this reflects the low production technology in maize cultivation in Indonesia. He does, however recognise that maize farming is typically undertaken by smallholders with less than 1 ha land ownership.

Constraints to adoption of technology, as reported by Benu, include:

1. Maize is grown mainly (89%) in rainfed and dryland areas, with low soil fertility and variable rainfall, and is often exposed to drought conditions.
2. Maize is grown in less developed or remote areas.
3. Farmers are small landholders, have little formal education and lack cash capital. They are therefore not able to purchase and apply modern inputs (certified seed, fertilizer, chemicals) properly.
4. There is no price incentive for the grain, and price of inputs are high.
5. Distance of maize production areas from seed and feed industries can be large.
6. Poor management systems make it difficult to ensure good seed quality.
7. Improved hybrids bred by Government research institutes receive little promotion. On the other hand, hybrids bred by private companies are expensive.

Benu et al (2011) reports that there are limited storage facilities at the farmer level. This contributes to farmers being price takers for their product, as they have nowhere to store it to sell out of harvest period. Of the grain that does get stored, managing moisture can be problematic in highly humid tropical environments.

PROCESSING AND TECHNOLOGY

Swaskika (2006) reports that Indonesia has significant potential for increasing maize production in the future, and that this will be possible mainly due to the increasing role of hybrids in maize production systems.

Maize is one of the primary means of animal feed. The by-products such as grain, flour and solid residues left after processing and distillation are used for feeding cattle. The Indonesian Feed Millers Association reported that in market year (MY) 2009/10 Indonesian feed production will reach 9.1 million tons. As around 50 percent of feed composition is corn, the estimated demand for corn by the Indonesian feed industry is likely to be in the order of 4.5 million metric tonnes (Slette and Meylinah, 2010).

Several reports discuss that an improvement on transportations facility and post-harvest technology would increase farmer's share of returns and marketing efficiency. Low transportation infrastructure in the some maize growing areas contributes to higher transportation costs to market. Benu et al (2011) also reports that technology uptake would be facilitated by better extension services being available to farmers.

MARKETING

There are two kinds of maize marketed and consumed in Indonesia - yellow and white maizes. Besides the two major groups, there is also glutinous white maize, and in some markets a "black maize or smoked maize[20]. This kind of maize does not show any sign of being infested by maize weevil, however, it does suffer from rodent pests. Benu et al (2011) also found heavily weevil infested maize being sold in markets for pig and chicken feed. The price is low (Rp.1000 per measuring can) but the demand is high in some regions. The price of maize varies

[20] Maize whose kernels were poured in palm leaf baskets on the ceillings and smoked till the kernels become dark to very dark colour.

in different markets and for the different products. Table 38 gives an indication of the price differentials by product in a provincial market.

Table 38: Price differential for maize related produce TTS and Kupang, 2011

Maize Types	Price (Rp/Kg)[21]	Noticed
Yellow local maize	4 000	kernel
White maize	5 000	kernel
Glutinous maize	8 000	kernel
White dehulled maize (white)	9 000	Half way process
Maize grits (yellow)	10 000	Clean & ready to use/cook
Very fine maize grits (yellow)	4 000	Rough flower
Yellow maize grits	4 000	Size ¼ of whole kernel
Yellow maize grits	4 000	Size ½ of whole kernel
Introduced maize (bisma) yellow	5 000	kernel
Weevil infested maize	3 000	Feed for chicken and pig
Smoked maize	3 000	kernel
Maize bran	1 000	Feeding pig

Source: Benu et al, 2011. Calculated from Primary Data, 2011

Farmers sell their crops through collectors, local consumers, local retailers, district markets through collectors, retailers at sub districts or city markets. The product often passes through several channels and phases before it is delivered to the end user (Table 39). Location is a key determinant on who the grain is sold to. Farmers who sell their products directly to consumers can gain up to a 50% higher price than farmers who sell maize to collectors (Benu et al, 2011).

Marketing activities conducted by maize stakeholders in Kupang in 2010 included:

Table 39: Example marketing activities, Kupang 2010

Stakeholders	Harvested and Post-harvested Activities
Farmer	Harvested and simply cleaned by separated it from dirt, dry leave, packed then sold it. Grading and labeling was not applied. Farmers also, manually, processed white maize kernel become dehulled maize (bose) and sold it to markets
Collector	No particular treatment. Received maize was sold soon after obtain profitable amount to cover cost. Some collectors also processed maize to become maize dehulled, very fine grits and other types of maize grits to sell in markets
Retailer	Purchase the crop from collector and/or farmer, and sold it back to end user. There no specific treatment to improve quality. Some retailers also processed maize to become maize dehulled, very fine grits and other types of maize grits to sell in markets
Inter-island Trader	Drying, cleaning, packaging (without label), chemical for pest and disease in storage were applied. Between 8-10% dirt was left in this particular activity. Inter-island traders also processed maize to become maize grits for feed or other needs using their own machinery.

Source: Benu et al, 2011. Primary data 2011

However Benu et al (2011) in their study found that the majority of farmers relied on collectors to come and buy their crops. Farmers did not actively deliver their crop to the market or trader warehouse. High transportation costs and a speculative market made the farmers reluctant to sell the crop by themself. In this

[21] Average price at retailer markets in SoE and Kupang in the second week of January 2011.

way the farmer is a price taker who takes the trader/collector offered price. Market intelligence information amongst farmers was also found to be poor. What information that was shared was through word of mouth between villages (Table 40).

Table 40: Average price of maize at different marketing sites

Stakeholders	Price (Rp/Kg)[22]					
	Atambua[23]	Kefa	SoE	Kupang	Java, Makasar	Average
Farmer	1500	1500	2000	2200	na	1800
Collector	2000	2000	2300	2400	na	2000
Retailer	2500	2500	2650	2800	na	2425
Inter-island Trader				2450	2450	2450

Source: Benu et al, 2011: Primary Data, 2011

Benu et al (2011) also reports that price differences between seasons (harvest and no harvest time) are high. To avoid this, inter-island traders and wholesalers only buy maize between April and August each year. At these times, the price of maize is lower than other months during the year due to a high supply. Supply and demand are the crucial points in the formulation of a price for maize.

To avoid low prices at harvesting time, losses in storage, and to stabilize maize supply to markets throughout the year, improvement in storage facilities is needed. Benu et al (2011) believes that this should be combined with research into good post-harvest treatments that will ensure product life of the grain without compromising quality.

The price gap discussed above apparently worsens when the transportation in rural areas during December to February becomes a constraint for maize marketing. Lack of supply of maize at this time causes high prices, which in turn causes low consumption of maize. This is because rural communities choose to consume other agricultural products such as cassava or bananas.

Swastika et al (2004) reported that the road infrastructure varied across maize producing regions, and had a considerable impact on the marketing of the grain for farmers. In NTB, the transportation system is not as good as in Lampung and East Java. The unfavourable transportation systems made it very difficult for farmers to sell their maize to the district or sub-district markets. Benu et al (2011) reports that high transportation costs reduce the level of trade between some islands and major market centres.

Price instability at the farm level has discouraged farmers from producing more maize through the use of improved technology, especially in the regions where food and feed industries are not available. The farmers in those regions are faced with a lack of marketing infrastructure. Since farmers have had problems of drying during wet season harvesting, they have been forced to sell their grain at a low price. Only in the regions where feed and food industries exist could maize prices be maintained at a reasonable and quite stable level (Subandi, Ismail and Hermanto, 1998 cited in Swastika et al, 2004). This condition has led Indonesia to import maize continuously. A study conducted by Timmer (1987 cited in Swastika et al, 2004) in East Java showed that demand for maize from feed mills is the key to price setting. When feed mills in Jakarta purchased imported

[22] Average price for yellow maize during 2010; ranges from Rp.1500 per kg (at harvest season April – August) to Rp. 5000 per Kg at no harvesting time (Oct-Feb)

[23] Atambua is the capital city of Belu, Kefa is the capital city of Timor Tengah Utara, SoE is the capital city of Timor Tengah Selatan, Kupang is the capital city of Kupang in NTT province. Price in Atambua and Kefa based on interview resulted from Retailers in SoE and Kupang city.

maize through BULOG (the National Food Authority) or private importers, at a competitive world price, the local price of maize in East Java decreased to a relatively low level.

QUALITY STANDARDS AND CERTIFICATION

Low quality is a barrier to Indonesian maize producers entering global markets (Benu et al, 2011). Farmers and collectors do not apply sorting, grading or labelling before their selling. Inter-island traders and bigger collectors do limited sorting on quality. Benu et al (2011) found that maize farmers in NTT generally lack the necessary knowledge and skills to maintain their harvested maize. The traditional practices in harvesting, collecting and transporting cause low quality. Hand harvesting is the norm in small holder systems and this often contributes to lower quality. There are no post harvest pest and disease treatments applied by farmers. In addition, improved seed varieties should be tested and produced at the local level for distribution to farmers.

IMPACT POTENTIAL

PRODUCERS AND PROCESSORS

The impact potential is high due to the very large number of landholders growing maize. Farmer's income could be improved through incremental improvements in productivity, crop quality and the marketing system.

Farmers lack knowledge in marketing information. Farmers tend only to have a relationship with local collectors/traders, and conduct selling activities individually. By forming farmer groups, they may strengthen their marketing position.

MARKET DEMAND

Indonesia used to be self-sufficient in maize production. A significant market base exists if Indonesian producers can lift both production and quality. The high demand from the feed sector is set to continue.

Success in marketing would be a key motivation for farmers to improve their productivity. Improved marketing technology and strategies (packaging, labeling, grading, harvesting methods, supply marketing information, i.e. newspapaer, radio, seminars, publications and calender; hiring stand point at wet markets, group marketing and networking) are some important aspects for future improvements (Benu et al, 2011).

Improving market information and intelligence back to the farmer on what consumers want would also provide incentive for farmers to adopt technologies to improve yield, and better harvest and storage practices.

POTENTIAL PITFALLS

Irrigation infrastructure is lacking and drought is a main risk for maize cultivation leading to potential crop failure.

To raise productivity, farmers will need to adopt hybrid maize varieties. Whilst hybrid varieties are available and have been for many years, Benu et al (2011) reports that many farmers are simply using seed from their previous harvest. Extension activities around this will need to improve in order to educate the farmers and provide better access to certified seed.

A number of pressures to the expansion of the maize sector have been identified in the literature.

- The area under maize in Java is trending downwards due to population pressure and land conversion (Benu et al. 2011).
- Indonesian farmers, like farmers elsewhere in the world, make their planting decisions based on the availability of water. In line with the Indonesian BMKG prediction of a rainy dry season and the actual rainfall that continues to occur, most Indonesian farmers are showing a preference to plant paddy, as they anticipate a higher yield margin than corn (IFC, 2011).
- During the harvesting season, maize grain price often drops to a level below the average cost of production. Therefore, some farmers changed from maize to other crops.

Research and development on white maize seems to have lagged behind that for yellow maize. During the last three decades only two white maize cultivars were released. In addition, there has been almost no government program related to the development and promotion of white maize (Swastika et al, 2004). Since food maize is becoming increasingly important, development of high yielding white maize is needed. One important trait to be incorporated into improved germplasm is resistance to storage pests, such as weevils.

CURRENT DONOR ACTIVITIES

In a previous project, IFC Indonesia Advisory Services facilitated maize farmers to obtain loans from commercial banks (IFC 2011). There is reference in the literature (Benu et al, 2011) that both the Government and NGOs have, at times, run seed aid programs in order to encourage farmers to use certified seed instead of replanting their own.

11) BEEF LIVESTOCK SUB-SECTOR

THE MACRO ENVIRONMENT FOR THE SECTOR

POLITICAL

LIVESTOCK POLICIES AND LAWS

"Policies" that apply Indonesia's cattle and beef industry include a suite of laws, regulations, plans, programs and policies that can be ordered in various ways (for a policy hierarchy in the Indonesian context see Mardha (2009) and for feed-livestock systems see Brown *et al*. (2008)). Together, the policies set the formal institutional environment in which industry activity takes place on multiple scales – from a long term horizon to day-to-day basis, from national down to household levels.

Signals emitted from central government are transmitted down to local levels. However, decentralisation and regional autonomy measures that began in the late 1990s have eroded national-level policy making and implementation power vis-à-vis local government. Local government set policy with considerable autonomy and discretion. This is particularly the case for powerful provinces like East Java (EJ) that account of large proportions of Indonesia's agricultural output. Formal policies – from the centre or regions – also interact with informal social rules (see Section 1.3 below), meaning that implementation and enforcement of formal policies can be variable, as seen in some of the sectoral policies discussed below

Examples of cross-sectoral policies that relate to multiple industries include beef include:

- Indonesia's Economic Masterplan (Masterplan for Acceleration and Expansion of Indonesia Economic Development) 2011-2025. Coordinating Ministry of Economic Affairs (2011).
- The Ministry of Agriculture five year plan 2010-14 (National Medium-Term Development Plan (NMTDP) for 2010-2014).

Examples of livestock specific policies include:

- Law No 18 of 2009 on Livestock and Animal Health
- Government Regulation No 22 of 1983 on Veterinary Public Health
- Government Regulation No 15 of 1977 on Rejection, Prevention, Eradication and Treatment of Animal Diseases
- Regulation of the Minister of Agriculture No 36/Permentan/Ot.140/8/2006 on National Breeding System, 31 August 2006.

Amongst the multi-faceted components of the NMTDP is the goal of self-sufficient in five agricultural commodities – rice, soybean, sugar, maize and beef. Self-sufficiency in beef is thought to be "easiest" to achieve because there is less competition for land (Prabowo, 2011). Targets of self-sufficiency and price stability arose out of the Asian Financial Crisis of the late 1990s (see ADO Socio-economic Review). Vanzetti *et al*. (2010) also attribute self-sufficiency policy orientation to the international food security debate – and the interpretation that Indonesia should respond by stimulating domestic production and trade barriers.

BEEF SELF-SUFFICIENCY POLICY

Indonesia has a long-standing program to develop the beef industry, including goals to build self-sufficiency.[24] However, policy attention has intensified in recent years, since the current cabinet included beef as one of the commodities that Indonesia will become 90% self-sufficient in by 2014.

The flagship policy for the beef sufficiency program is PSDSK (Program Swasembada Daging Sapi dan Kerbau) is implemented by the DGLAHS and effectively began in 2008. The program is otherwise known as the Beef Self-sufficiency Blueprint (PSDS-2014).[25] PSDS-2014 is one of the 21 programs of the Ministry of Agriculture pertaining to efforts to create cattle-source food security based on domestic resources.[26] A translated transcript of the blueprint is provided in Morelink (2010). Details on the heavily supply-sided policy appear in relevant sections below, but some of the "Strategies to Increase Domestic Beef Production" are to:

- Increase the population of productive cows
- Maintain the population of productive cows
- Maintain low rate of mortality (weaners and calves)
- Increase the weight of living beef cattle
- Improve the service quality of abattoirs

The aim of the self-sufficiency blueprint was to increase Indonesia's cattle herd to 14.23 million head and beef production to 420,200 tons, which would restrict imports to 32,000 tons (Prabawo, 2011). 20 provinces with high potential in livestock have been nominated as centers of beef production, which include EJ, NTB and NTT.

In developing industry plans, policy-makers were working off data from the last agricultural census of 2003 (ST03). In order to check feasibility and progress of the self-sufficiency program, a bovine census was conducted in 2011 by the Ministry of Agriculture and the Central Statistics Agency, called Data Collection of Beef Cattle, Dairy Cattle and Water Buffalo (PSPK, Pendataan Sapi Potong, Sapi Perah, dan Kerbau). The census found that the national herd had already reached 14.8 million head, well above the figure used in annual reporting (12.6 million head) and already above the PSDS target for 2014. Furthermore, the proportion of females in the national herd was 3% higher than expected (to reach 68.15% for beef cattle).

While some industry groups in Indonesia (e.g. Indonesian Meat Importers Association, ASPIDI)

[24] The GoI first included self-sufficiency targets into national government programs in 1999 to achieve self-sufficiency by 2005 (Ilham, 2006), and another cabinet aimed to achieve self-sufficiency by 2010. For details see Ilham (2006) p. 136; Sekretariat Negara (2007); Hadi (2002); Sullivan and Diwantyo (2007).

[25] Direktorat Jenderal Peternakan. 2010. Blue Print Program Swasembada Daging Sapi. 2014. Direktorat Jenderal Peternakan, Kementan Pertanian, Januari 2010.

[26] The PSDS program is governed by:

- Regulation of the Minister of Agriculture Number 59/Permentan/HK.060/8/2007 "Guidelines for Achieving Self-Sufficiency Acceleration in Beef"
- Regulation of the Minister of Agriculture Number: 60/Permentan/HK.060 / 8 / 2007 Accelerating Achievement of Self-Sufficiency Unit Beef 2010.

Other measures related to PSDS include

- Agriculture Minister No.19/Permentan/OT.140/2/2010 about General Guidance on Meat Self-Supporting by 2014;
- Director General of Husbandry and Animal Health at Ministry of Agriculture issued the circular No.30018/SE/HK.340/ F/12/2010 (General Guidance on Meat Self-Supporting by 2014) about imported cattle to 2011.
- Commitment to the PSDS program was reiterated in the National Strategy and Plan (RenStra) document of Ministry of Agriculture 2010–2014.
- And further reiterated at the recent Ministerial Consolidation Meeting conducted by the Minister of Agriculture in Jakarta, 3–4 February 2012.
- The PSDS program is in accordance with Law no. 18 of 2009 concerning Animal Husbandry and Animal Health (UUPKH).

question the statistics and methods used to derive them, the findings of the PSPK were used to pronounce that the PSDS program was on track and, indeed, that the budget planned for the program (Rp 10.65 trillion over 5 years) could be pared back (Prabawo, 2011). It has been reported that in 2013 alone, DGLAHS will spend approximately Rp1.5 trillion to implement the program (Kristedi). For assessments of policy mechanisms used to pursue self-sufficiency (import tariffs, production subsidies/credit, and research and development) see Hadi *et al* (2002) and Vanzetti *et al*. (2010).

INTERNATIONAL TRADE POLICY

International trade policy is a major instrument by which the GoI is seeking to stimulate domestic growth. The sector is governed by a large number of trade, quarantine and SPS regulations policies and regulations. Morelink (2010) provides a list of these regulations, and the following.

- Import restrictions. Indonesia imposes total country bans (not based on area of freedom) for FMD. Brasil and India are not "allowable country of imports" for beef, while Australia, New Zealand and Uruguay are FMD free. Other major infectious animal diseases include anthrax and BSE. Brucellosis restricts that trade of live cattle within and into Indonesia
- Import tariffs. A 5% tariff is imposed on imported beef and offal. On the rationale that breeder cattle imports are used to grow Indonesia's herd and produce beef cattle, a 0% tariff is applied to breeders. Feeder cattle were imported duty free, subject to the requirement of the maximum weight of 350 kg, on the basis that the value of weight gain is captured by Indonesian feedlots and fattening households. However a 5% rate was introduced in 2012 for cattle imports except "oxen and breeders" (which requires some interpretation). Under the ASEAN, Australia, New Zealand Free Trade Agreement (AANZ FTA) tariffs on bovines, beef and beef offal are to be eliminated or phased out.
- Quota. The issuing of import permits are the major instrument used to restrict beef and cattle imports under the PSDS beef self-sufficiency program.[27] This is effectively done through the use of an unofficial quota to restrict imports through reduced allocations (quantity) when applying for permits. The DGLS issues import permits 6-monthly, and the monitoring of imports occurs at Customs and Quarantine (Morelink, 2010).
- For live cattle, in December 2010, the GoI imposed a limit of 520,000 head of cattle to be imported from Australia during 2011 and a stricter enforcement of the 350 kg weight limit of imported cattle. The quota was further reduced for 2012 to 283,000 head. At the peak of the trade (2009), Indonesia imported 770,000 head, up to one-third of the total (registered) cattle slaughter.
- From a peak of 51,000 tonne in 2009, imports of boxed beef have also declined due to quota restrictions. After additional quota was issued in 2012 (8,300 tonne and 7,000 tonne), the total allocation was 41,000 tonne, or about 10% of Indonesia's beef production.
- The GoI also aims to increase the population of breeder cattle by using ex-import cattle or through imports of breeder cattle, using government or private funds (see below).

[27] Director General of Husbandry and Animal Health at Ministry of Agriculture issued the circular No.30018/SE/HK.340/F/12/2010 (General Guidance on Meat Self-Supporting by 2014) about imported cattle to 2011. In early December 2010, the Indonesian Government applied to WTO to have all offal imports except tongue and tails banned (Morelink, 2010).

THE BREEDING SECTOR

One of the aims of the Beef Self-sufficiency Blueprint (PSDS-2014) is to improve the productivity of local cattle. This is to be done through both optimising artificial insemination (IB, *Inseminasi Buatan*) and intensifying natural mating (InKA). Institutional measures to be taken include:

- Strengthening breeding regions (especially NTT and NTB);
- Development of Village Breeding Centre (VBCs);
- The provision of breeds through subsidies of interest (Cattle Breeding loans program/KUPS, Kredit Usaha Pembibitan Sapi)[28]; and
- And by using ex-import cattle or through import of breeder cattle from countries free from Major Infectious Animal Diseases. This to be done through government or private funds.

The vast majority of breeding occurs through natural and largely uncontrolled mating by bulls that belong to individual households or groups. Problems include genetic quality, long breeding season, and low conception rates. Measures have been taken to improve natural breeding including the dissemination of breeding stock, controlled breeding and spread of artificial insemination (AI)

Hadi (2002) writes that in the past AI services were provided entirely by the government, at no charge to farmers. The AI officers from the OLS provided the service and received an incentive for each AI application. Problems with the AI included:

- Lags in farmers detecting if cattle are on heat and notifying local AI officers;
- Insufficient AI officer and transport; and
- Insufficient liquid nitrogen (so cold water often used to preserve semen).

Government maintains a role as both regulator and facilitator of the breeding sector, as well as acting as provider of semen or breeder cattle. However, genetic material for beef cattle (semen or embryos) is now provided through a wider range of channels: research centres; breeding centres (national and local); private/cooperative; or via the community through Village Breeding Centre (VBC) (Morelink, 2010).[29]

Private inseminators purchased semen from the government AI stations and farmers are charged (Rp 25-30,000 in the past).

One of the measures that the GoI has used to strengthen breeding is to strengthen the Village Breeding Centre program, to support private breeding service providers, with the aim to provide 37,500 head by 2014. This will be achieved by three channels:

- The PUAP (*Pengembangan Usaha AgribisnisPerdesaan* – Village Agribusiness development) program, which aims to support 4,000 farmers group to develop their own good quality breeding cattle. Each group received Rp100 rupiah from the government.
- Integrated cattle – palm oil plantations projects [not relevant in EI].

[28] Minister of Agriculture No. 40/Permentan/PD.400/9/2000 Credit Guidelines for Implementation of Cattle Breeding

[29] Beef cattle breeding by the government are conducted through UPT (Technical Services Unit) that produces cattle seeds and another UPT that produces breeder cattle. Seeds are produced by three central UPT, the Cipelang Livestock Embryo Institute (BET), the Singosari Artificial Insemination Institute (BBIB) and Lembang Artificial Insemination Centre (BIB) and supported by several regional Artificial Insemination Centres. Currently, there are fourteen Regional Artificial Insemination Institutes (BIBD) located in West Sumatera, Central Java, Bali, North Sumatera, Jambi, South Sumatera, Bengkulu, Lampung, D I Yogyakarta, South Kalimantan, West Nusa Tenggara, South Sulawesi, South East Sulawesi and East Kalimantan (Morelink, 2010).

- Through joint ventures [also unlikely to be relevant in EI?][30]

Relationships between feedlots and small-holders are also relevant to the breeding sector. This was first developed in the 'nucleus estate and smallholder' (NES) approach in 1990 (Hadi, 2002). Feedlots, which have financial and management resources, are obligated to provide cattle, feed (esp. concentrates) and technical assistance to smallholders, and to purchase back their fattened cattle at prevailing market prices. Smallholders, who have land and family labour, are obligated to look after the cattle. All costs pre-financed by the feedlot are deducted from the sale price.

The use of imported cattle in the scheme stalled during the Asian financial crisis and depreciation of the rupiah. But by 2001, of the 1.5 million cattle fattened by smallholders, 99.9% involved NES partnerships and a further 252,000 cattle were fattened from live feeder cattle imports. Hadi *et al*. (2002) recommend that the scheme be more voluntary in nature.

Sullivan and Diwyanto (2007) write that under a previous self-sufficiency program (2010), the GOI continued the feedlot-smallholder partnership scheme. Feedlots were encouraged to retain pregnant females from live cattle imports, to distribute the females to small-holders, which raise the calf. The cow can then be sent to slaughter or kept for breeding. Sullivan and Diwyanto conclude that the scheme entails high costs on the GoI (because cattle are bought back by government at inflated/above market price) and that smallholders are not provided with bank loans to maintain the animals.

Credit schemes relevant to breeding are also discussed in the next section.

CATTLE PRODUCTION

Increasing productivity in the cattle production sector is by far the largest component of the PSDS-2014 program. The PSDS-2014 document specifies aims to:

- reduce calving intervals from >18 months to 13-15 months;
- increase the calving rate of productive cows from 55-57% to 75-80%;
- decrease calf death from 20-40% to 5-10%, and cow death from 10-20% to 2-5% (especially through provision of adequate feed and water in the dry season in breeding areas like NTT and NTB);
- These measures can increase calving rates by 30-40%; and
- Increase the cattle population by 10-15%.

In addition, the program aims to:

- increase average daily weight gain, shorten the fattening period, improve cattle feed efficiency, and increase the percentage of carcasses as well as enhance beef quality; and
- Postpone slaughtering so the cattle reach maximum weight, which is expected to increase beef weight or beef production around 20-40%.

The activities that will be used to achieve these aims are listed as:

- Development of breeding and fattening of local cattle;
- Development of organic fertilizer and bio-gas;

[30] Australian private investment was to work with their local partner to develop breeding centers. 6 Australian companies signed up aMoU in 2010, but had not materialised until February 2012, according to the Minister of Trade Gita Wirjawan(Jakarta Post, 2012).

- Development of integration of cattle and crops; and
- Postponement of slaughtering.

These cattle production activities are pursued through a large number of domestic and external RD&E programs and through slaughter policy (discussed below). However, one of the most direct policy measures is to provide credit and cattle to small-holders.

Hadi (2002) explains how the government provides assistance to farmers with breeder cattle through a revolving system designed to spread cattle to more farmers and reduce costs. The government provides an individual farm household with one breeder cow. Within five years, the farmer must return the first two calves to the government; the farmer keeps the rest (including the breeder cattle and the third calf). The two returned calves are redistributed to other farmers.

The government can also provide assistance to farmers with feeder cattle for fattening to increase liveweight. A number of male cattle are provided to farmer groups. Farmers must feed and maintain the cattle. A percentage of net revenue (total gross revenue minus total initial value of feeder cattle) returns to the government, while the rest goes to the farmer group. The initial value of feeder cattle also returns to the government. Relationships facilitated through government regulation and credit, between cattle importers and smallholder fattening operations / producer groups, are common in plantation systems in Sumatra (Morelink, 2010), but have become less common with reduced cattle imports.

Several credit schemes – KUPS (Kredit Usaha Pembibitan Sapi) and KKPE (Kredit Ketahanan Pangan dan Energi) – are aimed at increasing Indonesia's brahman cross breeding herd. KUPS is intended for breeding cattle with a subsidized interest rate 5% for period 6 years with 24 month grace period (when market interest rates were around 14% in 2010). Government has allocated a budget for 200,000 head per year (in a split of 80:20 between beef and dairy cattle enterprises). The regulations allow financing for up to 5,000 head of cattle with maximum loan capped at Rp66 billion per application. By October 2010, expenditure on KUPS had reached Rp128 billion or about 3.3% from target of program credit in 2010 (Hadibrata, 2011).

The credit program is governed by several policies.[31] For an idea of how the funding is delivered through a development bank, see BNI Bank website
www.bni.co.id/BankingService/Commercial/Kredit/KreditProgramBNI/KreditUsahaPembibitanSapi.aspx

In addition to national industry development plans, provincial government also set industry development plans. Examples include:

- East Java has implemented the Madura Sapi Berlian (Diamond Cattle) program with the aim of producing 5 million calves within five years. This program is an acceleration of a previous program that aimed for artificial insemination (AI) of one million cows. Based on a projected growth of 2.7% in beef production (source: Small-Scale Beef Cattle Production in East Java, Indonesia, cited by Priyanti *et al*, 2012).
- The government of NTB has launched the BSS " Bumi Sejuta Sapi – land of one million cattle" program, which aims to make the province a key source of local breeds and to increase the beef cattle herd from 685,000 to 1million head by 2014. The NTB medium Term Development Plan

[31] These include Ministry of Agriculture No.40/Permentan/PD.400/9/2009 and Regulation of Ministry of Finance No. 131/PMK.05/2009, while Vanzetta et al (2009) cite RENSTRA (Strategic Plan) of the Ministry of Agriculture and initiated under a Presidential Decree of Agriculture Revitalisation Plan in 2005.

(RPJMD) 2009-2013 is based around the 3 "qualified" commodities of cattle, corn and seaweed, associated with a multi-faceted industry development program (The Government of NTB, 2009).

- In NTT, provincial government has launched the "anggur merah" program to speed up economic growth and reduce poverty in which the beef cattle sector development is a strategic focus. Since 2010, provincial government has declared NTT a "livestock province" with a "one citizen, one cattle" program. This would return NTT to a position as one of the country's main suppliers of livestock, with 4 million cattle within the next 5 to 10 years (Fointuna, 2010).
- As an example of a district policy, East Sumba regency in NTT is preparing a total of 400,000 hectares of land across 140 villages to expand its cattle breeding industry (Fointuna, 2012).

