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co-authors/ contributors/ collaborators	Steffen Cambon, Rao Rachaputi
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List of Abbreviations

ACIAR	Australian Centre for International Agricultural Research
AFE	Action for Enterprise
AFI	Aflatoxin Forum Indonesia Program
AIPD-Rural	Australia Indonesia Partnership for Decentralisation – Rural Economic Program
ASA	American Soybean Association
AusAID	Australian Agency for International Development
B2B	Business-to-business
BAPPEDA	Badan Perencana Pembangunan Daerah - Regional body for planning and development
BPSP	Seed Control and Certification Agency
BPTP	Assessment Institute for Agricultural Technology (Extension/Research Office)
BPOM	Indonesian National Agency for Drugs and Food Control
BSO	Business Support Organization
BULOG	Indonesian State Board of Logistics
CBOT	Chicago Board of Trade
DINAS	Indonesian State Agriculture Office
EI-ADO	Analysing Agribusiness Development Opportunities in Eastern Indonesia
EJ	East Java
GOI	Government of Indonesia
ha	Hectare
HACCP	Hazard Analysis and Critical Control Point
hh	Household
IAARD	Indonesian Agency for Agricultural Research and Design
IFA	Invitation for Application
IFC	International Finance Corporation
ILETRI	Indonesian Legume and Tuber Crop Research Institute
KOPTI	National Association of Tempeh and Tofu Processors
LCT	Low Cost Technology
LF(s)	Lead Firm(s)
MBS	Market Based Solution
MSME	Micro, Small, and Medium Enterprise
MT	metric ton
NGO	Non-government organisation
NTB	West Nusa Tenggara
NTT	East Nusa Tenggara
OPVs	Open-pollinated varieties
PBR	Plant Breeder’s Rights
ppb	parts per billion

REEEP	Renewable Energy and Energy Efficiency Partnership
SCoPe	Indonesian Sustainable Consumption and Production in the Soybean Processing Industry in Indonesian Program
SME	Small and Medium Enterprise
TTU	Timor Tengah Utara
U.S.	United States

Glossary of Technical Terms

No.	Term	Definition
	Aflatoxin	Also known as mycotoxins, aflatoxins are toxins produced by certain fungi via infection of foods and feeds, particularly grains. They are associated with critical diseases of animals and humans and in Indonesia, aflatoxins are a significant concern in the peanut and maize supply chains.
	Value Chain	The range of activities required to bring a product or service from conception, through the phases of production (involving a combination of physical transformation and the input of various producer services), to delivery to consumers, and disposal after use.

Preface

This report titled *Eastern Indonesia Agribusiness Development Opportunities (EI-ADO)- Analysis of Legume Value Chains* [1] was prepared by the Collins Higgins Consulting Group Pty Ltd as commissioned by the Australian Centre for International Agricultural Research (ACIAR). The information and recommendations from this study will inform AusAID in the design of the Australia Indonesia Partnership for Decentralisation – Rural Economic Development Program (AIPD-Rural).

The report involved the analysis of secondary data, field visits and key informant interviews with stakeholders in the legume value chains of soybean, peanut and mungbean in Eastern Indonesia. The field work for the report was carried out during the month of October 2012.

The principal author of this study is Steffen Cambon from Action for Enterprise, with input from Rao Rachaputi of the University of Queensland. Additional support was provided by Teddy Kristedi (ACIAR Project Coordinator) and Action for Enterprise staff - Henry Panlibuton, Frank Lusby, and Jackie Flewelling. Environment and gender inputs were overseen by Emmanuel Santoyo Rio. Field support was provided by Ketut Puspadi and Lalu Wirajaswadi in NTB, Damianus Adar in NTT and Augustina Asri Rahmianna and Iqbal Rafani in East Java.

The views expressed in this report are those of the consultants and do not necessarily reflect the views of the Collins Higgins Consulting Group, ACIAR or the Governments of Australia or Indonesia.

Stuart Higgins

Director

Collins Higgins Consulting Group

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Executive Summary

Background on AIPD-Rural / EI-ADO

The goal of AIPD-Rural is to increase incomes by 30% for more than 1,000,000 male and female smallholder farmers in Indonesia by 2022.

The objective is to increase competitiveness of poor farmers, both male and female, through:

- Increased productivity;
- Improved business performance;
- The acquisition of a growing share of an expanding market; and
- The continuous adoption of innovations that contribute to productivity, performance, and market growth.