THE SLAUGHTER SECTOR

PSDS-2014 states the aim to increase the supply of beef through the "empowerment and improvement" of abattoirs so that they can produce meat that is the equivalent quality of imported beef – and can even be exported.[32] This is to be achieved through "technical" measures including sanitation and hygiene, animal welfare, aging, cutting system and cold chain management.

PSDS-2104 states that 150-200,000 productive cows are slaughtered per year, taking place mainly in NTT, NTB, Bali and Java.[33] The GoI aims to prevent the slaughtering of productive female cows through slaughter bans and the "rescue" (buy-back) of productive females.

To enforce slaughter bans, local Dinas Livestock officials check for the slaughter of productive females, notionally in every slaughterhouse and slaughter place at every slaughter time. The GoI had a scheme to buy back these animals at the slaughter plant Sullivan and Diwyanto (2007).

However, the slaughter of productive females is widespread. Producers, traders and butcher have vested interests in selling their livestock and meat regardless of government regulations. There is not a sufficient budget to have an effective buy-back program. Cattle can be slaughtered through very small and mobile slaughter facilities, or can be declared as unproductive, sick or injured. This is especially common in periods of cattle scarcity (e.g. festivals, decline in imported feeder cattle).

The slaughter of productive females is widely thought to lead to further decline of the breeding herd and herd regression (Hadi, 2002). However, ACIAR project AS2/2000/099 (Strategies to improve Bali cattle—eastern Indonesia) involving geneticists from various Indonesian agencies, concluded that there was no evidence of genetic regression, and that low turn-off weights and fertility rates were due to under-nutrition (Winter, 2011, Copland pers comm).

The government has built some slaughter facilities as a public good service and to maintain some food safety standards (although these are reported to be not necessarily high). Under Act No.18 (1998), slaughter charges of Rp 6,000 per head were to be abolished. However, autonomous local governments in most areas do apply a modest slaughter charge for cost recovery reasons (Hadi *et al*., 2002).

[32] PSDS-2014 states that domestic meat can be exported to Middle East and Asian countries because of: Indonesia is free from FMD; Halal guarantee; sanitation hygiene-based food security guarantee indicated with Veterinary Control Number (VCN) and implementation of Hazard Analysis Critical Control Point (HACCP) as a food security guarantee system.

[33] These figures are broadly consistent with earlier figures from the DGLS of 150,000 to 170,000 productive females killed per year (10% of slaughtered animals) (cited in Sullivan and, 2007). ACIAR data indicates that around 34% of all female cattle slaughtered are productive females (cited in Nimmo Bell and ICASEPS, 2007).

Morelink (2010) reports that the Government will aim to better regulate slaughterhouses by introducing two licenses covering: suppliers to local wet markets only; and suppliers to more distant markets that will need to have established cool chain systems. In 2009, there were 693 licensed slaughter houses and abattoirs in Indonesia which slaughtered 935,700 head of cattle. This probably accounts for less than half of the Indonesian cattle slaughter (depending on what set of slaughter statistics are used, see statistical section below). That is, unlicensed slaughter operations account for a large proportion of the Indonesian cattle slaughter. These small-scale and mobile operations have developed to avoid slaughter bans, inspection and slaughter fees or are able to slaughter stolen cattle.

Change in regulation of the slaughter sector may be driven by consumer or public demand or as a response to major disease, food safety, environmental or animal welfare concerns. Local government in particular may apply more stringent regulations in areas like registration, registered capital, tax, inspection, hygiene, building and bench materials, storage, water use and effluent management. These have a major influence on the activity in the sector and indeed the whole supply chain.

DOMESTIC TRADE AND MARKETING

Indonesia has long used measures to manage the flows and conduct of domestic trade (Hadi *et al*., 2002), some of which have a legacy in the colonial era (Rutherford and Dahlanuddin, 2004). With the intent of controlling depletion of the domestic cattle herd through excessive slaughter, central government (the DGLS) specified the number and weight of cattle to be sent from each province to another for slaughter.

Following the financial crisis in 1998, Indonesia entered into agreements (including with the IMF, Presidential Decree No. 2/1998) to relax these trade restrictions and to eliminate tax and retribution on the trade. However, regional decentralisation measures have allowed local governments to impose their own trade management measures, to pursue local industry development and generate local revenues. The measures include:

- Export quotas on number of cattle;
- Weight and sex restrictions;
- Government purchases and cattle redistribution; and
- Restrictions due to disease status. E.g. Brucellosis is in some districts of NTT prohibits the movement of breeding females, but allows the movement of males for fattening or slaughter (not breeding).

As an example of inter-provincial trade policy, NTT has established quota and regulations related to the export for livestock. In 2012, the quota was set at 55,000 cattle (and 7,000 buffaloes). The limits are that livestock must be:

- Livestock for slaughter, not breeding stock whether it be male or female;
- From Timor and Rote, only bulls that are not for breeding may be exported (while non-productive female buffaloes and horses can be exported); and
- For Flores, Lembata, Alor and Sumba, exports are permitted for cattle, buffalo and horses that are either males not suitable for breeding or unproductive females.

The trade is to be managed by Dinas Livestock (at provincial and district levels) including the tasks of:

- Managing shipments and animal health;
- Regulating the export of breeding males and productive females; and

- And regulating provincial export restrictions on minimum liveweights. The minimum weights are: Bali cattle 275 kg; cow Sumba Ongole 300 kg, 350 kg buffalo; horses 250 kg.

Other procedural details are that provincial government issues export permits to eligible export companies, which report to Dinas Livestock which back to the Governor.

In NTB there is a ban on the import of cattle into Lombok that are not Bali cattle. There is also quarantine of animals moved from Bima to Lombok supposedly for 2 weeks. Bulls imported from Sumbawa are supposed to be for slaughter only (not fattening or on-selling).

Reforms at the end of the 1990s designed to ease restrictions on domestic trade flows, also involved the elimination of all taxes and retribution previously imposed on inter-province and inter-district cattle trade (Presidential Decree No. 2/1998). Again however, regional autonomy has seen local government increase taxes and retribution (Hadi, 2002).

Regulations on inter-island trade are complemented by a series of regulations on local trade and marketing. This is largely a policy arena of local government, as reported by Suharyo (2007, pp24-28) on the business environment in NTT. They document:

- The fees and levies associated with cattle marketing (Table 7). These include Village retribution (leges), Sub-District retribution, Slaughter house (RPH) retribution, Traditional market retribution, Holding ground retribution, Cattle's Physical condition check-up, Send-out permit, Free disease authorization letter, Quarantine Port handling and services;
- The very long list of Checkpoints from Atapupu Port (Belu) to Tenau Port (Kupang) and Wini Port (TTU) (Table 15); and
- Relevant regulations
    - The Governor Instruction No. 7, 1993 on the Implementation of the Prevention and Elimination of Brucellosis (a contagious disease causing still births), which supplements Governor Decree No. 13, 1993 on Directives for the Prevention and Elimination of Brucellosis in NTT Province.
    - Governor Decree No. 5, 2006 on Export Allocations for Slaughtered Large Livestock (beef cattle, buffalo and horse) in 2006.
    - The NTT Perda No. 13/2003 on *Retribusi* for the Payment of Administration Cost.
    - The quarantine and seaport regulation refers to the Government Regulation (PP) and Agriculture Minister Decree—both central government regulations. Central government officials based in the region render the services. The tariffs for quarantine services are determined in PP No. 7, 2004, on Changes to Tariffs on Non-Tax Government Revenue.
    - A large number of village/*kelurahan* administrations in the West Timor region also.
    - Enforce charges (*leges*) for the trade of large livestock, which vary between Rp 5,000 and Rp25,000 per head. These village administration fees cover the cost of issuing ownership and origin certificates. These certificates are required by traders to prove that the livestock they are trading is legal and not stolen.

Nimmo-Bell and ICASEPS (2007) said that most regulations in NTT include charges, such as: the certification of calves and a permit to export, retribusi to cover the administration cost, a quota limit on the number of cattle exported, and the SPK charge for issuing a permit for import and export, the services of slaughtering houses, the services of livestock markets, the services of livestock health checks, and quarantine.

Benu (2011) outlines a series of costs and fees borne by farmers in selling cattle at markets in NTT like Camplong and Takari (transport, tax). Collectors also pay a tax for a legal document issued by KUD, pay

farmers in cash then consign animals to port/quarantine in Kupang (Tenau), Atambua (Atapupu), and Kefa (Wini) and are exported by inter-regional traders.

In addition to regulation of the trade in live cattle, there were restrictions on the trade of beef. Jakarta for example restricted the import of beef presumably for food safety reasons, instead importing live cattle for slaughter locally. This restriction has now been lifted with value-adding benefits for producing regions, environmental benefits for Jakarta, and lower transport and other costs passed on to consumers (Hadi, 2002).

KEY INSTITUTIONS

Under the Ministry of Agriculture, the Directorate General of Livestock and Animal Health Services (DGLAHS) is the central government authority responsible on behalf of the Ministry of Agriculture (MoA) for the planning, implementation and monitoring of national livestock production. This includes the formulation of policy, planning and implementation of national livestock development programs, provision of technical support services, regulatory oversight and livestock quarantine, including responsibilities for livestock product testing and quality control, quarantine and food safety.

Directorates in DGLAHS are:

- Directorate General livestock and animal health;
- DG secretariat;
- Directorate for animal breeding;
- Directorate for animal feed;
- Directorate for animal husbandry;
- Directorate for animal health; and
- Directorate for veterinary community health and post-harvest.

DGLAHS have vertical line linkages to Dinas Livestock at province and district levels. Dinas at province and district level and report to report to provincial/district government.

Hadi (2002) discusses the organisation of international and domestic quarantine facilities for fish, livestock and plants, and service charges. Quarantine has traditionally been under the jurisdiction of central government, but measures were taken to decentralise control to local levels. These were not formalised, instead remaining under central jurisdiction (Presidential Decree No. 66 of 23 November 2000 established the Agency for National Quarantine of Echelon I under the Coordinating Ministry of Economy) because of the need to coordinate with international regulations and inter-sectorally (between animals and plants). Further reorganisation of the international and domestic quarantine service is discussed by the Livestock Research and Development Team (2012).

Other important central government agencies include;

- Ministry of Trade is important due to its access to influence various border measurements. Agreement.
    - Directorate Generals include: Domestic Trade; Standardization and Consumer Protection; DG of Foreign Trade; International Trade Cooperation; and National Export Development.
    - Agencies include: Commodity of Futures Trading Regulatory Agency; and Trade Policy Analysis and Development Agency.

Within ministries, deputy-ministers and directors-general are key actors in shaping the decisions of ministers. Siloisation has meant limited communication across divisions, although steps are being taken in some cases to address this (Datta *et al*., 2011).

In addition to government agencies, the beef industry is comprised by a significant number of peak bodies and associations that play important industry roles. Details are provided in DGLAHS (2011) and Morelink (2010). These include:

- The MUI - Indonesian Ulema Council *(Majelis Ulama Indonesia*) set the *Halal* standard for Indonesia and is the only recognized authority to release *halal* label/certificate for a product sold in Indonesia, including food. *Halal* defines what is lawful according to Islamic law which in the context of beef supply chain include the slaughtering procedures, beef treatment, transportation and processing procedures. Abattoirs and meat processing in Indonesia should meet MUI's *halal* requirements if they wish their product to be labelled *halal* and reach Indonesia Moslem market. Similarly, all beef and processed beef entering Indonesia should be certified *halal* where appropriate. 88% of the Indonesian population is Moslem;
- Asosiasi Pengusaha Importir Daging Indonesia (ASPIDI) Indonesian Meat Importers Association;
- Asosiasi Produsen Daging dan Feedlot Indonesia (APFINDO) Indonesian Meat Producers and Feedlot. Though feedlots are few in number, the association is influential in communicating with the GOI on policy and industry issues;
- Perhimpunan Peternak Sapi dan Kerbau Indonesia (PPSKI). Cow and Buffalo Indonesian Cattlemen Association. PPSKI is integrally linked to APFINDO.
- National Meat Processor Association (NAMPA) Asosiasi Industri Pengolahan Daging Indonesia;
- Animal Husbandry Association of Indonesia (ISPI)

There are numerous cattle and beef associations at local levels.

ECONOMIC

STATISTICAL OVERVIEW

To provide a broad statistical overview of the Indonesian cattle and beef industry in regional context, Table 1 draws on a range of FAO data (FAOStat, July 2012).[34] The highly aggregated data must be interpreted with some caution but nevertheless provides some useful indicators on industry change, which are examined in more detail in the report below.

- Indonesia is a mid-sized player in the international cattle and beef industry, with the 20th largest cattle herd in the world, and the 27th largest beef output.
- Indonesia has the largest cattle herd in Southeast Asia with 13.63 million head in 2010. A more recent and detailed data collection process reports that Indonesia has 14.8 million head in 2011 (PSPK (*PendataanSapiPotong, SapiPerah, dan Kerbau* – Data Collection of Beef Cattle, Dairy Cattle and Water Buffalo). This represents an increase of more than one million head (7.7%) in one year. Growth

[34] FAO data on cattle numbers and beef production is consistent with national data, as it is derived from national agencies. Cattle population data is derived from the report of the Directorate General of Livestock Services and Animal Health (DGLSAH), obtained from reports submitted by government offices responsible for animal husbandry/livestock services throughout Indonesia. Another source of data is the National Livestock Survey (SPN, Survei Peternakan Nasional) carried out by BPS (Central Statistics Agency) in collaboration with DGLSAH in 2006-2008. As discussed below, there are large discrepancies between all three sources on slaughter numbers.

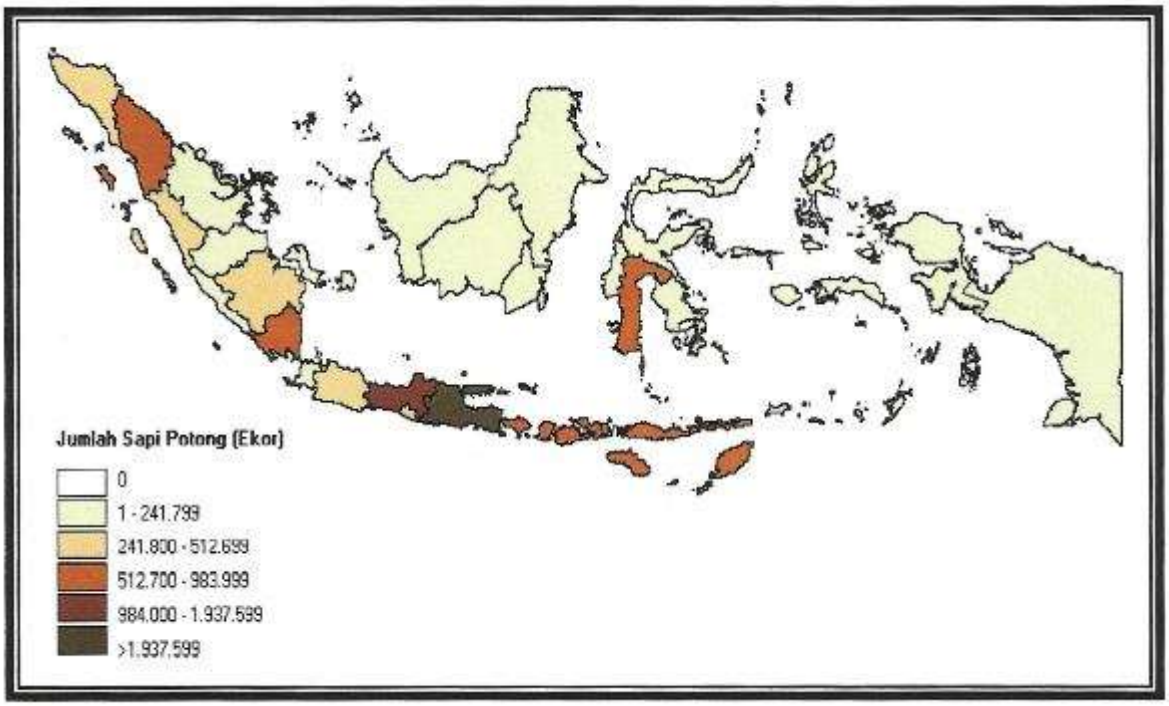
of this magnitude was also reported for the previous year (2009) and is projected for 2012, before moderating to 5% for 2013 (musrembang document – DGLAHS website).

- This represents a rapid increase in growth over preceding years, where growth averaged 2.4% over the 2000s (and 1.4% since 1991). The modest long-term growth rate has been attributed to resource (esp. feed) constraints and high prices that give incentives to farmers to slaughter productive breeders. This is especially pronounced in NTT and NTB that supply breeders to other regions (Hadi, 2002; Deblitz 2011; Nimmo-Bell, 2007). Note however, that these cattle population growth rates are lower from those reported in Indonesia's agricultural censuses in 2003 and 2011.[35]
- Slaughter rates record the number of cattle that are slaughtered per 100 head in stock. Indonesia's slaughter rate of 13% is relatively low even by Southeast Asian standards, and has actually reduced over the last decade.
- This is partially due to the under-statement of slaughter numbers by the FAO and other agencies.[36] Nevertheless, the rates are an aggregate indicator of low pregnancy, calving, weaning and growth rates, which are discussed below.
- Average carcass weights in Indonesia are reported as high, but this is skewed by under-stated slaughter numbers and the relatively high weights of imported cattle (521,000 head in 2010 of the 1.82 million slaughtered).
- Modest growth in cattle numbers and turnoff/slaughter rates have led to modest growth in beef production over the last decade of 2.4%.
- While Indonesia is a large beef producer in the Se Asian context, the very large population means that per capita production of beef is amongst the lowest in SE Asia (except East Timor).
- Limited supply and high demand has put upward pressure on prices, making it the most expensive in the region (Singapore and Brunei excluded).
- This has led to a large Indonesia having a high trade "dependency" ratio for beef (that varies depending on data and assumptions used).

Table 41, Table 42 and Figure 44 continues the statistical analysis on a provincial basis, with more specific reference to the three Eastern Indonesian provinces of East Java, NTT and NTB.

[35] Based on 2011 PSPK final result, the population of cattle (beef + dairy cattle) in Indonesia reached 15.4 million head of cattle. The 2003 Agriculture Census (Sensus Pertanian) indicated that the cattle population was 10.2 million head of cattle and this means that the average cattle population growth between 2003-2011 reached *5.33%* per year

[36] FAO slaughter numbers (1.82 mil) are higher than slaughter numbers reported by the Bureau of Stats (1.46 mil), but considerably lower than DGLAHS figures (2.07). DGLAHS slaughter figures derive from reports from staff of slaughter houses, and from Dinas officals who check slaughter based on interaction with village leaders, consumption patterns and retribution collection. They are not, however, able to report on all local-level slaughter activity. As an indicator of the magnitude over under-statement of slaughter statistics, the Beef Committee DKI estimates the slaughter numbers in 2012 will be 2.52 million head (Kontan articles).



Source: PSPK FINAL RESULT

Figure 44. Distribution of beef cattle population in Indonesia by island in 2011

Table 41. Production indicators of 3 Eastern Indonesian provinces in national context, 2011

	Cattle (head)	Slaughter rates (%)	Cattle slaughter (head)	Av carcass yields (kgs)	Cattle meat (tonnes)
Indonesia	14,824,373	15	2,239,149	208	465,823
East Java	4,727,298	11	528,050	207	109,487
NTT	778,633	5	42,279	109	4,595
NTB	685,810	8	54,476	191	10,418

Source: Livestock and Animal Health Statistics 2011 (DGLAHS)

Table 42. Indonesia cattle and beef indicators in regional context

	Cattle numbers		Turnoff rates		Cattle slaughter		Av carcass weights		Cattle meat		Population	Bovine meat per capita supply	Producer price cattle meat
	Mil. head 2010	Ann growth 2001-10	2001 (%)	2010 (%)	Mil head 2010	Annual growth 2001-10	2001 (kgs)	2010 (kgs)	Kt 2010	Annual growth 2001-10	2010 ('000 people)	2007	2009
World total	1,428.64	0.85	20.5	20.7	295.77	0.95	204.4	210.72	62,325.46	1.28	6,895,888	9.59	--
SE Asia total	47.57	2.38	12.7	14.3	6.80	3.99	163.58	194.48	1,322.56	4.45	593,414	4.22	--
Indonesia	13.63	2.24	16.0	13.3	1.82	0.17	189.8	231.74	420.60	2.42	239,871	1.93	5,422
Viet Nam	5.92	5.17	14.6	27.4	1.62	18.42	171.5	172.17	278.91	18.52	87,848	3.70	--
Philippines	2.57	0.30	31.3	32.3	0.83	0.65	234.4	226.62	188.25	0.29	93,261	3.95	3,234
Thailand	6.50	4.00	9.3	9.5	0.62	4.39	288.8	285.01	176.77	4.20	69,122	4.39	2,010
Myanmar	13.00	1.56	4.3	7.4	0.96	10.00	157.9	150.00	144.00	9.00	47,963	3.25	--
Cambodia	3.48	2.15	16.9	15.0	0.52	0.80	120	120.00	62.88	0.80	14,138	5.00	1,811
Malaysia	0.91	2.26	18.9	24.2	0.22	5.66	113.4	113.40	24.95	5.66	28,401	5.96	4,476
Laos	1.40	1.51	13.0	14.0	0.20	2.39	110	125.00	24.50	4.08	6,201	6.93	1,258
Timor-Leste	0.15	- 0.80	6.6	6.6	0.01	- 0.76	100	100.00	1.01	- 0.76	1,124	1.56	--

Source: FAO stats (http://faostat.fao.org/default.aspx). Retrieved July 2012

Provincial statistics are subject to similar statistical biases as those outlined at national levels above. Never the less, the data provides some useful insights.

- Eastern Indonesia plays a major role in the Indonesian cattle industry. East Java holds the largest number of beef cattle in Indonesia (32%), followed by NTT (4th, 5.2%) and NTB (6th, 4.6%). The 3 provinces account for 42% of total national cattle herd inventory.
- Slaughter rates are under-stated but are still likely to be low by national and international standards, implying potential for productivity gains. The micro-level agro-climatic, social and economic drivers of these figures are explored below.

GDP AND EMPLOYMENT IN THE LIVESTOCK SECTOR

Disaggregated data on the role of cattle in economic development and employment are not available. However, data is available for the livestock sector more broadly (DGLAHS, 2011). The livestock sector accounted for 1.9% of Indonesia's GDP and 16.1% of agricultural GDP in 2010 at current prices. These proportions have increased modestly since 2006, and the DGLAHS forecasts that livestock will make increasing contributions to GDP growth of around 4% between 2012 and 2014 (Renstra Pertanian 2010-2014, p.65). Livestock is not however a major component of the Indonesian economy on national level.

Livestock play a more important role in the provincial economies of Eastern Indonesia. In 2010 preliminary figures report that livestock accounts for 22.3%, 16.2% and 30.1% of agricultural GDP in EJ, NTT and NTB respectively. Livestock accounts for 3%, 2.8% and 10.2% of total provincial GDPs. As an indicator of the contribution of cattle more specifically (rather than livestock on a sectoral level), cattle contributed 14% to agricultural GDP in NTB, about half of that of livestock, and the largest contributor to agricultural GDP (The Government of NTB, 2009).

These figures do not fully reflect the regional distribution of industry activity within provinces, which can be concentrated in geographical pockets. For example,

- In particular sub-districts of NTT (TTS, TTU, Soe, Belu) cattle sales can make up over 80% of the family's cash income (Nemmo-Bell and ICASEPS, 2007).
- In NTT, cattle are concentrated in Madura, Malang, Trenggalek and Situbondo. Priyanti *et al.* (2012) found that gross cash income from cattle exceeded the income from crops in two surveyed sites in EJ; a lowland site (Probolinggo and Pasuruan Districts) where cattle accounted for 61% of cash income and an upland site (in Malang District, 84%).

DGLAHS (2011) also report on the number of producers engaged in livestock production. Nearly 4.2 million farmers raise livestock in Indonesia, 1.98 million in EJ, 34,000 in NTT[37] and 165,000 in NTB. While fewer farmers raise cattle specifically, they are still likely to account for a significant proportion of total livestock producers. Using different figures, The Government of NTB (2009), estimated that the beef industry absorbed the labour of 182,000 people, but this may be across all industry sectors. The provincial medium term development plan (2009-2013) aims to increase this figure to 344,000 people.

The macro-statistics also fail to take into account the value added in downstream industry sectors. The GDP generated from cattle (number of head sold multiplied by average price) is subject to transformation along the supply chain. Based on adjusted cost structures of various level of a supply chain in NTB, Deblitz *et al* (2011) report that the farm-

[37] The data for NTT appear under-stated. In 2003 there were approximately 330,000 smallholders (farming households) in the NTT district and around 136,000 smallholders farming cattle (Agriculture Census, Sensus Pertanian (SP) 2003, cited in Nimmo Bell and ICASEPS, 2007).

gate value of the animal can increase by about 70% by the time it reaches slaughter level and another 70% by beef retail level. Value is created in the chain through margins of industry actors, while product transformation (space, time, form) generates value for providers of goods and services.

No figures are publically available on the number of participants in downstream sectors of the cattle and beef industry. However, like the production sector, the vast majority of the participants are small-scale, rural-based and operate in fragmented and labour-intensive structures. They include: feed providers and traders; cattle traders and collectors; transport providers; slaughter units and their workers; beef processors; beef retailers and stallholders.

THE BEEF VALUE CHAIN

Figure 45 below presents a stylised illustration of the value chain for beef Indonesia (Deblitz 2011).

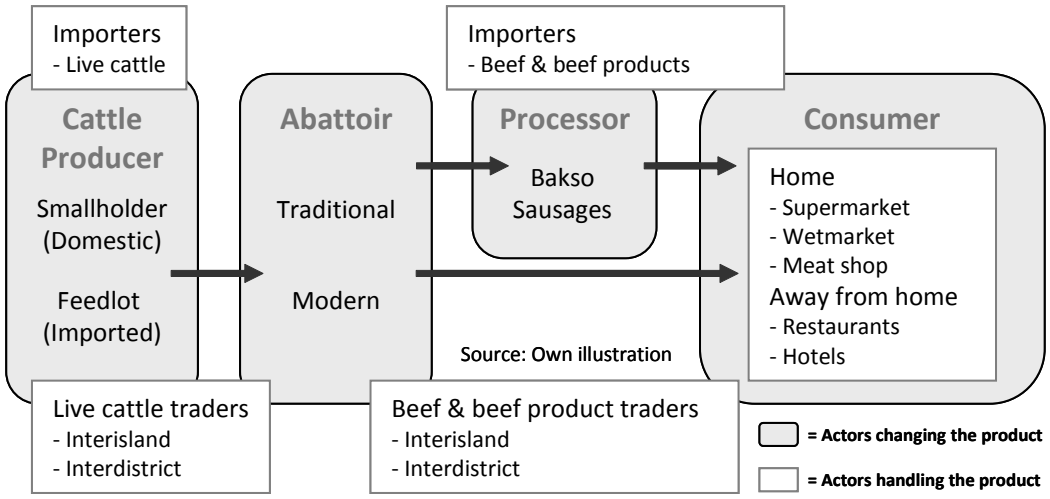


Figure 45. Illustration of the beef value chain in Indonesia

One of the features of the Indonesian beef industry is that all industry sectors have fragmented structures and are dominated by small-scale industry actors. However, each of the sectors also contains a limited number of larger-scale actors to form a continuum of industry structures by scale. Industry structures and change is a central determinant of value chain activity, industry participation, industry development and rural development outcomes. While detailed data required to build a detailed and quantitative picture of these structures are not available, categorisations required to do so are provided below based on secondary sources.

CATTLE PRODUCTION

The cattle production sector can be categorised in various ways.

Winter (2011) identifies two contrasting environments in Eastern Indonesia

- the wet tropics as characterised by Central Lombok and Bali, and
- the dry tropics as characterised by parts of Lombok, Sumbawa, Sumba and West Timor.

The main cattle species in both areas is Bali cattle.[38] In Central Lombok, animals are tethered in either stalls (wet season) or in the fields (dry season) during the day and at night are confined in a communal pen (kandang), and fed mainly cut-and-carry feeds of shrubs and grasses. In Sumbawa, cattle spend a larger portion of their time free-grazing during the day, including rice straw on fallow paddy fields, but are confined to communal pens at night. Cattle are used for draught in both locations, with peak requirements from November to January. Animals older than 2 years are used for an average of 4 hours/day.

Scale of production. Data on scale of cattle production in Indonesia is not systematically kept. However, probably more than 90% of cattle in Indonesia are raised by small-holders, often with only 2-3 cattle per household (Dahlan, 2003; Priyanti, 2012). That is, the production sector is dominated by small-holders. Scale increases in grazing systems – households with 50 head are common in places like Sulaweisi (Hadi *et al*., 2002).

Feedlots produced up to 570,000 head of cattle in 2008 (DG Livestock, 2010 cited in Deblitz 2011). While import restrictions may have reduced these numbers, feedlots account for a significant percentage of Indonesia's cattle slaughter, partly due to government schemes outlined above. There are however limited numbers of large scale feedlots in EI, which are concentrated around plantation systems or large end markets (West Java, Sumatra and Kalimantan). Commercial feedlots in these areas have preferences for imported cattle, but import restrictions may increase demand for feeder cattle from EI.

Cattle production systems can also be categorised by feeding systems:

- An intensive grazing system is where cattle are permanently kept in confinement and pens. Grass and other forages are cut, carried and hand fed (cut and carry system).
- An extensive production system is where cattle are grazed permanently. Depending on cropping regimes, animals are allowed to graze and scavenge around hills, roadsides, the home yard or village surrounds; and
- A semi-intensive production system is a mix of intensive and extensive systems that vary by season, feed supply and other farm activities (esp. cropping). In semi-intensive systems, cut and carry systems are usually dominant.

Extensive grazing occurs mainly when common land is available in areas including Lombok Timur (NTB), Sumbawa (NTB) and Timor Tengah Selatan (NTT). However, in the other areas of the provinces, most farmers run a semi-intensive production system

Cattle production systems can also be categorised by enterprise mix:

- Cow-calf (breeding) households that are specialised in selling weaners or calves out of the household system.
- Cattle fattening households that are specialised in buy feeder cattle for fattening or finishing.
- A mixed cow-calf and a fattening enterprise, usually as part of a broader crop-livestock farming system.

It is not possible to determine with any precision the relative importance of these cattle enterprises, but mixed cow-calf and fattening systems predominate. Priyanti *et al* (2012) surveys in East Java found that 92% of lowland farmers produced calves, and 78% specialized in calf production, there being little capacity to grow (l*et al*one fatten) animals in

[38] The major breed in East Java is Ongole Cross (introduced from India) which accounts for 34% of cattle. Other breeds are Madura (21%), Bali (3%) and crosses including Ongole and Simmental, Limousin, or Brahman (42%) (Dinas Livestock East Java). Other local breeds include Aceh Cattle and Sumba Ongole (Morelink, 2010). Indonesia had a population of 700,000 Brahman crosses in 2009 (Hadibrata, 2011).

this intensive land-use system. In contrast, only 18% of upland farmers specialized in calf production, most (82%) raised adult cattle. There were no specialized fattening operations in either site.

Other inter-related categorisations and continuums of cattle producers include:

- Between croplands and uplands (Winter, 2011);
- Subsistent vs semi-subsistent vs commercial cattle producers;
- Unspecialised vs specialised cattle producers – depending on the proportion of inputs and outputs that derive from a single activity; and
- Cattle keepers v cattle producers. Cattle producers are most likely to be receptive to new technologies and practices that focus on commercial efficiency (Luke, 1989; Neidhardt *et al*. 1996; Winter, 2011).

It is also important to differentiate between cattle owners, managers and owner-managers (Rutherford *et al*., 2004). Related arrangements include "contract breeding" operations where traders and other (wealthier) households in the community own breeding cows, which are raised by farmers and "wage only" fattening where trader supply store cattle to farmers for fattening. There are various profit-sharing arrangements, which were 50/50 in NTT (Nimmo-Bell and ICASPES, 2007; SADI, 2010).

CATTLE MARKETING

Various studies identify and categorise between actors engaged in cattle marketing

- Hadi (2002) identifies: smallholders; cattle fatteners; cattle traders (which may be classified into village traders, inter-district traders and inter-provincial or inter-island traders); cattle markets (which are common in Java but less so in other provinces); beef wholesalers.
- Fauzi and Djajanegara (2004) reported 10 chain actors involved in the marketing beef cattle in Garut District, West Java.
- The chain actors used in surveys conducted by Mahandri *et al*. (2012) are: other farmer, village traders, sub-district trader, district trader, and butcher.

To explore local level cattle trading activity, Mahendri *et al*. (2010) surveyed 184 farmers and 30 traders in two sited in EJ. They found:

- Most farmers sell cattle to village traders, who in turn mostly sold in the sub-district market-place. The cattle are then destined to fattening operations and slaughter-houses.
- Very few farmers sold their cattle directly in the public marketplace.
- In the lowland site about half the respondents sold to one regular trader, whereas in the upland site only a third did. Others varied their trader according to the best price they could receive or their assessment of the trustworthiness of the trader.
- All purchases were at the farm-gate and paid mostly paid in cash on the spot rather than by instalments or on credit. Marketing costs and risks are therefore borne by the traders.
- There was no significant difference in the price paid by traders coming from different locations. There were no price differences between lowland and upland sites, indicating an efficient and well-integrated regional market.
- Crossbreed animals obtained a higher price than Ongole Cross, and male cattle obtained a higher price than female cattle.

The survey of traders established the following profile.

- Most of the traders surveyed (53%) were categorized as village traders, 37% were sub-district traders, 7% were both village and sub-district traders, and only 3% was a butcher. (This profile mirrored that reported by the farmers).
- All traders bought and sold all types of cattle (calves, young cattle, and adults) each 81% and 82% respectively for village and sub-district traders.
- Most (77%) collected cattle from farmers in the village and all sold them in the sub-district marketplace.

In East Java, the livestock marketplaces are opened on the local market day (hari pasar). There are five local market days (*pon, legi, wage, kliwon, and pahing*) and most markets are open twice weekly. Hadi *et al* (2002) say that there is at least one cattle market place in every cattle-producing district or subdistrict. Most cattle sellers at market are village collectors (*blantik)* while most buyers are larger traders such as inter-district or inter-provincial traders. Other buyers include small breeders or fatteners also procure cattle in the local CMP. Sellers may try to sell cattle on several markets before a successful transaction takes place.

Hadi (2002) said that were far more market places in Java, and that there are few in other provinces. However:

- There are 9 livestock markets in NTB open 2 days per week (The Government of NTB, 2009)
- In NTT, there is a large livestock market at Camplong and another at Takari (Benu, 2011), and 6 other periodic markets in NTT listed in Suharyo (2007) may also sell cattle in combination with everything else.

Market transactions and price formation occurs through a complex set of economic, social, institutional, regulatory and structural factors. These have been mentioned anecdotally in some studies, but have been the subject of little systematic research.

INTER-DISTRICT AND INTER-ISLAND TRADE

Local cattle marketing structures outlined above can link to local, intermediate and end markets. Deblitz (2011) for example identifies:

- NTT local flow. The flow of cattle within the Timor Island, from Kupang district, Timor Tengah Selatan, Belu, and Timor Tengah Utara to be slaughtered and consumed in Kupang.
- Lombok local flow. This supply chain represents the flow of cattle from Lombok Tengah, Lombok Barat and Lombok Timur to Mataram. Cattle are slaughtered and sold as beef in Mataram wet markets.

However, a significant proportion (to be assessed) of cattle especially from EJ, NTB and NTT are destined for inter-regional markets. This is particularly the case in NTB and NTT that have a comparative advantage in the supply breeder cattle and feeders to other areas and that have limited slaughter facilities that would enable the “export” of beef.

Reliable statistics on inter-island trade are available from Dinas Peternakan Propinsi and from Quarantine Services. However, various “channels” are identified in Deblitz (2011).

Figure 46 provides a snapshot of the market structure of Eastern Indonesia beef supply chain and shows the main production area of Jakarta market.

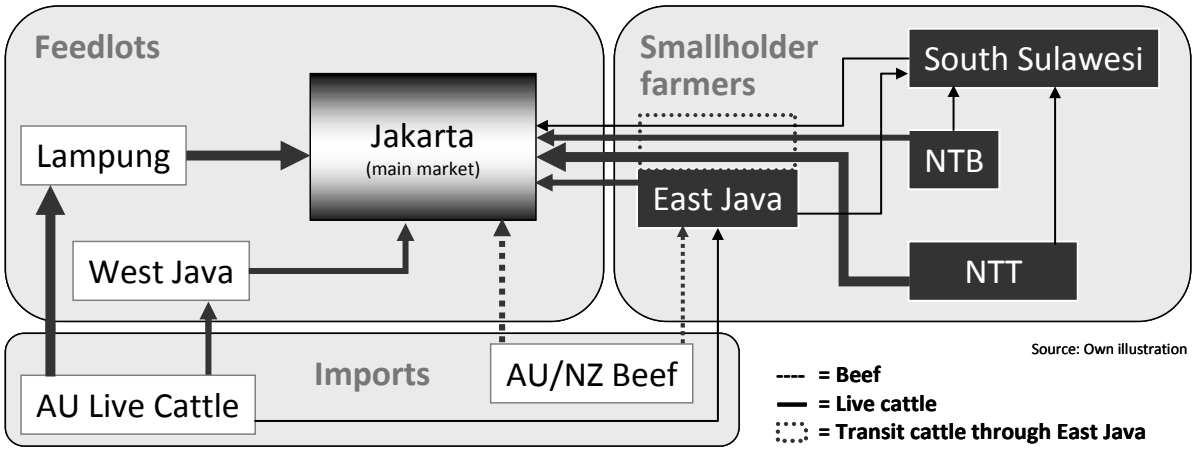


Figure 46. Snapshot of beef supply chain market structure in Indonesia

As shown by the flowchart there are several marketing channel of beef to the Jakarta market. Smallholder farmers dominate the production flow from NTT and NTB and also East Java and the Lampung and West Java have strong feedlotters operation. On top of that Jakarta also relied on imported live cattle and boxed beef from Australia.

- Inter-island trade from NTT to Jakarta (via East Java). A large amount of cattle are transported to Jakarta by boat and truck via Surabaya to be slaughtered in Bekasi and Tangerang and consumed in Jakarta on the same day.
- NTB – Sumbawa inter-island flow. This is the most important flow of cattle in NTB. It shows flow of cattle from districts in Sumbawa Island to Mataram (Lombok Island) normally by ferry and small boat. Some of them are slaughtered in Mataram and consumed on the same day while the rest goes to the interisland traders which hold them for a while in Mataram and later send them to Sulawesi, Java or Kalimantan (the latter is a growing channel).

Other flows are discussed in detail in Livestock Research and Development Team (2012).

Inter-island flows add extra layers of actors, logistics and costs. Inter-island traders aggregate cattle through a range of channels – from purchases at markets, from local traders and by commissioning purchases from local collectors. It is widely reported that inter-island trade can be controlled by a few individual companies:

- In NTT one company reported to be dominating the trade is the Erick's Group. This company and its subsidiaries have locked up key components of the trade: boats, loading facilities and quarantine space for their animals (Sullivan and Diwyanto, 2007).
- Similarly, Nimmo-Bell and ICASEPS (2007) state that many of the existing cattle traders in NTT have been able to trade profitably and have the resources to buy, finish and export large numbers of cattle. A Kupang based trader exports approximately 1,000 head of cattle from Tenau Port (Kupang) per month with gross revenue of Rp5-6 billion per month.
- One trader in NTB is reported to control 60% of the cattle shipped out of NTB (Kristedi, person comm)

Cattle transport services include (from Hadi, 2002):

- Trucking. A major form of cattle transport. Provided by private operators. Used for inter-island transport where ferries are available. Freight charges minimised by back-loading.

- Rail. Used especially from Surabaya (East Java) to Jakarta, and links with cattle shipped from NTB/T. Facility is provided by the state-owned company called PT Kereta Api Indonesia ('Railway State Company');
- Domestic shipping. Used for inter-island transport, esp. from Bali, NTB and NTT. Most sea transport from these provinces arrives to Java through the seaport of Kali Mas in Surabaya (East Java). The cattle are then transported to other destinations on Java, such as Jakarta, by truck and rail. Holding facilities are located near the port and rail. The sea transportation service is privately owned; and
- Animal quarantine. Local government in particular provinces provides quarantine services for animal health and infectious disease examination before cattle enter its territory. For live cattle imports, quarantine stations are available at international seaports where cattle disembark (including EJ). For domestic cattle, quarantine stations are available in many provinces (incl. NTB and NTT). Quarantine procedures involve the examination of shipping documents and cattle. Charges are paid for quarantine service, examination service and certification per truck. Feedlots pay the charges to the local quarantine office and also meet costs such as transport and meals for quarantine officers, vaccines and medicines.

THE SLAUGHTER SECTOR

While detailed data on the slaughter sector are not publically available, structures and actors have been overviewed in several studies

Hadi (2002) identifies three types of slaughter units based on scale:

- Type A (> 100 head per day);
- Type B (50–100 head per day); and
- Type C/D (5–10 head per day).

In 2000, there were 5 type A units, 35 type B units and 724 type C units (DGLS 2001).

In 2009, there were 693 licensed slaughter houses and abattoirs in Indonesia which slaughtered 935,700 head of cattle. The slaughter houses and abattoirs are spread across Indonesia's 33 provinces with 50% located in Java, Within Java, East Java is the main province with 22% (162 sites) of all sites. Many of the almost 700 slaughter houses / abattoirs are inefficient. They slaughter an average of 1,350 cattle each per year (average of less than four cattle each per day) (Morelink, 2010).

Slaughter units can also be categorised into 3 ownership and management structures (Hadi *et al*., 2002):

- Regional Technical Service Unit (UPTD) – non-profit, government owned;
- Regional (local) State Business Enterprise (BUMD) – profit oriented, government owned;
- Private Business Enterprise. Despite being small, they are formally registered. Located close to cattle production, markets etc. to stop stealing and to meet supply/demand in a timely way.

Hadi (2002) reports that government owned abattoirs are normally smaller than private abattoirs. They slaughter between two and a maximum of 200 cattle in normal days, while the private abattoirs slaughter between 30 and 120 cattle per day (2008 figures).

In addition to these formal abattoirs, illegal units are also common. These are small-scale, mobile and have formed so that owners can slaughter bans, avoid slaughter fees, inspection or are able to slaughter stolen cattle.

In addition to the above categories of slaughter units, other features of the Indonesian slaughter sector are:

- A distinction is made between slaughter houses (RPH) and abattoirs (TPH).
- Government abattoirs in Indonesia operate on a service slaughtering basis, where slaughter workers are hired by traders that maintain ownership of cattle, beef and by-products. Service fees on a per-head basis are very low. Private abattoirs can also operate on a service basis.[39] There are important implications for industry development, rural development and policy.
- The GoI with support from JICA built slaughterhouses in many provinces of Indonesia including EJ and NTB[40] in the late 1990s. The abattoirs were built to centralise and control the slaughtering of cattle (Hadi 2002) and are unmechanised service slaughtering plants with limited or no cold storage facilities.
- There are a limited number of large, modern, mechanised abattoirs in Indonesia (Santori, Elders etc.) listed for Java in Deblitz (2011, Figure 7.17). Most beef processors produce various meat products which usually include beef and poultry. Companies like JapfaSantori are fully integrated from farm to processed product both in poultry and beef. Other companies combine their business with slaughter activities, imports and/or food distribution.
- 15 abattoirs have accreditation under the under the (Aust) market supply chain assurance system, and can kill imported Australian cattle.
- There have been policy intentions or tangibles moves to upgrade abattoirs. For example the Meat Business Centre in Mataram integrates the abattoir with genetics (AI), feed mill and fattening operations.
- A private operation in Bogor is specialised in producing premium beef quality and slaughter cattle only from their facility in Lampung and sell the product only to a beef distributor (Kristedi).
- In NTB, there were two abattoirs with a slaughter capacity of 50-100 head per day located in West Lombok and West Sumbawa (The Government of NTB, 2009).
- According to Nimmo-Bell and ICASEPS (2007) NTT no longer has a functioning abattoir that can slaughter bulls and ship frozen or chilled beef to Jakarta markets. The industry lacks investment in slaughter and freezing facilities and downstream cold chain facilities and therefore market outlets are restricted to the live cattle trade.
- The sale of offal and hides are a major source of revenue for traders and butchers.

THE PROCESSING SECTOR

The beef processing sector is an important part of the beef value chain. Processed products account for a large proportion of Indonesia's beef production and imports, with important implications for cattle and beef demand. The processing sector is comprised of actors that range from multinational companies to small-scale household operations (for a list of large integrated operations see Deblitz, 2011).

Small-scale beef processors produce products like dried shredded meat (abon), smoked beef (dagingse'i), beef jerky (dendeng), and meatball (bakso). Unlike bakso that should be consumed within a few days, dendeng and abon can last for weeks because it is usually dried with salt, sugar or spices added during the process. Smoked beef (dagingse'i) is a NTT specialty and difficult to find in other regions while meatballs are prominent in all regions.

[39] Hadi (2002) writes kill–only service plants charge traders are charged with a fee for each head of cattle they killed in the facility. The normal charge for this service is IDR 15,000–34,000 per head. In contrast, fees in private–owned abattoirs in Jakarta are IDR 45,000 per head with the abattoir staff doing all the work.

[40] Other provinces are Aceh, Lampung, South Kalimantan, West Kalimantan, South Sulawesi, Southeast Sulawesi, North Sulawesi and Papua (formally Irian Jaya), and East Timor when it was a province of Indonesia.

Respondents to surveys in Deblitz (2011) claim that they use local beef (Bali or Ongole) to make processed beef products. Rendang requires a particular type of beef – which must be firm and dry (i.e. tenderness not required/desirable).

Most small-scale beef processors buy their beef in local wet markets. The main reasons for this include long established networks with the wet market traders, price (perceived as cheaper than supermarket) and convenience (because they can buy other ingredients at the same kiosk). Another reason is that there are usually several beef grinding service providers in wet markets, located conveniently next to the meat section, where bakso producers can grind their beef. Small scale meat grinder and mixer factory appears as new business opportunity in wet markets or at home industry scale. Most buyers, particularly bakso processors, prefer fresh to chilled or frozen beef (Hadi, 2002).

Large beef processors make products that include corned beef, sausages, meatballs, burgers, salami and cold cuts. However, bakso is likely to be the main processed beef product of most processors. Most of beef processor get their supply from beef importers or direct import (Deblitz, 2002, Table 7.17). It also indicates that beef processors use only imported beef and/or beef from feedlot production, which was confirmed by ASPIDI and NAMPA on interviews (Kristedi). Some of the processors own abattoir facilities and source their beef from there. Choice of input channels is driven by price, consistency (of cuts and quality) and hygiene/food safety considerations.

The main processed beef product is meatballs (Bakso). The majority of respondents to surveys by Morelink (2010) agreed that demand for bakso is increasing, due mainly to its affordability compared to other meat protein sources. Bakso is produced on a wide range of scales from households to large-scale multinational companies. Bakso is consumed in restaurant and at home and is widely available in wet markets, food stalls and supermarkets.

The 12 bakso manufacturers surveyed for Morelink (2010) purchased from 4 to 80 tons of meat per month, compared to the 10 home industry manufacturers, which purchased 15-200 kgs per day. The major bakso manufacturers sell their bakso through the modern retailers (supermarkets) and catering outlets whereas the home industry manufacturers sell their bakso to the wet markets and hawkers.

The National Meat Processor Association Indonesia (NAMPA, Assosiasi Industri pengolah daging Indonesia) is the peak association for large scale beef processors in Indonesia. NAMPA estimates that its members (big processors) have a workforce of 12,000 and a sales value of Rp2 billion (although this seems low).

Indonesia has a large tanning and leather industry. Hide standards are set on the number of scratches, ranging from prime (minimal to no scratches) to fourth grade (over 40% scratches). Local tanneries have stopped using the international standards and have resorted to pass or no pass. Sullivan and Diwyanto (2007) argue that this grading system is too subjective for shoe manufacturers, and it is hardly a system that improves price discovery or sends proper pricing signals to producers. Cattle in EI are often branded and marked to certain degrees, so more education could help to reduce the markings on animals and improve hide standards.

BEEF RETAIL AND MARKETING

Three retail channels are discussed below: wet markets, supermarkets and meat shops

As established, the majority of slaughtering is done on a service basis, where traders maintain ownership of the cattle and the beef. Beef can be distributed by these beef wholesalers (*jagal*) (Hadi, 2002). The abattoir can be the meeting point for specialised traders including: meat, bones and foot, skin, offal, and head (Deblitz, 2011). The wholesalers sell the beef to retailers at wet markets, supermarkets, and meat shops.

The daily processing of cattle and distribution to local wet markets is the traditional meat marketing method in Indonesia and other parts of South East Asia (MLA and Livecorp, 2011). The markets are characterised by the display of fresh meat in open air stalls with little or no refrigeration. Selling beef in this way overcomes three barriers that are faced by beef in supermarket cabinets:

- It is more affordable to lower income residents;
- It doesn't require refrigeration - there is limited availability of cold chain infrastructure and domestic refrigeration beyond urban areas and more affluent households, resulting in practices whereby generally beef is processed, marketed, purchased, prepared and consumed in the one day; and
- It allows beef to be available in remote rural areas of the country as transporting cattle to the point of slaughter in remote regions, and then processing the cattle and distributing the beef within close vicinity, requires less infrastructure than distributing chilled or frozen beef to remote regions.

The majority of Indonesian consumers still prefer hot boning of meat as it is considered to be fresher compared with imported frozen or chilled boxed beef. Many consumers who buy their meat supplies at wet markets are used to buying "warm" (freshly cut) meat.

Wet markets. There are wet markets in all cities. Two levels of beef traders (large and small) operate in wet markets. A large retailer sells directly to customers and to small retailers. On average, large retailers sell 2–3 head per day on normal days, while small retailers sell less than one head per day. Small beef retailers in wet markets or small meat shops freeze their unsold beef. (Hadi, 2002).

Hadi (2002) estimates that 60% of beef customers in wet markets were household consumers and 30% are meatball soup peddlers. This is especially the case in Java where meatballs are very popular. About 10% of customers are restaurants and supermarkets.

Most consumers shop at wet markets in the mornings on work days while those that shop at supermarkets and hypermarkets do so mainly on the weekends and in the afternoon. Trends in shopping at wet markets have not changed over time with most respondents going three times per week versus once per fortnight for hypermarkets (Morelink, 2010).

Supermarkets. While wet markets remain the dominant outlet for beef sales, supermarkets are thought to be increasing their market share (Sullivan and Diwyanto, 2007). The Modern Retailer Association (APRINDO) estimates that "modern" retailers sell 12,700 tonnes of beef per year, of which hypermarkets and supermarkets account for about 50% each. Beef sold through modern channels accounts for a small proportion (less than 3%) of overall beef production. Hadi (2002) noted that in the late 1990s, the amount of beef sold by supermarkets declined by 25–80%, mainly due to increased beef prices and reduced consumer purchasing power as a result of the economic crisis.

Hadi (2002) writes that most provincial capital cities and some district capital towns have supermarkets, but not all sell beef. Most buyers are households (65%); the others are restaurants (25%) and catering firms (10%). Some consumers prefer supermarkets to wet markets because they sell meat that is more tender, leaner and more hygienic; they are a more convenient shopping venue; the weight of beef purchased is indicated exactly on the label; the price is only slightly higher; and the meat is packed to a size to suit the consumer.

The amount of beef sold in supermarkets varies (from 35 to 500kgs) depending on the size of the city and the location of the supermarket. Beef is sourced from domestic cattle, imported cattle and imported beef.

Meat shops. There are meat shops in most provincial capital cities and some district capital cities, though in limited numbers. The share of beef sold through meat shops is very small, with only 1–3 head of cattle sold per day per meat shop on normal days. Households are the main customers.

The existence of meat shops reflects the demand by customers for quality domestic beef. Customers buy beef from a meat shop because they can buy native cattle (particularly PO); because they can select the quality and freshness of beef; because the price is not significantly higher than in wet markets, but is still lower than in supermarkets; because they can buy beef at any time during the working day (whereas wet markets operate only until 10 a.m.); and because they are near their home.

Timing/availability. For wet markets, supermarkets and meat shops, sales increase on big holidays (Idul Fitri, Idul Adha and Christmas), by 50% up to 400%, depending on the province/area. Since 1998, it has been increasingly difficult for meat shops to procure cattle as native cattle have become more scarce (from Hadi, 2002).

Cuts. The market segments for beef according to types of meat can be classified as follows (Morelink, 2010):

- prime cut meat for five star hotels, cafés, catering and supermarkets
- secondary cut meat for meat shop, traditional market and households
- variation meat, particularly trimming meat dominant, used as raw material in meat processing industry e.g. corned beef, sausages and meatball
- offal is used for processing industry and traditional culinary industry, e.g. ribs stew (*konro*), Makassar stew (*coto*), salad with water buffalo/cow snouts (*rujak cingur*), oxtail soup (*sop buntut*) and meatballs (*bakso*). Heart is used in bakso, and liver in traditional meals like “Padang”.

SOCIAL

Cattle play a major role in the lives of many Indonesians, and social issues impact on all aspects/sectors of the industry including productivity, adoption of technology and innovation and marketing.

PRODUCTION

Cattle play multiple roles in farming systems and livelihoods throughout the world. They provide cash income from sales of animals and animal products, food from animal products, provide farm inputs (manure and draught), and as are a source of savings, security, insurance and social status (Moll, 2005). The roles of livestock vary by production system, area and between individual households. These factors have to be accounted for in investments and interventions (Winter, 2011).

NTT, NTB and EJ have a long history of cattle production where cattle have strong cultural values. Beef (and sometimes a whole beast) has the highest cultural and social value of any meat at traditional ceremonies (*adat*) including weddings, funerals, and religious events which in Muslim areas is especially Hari Raya Idul Fitri and Idul Adha. The ability to serve meat at these events, and to hold large numbers of cattle is a source of social status in many areas of East Indonesia.

However, cattle production is primarily an economic activity, especially as a source of cash income. Deblitz *et al* (2011) asked famers about their motivation, reasons and incentives for keeping cattle. The vast majority named ‘economic reasons’, ‘good business’ and ‘cash income’ for keeping cattle. Reasons like ‘status’, ‘tradition’ were also mentioned but to a much lesser extent. In another question the farmers were asked: 'What determines the point in time when you are selling your cattle?' With very few exceptions, almost all farmers in NTT and NTB replied: 'When we need cash'. One of

the implications is that the price of live cattle typically drops at the beginning of a new school term when households sell cattle to pay school fees.

Mahendri (2010) also found that the main reason for selling the animals was to meet the farm-household's needs for cash for consumption, including schooling and health care, as well as acquiring durable assets such as a motorcycle.

Patrick *et al*. (2010) produced similar findings from a detailed survey of cattle farmer decision making and business priorities in Lombok and Bali. Households raise cattle primarily to increase household welfare and only secondarily as a source of wealth for events or emergencies. The main determinant of the timing of cattle sales was to meet an immediate cash need, followed by other bio-physical and market determinants (age, weight and price of cattle).

Group (kelompok) activities are also another social dimension of cattle production. Groups are common in the beef industry. There are for example 778 groups on Lombok alone, mainly in cow-calf/breeding activities, but significant numbers in mixed cow-calf and fattening operations, and fewer in fattening only (The Government of NTB, 2009). These figures do not reflect the actual functioning, viability and sustainability of the groups.

Patrick *et al*. (2010) explored the reasons for the establishment of cattle groups in Lombok and Bali. He found that security of cattle (i.e. to stop theft) was important in Lombok and that access to government and NGO funding through groups was important in both Lomok and Bali. The production and marketing efficiencies from group formation was of low significance. However, the groups that do engage in markets have higher levels of group capital formation including trust within the group and leaders who are confident and have the support of group members.

There were examples of successful group activities. For example, the National Program for Community Empowerment (2010) where a strong pre-existing group of 15 farmers in TTS in West Timor entered into integrated activities including commercial bull fattening, forages, organic fertiliser, biogas converters (from Dinas).

Another socio-economic dimension of cattle production is the extent to which cattle are kept to fit into farming systems. Priyanti (2012) found that use of cattle for draught power was less common than in the past, especially in the upland site. Likewise the production of manure was not as important. Rather, cattle production was a market-oriented activity, generating significant cash income for the household, often in excess of the income from cropping. While cattle production in NTT and NTB may be less market-oriented than in EJ, EJ provides an indicator of increasingly market- and objective-oriented systems.

The place and movement along the continuum of cattle "keepers" and "producers" have a strong social dimension too.

MARKETING

Social relationships and networks are particularly important in the marketing sector. For example,

- Transaction costs and risks are minimised if trading is based on social ties and trust. Farmers can (but not always – see Mahendri 2010) develop relationships with local traders, which impact on various dimensions of exchange including prices, credit and forward-payment.
- Farmers rarely sell their own cattle on market themselves, partly because of social norms (exclusion) and because of confidence in dealing with traders. Brokers can play a bridging role in price discovery and formation
- Ties between traders are often said to be strong and can extend to collectors, shippers, local authorities and buyers in end markets. This entails some positive aspects (integration, logistics, finance and credit) but also negative externalities (exclusion, collusion and information asymmetries).
- Institutional measures and industry initiatives should be utilised with this in mind.

SLAUGHTER

- *Halal* defines a range of industry practices including beef treatment, transport, slaughter and processing procedures. Abattoirs and meat processing in Indonesia should meet MUI's *halal* requirements if they wish their product to be labelled *halal* and reach Indonesia Moslem market.

RETAIL AND CONSUMPTION

- Beef an important source of protein in the Moslem diet
- Festivals etc. of Ramadan (Muslim fasting period) and during the festive period (Idul Fitr and Idul Adha).
- Beef prices increase during the month where the demand of beef is high, can be beef shortages, can lead to protest and disruption.

TECHNOLOGICAL

PRODUCTION

- Policy-makers are very interested in breeding technologies (breeding for multiple birth traits, embryo sexing, semen screening etc.).
- Policy-makers are also interested in the commercial feed sector (pre-mixes and concentrates) to boost productivity. Other on-farm feed treatment technologies include straw treatment
- ACIAR research suggests that emphasis on "high-tech" interventions such as these are misplaced and that practice change is best achieved through simple, low-cost, low-risk interventions that fit into existing farming systems. Practices discussed include the provision of bulls, feed and sanitation.
- Feed storage can be appropriate
- Cattle housing, including pens and concrete floors can be integrated with composting and household biogas converters, which is another area of interest for the GoI.

SLAUGHTER

Processing activities consist of slaughter, skinning, cutting, grading, chilling, freezing and packing. All of these have potential for technological and infrastructure upgrading. As established above:

- Beef grading, chilling, freezing and packing (with labelling) is mainly done by supermarkets and some big meat shops. Only a few slaughterhouses use modern processing technology, involving automated equipment. Most use manual labour (Hadi, 2002).
- There are another group of 10 service slaughtering abattoirs built in the 1990s (GoI/JICA, including in NTB and EJ). The abattoirs are small-scale with basic facilities (unmechanised, limited cold storage) but are nevertheless purpose-built on a fixed site. There have been moves to upgrade these facilities, especially in NTB. The Meat Business Centre in Mataram integrates the abattoir with genetics (AI), feed mill and fattening operations. This provides a model for what technological upgrading might involve in the EI context.
- The vast majority of the Indonesian slaughter sector is decidedly "low tech", occurring in rudimentary and low-cost operations.

There is therefore large "technical" scope to upgrade technological levels in the sector, but these are subject to underlying economic and policy factors discussed below. Technological areas include:

- Beef standards, training of slaughtermen and butchers, tender-stretching of electronic stimulation.
- Tenderness and colour can be improved through better cattle handling and slaughter procedures.

- Cold storage and transport facilities, cold chain management.
- Food safety, inspection and certification.
- Technological change driven by regulation will involve minimum standards in areas like: registration, registered capital, tax, inspection, hygiene, building and bench materials, storage, water use and effluent management.

INFRASTRUCTURE

Marketing and inter-regional cattle trade is constrained by the under-development of livestock selling and market infrastructure, cattle handling and purpose-built transport facilities (truck and sea), cold storage/transport facilities, and slaughter facilities. The poor infrastructure imposes costs on the cattle value chain that reduces competitiveness with imported product, leads to high priced beef and constrained demand, and puts downward pressure on prices that can be paid to prices. In-depth research is required to understand infrastructure constraints and the costs and benefits of addressing them at critical control points along the beef supply chain, including livestock handling on farm, road and sea transport and at ports, markets and slaughterhouses. Public-private investment in integrated supply chain infrastructure is urgently needed. Examples of infrastructure bottlenecks are raised below.

Hadi (2002) identifies two main problems in shipping cattle. First, ships are not specifically designed for shipping cattle; they are designed for other agricultural products, with cattle regarded as return cargo. Such ships have limited space, so cattle do not have enough food and drinking water. As a result, cattle become stressed, resulting in substantial weight loss. For example, when cattle were shipped from the quarantine examination premises in Mataram (West Nusatanggara) to Jakarta, there was a weight loss of 11-12%. Second, ships have limited capacity and no regular schedule. This makes the per unit shipping cost (per head or per kilogram liveweight) high and makes it time-consuming to gather large numbers of cattle. Inefficient cattle procurement from eastern Indonesia has been one of the factors discouraging feedlots from using domestic cattle in their business operations.

Deblitz (2011) writes that in the beef sector, cold chain infrastructure is critical to improve value chain efficiency. The lack of cold chain facility in most abattoirs, transport facilities (trucks/ships) and wet markets limit the distribution of beef. Cold-chains are not common in rural areas and only available to a certain degree in urban areas. Many food items are sold without temperature control, even in urban areas. This is particularly relevant for wet markets, food peddlers or small restaurants. According to USDA (2009) the main reasons for limited cold chain network are: (1) limited capital, (2) low awareness of the benefit of using refrigerators, and (3) the common practice of buying and consuming on the spot. Delitz (2011) also note that that in general, the costs of interisland cattle trading business are rising rapidly.

In a survey of cattle markets in 10 provinces, the Livestock Research and Development Team (2012) found that infrastructure in livestock markets is variable. All animals at market have a source of water and sufficient food. Some markets have a market courtyard, wet soil and offices that range from bad to good. Animal markets there are not fenced or gated. The average market animals only have a limited storage enclosure, which did not even have a shelter cage. At the average market, weighing scales are usually in working order but are not used, and loading and unloading facilities are inadequate.

ENVIRONMENTAL

(Animal welfare and food safety issues are discussed in this section too)

PRODUCTION

Significant environmental problems are associated with cattle production that can be alleviated through changes in production systems and practices.

In particular, livestock keepers in "traditional" systems operating in "survival" mode are most likely to keep cattle on feed for long periods with low input-output (conversion) efficiencies. Livestock keepers are most likely to over-graze land that exacerbates already widespread degradation in NTT and NTB (pers comm Dahlan and Mulik). The transition from livestock keepers to producers can mean fewer more productive animals, with higher input-output efficiencies (Kemp and Michalk, 2011).

There are also implications for methane emissions. The four main approaches to reducing CH4 emissions in livestock production are: (1) improving livestock productivity; (2) changing the management system; (3) managing the outputs more efficiently; and (4) reducing livestock numbers (Garnett 2009).

Policy-makers in NTT and NTB often have ambitious industry expansion plans and refer to large amounts of unused land and potential for growth (see below for details). However, stocking rates and degradation levels are already high in some parts of NTT.

The planting of new forages for beef cattle production around household cropping areas and backyards can substitute for grazing upland areas unsuited to cropping (and relieve grazing pressure) and also substitute for cut and carrying of local species (Martin, 2011). Tree forages and other legumes fix nitrogen.

The use of feed residues for cattle production (LPS/2008/038) also utilises resources otherwise lost from the carbon cycle. Rice straw otherwise burnt causing (solid particle) pollution, can instead be used for roughage. There are numerous other crop by-products (coca residues / pods, peanut stalks etc.)

Cattle penning is a significant environmental issue. Concentrations of animals can have high effluent (manure, urine) emissions (water flows, water tables etc.), which cause problems especially in peri-urban areas (common throughout EI). Better design of kadangs can reduce the impacts and bring environmental benefits. Concrete floors provide drainage for animal sanitation but also increase the capacity of farmers to manage effluent flows. Manure and urine can be used for compost and for methane / biogas converters (for household gas cooking etc.). Indonesia has a national program to promote this (with China).

Pen design (sanitation) and tethering practices (nose ropes vs rings) are also animal welfare issues.

MARKETING AND INTER-ISLAND TRADE

Animal handling in transport can be poor.

- At many markets, cattle are loaded and unloaded from trucks without ramps.
- Few ships used for cattle transport are purpose built.
- Cattle are often be lifted by rope on to ships.
- Can be inadequate feeding, watering (or over-watering).

There are animal welfare and productivity effects including mortality, stress, weight loss and sickness.

SLAUGHTER

Environmental issues in the slaughter sector are not the top priority of government or industry. However, the slaughter sector emits effluent (slaughter wastes, water, manure) that if not treated or managed can cause significant pollution and adverse health effects. This is particularly the case in areas with concentrations of slaughter units, in peri-urban areas.

In addition, animal welfare issues becoming more prominent in some beef chains (for imported cattle). Beere and Pettiford (2005, MLA report) look at the relationships between better cattle handling and product characteristics and profitability. Inappropriate pre-slaughter management and slaughter techniques result in dark cutting beef, reducing shelf life and overall product value, leading to meat being discounted by as much as 30% in the wet market. There is enough evidence to suggest that if management is improved from the holding yard to the point of slaughter, Australian cattle will produce meat with a lower pH and more optimal meat colour. This product will not be discounted in the wet market and will have a longer shelf life. An extra three hours shelf life is significant in the Indonesian wet market. Processors of Australian cattle are more likely to respond to and implement introduced techniques that improve shelf life and meat colour because it will result in an increased financial return

The slaughter bans on breeding females provide incentives (that are often acted on) for farmers to damage the animal (e.g. break their legs) and then sell them as injured cows.

LEGAL

Many of the policy, trade, industry structure and industry conduct issues discussed above have a base in laws and regulation. However the issue of land tenure at household level is however a major area of legal contention in many studies.

Many studies (including Deblitz, 2011) highlight the difficulties that farmers face in securing loans because of a lack of collateral certified by for example land or building certificates, or vehicle (car, motor bike) ownership documents (BPKB). As result, farmers have limited access to local credit systems, which farmers deal with by entering into credit-sales relationships with traders, or by entering into forced sales when cattle have not yet met (marginal) growth potential.

At the farm level, some farmers are still practicing permanent grazing; particularly in areas with strong communal systems such as in Sumbawa and certain regions of NTT. In these areas, grazing pasture are communal land, in which commons arrangements are used to manage the cattle. Without legal certainty, the land a potential source of conflict for the communities (and at the same time also limiting their ability to invest in more intensive farming system) (Kristedi).

In some areas of Sumbawa in NTB, the allocation of grazing areas for village breeding farms is very important. The status of land allocated for grazing is set in a letter from the district head. The letter requires that, of the available potential grazing areas, each village has to allocate land for communal grazing. The Sumbawa office of livestock services (OLS) plans to provide fences and animal drinking water to increase cattle production and district income. Where land is plentiful, particularly in Sumbawa, farmers own individual grazing land ("lar") (Hadi, 2002).

Cattle security is another important issue in EI. In Sumbawa and West Timor, for example, cattle have to be registered (for a fee) and documents/permission must be issued (by Dinas Livestock) to sell and transport cattle. Cattle are branded and tagged in different ways in EI, and some farmers can be adverse to the practices. However, tagging would seem to be useful for a range of industry activities including disease monitoring, traceability, grading, marketing and research.

SECTOR POTENTIAL FOR DEVELOPMENT

POTENTIAL FOR VALUE-ADDED

The fundamental settings for industry development appear sound. On a macro-level:

- Demand for beef appears robust (see section below "Impact Potential – Market Demand").
- Beef supply has increased only slowly in recent decades due to resource, productivity and institutional constraints.
- If these constraints can be addressed, and if price signals are effectively passed on to producers to give them incentives to respond through changes in production practices, then sustained industry growth could be expected.

There is also potential for the development of particular market segments.

- For example targeted promotion and marketing of higher value primal cuts and improved utilisation and value adding of sub-primals.
- Innovative marketing in traditional wet market and modern retail can capture latent demand for beef with particular quality, brand, food safety or animal welfare characteristics/standards.
- There is also a large range of products generated from cattle and beef products (processed beef products, offal, hides, medicinal etc.)
- There is significant potential for domestic beef to compete with imported beef markets in particular market segments (for specific dishes, niche markets, quality characteristics).
- There is high demand for breeding stock, in which NTT and NTB have a comparative advantage.
- Deblitz (2011) argue that market shares and preference for beef from eastern Indonesia in the main market Jakarta decreased in the last years and that new markets (in Kalimantan and Papua) should be explored.

PRODUCTION

For the purposes of discussion, discussion on potential for development of the production sector is divided into 2 sections – land use and cattle production.

LAND USE

Policy-makers in NTT and NTB often refer to large amounts of unused land and potential to increase cattle numbers

- Based on provincial Dinas livestock data, Nimmo-Bell and ICASEPS reported that NTT had 534,000 head in 2005 on 888,000 ha of grazing land, with stocking rates double in districts like TTS and Belu.
- Government sources in NTT cite an area of 750,000 ha. in unused land in NTT (Nimmo-Bell and ICASPES, 2007).
- In NTB, government estimates that 1.69 million ha. of "feed land" can potentially be used for cattle production, and natural resources can support an increase of 51.5% in cattle numbers (The Government of NTB, 2009).
- Grazing land is a particularly important source of potential development in NTT and NTB because of the comparative advantage of the region in cow-calf production and the production of breeders (8-12 m.o, >250kgs so not much fattening done). Only 5% of Lombok cattle go to Jakarta and the main market is for breeder cattle to EJ, Kalimantan, Irian (Deblitz, 2011). The eastern islands of Indonesia have struggled to meet their quotas for beef cattle exports for some years, due to supply side constraints (discussed below).

- While government in NTT and NTB often cite land availability as a source of potential industry development, this has to be interpreted critically. Environment costs outlined above are associated with grassland degradation and industry concentration. Invasive weed species (Jack in the Bush, Chromolaena odorata) has been reducing the size of grasslands.

East Java poses a very different land use problem. The World Bank (2011) writes that there is only little scope for agriculture land to expand with 74% of land has already been used for agriculture. Improvement in land to farmer ratio can only happen if numbers of farmers are reduced by helping some farmers move out to other non-farming activities and helping other farmers into higher value-added agricultural activities. Livestock is cited as one such activity.

This supported by interviews with EJ Dinas Agriculture (pers. comm. 120314) who emphasise that EJ is short of land, has very intensive agricultural systems and where the poor have small land areas. So there is a need to specialise in commodities produced in intensive systems – e.g. cattle and fruit. Cattle not are not land intensive and can be held by smallholders using low value household resources and residues.

This issue is noted also by Priyanti *et al*. (2012) who write that cattle production and farming systems in EJ are intensified, commercialised, and mechanised – and that the need for draught power and the availability of grazing land has declined. Never the less, livestock income in East Java is the highest of any province in Indonesia and increased at the rate of 3.7% during the period 2006-2010.

That is, especially in EJ, extremely high human, livestock and land use densities means that higher incomes is driven by improved animal productivity and market efficiency and development. Here the feasibility of larger-scale or more specialised feeding operations is determined by the availability of and access to feed (crop residues, agro by-products, cut and carry forages, tree legumes), other inputs (credit, extension) and output markets

As also noted below, industry growth and change will also be driven by the developments in the broader economy. As countries and regions develop economically and opportunities arise for farmers to work off-farm, then the higher value is less likely to be allocated to small-scale cattle production. This is shown through the household budgeting and the valuation of (opportunity costs) of labour in the case of China (Longworth *et al*., 2001; Waldron 2010) and Indonesia (Deblitz, 2011; Rutherford, 2004; Sullivan and Diwyanto, 2007). Deblitz (2011) show that when opportunity costs of labour, land and capital are valued, producers in NTT and NTB are more profitable (and therefore competitive) that producers in Sulawesi (and EJ?). Rutherford (2004) produce similar findings in the cases of Sumbawa (less developed) and Lombok (more developed).

FORAGES

As a major component of the cattle sector, a series of ACIAR projects looked at crop-livestock systems especially forages:

- AS2/2000/125 Optimising crop-livestock systems in West Nusa Tenggara Province, Indonesia (Sumbawa, IAT modelling).
- AS2/2000/ 124 Prospects for improved integration of high quality forages in the crop-livestock systems of Sulawesi, Indonesia (APSIM modelling).
- Economic impacts are reported in MacLeod *et al* (2007).
- These projects were continued in LPS/2004/005 Improving smallholder crop-livestock systems in eastern Indonesia (further IAT modelling to explore options/strategies and communicate with farmers). Findings are reported in the final project report.

- Other forage projects include LPS/2008/054 Improving smallholder cattle fattening systems based on forage tree legume diets in eastern Indonesia and northern Australia.
- In cross-country studies that include Indonesia, a series of ACIAR publications report on the identification of forage varieties (ACIAR Monograph No. 62), technical information on how to grow, manage and use forages (ACIAR Monograph No. 88), action–research approaches needed to integrate forages on smallholder farms (ACIAR Monograph No. 99) and on case studies in Southeast Asia where households developed agricultural systems through the introduction of robust forage varieties and sound management practices (Connell *et al*., 2010).
- Hadi (2002) argues that the feedlot sector has a number of commercial advantages in beef production relative to smallholder producers, although the applicability of this to NTT and NTB would have to be examined. Nimmo-Bell and ICASEPS (2007) discuss and budget small-holder fattening operations in NTT, especially those associated with the TLM program.

CATTLE PRODUCTION

The GoI has ambitious plans to expand cattle numbers and turnoff. There is widespread consensus amongst government, research and industry sectors in both Indonesia and Australia that production efficiencies are low and can be increased substantially. This section provides some perspective on the scope and magnitude of what these technical gains might be, while the economic impact on producers is left to Impact Potential – Producers and Processors.

Livestock Research and Development Team (2012) identifies the major reasons for low productivity as:

- The availability and quality of feed especially during the dry season, high prices for supplementary feeds, and declining livestock health die to malnutrition.
- Animal health problems are still encountered in some areas, including parasites (worms, ticks), SE, brucellosis, etc.
- Other management systems that don't conform with good farming practice.

While productivity was found to be low, there is also high potential for increase:

- Pre-weaning calf mortality in the province during the dry season can reach 40-45%, while in other regions varied in the range of 15-20% to 25-30%. The application of GFP and the provision of adequate feed can reduce calf mortality to 5-10%.
- Calving rates can be can be increased from 40-50% (pessimistic) to 60% to 70% (optimistic)
- Slaughter weights for local cattle can be increased from 200-300 kg (pessimistic) to 300 kg (realistic) or 400 kg (optimistic).
- Slaughter weights for cross-breeds can be increased from 400-450 kg (pessimistic) to 500-600 kg (realistic) or> 700 kg (optimistic).
- These weight changes will increase dressing percentages from <50% (pessimistic), to 51-52% (realistic) or > 53% (optimistic).

A series of ACIAR cattle and forage projects in EI provide evidence on achievable productivity gains. It is not possible to report on the large repository of project data, so this section paraphrases findings from ACIAR project AS2/2000/103 "Developing an integrated production system for Bali cattle in the eastern islands of Indonesia".

The project aimed to improve cattle productivity through simple changes in management practices that fit within existing systems and as an "integrated village management system". The project was conducted in NTB (Lombok and Sumbawa).

Research from the project in two villages each in Lombok and Sumbawa showed that cows are highly fertile but bull supply is erratic and feed supply and quality in the late dry season can be extremely low. Weaning removes nutrient demand from the cow. Scarce resources of high quality feed can then be directed towards the calf. Amongst the interventions used in the IVMS were controlled mating (one bull, 3 month mating period) and weaning calves at 6 months, improved feeding and penning. More specifically, in the Lombok site:

- Better management has achieved astounding improvements in weaner output.
    - Before the project, the annual weaning rate from cows in Kelebuh was approximately 60%, compared with approximately 90% with the new management system.
    - In the first year of observations at Kelebuh, the pregnancy rate achieved in 2-year-old maiden heifers was 40% compared with up to 100% with the new management system.
    - Calf mortality rate across other sites, and from anecdotal reports, appears to be at least 10%, which is far higher than seen in Kelebuh with the new system.
- Cattle fertility. The adoption of the integrated management system in Kelebuh, Lombok, in late 2001 and early 2002 shifted the calving and weaning patterns for calves born in 2002 and 2003. In both years, calving started in late March but was 75% complete in June 2003, in contrast to only 50% complete in the previous year at the same time. The average calving date moved from mid July to mid June.
- Cattle growth. Pre-weaning calf growth averaged about 0.3 kg/day before the new management system, but has since risen to more than 0.4 kg/day. One outcome of the new management system was the significant increase in the average size of progeny (by 20–40 kg) by December when the average age was approximately 6 months. Post-weaning, growth in yearling female cattle was approximately 0.2 kg/day, but increased by 0.1 kg/day in heifers aged 1.5–2.5 years. The average growth rate of yearling bulls increased from 0.25 kg/day to 0.3 kg/day.
- Since implementation of the new management system at Kelebuh, a combination of better calving and weaning times and improved growth rates has indicated that males would reach target weights approximately 6 months earlier than previously, and that females would reach mature size up to one year earlier (i.e. at 3 rather than 4 years of age). This has substantially improved the value of cattle and resultant cash flow.

Economic analysis of the improved production systems is provided in the Impact Potential section. Research is continuing in EJ through ACIAR Project LPS2008/038 “Improving reproductive performance of cows and performance of fattening cattle in low input systems of Indonesia and northern Australia”. The management changes from AS2/2000/103 were also scaled out in Lombok in ACIAR project SMAR2006/096 through a three-step approach (Martin, 2010).

- Improvement of existing kandang facilities (drainage in particular and construction of a bull and calf pen—encouraged by a small contribution of project funds, but mainly funds/labour from member farmers) and provision of a communal bull rather than free mating (thereby ensuring controlled mating with an emphasis on a calf from each cow every year)
- Improving forage resources, starting with nurseries and small demonstration areas established by the OGT and farmers at each participating kandang to demonstrate new forages, forage management, and balanced rations and other aspects of animal nutrition for improving productivity
- Introduction of additional breeding and management strategies shown to be successful in previous ACIAR projects (in particular early weaning and preferential feeding of calves).
- Economic impacts are also cited in the Impact Potential section.

Modelling reported in Hadi (2002) found that improving technical efficiency can do much to improve Indonesia’s beef cattle production and the incomes of smallholders. The constraint on expanding breeding cattle numbers severely

curtails the development of a smallholder beef industry in Indonesia. There is a need to develop production systems that will allow for larger-scale and more specialised breeding. More efficient native cattle breeding will deliver significant improvements in beef self-sufficiency and smallholder fattener incomes. Consumers also gain substantially through lower beef prices and increased consumption. More efficient native cattle fattening will also deliver significant gains to consumers, though its effects would be much less pronounced than is the case with smallholder breeding efficiency improvements.

Other issues are (Nimmo-Bell and ICASPES, 2007):

- Training and extension services to smallholders are very limited. Traders also need to be engaged in improving the quality and productivity of local cattle. The economic benefits for all industry players need to be clearly identified in this process to create buy-in. The network of regional DINAS offices have a crucial role to play in extension and do not currently engage with research providers; and
- Lessons from research are not often integrated into policy.

PROCESSING AND TECHNOLOGY

SLAUGHTER

PSDS-2014 aims to "improve the service quality of abattoirs to be able to produce meat equivalent with the quality of ex-imported meat are conducted. Therefore, domestic meat production can compete with ex-imported meat and can even be exported to Middle East and Asian countries because of: Indonesia is free from FMD; Halal guarantee; sanitation hygiene-based food security guarantee indicated with Veterinary Control Number (VCN) and implementation of Hazard Analysis Critical Control Point (HACCP) as a food security guarantee system. This is to be achieved through "technical" measures including sanitation and hygiene, animal welfare, aging, cutting system and cold chain management".

There is large scope to technologically upgrade the slaughter sector. However, the question of whether there is to potential to generate value through technological upgrading has to take into account both economic and policy factors.

Economic factors include economies of scale, capital and labour costs, input-output markets, transport costs of beef vs cattle etc. A priori, numerous factors constrain technological upgrading on a sector-wide basis.

- Service slaughter costs in Indonesia are very low (the highest reported to be Rp 200,000 in Mataram). Even at these low fees, service slaughter plants struggle to attract traders to slaughter at the fixed plants/facilities, and most are reported to operate well under capacity.
- Labour costs in Indonesian plants are very low, which reduces incentives and competitive advantage to invest in capital-intensive technologies
- The vast majority of beef in Indonesia is destined for generic beef markets – with undifferentiated cuts, few quality characteristics and used for heavily sauced and cooked dishes, or for processing. Technologies designed to improve quality characteristics of beef are unlikely to be viable for the majority of plants
- There are still strong consumer preferences for fresh beef, negating incentives to invest in cold storage and requiring small, localised operations located close to market

There may however be growing demand for beef that requires particular types of beef over time, space and form. For example:

- NTT and NTB abattoirs may see opportunity in the inter-island beef (as opposed to live cattle) trade or for particular areas or niche markets (e.g. mining operations in Kalimantan). Rising live cattle transport and marketing costs, fees or disease protocols may make this an increasingly viable option.
- Targeted promotion and marketing of higher value primal cuts and improved utilisation and value adding of sub-primals.
- Innovative marketing in traditional wet market and modern retail can capture latent demand for beef with particular quality, brand, food safety or animal welfare characteristics/standards. Inappropriate pre-slaughter management and slaughter techniques result in dark cutting beef, reducing shelf life and overall product value, leading to meat being discounted by as much as 30% in the wet market. Improved handling and slaughter techniques through training and infrastructure investment will not only improve animal welfare, but will result in increased financial returns through improved meat colour quality and shelf life.
- Particular branding programs – e.g. "Bali beef" (reportedly done in Bali, and planned for the Amarta project).
- Demand for safety assured product (through facilities, certification, inspection, cold storage and transport facilities, cold chain management etc.).

In addition to technical change induced by customer and consumer preferences, technological upgrading may also be induced by regulatory change, or a major disease outbreak, food safety or environmental concern. Effective implementation of slaughter bans would require more centralised slaughter structures. Local government in particular may then draft and implement more stringent regulations on the slaughter sector that include minimum standards in areas like registration, registered capital, tax, inspection, hygiene, building and bench materials, storage, water use, effluent management, slaughter facilities and processes. Implementation of these measures can effectively consolidate and centralise slaughter activities in a particular locality, but this raises issues of preferential licencing and local monopolies/monopsonies in the sector (Waldron *et al*., 2010) although this would seem to be less likely in service slaughtering structures.

PROCESSING

Other products include offals, hides, pharmaceutical products, and processed beef that generate value and employment accessible to small-scale actors.

Cattle in EI are often branded and marked to certain degrees, so measures to reduce the markings on animals and improve hide standards could increase hide value.

MARKETING

The Indonesian cattle marketing sector is undeveloped. Addressing issues in the sector has the potential to stimulate cattle production, increase producer incomes, and help realise the policy objectives of the GoI.

Discussion on cattle marketing here is split into 3 sections: cattle marketing systems; levies and fees; and inter-island trade.

Before looking at these sections separately, some observations on marketing from Deblitz (2011) that span these sectors are worth noting. They conclude:

- At present, the vast majority of policies and most projects are largely targeted towards regulatory measures and incentive programmes to improve cattle supply. Examples are quotas for exporting cattle, the ban of slaughtering productive female cattle and breeding programmes including the provision of breeding stock and insemination. Reports from the regions are conflicting whether these policies are effective in increasing cattle

numbers. Another question is whether they are efficient, in other words, whether the way the tax money is presently spent yields the maximum number of additional cattle.

- Supply related measures should be used rather in emergencies but not as a standard and persistent policy instrument. Tax money might be better directed towards improving transport infrastructure, hygienic conditions along the supply chain, cooling facilities, solving a cash problem with farmers and encouraging marketing initiatives for local beef on local, domestic and even overseas markets.

Recommendations from Deblitz *et al* (2011) include:

- Improve data quality and quantity (statistics, cattle weights, market reporting including price information);
- Target policies and projects towards incentives and driving forces (cash requirements of farmers, consumer needs, infrastructure deficits);
- Improve communication and information in the supply chain (creation of an Indonesian Beef Forum); and
- Creation of new markets for eastern Indonesian produce.

CATTLE MARKETING SYSTEMS

Problems in the marketing sector are commonly framed by industry stakeholders in the following way. Farm-gate prices for cattle are low, not due to the underlying demand or prices of beef (which is firm), but because of high costs and margins in intermediate sectors of the chain (especially traders) (Hadi, 2002; Deblitz, 2011; Sullivan and Diwyanto, 2007). This squeezes margins in early stages of the chains (especially farmers). That is, traders accrue a disproportionately large share of value in the chain, compared to producers who are regarded as passive/inactive participants in the chain as "price-takers".

While these claims require empirical testing, there are other reasons why the Indonesian cattle value chain could be argued to be trader-driven (Gibbon, 2001).

- A large hierarchy of traders exchange cattle numerous times along the chain – more than in comparable countries – which provides opportunities may exist to shorten chains.
- Traders commonly control activity across multiple stages of the chains by retaining ownership of product through beef wholesaling, slaughter and sometimes (contract) production stages. Traders generate profit not so much through trading activities but the integration of multiple activities (Deblitz *et al*., 2011).
- Traders have a much better knowledge of cattle attributes, market preferences and markets, than do farmers. While this is as expected, even larger feeding households in Indonesia appear to be largely passive market actors.
- Farmers rarely have the knowledge or confidence to pro-actively discover prices and market their own cattle, even at nearby livestock markets. Rather, the vast majority sell to traders at farm-gate, to traders with whom they have established relationships or who forward credit in "tied" / reciprocal obligations.
- Accessing alternative forms of credit appears to be a significant factor in opening up marketing choices, as well as building more productive systems. Subsidised finance has been allocated (through banks) for cattle producers, but is not readily accessible to all households and has been divisive in communities.
- Rather than maximising cattle prices, households very often sell to traders on a cost-recovery basis, where prices are set to cover costs, and then add a profit margin. This price may be lower than the "real"/market value of the animal. Furthermore, budgeting does not account for all "real"/opportunity costs of production (labour, depreciation, feed inputs, finance).
- Information asymmetries (between farmers, local traders and larger traders) are a feature of the Indonesian cattle value chain. Another often-cited form of market failure (that again would need to be tested) is

uncompetitive markets due to oligopolies (especially for inter-island trade) and collusion (a so-called "mafia" of traders).

Thus, the cattle marketing sector may contain cases of market failure (information asymmetries, collusion).

While industry stakeholders regard cattle marketing as a serious constraint to industry and rural development, few effective solutions have been devised or implemented. Most measures are interventionist in nature (trade barriers, slaughter bans, processing investments). More relevant to this proposed project, some localised marketing measures have been trialled, including cattle auctions,[41] scales in markets, and guidance prices have been developed for inter-regional trade.[42] While these measures provide some useful lessons, they have not been taken up or used. This may be because they are not critical intervention points, are not seen as industry- and community relevant, have not been "connected" with users of the services, or are not based on in-depth research.

Amongst the measures that offer high potential to upgrade the cattle marketing system are:

- Market reporting systems, especially price reporting linked to cattle grading systems;
- Training and information for producers to produce for target markets, and assist with more direct integration into those markets;
- Linking group production activities with marketing activities; and
- Linked to increased access to formal credit channels (to break sales obligations to traders, and reduce forced sales, and increase marketing options).

These observations conform with the findings of other studies

Deblitz (2011) in a benchmarking study:

- argues that beef prices, sometimes costs and in most cases profitability are high throughout the supply chain.
- recommends improving information about cattle and markets to farmer, building confidence in dealing with traders and reducing reliance of credit from traders that tie them into reciprocal sales arrangements will increase farmer's access to and competitiveness in cattle markets.
- However, Deblitz (2011) also show that the margins of traders are thin, as a single trading activities (not integrated with up or downstream activities)

Hadi (2002) writes that:

- live cattle fattened for slaughter by traditional smallholders have to pass through a complex and inefficient and "imprecise" marketing chain, incurring transport costs and marketing costs. A number of trader operations may be involved — village trader, subdistrict trade, interregional trader. Many farmers must sell their cattle to a village collector rather than to a cattle market place because they lack access to a cattle market place.

[41] Auctions have been tried in NTT and NTB (SADI initiative). They didn't work because they are too confrontational for households that are used to working with one or two traders, no forward crediting; and because traders don't want to work with government

[42] Each year in December/January the Governor of NTB set, via government decree, an official standard minimum inter-island trade and export price per head for breeder cattle by age/sex (young bull, heifer) and by grade (grade A, B, C based on height) and for beef cattle by sex and live-weight. These prices are utilised less strictly as a guide for intra-island and intra-province trade prices but are not common knowledge amongst farmers at least. Apparently, the price is determined by taking the annual average of all the average daily livestock market prices for cattle recorded as a range by Dinas officials in the livestock markets. Some staff mentioned that the Department of Trade also collected this information (Rutherford and Dahlan, 2004).

- Marketing costs for cattle sold by traditional smallholder non-partnership fatteners came to 2,483,632 million Rp in 2001. This represents a mark-up of 44% over the ex-farm value (although this may include other costs including fees and transport).

Suharyo *et al* (2007) point out that the presence of many middlemen and traders at the village and sub-district (kecamantan) levels in NTT has very limited impact on price information, since product prices are mostly determined by a small number of inter-island or large traders that form a monopsony market structure. The recent increase in the number of traders and exporters coming to Kupang, has not fully benefited farmers, due to the limited information on product location and excessive inspections that give rise to informal charges and uncertainty.

Similarly Sullivan and Diwyanto (2007) report:

- That the inter-island transport of livestock is reported to be controlled by a few individual companies, and costs are high. They recommend that the GOI has a role to play in opening the marketing channels to competition.
- Marketing mark-ups of around 33%.
- Write that the market channels for beef cattle are crowded with large numbers of livestock traders. These traders serve an important function; however, their costs contribute to lower prices for producers. It will be important to better coordinate the transfer of cattle from producer to feedlot or slaughter plant with the most efficient marketing method. Traders are important to livestock smallholders. They provide the necessary liquidity and outlets for a farmer's livestock. At the same time, traders can be a cause of concern. A number of trade exchanges occur as animals move from farm to feedlot or direct to slaughter. For example, in West Timor the main live animal market is Camplong and there are traders who extract rent from buyers and sellers just by their presence during negotiations. The market has no weigh scale. They offer no value added services. It was interesting to hear a livestock trader in Yogyakarta report that he would lose Rp.500,000/head if he buys in the market because of unnecessary middlemen. The individual traders' margins are small but when added together can be relatively high.

Rutherford and Dahlan (2004) write that:

- There is potential for both marketing chains to be made more efficient and a larger proportion of the profits to be distributed to farmers as a group by increasing their market power - particularly by reducing the number of middlemen (i.e. brokers) on Lombok.
- Simple things such as means of weighing cattle, regular updates of market information from a trusted source and some grading system to define price premiums would enable farmers to capitalise on their product.
- For farmers, the major marketing constraints to improving their returns were not having access to timely and accurate market information and having to be 'price-takers' rather than 'price-makers' – particularly in relation to accurately estimating the weight (for beef cattle) and height (for breeder cattle) of their cattle. This situation is exacerbated by not having access to credit and thus being forced to sell even when prices were relatively low.
- Cattle prices reflected various events in the cropping, religious, school and inter-island and export calendar. These are generally well known with prices reportedly varying by 25-30%. The farmers' ability to capitalise on higher prices and avoiding lower prices is constrained by financial capital (as discussed in more detail in the recommendations below).

Recommendations are to:

- Improve the availability and/or accuracy of government information related to the number of cattle.

- Improve the availability and/or accuracy of government information related to the price of cattle by type and trade.
- Increase the marketing power of farmers via the provision of timely, accurate, and widely accessible marketing information.
    - Cattle price information (e.g. chalk boards at market, television, visits to production areas by government officials).
    - Cattle measurement (scales at market or production areas, girth measurements and weight conversion tables and education of farmers, height of breeders).
- Increase returns to farmers via the following:
    - improving the efficiency of marketing chain by reducing the number of middlemen and simplifying government charges and procedures;
    - developing and utilising grading standards to obtain price premiums for breeders in addition to developing specialised breeder markets;
    - improving the quality of cattle by using selected best quality bulls (and castrating the rest);
    - providing and utilising tailor-made micro-finance schemes (e.g. village and sub-district cooperatives contributing to 'rice banks') to reduce farmers need to sell and therefore increase their ability to capitalise on higher prices at the same weight, or grow the cattle out longer and obtain greater profits.

Benu (2011) cites Barlow (1990) that puts marketing costs at 25% of the value of a 300kg animal sold to Jakarta, which is deducted from the farm-gate selling cost to farmers. Benu argues that while 25% marketing costs may seem high, the traders provide numerous services, in a competitive market and weigh up returns against alternative trading opportunities. As many traders have mobility to operate across commodities, many have taken up other more lucrative non-cattle trading activities

SADI (2010) write that with a lack of investment in slaughter facilities and marketing of NTT beef, bulls are sold in Jakarta alongside Bali bulls from other regions. Anecdotal evidence suggests that NTT Bali bulls have a strong demand although it is very difficult to differentiate NTT beef from other suppliers.

FEES AND LEVIES

Hadi (2002) writes that since regional autonomy in 2000, all local governments impose taxes and levies on cattle which pass through their territory. Model results are that changing restribusi payments do not have large impact on the industry or it's actors (presumably because fees do not form a large proportion of overall marketing costs) but the authors do point out that the fees reduce the competitiveness of domestically produced beef relative to imported beef.

Writing about the NTT business operating environment, Suharyo (2007) found that the NTT cattle industry has been the subject of various regulations and excessive charges, starting at the village level. The study found that the regional governments in NTT persist with imposing charges and regulations to agricultural products although the contribution of these charges to regional government revenues is very small. Some progress has been made on reducing regulations and charges for agricultural food crops, however less progress has been made in the beef cattle industry. The regulations and licensing have drawn out informal charges applied at various levels that distort the marketing of cattle (amongst other agricultural products) and in turn limit the opportunity of farmers to receive better prices and incomes.

Nimmo-Bell and ICASEPS (2007) write that close coordination is needed between local governments within the same province to avoid double taxation and retribution impositions on the same cattle. The varying rates of tax and retribution across provinces need to be made uniform.

[In addition, there are revenue and statistical issues associated with about where retribusi is paid – in the production, trading or "export" areas].

Suharyo (2007) document in detail in NTT the numerous costs and regulations associated with cattle trading. The argue that costs are high, and that show the existence of charges (retribusi) to fund local government services in accordance with the regulations, even if the service is not provided. Several charges, like the 'holding ground' (livestock receiving yard) service fee in

TTU and Belu, the health inspection fee, and quarantine fee in Atapupu, are charged although the local government or government do not provides any services.

INTER-ISLAND TRADE

Hadi (2002) writes that inter-regional cattle transport is expensive, especially between islands.

- So to reduce transport costs, traders make use of back loads where possible.
- Ships are not specifically designed for shipping cattle; they are designed for other agricultural products, with cattle regarded as return cargo. Such ships have limited space, so cattle do not have enough food and drinking water. As a result, cattle become stressed, resulting in substantial weight loss. For example, when cattle were shipped from the quarantine examination premises in Mataram (NTB) to Jakarta, there was a weight loss of 11-12% of bodweight.
- Ships have limited capacity and no regular schedule. This makes the per unit shipping cost (per head or per kilogram liveweight) high and makes it time-consuming to gather large numbers of cattle. Inefficient cattle procurement from eastern Indonesia has been one of the factors discouraging feedlots from using domestic cattle in their business operations.

Deblitz (2011) finds that

- Industry development and investment is necessary to improve: physical and institutional access to markets; cattle handling facilities; inefficient road, port, market and sea infrastructure; efficiency, professionalism, food safety and animal welfare standards of beef slaughter and processing facilities; and simple innovations in wholesale and retail meat marketing and value adding.
- Deblitz also conducted feed trials to test effects on weight loss in shipping. Findings were inconclusive as weight loss is caused not just by feed regimes but also a whole range of issues surrounding the interisland transport with an impact on weight losses, overall mortality and also stress for the animals: insufficient loading facilities, resulting in injury and stress for animals, inadequate ship design leading to stress, insufficient water supply leading to reduced feed intake. This it appears that a more comprehensive approach needs to be taken to reduce these losses.
- In general, it appears questionable whether the present transport system is sustainable under the changed market conditions and animal welfare aspects, especially as the only reason for the long transport is to slaughter the animals in Jakarta. It should be remembered that the transport is carried out for the sole purpose of slaughtering the animals once they arrived in Jakarta after a journey of at least 14 days.
- Specific issues to be addressed are:
    - The feeding in the Kupang quarantine needs improvement. Fresh herbage should be provided;
    - The cattle loading and unloading facilities need improvement, for example by installing loading and de-loading rams for trucks and boats;
    - The boats used for transport should be constructed for this purpose;
    - The cattle density on the boats should be reduced;
    - Training in animal handling should be provided for the stockmen;

- The water supply pre-, during and after transport needs drastic improvement. This will lead to increased feed intake and lower weight loss; and
- The use electrolytes solutions (Na, K, Ca, Mg) for reducing transport stress should be considered (Schaefer *et al*, 1997).

Livestock Research and Development Team (2012) recommends:

- Soft loans for cattle shippers to invest in purpose built ships (scale) with multiple decks. Also can use temporary enclosure facility that is made of bamboo on the condition the vessel carrying only cattle.
- Transportation is expensive, involves risks (bourne by owners or in some cases shipping companies) and cattle lose weight.
- Quarantine stations – are good for international quarantine Under IKHS) but there is large variation in hygiene, sanitation and animal welfare standards in inter-island quarantine stations (RPH), which requires increased education of managers, workers, and business diversification, and law enforcement. This needs firm government policy, to reduce underutilized assets.

QUALITY STANDARDS AND CERTIFICATION

There appear to be limited industry standards to report on.

Quality standards. There is no public beef grading system in Indonesia (Kristedi, per comm.). This is largely a function of the generic product and uses that dominates the Indonesian beef industry. Large private abattoirs use their own in-house, private systems for particular markets.

However, even given largely generic markets, there would appear to be scope to develop a set of standards on product, cuts and language, which can vary across regions, islands and plants, and industry sectors, in order to facilitate and normalise trade. This, however, must be weighed up against the considerable costs in developing such a system and the incentives of industry actors to adopt on a widespread basis.

Compliance with halal requirements is an important factor for consumers and beef producer particularly in predominantly Islamic region. In government managed abattoirs, the government regularly provides training for selected traders to conduct Halal - slaughtering in their facility. Those trained traders then receive a certificate and have “the right” to use the abattoir. Non-typical abattoir (typically owned by private sector) normally has one or more dedicated staff to do Halal slaughtering, trained by the government and receives halal certificates from the government.

Recording of cattle history and cattle tagging system is not common. As a result is very difficult to differentiate the purity of breed, and to trace back the cattle (origin, owner, breed type etc).

IMPACT POTENTIAL

Areas identified in the Sector Potential for Development section above have the potential to generate value and employment throughout the beef value chain. Due to the structure of the industry, these opportunities are largely accessible and predominantly available to small-scale actors (producers, traders, slaughterers, processors, retailers). Another dimension is the distribution of value – especially through prices – to different actors along the chain. Data that may be useful in assessing the economic impacts on actors and distribution of value is provided.

PRODUCERS AND PROCESSORS

PRODUCERS

Data on the numbers of producers that could potentially be impacted include:

- Nearly 4.2 million farmers raise livestock in Indonesia, 1.98 million in EJ, 34,000 in NTT[43] and 165,000 in NTB (DGLAHS, 2011). More disaggregated data is required to quantify the number of cattle producers.
- As reported above, cattle can make up a significant part of agricultural income in some areas and households.
- In many cases, these households are poor. Patrick (2004) argues that the agricultural sector in NTB is under mounting pressure to become more productive due to population growth, relatively low education levels and increasing landlessness. Over 35% of farmers collaborating in ACIAR Project SMAR/2006/096 were landless.

Technical innovations leading to income gains appear highly scalable and transferable.

- EJ, NTT and NTB contribute to more than 40% of national herd inventory. The beef sector produces over 120,000 tons of beef, mainly from smallholders, which accounts for more than half (52%) of total Indonesian beef production.
- Recent research has demonstrated more profitable management practices e.g. Integrated Village Management Systems are readily adopted by farmers.
- In a review of SMAR2006/096, Martin (2010) estimated that if agency ownership (of cattle) could be achieved in Lobok, a 5% adoption rate (equivalent to 11,000 farmers) could be achieved by 2023. With effective extension, he estimates that this figure could be achieved by 2018. At a 16% adoption rate, 34,000 farmers could be impacted by 2023. Integration of ACIAR research into the policy process (and relatedly the extension system) will mean that these upper level estimates – and perhaps above – could be expected to be achieved.
- However, ongoing adoption requires strong technical and policy support.
- Similarly LPS/2005/005 (Improving smallholder crop-livestock systems in eastern Indonesia (Sulaweisi, Lombok, Sumbawa) say that "The feedback from farmers and the results from monitoring the on-farm trials indicate that the participatory, farming systems approach was successful".

Economic research reported in Rutherford *et al* (2004) quantifies economic impacts of management changes trialled in ACIAR project AS2/2000/103 (Developing an integrated production system for Bali cattle in the eastern islands of Indonesia).

In sum, economic analysis of the IVMS indicated a 65% increase in farm cash flow if the IVMS was introduced (weaning, seasonal mating, natural mating, strategic supplementation) and weaned calves were retained and grew at moderate levels of 0.2 kg/d, as recorded in village studies under prevailing management practices. However, a 120% increase in farm cash flow was generated if the weaned calves were retained until 12 months of age and grew at 0.36 kg/d. profitability of an owner/manager was much more profitable than a manager (who does not own the cow).

In more detail, Rutherford constructed two partial budgeting models (gross margin and cash flow) related to two different production systems (owner/manager and manger) on two different islands (Lombok and Sumbawa) to test the economic impacts of the following technical/management options:

- Current system with sale of calf at 12 months.
- New integrated management system adopted which involves bull supply, weaning at 6 months with 86% weaning rate and modest live weight gain (LWG) based on current village records and sale of calf at 6 months.

[43] The data for NTT appear under-stated. In 2003 there were approximately 330,000 smallholders (farming households) in the NTT district and around 136,000 smallholders farming cattle (Agriculture Census, Sensus Pertanian (SP) 2003, cited in Nimmo Bella nd ICASEPS, 2007).

- New integrated management system as above but calf retained after weaning until 12 months old with current LWG.
- New integrated management system as above with calf retained until 12 months but LWG increased by 50% with and without a 20% price increase.

The economic impacts on the household are shown in Table 43 below.

Table 43. Summary of major economic, financial, and social impacts for Bali cattle production systems in Kelebuh, Lombok and Boak, Sumbawa

Village	Production System	Gross Margin in steady state ($/breeder/yr)	Cash Flow in steady state ($/breeder/yr)	Labour requirement change from base (hrs/hd/mth)
Kelebuh, Lombok	Current system – owner/manager	-1	185	Base = 0
	Current system – manager*	-89	97	Base = 0
	Basic mgt - owner/m	35	205	-9 x 6 mths
	Basic mgt - manager*	-63	107	-9 x 6 mths
	Extension 1 – hold calf to 12	91	289	0
	Extension 2 – hold + LWG	189	397	0
	Extension 2 + 20% price rise	267	475	0
Boak, Sumbawa	Current system	65	114	Base = 0
	Basic mgt	41	91	- av. 2 x 6 mths
	Extension 1 – hold calf to 12	123	177	0
	Extension 2 – hold + LWG	212	267	0

* Average of year 3 and 4 due to calf and breeder value sharing

The key points are that arise from the budgeting are that:

- "Current" (pre-project) systems can have positive cash flow in both locations, but are lower in Sumbawa ($185 v's $114/breeder/year in the steady state). This is a very significant proportion of av per capita rural income in NTB.
- But the relatively is reversed when looking a gross margins that take into account opportunity costs, especially of labour. As the less developed area (low opp costs of l), gross margins are higher in Sumbawa ($65 / breeder / year) than Lombok ($-1).
- In the case of Lombok, breeder production becomes a viable ($35) activity if basic management interventions are made (bull selection, controlled seasonal natural mating, strategic weaning, sell calf at weaning at 6 months).

- Introduction of new integrated management package is beneficial especially if calf is not sold until 12 months of age. Gross returns increase to $91 if calves are held until 12 m.o.
- Increasing the LWG of calf after weaning (6-12mths) is extremely beneficial. Gross margins are $189 if those calves have a 50% increase in LWG.
- In this system, interventions that increase cattle prices by 20% have a major impact on returns ($267).
- Holding and feeding a calf increases (or saves if wean and sell) labour requirements, mostly for men, by nine hours/month (or 25% during wet season) in Kelebuh and two hours/month (or 25% during dry season) in Boak.
- The incentives apply to owners/managers of cattle, but not to managers (because they do not gain proportionately to productivity increases in every second calf). Measures to convert managers into manager-owners especially through credit are important.
- Economic benefit is high to retain calf with improved LWG to 12 months but barrier of need for cash and sale would be removed through credit access or some such scheme.
- Results are sensitive to price and transaction costs which are sensitive to policy and supply and demand of animals. Policy and market analysis is needed.

Other economic analyses include:

- SMAR-2006-096 final report. The key economic impact is generated by production practices that increase household returns from cattle sales (through breeding, nutrition, conception, calving intervals, mortality, birth and weaning weights, and growth). Analysis in SMAR-2006-096 estimates that (compared to existing NTB figures) project groups could over five years increase the number of animals sold by over 80% and more than double the quantity of beef produced and sold.
- Sullivan and Diwyanto (2007) report that the economics of cow/calf operations are not as favorable to investors as short term feeding of beef cattle. Smallholders of livestock may invest their time in cattle breeding if other alternative employment opportunities for household labor are not available. Smallholder fattening schemes being undertaken by the National Cooperative Business Association (NCBA) in Central Java and West Timor are attractive investment opportunities because of the short time period (less than a year) to fatten and sell feeder cattle.
- Nimmo-Bell and ICASEPS (2007) discuss and budget small-holder fattening operations in NTT, especially those associated with the TLM project).

MARKETING

Cattle marketing supports to livelihoods of a very large (but unknown) number of traders, brokers, transport operators and other service/input providers. Provides a path for mobility for households – to move into cattle trading or to operate speculative fattening/ trading operations. Provide credit, information and trading services for rural communities. Have to be considered as *part* of any development initiatives. Shorter chains will have employment effects, but can shift value toward producers.

Hadi (2002, Table 8.1) simulated the impacts of "Reducing the costs of marketing native cattle" of Table 8.1. Measures to reduce native cattle marketing costs provide a big boost to the incomes of smallholder fatteners and significant flow-on effects to smallholder breeders, but not feedlotters (so a distribution issue). The main points are that:

- because the current marketing margin is high, the reduction causes a substantial (10%) increase in the farm price of native fattened cattle, some of which is passed back as higher prices to native cattle breeders (price increase of 4.6%), resulting in a big boost to the incomes of smallholder fatteners (income gain of 39.1%) and to native cattle breeders (gain of 7.3%);

- commercial feedlot operators are disadvantaged because they do not participate in these cost savings, so production in the feedlot sector falls (by 2.3%) and feedlot value added falls (by 5%);
- all the gains are captured by smallholder fatteners and breeders; and
- there is no change in beef retail prices and consumption.

Amongst other findings from Hadi (2002) are that:

- [Presumably because retribution does not form a large proportion of overall marketing costs] a doubling of the retribution charge on marketing cattle would have only a minor impact on the beef industry. Domestic beef production would fall slightly and beef imports would increase slightly. Live cattle imports would fall, as would beef consumption. That said, it is important to acknowledge that the retribution charge is a tax on internal trade. Trade, both internal and external, provides the means through which wealth is created. A tax on trade is not an efficient way of raising government revenue.
- adopting a weighing system to replace the old guess-weighing system is estimated to save around 10% of the producer selling price and would reduce 22.7% of trader margins

More generally, the costs of investment in shipping and transport infrastructure would have to be weighed up against the benefits especially on weight loss, mortalities and stress of cattle and transit. It is said that feedlots that buy cattle at the landed weight/price gain from the poor transport procedures. Cattle that lose weight in transport can put it back on quickly as they compensate for the losses (compensatory feeding).

SLAUGHTER

Hadi (2002) simulated the effects on the beef industry of a 10% improvement in the efficiency of processing beef. They found that there are gains for consumers (retail prices for beef decrease (by 0.2%) and consumption increases (by 0.3%) and producers (cattle producers gain through higher farm prices for fattened cattle (an increase of 1.2% for native fattened cattle, 0.3% for lot-fed cattle and 0.7% for native feeder cattle); and beef producer incomes increase by 1.9%, with the largest gain (4.2%) accruing to smallholder fatteners.

Upgrading can bring about public welfare benefits (food safety, environmental and animal welfare impacts).

However, delivering these benefits involves imposing minimum standards in areas like registration, registered capital, tax, inspection, hygiene, building and bench materials, storage, water use, effluent management, slaughter facilities and processes. Implementation of these measures can effectively consolidate and centralise slaughter activities in a particular locality. This raises issues of preferential licencing and local monopsony issues in the slaughter sector that can be linked to up- and down-stream sectors [but this less likely in service slaughter structures?].

The vast majority of slaughtering in current systems (in service slaughter plants or backyard operations) is done by in unmechanised facilities, with a high division of labour (for each slaughter activity), and links up with a vast number of downstream actors (hide, offal, beef traders and processors). The sector is therefore highly labour-intensive and generates a lot of employment. Measures to mechanise or centralise slaughtering in particular localities can reduce labour intensity, but his can be minimised – e.g. the provision (for a service fee) of large, centralised, hygienic slaughter areas, where traders continue to run labour-intensive slaughtering.

MARKET DEMAND

A literature review revealed no English-language beef consumption studies based on primary data (surveys). Data in most studies is drawn from the (triannual) Household Food Expenditure and Consumption Surveys reported in national socio-economic household survey (SUSENAS) conducted by the Bureau of Statistics (BPS). Not presented here, but studies that use the data are overviewed.

Per capita beef consumption in Indonesia is low by world and regional standards (even though Moslem preferences mean that pork is not a substitute for beef). However, beef consumption increased at 4.2% per annum during the period of 2005-2009, from 1.08 to 1.18 kg/capita/year (Direktorat Jenderal Peternakan dan Kesehatan Hewan, 2009).

Consumption is widely expected to increase (Morelink, 2010, citing the Animal Husbandry Association of Indonesia and the Indonesian Meat Importers Association) due to factors including:

- Population growth of 1.3% per annum; an extra 3 million people,
- Tourist growth target of double the current 7 million people in a few years,
- Economic growth,
- Expatriates populations,
- High demand during religious holidays,
- In response to rising incomes and the influence of western style foods, Indonesian diets have diversified to a wider range of products, including beef and dairy products,
- Consumption of fresh food is increasing due to availability (logistics from supplies) and storage (incl. refrigeration) at home,
- City consumers are becoming more conscious of health and food safety issues, and
- There are substantial and growing niche beef markets for beef – for example in mining operations in Kalimantan.

Many of these demand drivers appear to be relevant and strong. However, the impact on consumption is also determined by price and supply. As discussed above, Indonesia faces constraints to growth of the domestic supply and has restricted imports. Beef prices – already high by regional standards[44] – may be under further upward pressure. Alternatively, stimulating domestic supply and easing import restrictions on imports could be expected to have the opposing price effect. Either way, understanding the way that consumers respond to changes in beef prices and incomes is a crucial.

A review of studies on food demand in developing countries (Abler, 2010) shows that most studies aggregate food groups beyond the individual commodity (e.g. beef) level. Demand elasticities for the meat food group in Indonesia vary considerably over study, method, time are sample area. Most studies draw on consumption and socio-demographic data from the triannual Household Food Expenditure and Consumption Surveys reported in national socio-economic household survey (SUSENAS) conducted by the Bureau of Statistics (BPS).

Several studies do however estimate demand elasticities for beef. While the review below is not exhaustive, the literature on beef demand in Indonesia appears to becoming dated.

Using 1981 SUSENAS data, Deaton (1990) estimates a very high income elasticity for beef of 2.30, which regarded by Abler (2010) as "consistent with recent trends".

Hutasuhut *et al* (2001) drew on SUSENAS data from 1990, 1993 and 1996 to estimate demand elasticities for meats in Indonesia, in particular in Jakarta and West Java, and two between two meat groups: MG-1 dominant meat beef; and MG-2 dominant meat chicken. They found that:

- Expenditure elasticities of both major meat groups were positive (i.e. if income increased, consumption increased). However expenditure elasticities were lower for beef (0.51 to 0.74) than for chicken meat (1.11 to

[44] While consumer beef prices increased rapidly between 1995 and 2009, Deblitz et al (2011) point out that prices increased in line with the CPI, and were lower than income increases in some periods in the 2000s. This makes beef no less affordable compared to other consumer goods or for the average consumer.

1.15). This was attributed by the authors to the poor quality of beef. This is in contrast to Puslitbangnak (1992) who finds that beef is more of a luxury than chicken.

- Results also suggested that the estimated expenditure elasticity is greater for urban households that rural households, and that demand growth for beef would be smaller in the rural areas than in the urban areas. This was at odds with the findings of Olivia and Gibson (2005).
- The estimated own-price elasticities are negative for both meat groups. The demand for beef is own-price inelastic (-0.91 to -0.93) whereas chicken is own-price elastic (-1.08 to -1.09). An inelastic demand for beef suggests that it has fewer close substitutes compared to chicken meat.
- The estimated expenditure and own-price elasticities are comparable to recent previous Indonesian studies that use similar commodity coverage and similar methods (see Appendix 1 of Hutasuhut (2000)).
- The cross-price elasticities estimated in this study suggest that MG-2 is an unambiguous substitute for MG-1. For example, the estimated value for MG-2 in Jakarta in 1996 (0.17) suggests that if the price of the chicken group increases by 10% then the quantity demanded of products in the beef group will increase by 1.7%.

Olivia and Gibson (2005) drew attention to biases that arise from household survey data such as SUSENAS that equate unit values with prices.[45] Adjusting for these biases lead to lower elacsticities. A series of other methods were used, which had significant effects on demand elasticities.

In other studies, Hadi (2002) estimated an own-price elasticity for retail beef demand in Indonesia of –1.09 (short run) to –1.43 (long run). Another study in Bali suggests a demand elasticity of –0.9 (Ambarawati *et al*. 2003).

Further, MLA consumer research in Indonesia (conducted in late 2007, MLA feedback 2009) suggests that beef is still viewed as a luxury good, and thus consumer are sensitive to price. The MLA consumer research also suggests a lack of awareness of how to cook beef in a way that is perceived superior to meat and fish.

POTENTIAL PITFALLS

There are a number of low to moderate risks that could jeopardise the likelihood of achieving significant income benefits to the poor.

- Several production-side technical innovations are proven and relatively simple, however will require significant institutional resources to support scaling-out and widespread adoption across huge numbers of farmers.
- The risk of reduced support for the domestic industry at national and provincial levels is probably low. However there is a moderate risk that changing trade policy, policy distortions and policy inconsistencies occurring at district, provincial and national levels. These will impact on prices of inputs, cattle and beef, slaughter rates for breeding females and incentives for farmers to invest in cattle production.
- There is a low risk that institutional barriers will hinder farmer access to credit, and ability to form functional beef marketing groups.
- There is a low to moderate risk that little progress will be made on efficient policy measures to promote public private partnerships and an efficient business enabling environment necessary to promote private sector investment and overcome infrastructure, institutional, market and supply chain inefficiencies.

[45] Unlike developed countries where meat demand studies tend to use aggregate data and market prices, Indonesian studies rely on household surveys to derive unit values (expenditures divided by quantities purchased). These unit values are used as proxies for price – which are used to estimate price elasticities. Unit values, however, are not prices, because household surveys typically aggregate different varieties, so even if consumers faced the same prices, as the mix of varieties changes, the unit values change. Unit values will tend to vary less than prices if consumers react to high prices by choosing lower quality, and this is likely to create a systematic overstatement in the absolute value of estimated price elasticities (Deaton, 1988).

- The risk of major disease outbreaks (e.g. FMD, brucellosis) that could disrupt production and inter-regional trade is currently low but could be enhanced by policy decisions that lead to increasing unofficial and official imports from less bio-secure markets.

CURRENT DONOR ACTIVITIES

Australia, by far, is the largest donor supported the beef sector in Indonesia. In the past some donors provide intermittent support to the sector which includes:

- The World Bank conducted a study and they have the FEATI project which include livestock;
- JICA support the development of abattoir; and
- DFID have the DELIVERI project that focus on livestock.

In NTT, the following activities are listed in SADI (2010) Provincial Profile: Nusa Tenggara Timur, SADI publication:

- PUSKUD Kupang – Project Location: Kupang, Kupang, Timor Tengah Selatan, Timor Tengah Utara, and Belu Districts; Program: Cattle fattening (production sharing); Result: production sharing with farmers on 2,262 cows fattened in 2008 giving 70% of the profit to breeders and 30% of the profit to PUSKUD. Partners further expect the following support programs: calf management, forage management, and forage bank development, veterinary health and water provision facilities (wells, check-dams, and lakes). Partner: NCBA through the USAID-AMARTA Program (see Sullivan 2007).
- Tanaoba Lais Manekat (TLM) – Program: working capital for cow fattening and trading business through breeder associations (with 25 members minimum) giving 60% of the profit to breeders and 40% to TLM; Location: West Timor; Result: -/+ 4,000 cows/year are managed through TLM; International Partner IFAD – Bali.
- USAID AMARTA (NCBA) – Program: Bali cattle calf and demplot development; Location: A small area in West Timor; Partner: PUSKUD Kupang.
- Directorate General of Rural Community Development– Program Name: National Program for Poverty Reduction – Rural Agribusiness; Location: Timor Tengah Selatan (Mollo Utara and Kuan Fatu Subdistricts); Result: some intensive cattle fattening dem plot locations; Local Partner (s): BPPT NTT, LPM Undana, Politani Kupang, and Dinas Pertanian of TTS District.
- BPTP – Program Name: PUAP.
- CRS (Catholic Relief Service) – Program: Market Value Efficiency Chain (Common Market); Location: throughout continental Timor.
- ACIAR-SADI & BPTP: Research & development on practical technology and management model of integrated maize-cattle programs to support rehabilitation of dry land farming system in NTT (Pilot Roll-Out): Tuapanaf and Oebola, Kupang.

The overall goal of USAID's AMARTA livestock project is to improve the beef value chain in Indonesia. The best course of action to achieve this goal is through better integration and vertical coordination within the beef value chain. The implementing agencies are P3Bali, National Cooperative Business Association (NCBA), Pusat Koprasi Unit Desa (PUSKUD), and BPTP-Bali. Activities to be conducted are (Sullivan and Diwyanto, 2007):

- Establish Prototype Breeding Units for Bali Cattle;
- Training of Lead Farmers in Good Management Practices;
- Production of High Performance Bali Bulls;
- Seal of Quality for Kupong Feeder Cattle;

- Improved Handling and Transporting of Cattle; and
- Improve Feeding of Bali Cattle on Java.

Recommendations by Nimmo-Bell and ICASPES (2007) for the SADI and IFC TA program fall into the following areas:

- smallholder credit conditions;
- smallholder trading conditions and bargaining position;
- animal nutrition, cattle productivity and farm management practices;
- smallholder management of crops; to be grown with beef to improve ability of the whole farm system to generate cash for smallholders; and
- the genetic base of the industry and reduce the decline in regional herd numbers.

The more specific recommendations for the SADI/IFC project are:

- IFC SADI should collaborate with the BEE program to investigate the needs and requirements of existing beef processors and traders. Investigate opportunities to work with existing SME's involved in trading and local processing to test the economics and feasibility of investing in cold chain facilities for added value export to Jakarta. This process may identify opportunities to improve supply chain channels, provide opportunities to link smallholder farmer groups to traders and processors and provide improved insight on industry issues and the social networks that the industry relies upon for successful trading.
- Conduct a detailed study of NTT social structures and how this affects the growing and trading of cattle in the province. Incorporate the new knowledge of social structures into project planning and implementation and develop methods of utilising the favourable aspects of this structure for the benefit of smallholder beef farmers.
- Investigate new models of smallholder cattle finance and investigate opportunities to partner and develop commercial livestock financing operations with new and existing finance providers.
- Collaborate with ACIAR and BPTP to establish a demonstration farm with selected farmer associations or groups to identify key on-farm productivity barriers to improving smallholder returns.
- Collaborate with BEE to verify whether current regulations and taxes are in-fact a barrier to further investment in the industry (i.e., processing and cold chain).
- Evaluate the impact of local taxes (retribution) on internal trade (trade being essential for generating wealth) explore more efficient means of raising government revenue through BEE.
- Conduct a feasibility study, including market analysis and capacity study, for an investment in a Kupang abattoir and cold chain to the Jakarta market for chilled and frozen meat trade.
- Collaborate with KDP Sub-program 1 to improve NTT road infrastructure to overcome wet season supply constraints and provide technology to clustered farmers (e.g., village based weigh stations, AI services).
- Conduct a survey of Jakarta based live cattle buyers to identify key requirements for NTT beef industry to improve bull prices and returns to smallholders.
- Collaborate with ACIAR to evaluate current practices for live shipment of cattle to Surabaya and handling of cattle at central markets to develop improved practices for shippers to reduce live-weight losses and minimise animal welfare issues.
- Engage local DINAS to review current services to smallholders and encourage DINAS extension workers to become involved in demonstration farm trials to develop improved extension services to smallholders and improved local policy development.
- Establish a nucleus breeding operation that can access superior Bali genetics and encourage farmers to become involved in commercial beef breeding enterprises.

12) CASSAVA SUB-SECTOR

GEOGRAPHICAL SCOPE

Cassava is part of the staple diet in Indonesia and is an important source of carbohydrate vital for rural food security. Besides its importance for food security, cassava is an important source of starch used for the production of a wide range of goods, as well as a crop of increasing importance for the development of bio-ethanol and the bio-fuels industry. Whether for human consumption or industrial use, cassava has a growing and diverse market application.

Cassava is grown all over Indonesia, with Lumpung being the main growing province, with 361,538 Ha of cassava in 2011 (Badan Pusat Statistik, 2012) .

However, despite the diverse use the data in Table 44 shows that in the last 5 years there has been no national growth in the cassava harvested area. In Provinces such as East Java and West Nusa Tenggara the cassava cultivated areas have dropped by 11% and 30% respectively. At the same time, East Nusa Tenggara has expanded cassava areas by 36%.

Table 44: Cassava harvested area (Ha)

Province	2007	2008	2009	2010	2011
Indonesia	1,201,481	1,204,933	1,175,666	1,183,047	1,203,293
East Java	223,348	220,394	207,507	188,158	197,969
West Nusa Tenggara (NTB)	7,510	5,688	6,514	5,352	5,273
East Nusa Tenggara (NTT)	76,247	87,906	89,154	102,460	103,568

Source: Badan Pusat Statistik

PRODUCTION

Indonesia is the third largest producer of cassava in the world behind Nigeria and Brazil. Cassava is the staple food of nearly one billion people and the fourth most important crop in the developing world. In Indonesia, cassava is consumed as an alternative food to rice and used as animal feed because of its relative cheaper price. Indonesian cassava production is yet to meet domestic industry and overseas demand. Although large areas are suitable to grow cassava and a higher price is offered in recent years, cassava production in Indonesia can only meet 5% of the demand (according to Indonesian Cassava Society (ICS) records).

In Indonesia, the cassava production has gone up by 17% nationwide in the period between 2007 and 2011 (Table 45). Lumpung is the biggest producer with 9,017,137tonnes of production in 2011 or 38% of all national production. East Java has contributed 13% of the total production and NTB and NTT have contributed under 1% and 4.7% respectively. An important trend to note is that while the production in East Java and NTB has gone down by 8% and 15% respectively, in NTT production has gone up by 38%, indicating both potential and prioritization of cassava production in this province.

Table 45: Cassava production (Ton)

Province	2007	2008	2009	2010	2011
Indonesia	19,988,058	21,756,991	22,039,145	23,918,118	23,464,322
East Java	3,423,630	3,533,772	3,222,637	3,667,058	3,154,295
West Nusa Tenggara	88,527	68,386	85,062	70,606	74,912
East Nusa Tenggara	794,121	928,974	913,053	1,032,538	1,093,885

Source: Badan Pusat Statistik

In terms of productivity Table 46, national average productivity per Ha has increased by 17%, with East Java showing a 4%, NTB a 21% and NTT a 1% increase of productivity. In absolute values, East Java and NTB are also closer to the national productivity average.

Table 46: Cassava Productivity (t/Ha)

Province	2007	2008	2009	2010	2011
Indonesia	16.64	18.06	18.75	20.22	19.50
East Java	15.33	16.03	15.53	19.49	15.93
West Nusa Tenggara	11.79	12.02	13.06	13.19	14.21
East Nusa Tenggara	10.42	10.57	10.24	10.08	10.56

Source: Badan Pusat Statistik

Cassava in Indonesia is mostly grown in rain fed intercropped farming systems and the majority of the production is for own consumption. Traditional practices are to grow with minimal inputs (such as fertiliser and agri-chemicals) and main input is family labour. In NTT, the main growing areas are Manggarai and Ngada (Flores), Timor Tengah Selatan Timor Tengah Utara, Beluand Kupangin Timor Island, and Sumba Barat. A well-known local cassava variety comes from the Ende district “Nuobosi”, a variety favoured by locals for household consumption. In Manggarai, Ende and Ngada smallholders grow both yellow and white varieties mostly for consumption.

In West Sumba, cassava is used for chips or “gaplek”, which is the process of peeling the skin, shredding the root into chips and drying. Gaplek or dried cassava chips are used as a staple food during the dry season. Dried cassava chip or gaplek can be stored for two to three years. In Maumere and Lembata, cassava is a major staple food and in these locations there is a traditional ceremony “Lamaholot”, where cassava is served with corn chips, fish and tuak (local alcoholic drinks). Supply is seasonal for dry-land cassava with peak production to occur from July to September (Giera and Struthers, 2007b).

PRODUCTION PITFALLS

- Lack of experience in post harvest practices
- Lack of experience in dealing with international buyers
- Difficulties in obtaining optimum varieties for high quality cassava chips for bio-ethanol production
- Limited access to inputs such as fertilizers and agrichemicals
- Limited access to credit for seasonal production investments
- Substituting traditional varieties more suited to human consumption with improved varieties for the bio-fuels industry, which cannot be consumer fresh may impact negatively local food security
- Yields and quality are compromised by early harvests

(Giera and Struthers, 2007b)

PROCESSING

Cassava roots and leaves are suitable for human consumption as a cheap source of carbohydrate. A typical cassava root is made up of moisture (70%), starch (24%), fiber (2%), protein (1%) and other nutrients (3%), while the cassava leaves contain protein and minerals. Some cassava roots contain large amounts of cyanohydrin (containing cyanide) that gives the root a bitter taste. Varieties are classified as sweet or bitter depending on their cyanide contents, with the bitter variety unsuitable for human consumption unless properly treated. Bitter varieties are especially suitable for industrial and feed purposes, because of their higher starch content, while sweet varieties are generally preferred for consumption. Globally, cassava is the fourth leading source of starch, after maize, wheat and potato, four to five tonnes of roots on average produce one ton of starch (Giera and Struthers, 2007b).

Global ethanol production is growing rapidly worldwide and interest in cassava as a source of starch for ethanol production is following this trend. By 2010, there were 22,947 millions of gallons of ethanol produced globally. (Table 47) The leaders in bio-ethanol production are the United States, Brazil and the EU, followed by China and Canada.

Table 47: Global fuel ethanol production by region and country, 2010

(Millions of gallons, all grades)	
Region	2010
North & Central America	13,720.99
Europe	1,208.58
South America	7,121.76
Asia	785.91
Oceania	66.04
Africa	43.59
Total	22,946.87
Individual Countries	2010
United States	13,230.00
Brazil	6,577.89
European Union	1,039.52
China	541.55
Canada	290.59

Source: Renewable Fuels Association, 2011

In just over 10 years, the global capacity for ethanol production has increased more than 10 times and the number of processing plans has more than quadrupled (Table 48).

Table 48: Global ethanol plant statistics 1999-2011

Year	Total Ethanol Plants	Ethanol Production Capacity (million gallons per year)	Plants Under Construction/ Expanding	Capacity Under Construction/ Expanding (million gallons per year)	States with Ethanol Plants
1999	50	1,701.7	5	77.0	17
2000	54	1,748.7	6	91.5	17
2001	56	1,921.9	6	64.7	18
2002	61	2,347.3	13	390.7	19
2003	68	2,706.8	11	483.0	20
2004	72	3,100.8	15	598.0	19
2005	81	3,643.7	16	754.0	18
2006	95	4,336.4	31	1,778.0	20
2007	110	5,493.4	76	5,635.5	21
2008	139	7,888.4	61	5,536.0	21
2009	170[a]	10,569.4[a]	24	2,066.0	26
2010	189	11,877.4	15	1,432.0	26
2011	204	13,507.9	10	522.0	29

Source: Renewable Fuels Association (2011)

Indonesia is one of these countries investing in bio-fuel production capacity. In January 2007, 59 energy firms and institutions made preliminary commitments to invest US $12.4 billion in the renewable energy sector. The largest investments come from China, such as the energy firm CNOOC, which in partnership with Sinar Mas Agro Resources and Technology and Hong Kong Energy invests a total of US$5.5 billion. These investments are focused on the use of palm oil as a bio-fuel, however the Sugar Group would start producing ethanol from sugarcane in March and Medco Bioethanol will build an ethanol industry in Lampung based on cassava with a total investment of US$40million, and with a production capacity of 60 million liters of ethanol per year (Giera and Struthers, 2007b).

EN3 Green Energy has established three manufacturing plants in South Sulawesi to provide cassava chips and tapioca flour for export to Japan. The combines manufacturing facilities will have a capacity of 47 Mgy (180 million liters) and will utilize up to 360,000 tonnes of cassava root annually. Since 2007, EN3 Green Energy has launched 2 integrated factories (IPPU 1 & IPPU 2) manufacturing cassava chips (tapioca chips) , cassava flours (cassava chip flours) , and cassava feed stuff based on the Indonesian National Standard (SNI 01-2905-1992 & SNI 01-2997-1996) and the Thai Industrial Standard (TIS 52- 2516/ 1973). Under a strict quality control system, the company supplies high quality cassava-equivalent products for various industrial sectors such as foods, biofuels, livestock feeds, and other industrial purposes (PT EN 3 Green Energy Co., 2012).

Strong demand from China is driving forecasted increases in the global trade of cassava and cassava products. China is the world's fourth largest ethanol producer behind Brazil, the US and the EU and is the largest exporter of ethanol (Renewable Fuels Association, 2011).

Relatively small amounts of Indonesia's cassava production are used for food consumption, majority being destined for the production of ethanol. In Indonesia two ethanol plants are currently operating, both using molasses as raw material. The industry is also looking at cassava as a feedstock. Since molasses is also used to produce monosodium glutamate, cassava may be an attractive alternative. At least two companies are currently making plans to use cassava as a feedstock. Indonesia's largest-listed energy firm, PT Medco Energi Internasional, plans to spend $135-$144 million on three ethanol plants, each needing an investment of $45 million. One plant in Sumatra's Lampung will have a

capacity of 60 million litres of cassava-based ethanol a year, which is going to be exported to India, Korea, Tai- wan and China (Kuiper et al., 2007).

Traditionally cassava has been produced mainly for human consumption and animal feed and did not require complex processing. Modern cassava targets the bio-ethanol production, which needs new varieties and complex processing technologies. The re-orientation of the industry and introduction of varieties not suited for direct human consumption will inevitably change the value-chain and shift more production and processing investment towards the more lucrative bio-ethanol market.

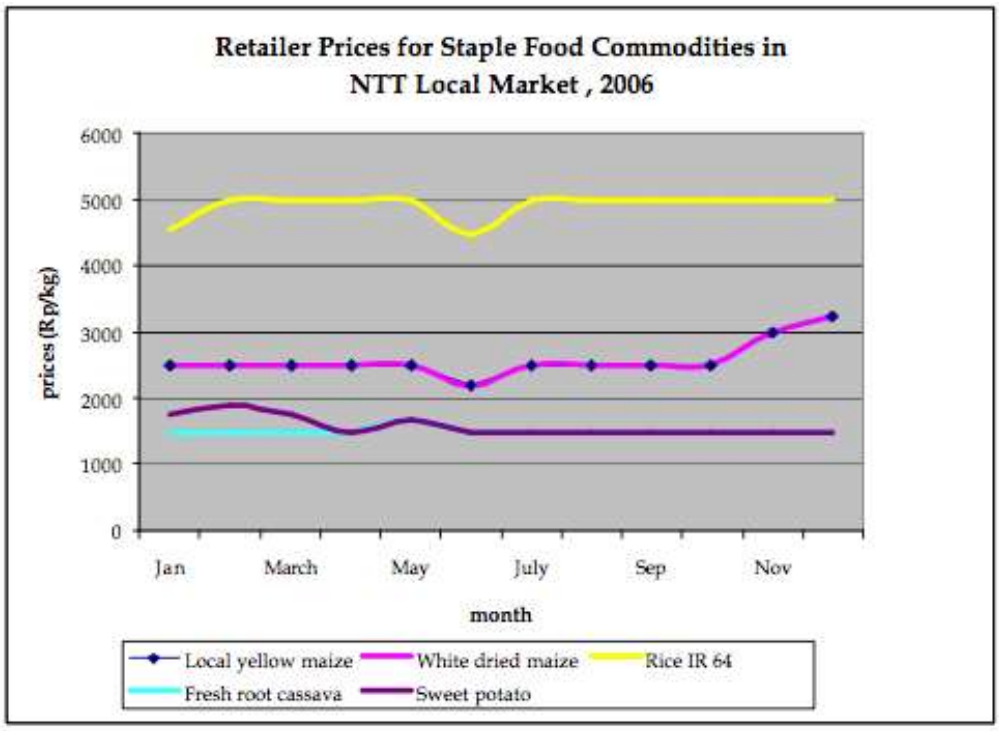
PROCESSING PITFALLS

Despite its demonstrated potential, several important constraints limit cassava production. One of the major limitations is post-harvest physiological deterioration (PPD), which renders the roots unpalatable and unmarketable within 24-72 hours depending on the genotypes and environmental conditions. Therefore the ability of the producer to deliver his/her harvest to a processor or to process the harvest is essential for minimizing post harvest value and physical losses. PPD is characterised by a blue-black streaking of the vascular tissues. It forces farmers to sell fresh cassava roots or to process them rapidly after harvest as root deterioration leads to price reduction and, eventually, to its use as feedstock. Losses due to PPD increase when the production site is more distant from the market site (Gruissem, 2011).

- The potential yields and quality attributes for commercial cassava (for bio-fuels) in NTT are largely untested.
- Manual post-harvest practices are likely to affect negatively the consistency of the quality of produced chips (Giera and Struthers, 2007b).

MARKETING

Smallholders in NTT sell cassava in fresh root form in local markets, as a major staple food. The crop is also commonly used for “in-kind trading” or barter amongst households. Cassava for household consumption is mostly used as a food reserve during the dry season when corn and rice are no longer available. Without a critical harvest age (i.e. for ripeness), cassava offers smallholders flexibility in consumption. Figure 47 shows that fresh cassava is considerably cheaper than maize and rice.

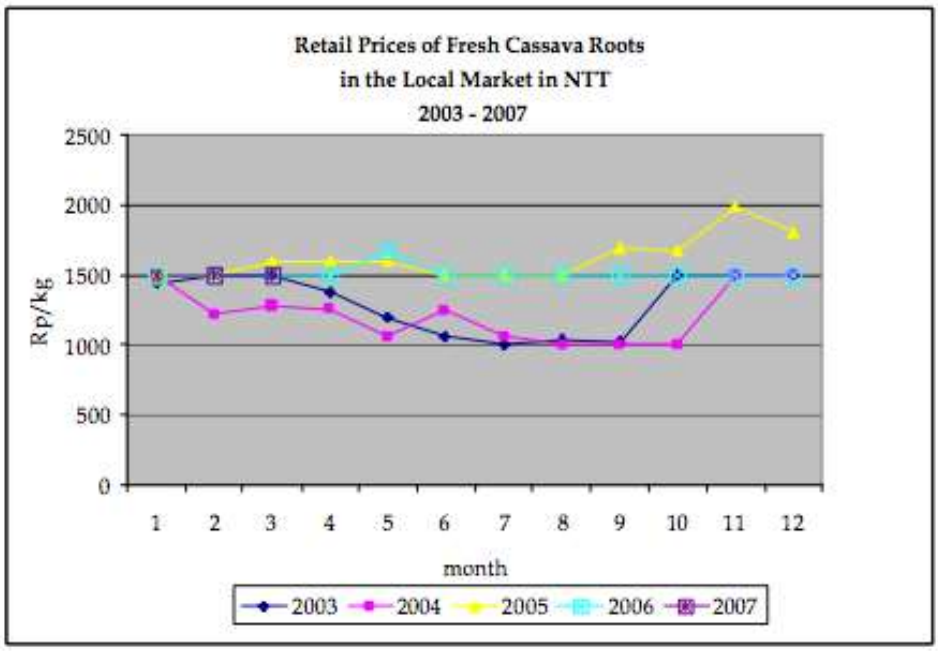


Source: Giera and Struthers (2007b)

Figure 47: Retail prices for staple food crops in NTT 2006

Cassava price increases caused by a rising cassava demand for ethanol production are likely to have effects on poor who do not produce cassava themselves and rely on the cheapest staple food commodities for food security (Kuiper et al., 2007).

Besides cassava flour (known as "tepung sagu") and cassava chips for snacks, there are few other marketing options for cassava as a cash crop. Retail prices of cassava flour in local markets are around 5,800 – 6,000Rp/kg. Further research is required to understand the returns for cassava growing and processing into flour. Figure 48 below shows the retail prices for fresh cassava roots in local NTT markets. It shows that prices in local markets have been relatively stable over the past five years with the main driver of price being seasonal variations in supply. Peak production occurs from July to September. Evidence suggests that NTT prices for fresh cassava are similar to other regions of Indonesia.



Source: Giera and Struthers (2007b)

Figure 48: NTT market retail prices of fresh cassava

Prices in the local NTT markets (Naikoten, Oebobo, Oeba and Kuanino market), for fresh cassava are usually around 1,500 - 1,600 Rp/kg, maximum 2,500 Rp/kg. A price for cassava chips (for bio-ethanol purposes) has yet to be been established in NTT. Given its single use for bio-ethanol production (and limitations for home consumption due to a more bitter taste) the prices for cassava chip varieties are likely to be lower than traditional varieties (Giera and Struthers, 2007b).

Cassava prices have been going up in the last few years and went up by 1.13% in the first half of 2011, reaching the average price of Rp 2,988/kg in January and Rp 3,022/kg in June 2011 (Agro2, 2011).

The Cassava Indonesia Society Head, Mr Suhayo Husen, said the price increase is driven by high demand from both domestic and overseas industry. For example, Mr. Husen said, Indofood demand alone for semi-finished cassava processed into chips reached 200,000 to 300,000 tonnes per year, whereas to produce 1 kg of chips it takes about 3.5 kg of fresh cassava. The demand for cassava chip exports to China have also hugely outstripped supply, as one factory alone could require up to 4 million tones of cassava per year, at this stage Indonesia can only meet about 5% of that figure or about 200,000 tonnes of cassava chips. The high demand and prices offered by the food processing industry is creating a strong incentive for cassava production (Agro2, 2011).

According to Mr Huesn, in order to increase production, farmers not only need to expand their production area, but also need to use improved cassava varieties such as Manggu Darul Hidayah, which can give yields of 100Tonnes/Ha, as opposed to 20 Ton/Ha (Agro2, 2011).

The international marked demand for cassava is for ethanol, thus the export demand is for a processed product. To do this processing on a small scale, farmers need to invest in costly equipment such as a cassava cutting machine and dryer. Such investments have proved to be overwhelming even for the joint efforts of cooperatives or farmer groups combined.

The marketing channels for cassava are relatively simple Figure 49 – highlights that middlemen buy cassava, transport and sell directly to processing units. There are two types of middlemen - ordinary middlemen/collectors and middlemen who work under the *tebasan* system. The latter buy standing crop from the farmers' field. The majority of transactions are done through the ordinary system of collection.

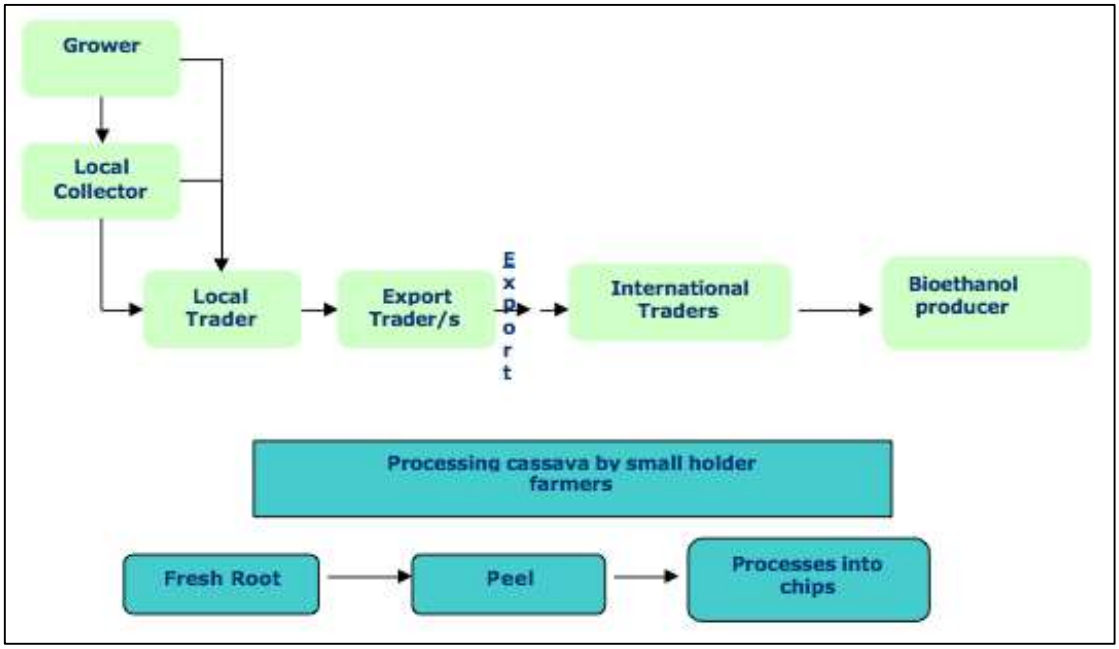


Figure 49: Supply chain for cassava from smallholder growers to bio-ethanol producers

The relatively low prices of cassava are the result of the oligopsonistic power of the existing large-scale processors. In an attempt to overcome this problem the Provincial Government of Lampung initiated the development of Farmer's Tapioca Processing Units (ITTARA) that are an autonomous business unit of a farmers' cooperative/group. These have three types of financing: a) personal finance; b) private companies and c) local government. It is believed that the coordination of efforts by small producers will lead to better prices and value-added potential at the lower end of the chain and thus improve farmers' income. In order to support the initiative the provincial government also supported local cooperatives of producers and traders, carried out training on technical and business issues, and encouraged the development of partnerships with businesses further up the chain. It also established a committee that agreed on prices and established a farm gate price of cassava of 13.6% of tapioca or 70% of FOB[46] price of dried cassava (gaplek). However, this price transmission to farm gate never reached the agreed level and many of the ITTARAs collapsed (especially the government funded ones). The reasons for this are outlined in the section on Marketing Pitfalls below.

The prices offered by the ITTARAs are often more favourable for the farmer than those offered by middlemen due to the proximity of the ITTARA and the relatively lower transport costs. (Indonesian Centre for Agricultural Socio Economic Research and Development, n.d.)

The literature review of cassava marketing has identified two clearly distinct market chains for cassava. One is based on the traditional (sweet) varieties of cassava, which is sold fresh or cooked for human consumption or used for animal feed and is predominantly for domestic consumption and the food processing industry. The second market chain is mainly for export and is based on ethanol production and the growing global demand for bio-fuels, especially with the exponential development of processing capacity in Asia (notably China).

[46] Free On Board

MARKETING PITFALLS

There are bottlenecks in the chain that impact negatively the producers and middlemen. This arises in situations during peak production season when middlemen have to wait in a queue for days before they can finally sell the fresh cassava to the processing unit. However by then the quality of the product has dropped and so has its value, thus affecting the producer, who is a price taker.

Factors that cause the failure of the government ITTARA initiative, especially the units funded through local government include:

- Inadequate managerial and technical skills
- Insufficient investment and working capital
- Inappropriate location selection
- Insufficient equipment to optimize outputs
- Weak coordination among government institutions
- Weak supervision and mentoring of the units

(Indonesian Centre for Agricultural Socio Economic Research and Development ND).

- Farmers often have limited marketing options with only one major buyer for bio-fuel
- The variability of seasonal supply may compromise the viability of small processing units

(Giera and Struthers, 2007b).

Finally, an externality that directly affects the costs of cassava production is the increase of the price of land as a result of the rise in demand for cassava production for bio-ethanol to satisfy growing domestic and international demand (Agro2, 2011).

13) SWEET POTATO SUB-SECTOR

GEOGRAPHICAL SCOPE

Sweet potato production in the Indonesian and Melanesian island groups dates back to pre-Colombian times, and Indonesia possess a rich set of indigenous sweet potato genetic resources. Traditional, sweet potato has been a staple food in the eastern part of the country (Papua Province especially) and an important food security crop in the densely populated island of Java (International Potato Center, 2003).

In 2011, in Indonesia there were 177,605Ha of sweet potato harvested area, showing growth of 0.38% in cultivation area since 2007 and is consistent with data from the previous decade, showing a lack of demand for growth. (Table 49) Out of the provinces included in Table 49, Papua has by far the largest sweet potato harvesting area. A comparison between East Java, West Nusa Tenggara (NTB) and East Nusa Tenggara (NTT) shows that East Java and NTT have similar amount of sweet potato cultivation areas, while NTB has dedicated just over 1,000Ha for sweat potato production, making it by far the smallest producer alongside West Papua.

Table 49: Sweet potato harvested area (Ha)

Province	2007	2008	2009	2010	2011	% Change
Indonesia	176,932	174,561	183,874	181,073	177,605	0.38%
East Java	13,975	13,750	16,203	14,981	14,340	2.61%
West Nusa Tenggara (NTB)	1,135	953	969	1,123	1,032	-9.07%
East Nusa Tenggara (NTT)	12,940	13,437	12,902	14,963	15,160	17.16%
West Papua	1,874	1,524	1,044	1,039	1,429	-23.75%
Papua	30,634	34,028	35,028	34,670	35,810	16.90%

Source: Badan Pusat Statistik (2011)

Most of the sweet potato varieties released on the market in the last decade have been the result of collaborative breeding between the Indonesian National Program and International Potato Centre (CIP). The newest releases are especially selected for their high productivity and potential for agro-processing (starch and flour, especially).

PRODUCTION

Sweet potato is a minor root crop traditionally grown by small farmers in Indonesia. Its status is still very much a crop grown for home consumption or for the fresh food market. Technical progress in sweet potato in Indonesia has been slow, and production has remained stagnant at around two million tons per year over the past two decades. A key challenge facing sweet potato is to develop new uses for the crop, especially in starch and flour processing. The trend toward greater utilization of sweet potato for agro-processing is slowing taking place. But one critical requirement is new and improved production technology to raise yields and reduce unit production costs in order to make sweet potato a competitive source of raw material in agro-processing (Gunawan, 1997).

Constraints to the diffusion of new varieties are an on-going concern. So far, no formal system has been established in Indonesia for disseminating improved sweet potato varieties to farmers. Farmers obtain most of their planting material locally, with very little exchange of planting materials between districts. One reason is the site-specificity of preferred varieties, with different varieties dominating in each different locality. Besides new high-yielding varieties, another approach to increasing sweet potato productivity is to improve crop management practices. Through better fertilization, plant spacing, hilling up, post-harvest handling, etc., farmers can increase crop yield and reduce production costs.

Even as we emphasize transforming sweet potato from a food crop to an industrial and feed crop, it is important not for forget that sweet potato is still and will continue to be a staple food for Indonesia's eastern citizens, especially those in Papua Province. This is the least developed of Indonesia's provinces, and there has been little prior work in trying to improve the subsistence sweet potato production systems found there. In 2001, CIP together with Indonesian partner institutions embarked on a three-year project with support from the Australian Center for International Agricultural Research (ACIAR) to develop improvements to the sweet potato and pig production systems in the highlands of Papua (International Potato Center, 2003).

The studies undertaken by UPWARD (Users Perspective with Agricultural Research and Development), a CIP network, have identified four major sweet potato production systems: (1) shifting cultivation in hillside and mountain areas, (2) home gardens, (3) upland rotations, and (4) lowland post-rice systems. The last is the most commercialized production system in Southeast Asia and by volume the most important system in Vietnam, Indonesia, and the Philippines. The different systems influence farmer maintenance of sweet potato diversity (Prain and Campilan, 1998).

Factors that affected the low sweet potato productivity were: (1) low and fluctuating root prices at farmers' level due to marketing system (about 30% spent for transportation cost); (2) local market for sweet potato still undeveloped; and (3) post-harvest technologies not adopted by farmers (Hasanuddin and Wargiono, 2003).In Indonesia, sweet potato is cultivated predominantly under lowland conditions. One common farming system is rotation, e.g., rice-sweet potato-vegetable (high elevation); rice-rice- sweet potato and rice-sweet potato-rice (lower elevation); and rice-sweet potato (rain-fed). Intercropping sweet potato with maize is a common practice. In this system, the crops are irrigated, where sweet potato is harvested when it matures after four to five months. Maize is either planted at the same time as the sweet potato or two weeks before sweet potato is planted.

It is cheaper to produce sweet potato than cereals for food security or as a famine crop (as staple food, rice substitute, or supplement). Sweet potato is increasingly cultivated for its cash value, where both vines and roots are processed into food or starch prior to sale. Its production cost is low and the risk of growing it is lower than growing cereal crops (Hasanuddin and Wargiono, 2003).

Sweet potato production in Indonesia has increased by 15% in the period 2007-2011. (Table 50) The biggest change in production is seen in East Java where production has increased by 46% during this period and NTT's output has gone up by 22%, in contrast NTB production has declined by 8%. The biggest overall decline is seen in West Papua where production levels have gone down by 22%.

Table 50: Sweet potato production (Ton)

Province	2007	2008	2009	2010	2011	% Change
Indonesia	1,886,852	1,881,761	2,057,913	2,051,046	2,172,437	15%
East Java	149,811	136,556	162,607	141,103	219,324	46%
West Nusa Tenggara	13,007	10,985	11,276	13,134	12,021	-8%
East Nusa Tenggara	102,375	107,316	103,635	121,284	125,048	22%
West Papua	18,702	15,340	10,599	10,557	14,680	-22%
Papua	306,804	337,096	343,325	349,134	361,870	18%

Source: Badan Pusat Statistik (2011)

In terms of productivity per Ha, East Java has shown the biggest increase of 43% (Table 51), which is consistent with the land increase data of 2.61% and simultaneous output volume increase of 46%. During 2007-2011 average national level productivity has increased by 15%, with NTB and NTT only showing 2% and 4% increase respectively.

Table 51: Sweet potato productivity T/Ha

Province	2007	2008	2009	2010	2011	% Change
Indonesia	10.66	10.78	11.19	11.33	12.23	15%
East Java	10.72	9.93	10.04	9.42	15.29	43%
West Nusa Tenggara	11.46	11.53	11.64	11.70	11.65	2%
East Nusa Tenggara	7.91	7.99	8.03	8.11	8.25	4%
West Papua	9.98	10.07	10.15	10.16	10.27	3%
Papua	10.02	9.91	9.80	10.07	10.11	1%

Source: Badan Pusat Statistik (2011)

Most varieties now cultivated have low dry matter (DM) content – 22 to 30%, too low for them to be used as a raw material in the processing industry, which prefers root DM content of more than 35%.

Between 1996 and 2000, Central Research Institute for Food Crop (CRIFC) and the regional office of the International Potato Center for East, Southeast Asia and the Pacific (CIP-ESEAP) released two new varieties of sweet potato. (Table 52 and Table 53) One, named Sewu (1998), which is moderately resistant to sweet potato weevil and the other, named Cangkuang (1998) is resistant to leaf scab. Anticipating the consumer demand for high DM and good eating quality, five sweet potato varieties were released in 2001: Sukuh, Jago, Kidal, Sari, and Boko. Most of these varieties have DM contents above 30 percent and have good eating quality (Jusuf, 2003).

Traditionally sweet potato is closely linked with pig farming, thus its growth brings positive economic gains, especially for poor smallholder producers. For example, Sweet potato and pig are connected to all the Papuan traditional events, such as marriages, funerals, and the resolution of conflicts. In Central Irian Jaya certain varieties are the most important human food and, in particular are the appropriate food for women to present to men (Prain and Campilan, 1998).

As shown by an evaluation of a CIP program using sweet potato to improve pig production in Papua-Indonesia, they also can be measured in terms of numerous livelihood assets. The results showed improvements in social cohesion, animal husbandry skills, technology, and planting material quality, in addition to increases in income and yields (International Potato Center, 1995). According to women (who plant and tend the beds), the proportion of beds dedicated to particular cultivars varies, depending on the proportion of people and pigs in households and compounds (Prain and Campilan, 1998).

Several government agencies have eagerly pursued breeding and improvement of sweet potato. Since its establishment, the Research Institute for Legume and Tuber Crops (RILET) is actively doing breeding work to increase yield and improve component characters such as dry matter, starch content, good eating quality, resistance to pests and diseases, and tolerance to problem soils. The objectives of the national sweet potato breeding program are:

1. To improve sweet potato productivity, tuber quality, and maturity for food, feed, and industrial purposes.
2. To improve tolerance of sweet potato clones to major biological constraints (sweet potato weevil and leaf scab disease).
3. To improve tolerance of sweet potato clones to major environmental stresses (drought and shading) (Jusuf, 2003).

Opportunities for expanding the use of sweet potato lie in three categories:

(1) *Fresh and processed for human consumption* - Sweet potato fulfills a number of basic roles in the global food system, all of which have fundamental implications for meeting food requirements, increasing food security, and reducing poverty as a cheap calorie source also rich in vitamin A and C and minerals. It is generally accepted that sweet potato has good prospects as a source of food. It contains more calories per unit weight than potato (113 vs 75 calories/100 grams), it is rich in vitamin A (100 grams provides 7,100 IU), ascorbic acid, thiamin, riboflavin, niacin, and minerals; (See Appendix 1 - Table 54).

(2) *Fresh and dried for animal feed* - Use of unmarketable fresh roots (very small size, damaged by pests/diseases) was most common in production areas. Moreover, sweet potato foliage as feed for livestock has been gaining importance. Cattle fed with it produce much manure that can be recycled as fertilizer in crop production. In a rice-sweet potato cropping system where rice is fertilized with cattle manure, root yield increases significantly;

(3) *Starches and flours for food and non-food uses* - Expanding sweet potato for industrial uses must be backed up by innovative postharvest technologies. Physicochemical properties of sweet potato significantly differ among varieties. Therefore, suitable varieties for each processed product are needed.

(Hasanuddin and Wargiono, 2003)

PRODUCTION PITFALLS

Consumption of fresh roots tends to decline as per capita income rises and consumers will switch to more preferred foods. Therefore, future research must investigate the feasibility of improving quality and lowering unit cost, or channeling output into emerging specialist markets such as the starch market for upstream industries (Hasanuddin and Wargiono, 2003).

- Short comings of new varieties in terms of eating quality, storability, and adaptability to marginal environment;
- Limited access of farmers to planting materials of new varieties, no distribution program for sweet potato cuttings;
- Difficulty in distribution of sweet potato seed pieces because of their high perishability, bulk, and problems in maintaining/multiplying quality seed pieces in the field;

- No stable market for increased production;
- Need to identify adequate national conservation strategies to ensure the continued availability of genetic diversity to farmers and plant breeders (Prain and Campilan, 1998)
- Bulkiness/perishability – Prone to pests and diseases after harvest;
- Low multiplication rates - Takes longer to produce an adequate supply of the crop's planting material than that of cereals;
- High per unit production cost - For sweet potato to become more widely used in processed form, higher yield in starch equivalent is necessary to bring down the cost of the roots as a source of raw material;
- Low status - Sweet potato carries the stigma of being the "poor people's food" and as such, consumption is low;
- Small resource-poor producers - Farmers who cultivate sweet potato are typically among the poorest farm households in a region;
- Supply chain linkages - Sustained improvements in sweet potato production are often highly contingent upon access to new markets and the development of processing and marketing activities (Hasanuddin and Wargiono, 2003).

PROCESSING

In Indonesia, sweet potato is a major root crop but is not processed on a significant scale. Besides some snack and street food production, and some sales to larger scale sauce producers, the bulk of the crop is consumed fresh. However, per capita fresh consumption generally declines as income and urbanization increase, both strong current tends in Indonesia. Farmer field schools for sweet potato production in Central and East Java report increased fresh root price fluctuations in recent years, and farmers are now interested in market diversification for sweet potato (Peters and Wheatley, 1997).

Sweet potato has long been used for food, industrial purposes, and feed in Indonesia. Production, however, is stagnant due to relatively low consumer demand. Recently the use of sweet potato as food has decreased, while its use in industrial processes and as a feed has increased (Jusuf, 2003). Estimates of the total demand for sweet potato by food industries vary widely, from 2,000 t/year to 500,000 t/year (Jusuf, 2003).

Fresh roots are cooked in various ways: boiled, steamed, coated with butter then fried, and used in a variety of local dessert or snack preparations. There is no accurate information regarding the proportion used in processing, but sweet potato is used in some food industries as a thickener (e.g. in sauces). It is also used in making fried crisps (locally known as *kripik*) and a confectionery called *kremes* made from fried matchstick-sized sweet potato cuts coated with liquid brown sugar (Jusuf, 2003).

The future of sweet potato is related to several conditions: the advantage of this crop over the nearest substitute for cassava in terms of maturity, high yield, cultivation techniques, and high profitability to farmers and processing industries; and the ability to substitute for cassava flour/starch and wheat flour for many different processed products. Processing technology is most crucial to improve the role of sweet potato as a source of food and in the food industry. Based on the data on food processing capacity, and assuming that sweet potato can substitute 5% of wheat flour and cassava in glucose and fructose industries, and considering that 80% of tomato or chili sauce contains sweet potato, a rough estimate of large industry's demand for sweet potato is about 1.7 million tons. This means the total demand including that for human consumption will be about twice the current national production (Gunawan, 1997).

Starch is important for the textile industries and in the manufacture of flavor enhancers such as monosodium glutamate (MSG), sweeteners such as glucose and high-fructose syrups, and fermentation products such as lactic and acetic acids (Jusuf, 2003).

Large demand for sweet potato comes from large-scale processing industries and exporters. PT Siantar Top, for example, can process 80-100 of sweet potato per day. Sweet potato crackers, cubes, chips, and flour seem to be the most important products of this company. Some of these products are exported to Japan. But some of these are also available in the domestic market (Jusuf 2003).

Sweet potato processing is an income-earner for poor households. Sweet potato processing for starch is also closely linked to pig production as residues are used as feed. This integrated system, which generates income from starch and noodle as well as livestock, requires improvement in efficiency and profitability if it is to remain sustainable (Hasanuddin and Wargiono, 2003).

Sweet potato flour was shown to be the best opportunity for new product introduction (sweet potato starch would face strong competition from cassava starch, which is inexpensive and widely available, and snack foods made from fresh roots have limited market potential). Sweet potato flour has potential markets in both bakery and noodle sectors of the food industry, at both small and medium scales. Rising national wheat flour prices since 1994 have started to impact on Indonesia's flour users (Peters and Wheatley, 1997).

PROCESSING PITFALLS

- As a source of starch sweet potato can not compete with cassava;
- There are two technical concerns that need to be addressed before sweet potato flour processing can be considered feasible from the production and processing perspective:
    - the browning effect during processing, and
    - the unexpectedly low conversion rate. The former adversely affects flour color, reducing market acceptability, while the latter reduces the economic benefits from flour processing (Peters and Wheatley, 1997).

MARKETING

Traditionally, sweet potato, along with maize and peanuts, is sold by the *tobasan* system, in which sweet potato is sold while still in the ground before harvest. In this system, the local collectors sample one or two plants in any particular field, estimate the tonnage one might harvest from that field, and offer a price for that specific field. Thus, at the farm level, the role of middlemen has been exceptionally large putting farmers in a weak bargaining position. Sweet potato farmers sell their product by the *tebasan* system (selling the crop before harvest) simply to reduce the risk from loss because of spoiled, unsold crop (Peters and Wheatley, 1997).

There is no immediate change in market prospects for sweet potato under current use and technology conditions. The demand for sweet potato will increase considerably if it can substitute for other raw materials, especially cassava, in sugar, fructose, and maltose industries.

These industries are currently facing shortages of raw material. Sweet potato is a perfect substitute commodity for these industries, because it requires less time for production, yields higher and contains a better nutritional composition. This, however, needs to be supported by more efficient market links.

Theoretically, marketing utility or value added can generally be divided into: (a) *space utility* - through transporting the commodity from the production area to the consumption area, (b) *time utility* - through storing the product for future consumption during the off season, and (c) *form utility* - through quality improvement and processing. The bulky and perishable characteristics of the product and the limited use of sweet potato in downstream industries have constrained the commodity from achieving added value (Gunawan, 1997).

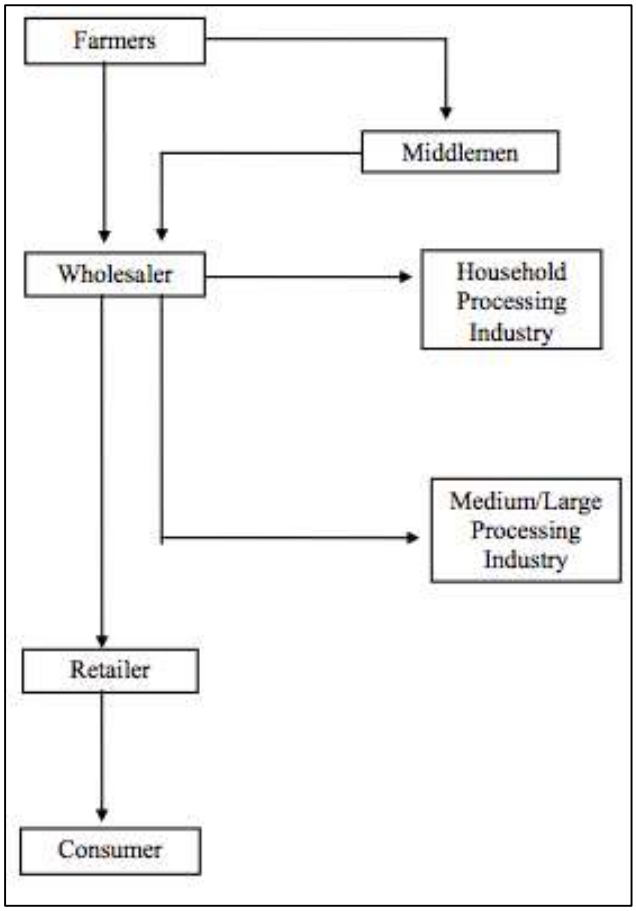
Sweet potato marketing channels are usually simple and short. Farmer - wholesaler - retailer or farmer - wholesaler - processor industry is the most common channel in sweet potato marketing. In producing areas few village traders are interested in marketing because of the product's bulky and perishable characteristics.

Two common marketing mechanisms are found in the sweet potato market, namely:

- Commission agents or middlemen play a significant role in the transaction between traders and farmers, which often results in buyers paying a high price and farmers receiving a disproportionally low price.
- Wholesalers or processing plants buy the product directly or from farmers through their hired agents only if the farmer has had a long relationship with the wholesaler or processing industry.

In general farmers sell sweet potato directly from the field to small or village traders. The common marketing chain for sweet potato is presented in Figure 50. In the case of grain, small traders usually operate at the village level and buy grain from farmers and then resell to larger sellers or wholesalers. However, sweet potato should be sold usually no more than 2 days after harvest or its price drops substantially due to reduced quality. In the sweet potato market, the role of small traders is less pivotal (Gunawan, 1997).

Because of its bulky feature and high transportation cost most traders transport the sweet potato directly from farms to regional markets before distribution by large wholesalers to other cities and retailers. In Indonesia there is no, or very little, inter-island market for sweet potato (Gunawan, 1997).



Source: Gunawan, 1997

Figure 50: Fresh sweet potato marketing channels

As in many other agricultural product value-chains, the distribution of the profit margin in the sweet potato economy is biased towards traders. Although farmers acquire the highest profit margin per kg, in terms of unit of time the profit margins of middlemen and wholesaler are higher (Gunawan, 1997).

Sweet potato marketing and market development are areas where significant research gaps remain. For starch, cassava is currently the most competitive raw material in Southeast Asia, but sweet potato is economical in parts of China and for food products requiring specific functional properties of starch found in sweet potato. New, high starch-yielding varieties of sweet potato will improve competitiveness in regional starch markets (International Potato Center, 2003).

For animal feed, sweet potato is most competitive in mixed crop-livestock systems where the high protein content of sweet potato vines can be added to animal feed along with the energy-rich roots. Since protein is a major constraint to livestock productivity in Asia, the potential of sweet potato to supply protein for animal feed rations needs further attention (International Potato Center, 2003).

MARKETING PITFALLS

There are a number of pitfalls associated with the marketing of sweet potatoes that are linked to the characteristics of production and the current trends for its use. Some of the key issues that need to be considered are:

- The dispersed location of production and the natural characteristics of the product cause transportation costs to be a major component of the sweet potato price;
- The market for sweet potato is relatively small and, therefore, does not create incentive to farmers. Increasing production under the current consumption pattern will result in a price decrease; and
- Fresh root consumption of this crop is declining. Creating demand for further processing is essential to develop a better sweet potato market (Gunawan, 1997).

Economic feasibility of sweet potato flour production must take sustainability into consideration. This means persistent and acceptable profit gained from the difference between the potential market price and the costs of producing the flour – currently evidence suggest that achieving economic profitability is difficult unless done through improved market channels and on a large scale (Peters and Wheatley, 1997).

APPENDIX 1: CHARACTERISTICS OF SWEET POTATO

Table 52: Sweet potato varieties officially released in Indonesia since 1980

No	Official variety name	Year of Release	NARS breeder and institution	Source of material Country /institution	Year of first use in NARS	Related to CIP Yes or No	CIP number
1	Sukuh	2000	M. Jusuf, RILET	Indonesia, CIP	1996	Yes	AB 94001-8
2	Jago	2000	M. Jusuf, RILET	Indonesia, CIP	1996	Yes	B 0053-9
3	Kidal	2000	M. Jusuf, RILET	Phillipines, SAPRAD	1993	No	
4	Sari	2000	Rahayuningsih, RILET	Indonesia, RILET	1995	No	
5	Boko	2000	Rahayuningsih, RILET	Indonesia, RILET	1995	No	
6	Cangkuang	1998	M. Jusuf, RILET	Indonesia, CIP	1994	Yes	
7	Sewu	1998	M. Jusuf, RILET	Indonesia, SARIF	1994	No	
8	Muara Takus	1994	M. Jusuf, RILET	Indonesia, BORIF	1990	No	
9	Kalasan	1989	Sriwidodo, MARIF	Taiwan, AVRDC	1983	No	
10	Mendut	1987	Yudi Widodo, MARIF	Nigeria, IITA	1982	No	
11	Prambanan	1984	Wargiono, BORIF	Not Known	1978	No	
12	Borobudur	1984	Wargiono, BORIF	Not Known	1978	No	
13	Daya	1982	Wargiono, BORIF	Not Known	1976	No	
14	Gedang	1982	Wargiono, BORIF	Not Known	1976	No	

Source: Jusuf (2003)

Table 53: Characteristics of sweet potato varieties released in Indonesia

Variety	Cangkuang *)	Sewu *)	Kidal	Sukuh *)	Jago *)	Sari	Boko
Promising clones	SRIS 226 Op 95	I 1186= Daya-6	Inaswang Op 95-6	AB 94001-8	B 0053-9	MIS 104-1	MIS 146-1
Year released	1998	1998	2000	2000	2000	2000	2000
Skin color	Red	Dark Yellow	Dark Yellow	Yellow	Light Yellow	Red	Dark Red
Flesh color	Light Yellow	Orange	Red	White	White	Orange	Light Yellow
Dry matter (%)	30.7	27.7	31.0	35.0	33.0	31.6	32.5
Fiber content (%)	1.13	1.03	1.07	0.85	1.09	-	-
Protein content (%)	1.32	1.59	1.62	1.62	1.50	1.91	1.73
Total sugar (%)	4.56	4.5	4.82	4.56	4.26	5.23	4.69
Vitamin C (mg/100 gr)	22.31	27.3	20.22	19.21	20.65	21.52	30.89
Beta carotene (mkg/100 gr)	14.6	14.05	347.84	36.59	84.99	380.9	108.1
Fresh yield (t/ha)	30 - 31	28.5 - 30	25 - 30	25 – 30	25 - 30	30 - 32	25 - 30
Specification	High yield, good root shape, R to scab, MR to Cercospora	High yield, good root shape, MR to scab, MR to Cercospora	High yield, high beta carotene, R to scab, R to Cercospora, fresh consumption	High yield, high dry matter, for starch/flour, MR to scab, MR to Cercospora	High yield, high dry matter, for starch/flour, MR to scab, MR to Cercospora	High yield, high beta carotene, R to scab, MR to Cercospora	High yield, good root shape, R to scab, MR to Cercospora

*) Involvement of CIP - ESEAP

Source: Jusuf (2003)

Table 54: Food crops nutrition values comparison

Food Crops	Calorie cost (Rp)	Vitamin			Minerals		
		A (Si)	B1 (mg)	C (mg)	Fe	Ca	Fe
					——mg——		
Rice	172	0	0,69	0	20.82	486	2.78
Maize	86	1795	1,34	0	35.20	901	8.45
Cassava	59	3065	236	0,48	262.68	318	5.57
Sweeetpotato	84	78232	224	0,91	304.80	498	7.11

Source: Hasanuddin and Wargiono (2003)

Table 55: The different characteristics suitable for the different uses of sweet potato

Characteristics	Foods		Industrial uses/export	Feed
	Fresh roots	Processed food		
High yield *)	X	X	X	X
Drought tolerant	X	X	X	X
Shading tolerant	X	X	X	X
High DM content	X	X	X	-
Roots size	X	X	X	-
Roots appearance	X	-	X	-
Good taste	X	-	X	-
Tolerant to	X	X	X	-
Pests & diseases	X	X	X	X

* Root and foliage

Source: Hasanuddin and Wargiono (2003)

14) GRAIN LEGUMES SUB-SECTOR

GEOGRAPHICAL SCOPE

Soybean (*Glycine max*) and mungbean (*Vigna radiata*) are two crops requiring a similar agroecosystem and for the purposes of this review are discussed under the collective grouping of grain legumes. They are important food and cash crops for for the eastern Indonesian provinces of Nusa Tenggara Barat (NTB) and Nusa Tenggara Timur (NTT). However they have differing importance to each region according to the type of crop. For example, soybeans are of a higher importance than mungbean in East Java and NTB. Proportionally, mungbeans are of greater significance in the NTT region than are soybeans presumably due to their lower water requirements and shorter time to maturity. This is important in NTT where the seasonal variations are more distinct and the main wet season is shorter with more intense rainfall.

Table 56 shows that the area under cultivation for soybeans has steadily increased in East Java and NTB, while in NTT the area under cultivation remained flat with a decline in 2011. East Java accounted for over 40% of the national production area in 2011, in turn NTB accounted for less than 12% and NTT less than 0.0021% of the area. In relative terms soybeans are insignificant within NTT. The three provinces of East Java, NTB and NTT account for approximately 43% of national production area.

Table 56: Soybean harvested area (Ha)

Province	2007	2008	2009	2010	2011
Indonesia	459,116	590,956	722,791	660,823	631,425
East Java	199,493	216,828	264,779	246,894	254,666
West Nusa Tenggara (NTB)	56,901	76,154	87,920	86,649	74,806
East Nusa Tenggara (NTT)	1,529	2,326	2,010	1,758	1,320

Source: Badan Pusat Statistik 2011

Table 57 displays the area under cultivation for mungbeans nationally and across the selected provinces. Mungbean production areas have remained static nationally, in East Java and NTB, while the area under production has halved in NTT between 2007 and 2011.

Table 57: Mungbean harvest area (Ha)

Province	2007	2008	2009	2010	2011
Indonesia	306,207	278,137	288,206	258,157	292,040
East Java	71,743	62,921	71,581	67,868	68,397
West Nusa Tenggara (NTB)	43,990	40,017	34,536	45,511	46,620
East Nusa Tenggara (NTT)	24,694	28,015	24,277	15,767	12,488

Source: Badan Pusat Statistik 2011

In NTT, mungbeans have a greater significance than soybeans. It ranks as the fourth most important crop after maize, rice and cassava in terms of area planted. In West Timor in the Belu district in particular, where soil fertility and rainfall are higher than other districts, mungbeans represents a major crop that fits within the planting and harvesting of rice and maize (Rao, Douglas & Rahmianna 2007).

PRODUCTION

Soybean and mungbean are important food and cash crops in NTB and NTT. Both crops are used extensively in Indonesian cuisine and the demand for soybean in particular is well in excess of domestic supply. Currently Indonesia runs a large trade deficit in soybean (over 1.3 million tonnes) and small deficit in mungbeans (11,000 tonnes)[47]. The high demand from China and current price for soybean at approximately $US660/tonne indicate that prices are likely to remain high. The rapidly raising demand and the high international market prices of both soybean and mungbean

Table 58 highlights that East Java and NTB are dominant producers of soybean in the Indonesian market with East Java accounting for over 41% of production and NTB 9.5% pf production. Soybeans are a minor crop in NTT accounting for only 0.16% of production in 2011.

Table 58: Soybean production (tonnes)

Province	2007	2008	2009	2010	2011
Indonesia	592,534	775,710	974,512	907,031	870,068
East Java	252,027	277,281	355,260	339,491	357,438
West Nusa Tenggara	68,419	95,106	95,846	93,122	82,836
East Nusa Tenggara	1,561	2,295	2,101	1,780	1,338

Source: Badan Pusat Statistik 2011

In terms of productivity, soybeans in Indonesia are significantly lower than the two leading producers, the United States and Brazil. According to FAO statistics (2010) the average national production per hectare in Indonesia at 1.37 t/Ha was less than half the average tonnes per hectare of the United States and Brazil at 2.92 t/Ha and 2.94 t/Ha respectively. Table 59 indicates there has been steady but slow increase in soybean productivity between 2007 to 2011. This data indicates there is considerable scope for improvement in soybean productivity which would have economically beneficial impacts for farmers and reduce Indonesia's dependence on importation.

Table 59: Soybean productivity (t/Ha)

Province	2007	2008	2009	2010	2011
Indonesia	1.29	1.31	1.35	1.37	1.38
East Java	1.26	1.28	1.34	1.38	1.40
West Nusa Tenggara	1.20	1.25	1.09	1.07	1.11
East Nusa Tenggara	1.02	0.99	1.05	1.01	1.01

Source: Badan Pusat Statistik 2011

As indicated earlier NTT has a greater emphasis on mungbean production than soybeans due to limitations in the agronomic potential of the latter in the province. However, mungbean production has shown a significant decline in NTT, halving in the period between 2007 and 2011 from over 20,000 tonnes in 2007 to under 11,000 tonnes in 2011 (Table 60).

47 FAOStat 2009 – Indonesia trade data for soybean and mungbean (Bean -Dry) 2009

Table 60: Mungbean production (tonnes)

Province	2007	2008	2009	2010	2011
Indonesia	322,487	298,059	314,486	291,705	334,733
East Java	80,241	72,126	83,629	79,878	80,081
West Nusa Tenggara	40,970	39,756	33,774	50,012	52,172
East Nusa Tenggara	20,802	23,392	20,447	13,462	10,514

Source: Badan Pusat Statistik 2011

Productivity has also remained static nationally. However, NTB has show significant growth with up to a 17% increase in productivity in NTB over a four year period from 2007 to 2011 (Table 61). The peanut, mungbean and soybean sector has been a focus of ACIAR over this same period. Anecdotally the evidence appears to suggest that the research and extension from ACIAR, the International Finance Corporation (IFC) and their association with Garuda Foods has lifted productivity particularly in NTB.

Table 61: Mungbean productivity (t/Ha)

Province	2007	2008	2009	2010	2011
Indonesia	1.05	1.07	1.09	1.13	1.15
East Java	1.12	1.15	1.17	1.18	1.17
West Nusa Tenggara	0.93	0.99	0.98	1.10	1.12
East Nusa Tenggara	0.84	0.83	0.84	0.85	0.84

Source: Badan Pusat Statistik 2011

Soybean and mungbeans are predominantly grown in three seasons of the year and is dependent on the availability of rainfall or irrigation and the competitiveness of rice in terms of marketing. The three growing seasons (scenarios) are as follows:

- Upland rainfed production – In East Java and NTB, these crops are grown over the wet season wet season from November to March on clay loam to sandy loam soils with no irrigation
- Lowland rainfed production – grown on the heavier clay soils following on from the wet season rice crop.
- Lowland irrigated production – grown on the heavier clay soils following multiple rice crops which are grown between November and May.

In NTT mungbeans, which are more significant than soybeans in terms of production, tend to follow a rotation pattern with other crops as follows:

- Lowland rainfed production – following rice harvested in April/May the mungbean crop is planted and harvested in July. Field are often left to fallow through to the next season rice crop. If irrigation is available some farmers may plant another crop prior to the main rice crop.
- Upland cropping systems – mungbeans are often grown after the harvest of maize or cassava utilising stored moisture or opportunistic rainfall events. In some part of NTT (Belu district) where there is a bi-modal rainfall pattern, farmers will intercrop maize or cassava with mungbeans.

Similarly to peanuts, soybeans and mungbeans offer additional income streams to farmers often in the post-rice harvest season, when a short-term legume can be rotated with rice in order to utilise residual moisture after the rice crop. With agriculture being the major source of employment for the rural poor in East Java, NTT and NTB (usually as

tenant farmers) and the rural poor estimated to be in excess of 3 million people there is a high potential to reach a large number of poor household involved in production and post-production activities.

PRODUCTION PITFALLS

- Access to seed in terms of high quality (high germination) and improved varieties for both soybean and mungbeans is a major production limitation.
- Low knowledge regarding crop protection and best management practices.
- Currently low input systems with little capital costs, results in low output.
- Practice of "dibbling" (4-6 seeds per hill), particularly for mungbean reflects a lack of confidence in the quality of the seed.

PROCESSING

MUNGBEAN

Mungbean starch is used as an ingredient in many food products. Mungbean starch processing is more or less an integrated food manufacturing industry engaged in the production of vermicelli or transparent noodles. Most human consumption of mungbean is in the form of bean sprouts, which is popular in many typical Indonesian dishes.

Mungbean is also consumed as a dessert by either boiling the whole bean or boiling the dehulled half-bean with sugar. Figures for the amount of mungbean consumed as a dessert were not available.

Mungbean flour is produced by grinding or crushing mungbean into flour. The flour has various usages in food processing and daily food preparation as well. A certain proportion of mungbean flour is used in bakery products such as cookies or biscuits. The total production, as well as annual consumption of mungbean flour is still unknown.

SOYBEAN

Much of the soybean grown in Indonesia is used to produce Tofu and Tempeh which is mostly an activity of small scale merchants. In Lombok over 132 tonnes of soybean are used each day of which over 70% is imported. There is an overwhelming demand for soybean but an inadequate supply from local production. Much of the demand for imported soybean has arisen from the demand for more consistent seed sizing ad colour.

Tofu and Tempeh makers are mostly small scale householders which use approximately 100 kg/day. Due to their size many producers can not afford to buy grain in bulk and store which leaves them vulnerable to grain traders and inflated prices in periods of high demand.

Recommendations have been made by Garside et al (2009) that the Tofu and Tempeh Association with the assistance of the government, develop grain storage and handling facilities to allow for bulk purchases, storage and sale of grain to members on a non-profit basis.

MARKETING

The marketing of mungbeans is generally for the domestic market. The desirable characteristics of mungbeans include size, presence of fully filled seed, lack of split beans and absence of dirt in the sample. In 2007 the average price paid to farmers was between IDR 3,000 – 4000 per kg. At traditional markets in Kupang, West Timor the price was between

IDR7500 – 8000 per kg with bean sprouts averaging IDR5000 per kg. This represents a 100% increase in price above farmer prices in the market and an additional 100% again for sprouts considering 1kg of dry beans produces 3 kg of sprouts.

Opportunities exist in three areas for mungbean farmers in particular:

1. Selling to local collector/traders
2. Direct selling own produce at market
3. Selling to wholesale market traders

In terms of soybean, much of the production in NTB goes to Tofu and Tempeh production or is exported to other provinces in Indonesia. In Sumbawa for example, up to 90% of the harvested soybean is exported to other provinces and Lombok (Garside et al 2009).

MARKETING PITFALLS

- Smallholders have limited bargaining power with local traders
- Little awareness of market specifications for products derived from soybean and mungbean
- Relationships with large buyers can be difficult to maintain in terms of adhering to quality for supplied commodities

15) NON-TIMBER FOREST PRODUCTS (NTFP) SUB-SECTOR

GEOGRAPHICAL SCOPE

The NTFP sector is really a variety of products harvested from the forest rather than a single commodity as indicated in other sectors decribed in the review. Such products include for example, wild honey, wax, candle nut, bamboo, plant oils, edible mushrooms, foods and drinks and basketry products. The term NTFP was first developed by de Beer and McDermott (1989, cited in Belcher 2003) when they described Non-Timber Forest Products as encompassing all biological materials other than timber, which are extracted from forests for human use. In Indonesia many farmers still maintain customary agroforestry systems, with plots made up of mixed fruit trees and other useful plants (ProFound, 2007).

NTFP is a diverse "sector" in that multiple products across a broad area of forest and forest margin communities can be considered as NTFP. Table 62 provides some estimates from the literature of the contribution to the Indonesian economy and the number of people included in the "informal sector" of NTFP in Indonesia.

Table 62: Estimates for the production/harvesting of NTFPs

	East Java	East Nusa Tenggara (NTT)	West Nusa Tenggara (NTB)	Papua	West Papua	Indonesia
Area of Production (ha)	• Estimates of area, production and value for individual provinces are unavailable because of the generally unofficial nature of the broad sector that is NTFP. • Multiple products, inconclusive or unknown use of certain forested areas and precise yields are unobtainable. • Estimates of national value of production: $US1.5 Billion - $US3 Billion • Estimates of national dependence on forests vary widely between: 1.5 to 65 million.					
Volume of Production (tons)						
Yield (t/ha)						
Value of Production (Rp/US$)						
People Employed						

NTFPs offer a reliable source of basic subsistence needs and income for a diverse group of people across Indonesia. They are closely related to land right and forest user right issues. NTFPs – as collected from the wild and from cultivation - also offers local people a bridge between agriculture and forest management. This is important, as a risk avoidance strategy (food variety, medicines, building materials and such), within the context of deforestation and growing dependence on sedentary agriculture and the market economy. Many NTFPs, notwithstanding their connotation as a "poor man's" resource, represents high market value and are not easily subjected to monopoly by government and the private sector (ProFound, 2007).

NTFP provides many poor households with an "informal" sector income to often subsidize their so called formal income. Many products developed from harvested raw materials are linked to culture and religion. These foods and materials have been used for hundreds of years and provide poor households with some economic security in periods

of instability, such as the economic financial crisis of 1997. NTFP requires minimal capital expense to initiate and maintain the activity (Cunningham et al, 2011).

PRODUCTION

Because of the "informal" nature of NTFP it is difficult to place a real estimate on the production and value of those products that constitute NTFP. However estimates for some of the products that are part of the NTFP sector can provide an insight into the value of the sector to the economy and the many rural poor in Indonesia. Because of the great variety of products harvested from forests and on the margins of forests and agricultural land, this review can only provide examples or case studies to reflect the complex issues involved in the production, processing and the marketing of NTFPs.

For example the sale of wild harvested candle nut (*Aleurites moluccana*) fetches between US$350 and US$700 per tonnes. This product is high in polyunsaturated fatty acid and is comparable to other cosmetic oils such as blackcurrent or primrose oil. Global sales in natural or organic cosmetics and cosmetic oils were almost US$7 billion in 2007 and were expected to increase to US$10 billion by 2010 (Cunningham et al, 2011).

Income increase for farmer however, is reliant on the ability of harvesters to participate in value adding activities. Much of the raw harvested product requires value-adding to become a saleable commodity. The potential to encourage micro-enterprise development based around NTFP to create employment and economic activities is high. There is a suggestion in the literature that in regions such as NTT with a low arable potential, the sustainable harvesting of NTFP may provide a better path out of poverty than some agricultural activities or other forest based activities such as logging (Cunningham et al, 2011).

Estimates are that there is up to 30 million people depending directly on the forestry sector and even more depending on NTFP for their livelihood. Many of these people live by a tradtional "portfolio" of economic strategies, which include common agricultural activities as well as the gathering or harvesting of NTFPs.

PRODUCTION PITFALLS

- At low levels of harvesting for private or local consumption there is little problems, however if high prices lead to over exploitation then forest degradation can result (D.N., 2001).
- Often many of the species are suitable only in forested or forest margin plant communities. The attempted establishment in plantation or local farms is often not suitable to plant development and growth. Maintenance of the forest communities is vital for the ongoing production of many species.
- Common land is the most common form areas within which NTFPs are harvested. If there is tenure of land then there is a higher likelihood that the land will be used for other longer term agricultural activity. Under common access rights there is less incentive to plant and engage in cultivated activities rather than the opportunistic harvesting of products instead.

PROCESSING

Processing of NTFPs is dependent on the specific product being harvested and the resultant end product available to consumers. For example the harvesting and processing of wild honey from the large wild honey bee (*Apis dorsata*) in West Timor is mainly from the large combs hanging from branches. Official trade figure suggest over 3000 ltr/year is

exported from Kupang, West Timor. The only processing that occurs is bottling in second-hand bottles, which then get sold to passing traffic. Some honey harvesters transform the bees wax into candles. However the marketing of the products are rudimentary and do not take full advantage of their "wild honey" status (Cunningham et al, 2011).

Many of the NTFPs require a processing stage to create the final product for sale either locally or internationally. This processing stage actually offers significant permanent or seasonal alternative employment opportunities to many households. Indonesia is varied both geographically and culturally. The development model that is appropriate for Java is not necessarily appropriate for West Timor or Flores for example. A development model that can take into account local conditions, local economies and local social structure and patterns of resource use may be more beneficial.

Processing of NTFPs is often part of a large informal sector of a developing nation's economic activity. Efforts to reduce the effects of poverty should also address the issues surrounding the importance of the informal sector to the poorest households, particularly in Indonesia, rather than necessarily focussing on commercial products for large scale markets and dealing with medium to large scale enterprises (Becker, 2004 cited in Cunningham et al, 2011).

Micro-enterprise development is widely acknowledged as an important activity to foster in developing countries, where self-employment contributes towards economic opportunities for low-income households that have limited employment opportunities (Woller 2004, cited in Cunningham et al, 2011).

Many of the NTFPs from eastern Indonesia are related to cultural food preferences and traditional uses. Traditional medicines have been harvested for a long time and used across the variety of culture along the archipelago. For example, *jamu* (traditional medicine) has a large trade in Indonesia with the literature suggesting over 997 manufacturers, 98 of them at an industrial scale (Afdhal and Welsch 1988, cited in Cunningham et al, 2011). There may be opportunities to bring NTFP jamu ingredients into this larger processing system.

PROCESSING PITFALLS

- Efforts to enhance processing may not fully take into account the informal nature of the sector and a drive to develop more capital intensive processing may not account for the multiple activities these household pursue in order to maintain a year around income stream.
- Many of the NTFPs are niche activities. Over estimating the importance in terms of income generation potential is a large risk to upgrading the processing activities in a particular niche product.

MARKETING

The marketing of NTFP goes hand-in-hand with the processing. In the previous limited example regarding the processing of wild honey. Currently the wild honey is sold on the roadside with no labelling or branding. An approach used by the Sumbawa Forest Honey Network which was assisted by the Indonesian Forest Honey Network through training and better marketing to develop a specific brand and label for their honey. The "honey-harvesters" have also improved their processing techniques to subsequently improve the honey quality (Cunningham et al, 2011).

Regionally the trade in NTFPs is large but closely associated with seasonal cultural practices and the seasona availability of the variety of products. Marketing is not necessarily a mojor focus of this aspect of trade, rather the domain of the potentially international products derived from NTFP. In the example of jamu, the cost of complying with certification such as Halal or organic, that would substantially increase the value of returns to harvestor and processors

MARKETING PITFALLS

- It is often wrong to assume that because NTFP is important to the poor that any measures to develop the sector or product will actually help the poor. There may be some significant constraints that make it difficult to develop beyond the stage of wild harvesting. Where the resources are in the commons, over exploitation and dissipation of revenues from open access will often prevail (Belcher, Ruiz-Perez and Achdiawan, 2005).
- External conditions such as transportation infrastructure, market access, property rights, education and health care and limits to capital, skills and connections make it difficult for the poor to move beyond the current situation and fully engage in higher market development.
- Development of medicinal markets may be difficult due to the fact that much of this trade is done through tight social and cultural networks. Creating new markets in this scenario can be costly and unsuccessful due to these non commercial and historical factors.

16) VEGETABLE SUB-SECTOR

GEOGRAPHICAL SCOPE

Vegetables are a major component and an important part of the Indonesian diet and regularly served along with rice with spicy ingredients that often include condiments such as chilli and shallots. Indonesia grows over 20 types of vegetables across its 33 provinces and yet over 85% of all vegetables are produced in Sumatra and Java (West Java produces 35.6% of the national production) (White et al, 2007). The top five vegetable production crops grown in Indonesia in 2010 in order of production tonnage were Shallot, Chili, Potato, Cabbage and Tomato (Table 63).

Table 63: Top five vegetables produced in Indonesia

Indonesia	Yld (tonnes)	Area (Ha)	Prod. (t/Ha)
Cabbage	1,048,934	109,634	9.57
Chili[48]	1,328,864	237,105	5.60
Potato	1,060,805	66,531	15.94
Shallot	1,385,044	67,531	20.51
Tomato	891,616	61,154	14.58

Source: Badan Pusat Statistik (2011)

In contrast to the high productivity and large production of vegetables stemming from Java, eastern Indonesia, which includes Sulawesi, West Nusa Tenggara (NTB) and East Nusa Tenggara (NTT), accounted for approximately only 11.6% (2005 data). The eastern part of Indonesia is a net importer of vegetables mainly from Java. Not all of the provinces have the geographic potential that favours vegetable production as does Java. In the drier parts of eastern Indonesia the potential for a diverse range of vegetable production is lower due to lower rainfall, poorer soil fertility and a longer more pronounced dry season. The focus of the data in this report is on the opportunities and constraints for high value vegetable production in East Java, NTB and NTT specifically.

According to Johnson, Weinberger and Wu (2008) the Ministry of Agriculture (MoA) has placed priority on shallots, chilli, potato, tomato, beans, cabbage, mushroom, yard long bean, eggplant and cucumber.

Due to the variety of landscapes and altitudes across Indonesia there is great scope to produce a wide variety of vegetables, including European types that do not tolerate tropical conditions. According to Darmawan and Pasandaran (n.d.) Indonesia's vegetable production systems can be divided into three categories:

1. Highland production (> 800m altitude):
    a. Intensive commercialised farms generally located in mountainous areas of Bandung and Malang
    b. Less intensive systems often in remote highlands producing a combination of perennial and annual crops.
2. Medium altitude production (201-800m altitude):
    a. Usually close to urban markets, fully commercialilsed producing large volumes of production growing a variety of temperate crops adapted to higher temperatures and typical sub-tropical/tropical leafy vegetables or chillis and tomatoes.
    b. Further from urban markets and with less perishable crops.
3. Rainfed lowland areas:

[48] Combination of chilli (Cabe), large chilli (Cabe besar) and bird's eye chilli/cayenne pepper (Cabe rawit).

a. Intensive production of leafy vegetables water dependent vegetables such as kangkong (Morning glory/Water spinach)
b. Less intensive and opportunistic cropping usually in rotation with less intensive and staple cereals.

Much of the vegetable production is in the dry season (March-April) and is completed prior to the main wet season in July-August, with only a few varieties grown year-round. With the varied altitude and a wide variety of crops adapted to low, medium and higher altitudes in Indonesia, it has a high potential to develop a strong export sector to fulfil the high demand for fresh vegetables from Singapore and Malaysia in particular (Darmawan and Pasandaran, n.d.).

PRODUCTION

East Java is a major producer of fresh vegetables in Indonesia ranking in the top five for the major crops identified above. East Java also has the advantage of being located close to major urban markets and enjoying the benefits of multiple production system types including altitude, with highly fertile soil and a shorter less pronounced dry season.

Table 64: Production of the key national vegetables in East Java, 2010

East Java	Yld (tonnes)	Area (Ha)	Prod. (t/Ha)	% of National Production	National Rank
Cabbage	181,344	9,993	18.15	17.29%	4th
Chilli	**213,674**	**57,706**	**3.70**	**16.08%**	**2nd**
Potato	115,423	8,561	13.48	10.88%	5th
Shallot	**203,739**	**26,507**	**7.69**	**14.71%**	**2nd**
Tomato	56,342	4,439	12.69	6.32%	4th

Source: Badan Pusat Statistik (2011)

The eastern parts of Indonesia, NTT and NTB are characterised by higher levels of rural poverty than the western sections of the country particularly Java. This has historically been related to the poor agricultural potential in the region due to lower rainfall, an extended dry season and poorer soil fertility. This means that people tend to use their land for a shorter period of time generally during the wet season only with little cropping during the dry season (ACIAR, 2009b). This can partially account for the low contribution of vegetables to the national production from NTB and more specifically NTT.

The major vegetable crops in NTB include Shallot, Chilli, Tomato, Yardlong bean and Swamp cabbage. Table 65 details the top five national vegetable crops and the production yield, area and productivity of each of these crops in NTB. Of note is the inclusion of some of the top five production crops in Indonesia. Compared to national productivity data in Table 63, NTB performs above the national average in cabbages and tomatoes. Even though NTB is the 4th largest producer of shallots nationally its productivity is half that of the national figures at 20.51 t/Ha.

Table 65: Production of the key national vegetables in West Nusa Tenggara, 2010

West Nusa Tenggara	Yld (tonnes)	Area (Ha)	Prod. (t/Ha)	% of National Production	National Rank
Cabbage	9,726	418	23.27	0.93%	12th
Chilli	18,870	4,687	4.03	1.42%	12th
Potato	5,130	367	13.98	0.48%	11th
Shallot	**104,324**	**10,159**	**10.27**	**7.53%**	**4th**
Tomato	25,639	1,335	19.21	2.88%	10th

Source: Badan Pusat Statistik (2011)

NTT is a more difficult region within which to produce vegetables due to its short intense wet season and long dry season and landscapes considerably less fertile and more fragile than Java or Bali. The major vegetable crops in NTT are Red Kidney bean, Chinese cabbage, Pumpkin, Shallot and Egg Plant. In terms of the major national vegetable crops produced in Indonesia, NTT only produces significant amounts of shallots from the top five vegetable crops. In 2005 NTT produced only about 50,000 tonnes of vegetables from 11,000 hectares with Red Kidney Bean being the largest at 16.6% of vegetables produced. There has been significant growth in two of the top five major vegetables in NTT. Between 2005 and 2010 chillis increase production by over 57%; tomatoes increased by over 52%; shallots remained stable (White et al, 2007). Table 66 shows the major five vegetable crops in relation to yield, area and productivity in NTT.

Table 66: Production of the key national vegetables in East Nusa Tenggara, 2010

East Nusa Tenggara	Yld (tonnes)	Area (Ha)	Prod. (t/Ha)	% of National Production	National Rank
Cabbage	854	154	5.55	0.08%	20th
Chilli	5,968	1,477	4.04	0.45%	26th
Potato	542	129	4.20	0.05%	16th
Shallot	**3,879**	**923**	**4.20**	**0.28%**	**12th**
Tomato	6,151	870	7.07	0.69%	20th

Source: Badan Pusat Statistik (2011)

Nationally the production increase has been enormous for three of the top five vegetables produced in Indonesia over the last five years. Table 67 highlights that shallots, tomatoes and chillis have rapidly increased their production yield over the last five years; potatoes and cabbage has remained reasonably static.

Table 67: Increase in production of the five key vegetables in Indonesia

	2005	2010	% change
Cabbage	1,292,984	1,385,044	7.12%
Chilli	1,058,023	1,328,864	25.60%
Potato	1,009,619	1,060,805	5.07%
Shallot	732,609	1,048,934	43.18%
Tomato	647,020	891,616	37.80%

Source: Badan Pusat Statistik (2011)

Fertiliser and chemical use is considered to be quite high in the vegetable sector. This has been recognised by the Indonesian government and they are moving to introduce Good Agricultural Practice (GAP) Certification for the vegetable sector in response to national, regional and European market demands in particular (Johnson, Weinburger and Wu, 2008)

PRODUCTION PITFALLS

- Access to credit and at an affordable rate is a major constraint for many farmers and rural poor. Credit access is mainly informal (Johnson, Weinburger and Wu, 2008)
- Lack of information on technology, including labour requirements, capital requirements, input requirements and management process is limiting adoption by many farmers.

- Lack of access the good quality seed. For example potato farmers in East Java often preserve the seed the seed sets from harvest for replanting the following season. This lowers yield and make potatoes unsuitable for export and processing into chips.
- A major constraint and production pitfall is the incidence of pests and diseases that prevents farmers from achieving consistently high yields. Tomatoes and shallots in Indonesia are particularly sensitive to disease issues as indicated by Darmawan and Pasandaran (n.d.). In general many of the vegetables grown in Indonesia have been introduced from the sub-tropics and are only suitable to the highland milder climates. Lowland vegetable farmers tend to concentrate on locally adapted vegetables.
- High use of fertiliser and chemical pesticides and herbicides is cost-ineffective and environmentally unsound. Despite high fertiliser use many farmers fail to achieve potential yield.
- Asset management particularly for infrastructure assets such as permanent raised beds and embungs (depressions dug that act as a water storage to capture wet season) in NTB and NTT – water availability and harvesting is a critical issue if high value vegetables are to increase in NTB and NTT. Lack of consultation regarding the construction of enbungs has created lack of clarity in terms of property and ownership rights.
- There is great variability in the area, production and productivity of vegetables throughout Indonesia particularly in the drier eastern parts of the country. In data analysed by Darmawan and Pasandaran (n.d.) indicates that vegetable production due to variability in area is much higher than variability in yield. The high variability in yield is most unstable in crops such as pumpkin, chilli, eggplant, kidney beans and yard long beans. These are the major vegetable crops in NTT. High variability in production can lead to high or unstable prices which are not evident in rice or some fruits such as bananas and papaya.
- Regions of NTB and particularly NTT experience frequent droughts and regular crop failures even in staples such rice and maize. Vegetable production perceived as too risky for smallholder producers
- Staple crops have strong cultural and social significance. Many farmers unwilling to reduce production area of these crops because they contribute to food security under consistent climatic and economic difficulties (White et al, 2007).

PROCESSING

Food processing in Indonesia is a significant driver of the national economy; however the emphasis has not been on the vegetable sector. The processing of vegetables in Indonesia particularly at the farmer level is rudimentary and has considerable scope for greater development. Much of the small scale processing that does occur is sun drying, for example, by chilli farmers and traders. Much of the larger scale processors tend to import chilli powder for their food processing needs (Mustafa et al, 2006 cited in Johnson, Weinburger and Wu, 2008).

While the small scale processing of vegetables is not expansive and is generally located in Java, Sumatra, Bali and Sulawesi, it is labour intensive and provides significant employment and empowerment opportunities especially for women.

Frozen processed foods are increasingly appealing to the urbanising, time constrained segment of the Indonesian population due to an increase in the availability of frozen foods in supermarkets and an increase in household ownership of refridgerators (White et al, 2007).

There are 10 major processing companies in Java, with a particular focus on chilli processing. ABC Heinz is a mojor company in this group and is one of the largest processors and distributor of chilli sauce in Indonesia. According to White et al (2007), ABC Heinz uses about 50 tonnes of fresh chilli daily sourced from contract farmers. ABC Heinz has

worked closely with contracted farmers to ensure seed quality and agronomic practices are followed. There is no cold chain in place due to the chillis being consumed by the manufacturing process within 48 hours of delivery to the factory.

While still not as developed as other regional countries, the vegetable processing industry is developing quickly. There is a greater need for coordination between farmers and industry to maintain supply and quality and consistency of product. Darmawan and Pasandaran (n.d.) suggest that the food processing industry is operating below the installed capacity, with the reasons being the insufficient supply of raw materials, the unsuitability of produce for processing and the long distance between production and processing point.

PROCESSING PITFALLS

- Constraints in the supply of raw materials to the processing sector often as a result of poor quality vegetables not suitable for input to the higher value adding step.
- Logistics bottlenecks, including poor transportation networks and long distances to higher value markets especially for NTT, and the lack of a sophisticated cold storage system prevents the transport of fresh vegetable long distances to processing facilities.
- Maintenance of tight control over the installation of processing industry is a constraint that once freed would encourage greater expansion in this sector.
- Current large processing companies operating below capacity due to some of the constraints outlined above.

MARKETING

Generally in Indonesia the markets for local consumption of vegetables and the markets for shipment to other regions are clearly separated. The system is characterised by the specialisation of inter-village collectors and market retailers. Vegetables for the urban markets are coordinated by village-collectors and then shipped to those markets diverting them from local consumption. Marketing of locally consumed vegetables is done usually by 'bazzaar vendors'. These vendors are mostly village women who collect vegetables from nearby farmers and transport to the market for sale in the open space (Darmawan and Pasandaran, n.d.). Figure 51 shows the typical vegetable marketing chain in Indonesia with the two distinct and separate channels for the urban retail market and the local town/village market.

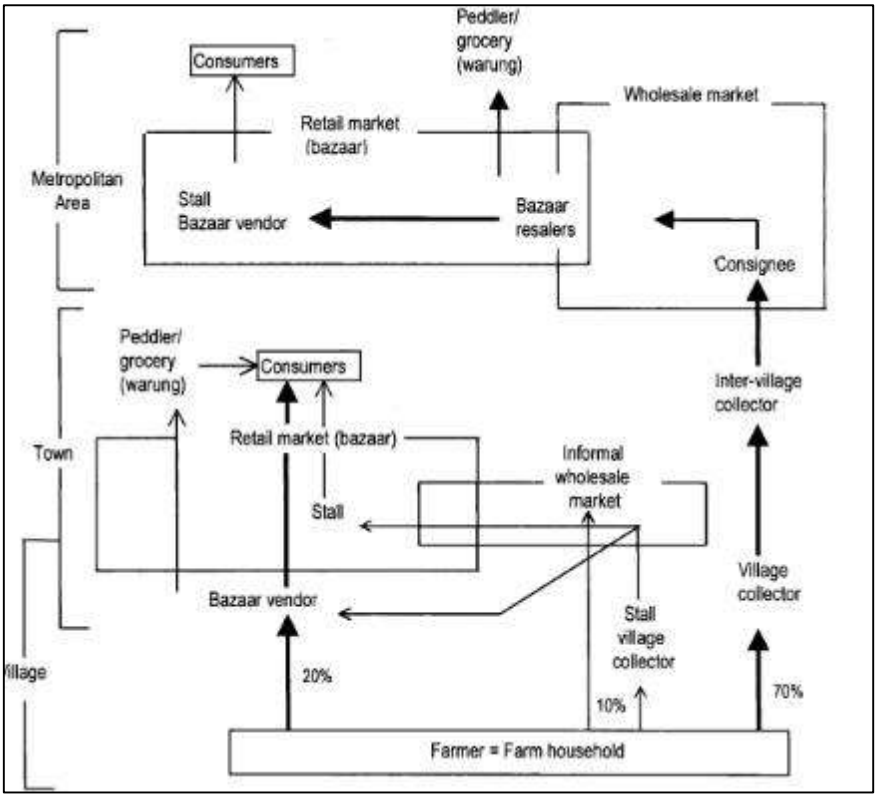


Figure 51: Typical vegetable marketing chain in Indonesia

The biggest opportunity in eastern Indonesia is for the import replacement of fresh vegetables imported from other provinces within Indoesia such as Java. Due to limited supply and low quality in local markets in eastern Indonesia, particularly NTT, the long distance transport of fresh vegetables into the region increase the cost to consumers. Within eastern Indonesia many of the vegetable growers are small scale with less than 1 hectare of mixed farming systems. Often the farmers lack the ability or are not in a position to negotiate prices with the collectors and traders due to limited knowledge of current market prices and trader margins (White et al, 2007).

White et al (2007) has identified that supermarket trade consistently provides farmers with the highest returns when compared to selling through collectors and traders, which implies that more assistance should be provided to farmers in terms of varieties, quality control and post harvest skills in order to participate more fully with supermarkets and food processing facilties. The Indonesian government also believes that a shorter marketing chain would improve income to farmers and reduce costs to consumers. It is currently promoting the establishment of horticultural cooperatives which have to potential to reduce marketing costs. Cooperatives have a tendency to be poorly managed though and farmers have limited faith in them unless they are well managed (Darmawan and Pasandaran, n.d.).

Rising incomes and urbanisation and higher participation rates in the worksforce has led to a change in the composition of food demand and an increase in the development of the processed foods sector such as ready to eat, preprepared foods, which include vegetables. This has developed alongside new market channels such as the rise of the supermarket sector (Johnson, Weinburger and Wu, 2008). However, the emergence of modern retailing has other consequences that go beyond consumers. It requires deep integration with farmers and can influence the production and transaction costs at farm level. It can also influence the distribution of value among different agents involved in production, intermediation, and retailing (Chowdhury, Gulati and Gumbira-Said, 2005).

For farmers, vegetable production is a major area for future diversification which is being driven by consumer demand, export opportunity and inter-province import replacement.

MARKETING PITFALLS

- Evidence based on case studies and rapid rural appraisal in West Java has shown that small holders are equally competitive and participating in the emerging vertical arrangement through modern vendors. However, though small holders in the case of Indonesia are producing HVP, one of the major constraints that they have been facing is credit. Since smallholders do not have access to formal credit such as commercial banks, they are highly credit constrained and often pay much higher interest rates in the informal market than the rate prevails in the formal market (Chowdhury, Gulati and Gumbira-Said, 2005).
- One of the major constraints that smallholders face in the production of HVPs is credit. Due to information asymmetries and high transaction costs, commercial banks are not willing to finance smallholders.
- In an archipelago as large and diverse as Indonesia, with more than 14,000 islands, an efficient distribution of fresh fruits and vegetables (FFV) is extremely difficult to build. Not surprisingly, Indonesian retailers vary in their distribution capacity of FFV. Modern storage and distribution capacity is scarce. Although trucking remains the preferred means of distribution, the availability of refrigerated trucks is very limited (DFAT 2003 cited in Chowdhury, Gulati and Gumbira-Said, 2005). As a result, a modern collection and distribution system for fresh fruits and vegetables remains a major constraint for further internal and external market development for FFV.

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