The expected outcomes are:

- Improved farmer practices;
- Increased access to input and output markets; and
- Improved business enabling environment at the sub-national level.

The strategy to be used is to address systemic growth constraints in rural agricultural sectors that are most relevant to small farmers, in the districts in which the Program operates.

The Program is to take a market-led approach of working with on- and off-farm market stakeholders (public and private sector) to stimulate both increased access to, and the sustained delivery of, public and private inputs and services that are likely to increase the incomes of poor farmers.

The Legume Study

From September 27 through October 19, 2012, on behalf of the AIPD-Rural program, Action for Enterprise (AFE) conducted value chain analysis and initial program design research on three legume commodities in Eastern Indonesia: soybeans, peanuts, and mungbeans. This report presents the findings of that research, as well as recommendations for further program development within AIPD-Rural.

The field work began by interviewing market actors in the mungbean value chain in East Nusa Tenggara (NTT) (Kupang, Belu, and Timor Tengah Utara (TTU) districts). This was followed by extensive field interviews in East Java (EJ) (October 6-12, 2012) and West Nusa Tenggara (NTB) (October 13-18, 2012), focusing almost exclusively on the soybean and peanut value chains.

AFE used the value chain analytical framework, interviewing market actors as well as other key informants such as relevant government agencies and local non-government organizations. Information from these actors was solicited to evaluate the relations between buyers and suppliers, end markets and competitiveness, value chain dynamics, and the major constraints faced by each value chain actor. Extensive secondary research was also conducted which helped provide a broad overview of each commodity and its current context and status in Indonesia.

The team also identified ‘’market-based solutions’‘(MBS) that may address and help resolve the key constraints facing producers and other market actors in the targeted value chains. These MBS have the potential to be delivered by the private sector in a commercially viable manner as part of their commercial relationships with producers from whom they buy and to whom they sell. Existing and potential providers of MBS in the legumes value chains include tofu and tempeh processors, snack food companies, retailers, seed companies, input supply companies, wholesalers and traders.

AIPD-Rural can play a key facilitation role by creating incentives and building the capacity of these MBS providers (also referred to as ‘Lead Firms’ or ‘inclusive businesses’) to invest in and provide needed products, services and technical support to farmers in their value chain. In so doing, their own competitiveness will be strengthened and poor farmers will benefit through their ongoing commercial relationships with the firms. Examples of illustrative AIPD-Rural ‘facilitation activities’ are presented below. These ideas were generated based on suggestions from private sector ‘Lead Firms’ (LFs) during interviews and will need to be further designed and formalized (through specific agreements with the project) once the implementation phase begins.

Illustrative AIPD-Rural Facilitation Activities

1. Develop capacity of Lead Firms to conduct producer training and extension activities

Illustrative facilitation activities can build the capacity of LFs to develop training modules, organize demonstration trials to expose producers to improved production practices and/or new varieties, and introduce high-yielding and sustainable production methods. For example, several soybean and peanut wholesalers in EJ, NTB, and NTT are interested in conducting farmer training to improve the quantity and quality of product available to them and to improve relationships with farmers.

2. Support the Seed Control and Certification Agency (BPSB), Lead Firms and distributors to introduce improved/certified varieties of seed to producers

Illustrative facilitation activities include supporting LFs to identify and test new varieties of seed needed by producers and the industry. For example, Garuda Foods, which has already worked with the International Finance Corporation (IFC) and ACIAR on improving its sourcing capabilities in NTB, expressed interest in developing its ability to test and extend new and improved peanut seed to its supply areas, including target districts in NTB.

The intervention would also include working with the BPSP, who are responsible for certifying seed in Indonesia. Support would be in the form of identifying ‘best practice’ governance and funding mechanisms based on other industry/country case studies. BPSP would also require support to develop technical capacity of their staff in seed production, storage and market linkages to LFs.

3. Build the capacity of Lead Firms to improve and expand their procurement from producers

Illustrative facilitation activities include supporting wholesalers and processors to develop new and innovative procurement models, organize farmer outgrowing operations, facilitate group purchasing by producers, and investigate new areas where commodities can be sourced. For example, a wholesale mungbean collector in NTB (Chakhra Shop) is interested in organizing several hundred mungbean farmers to produce improved varieties

in TTU. Tofu/tempeh processors in Mataram (Lombok) are seeking to organize informal groups in order to facilitate sales to wholesalers.

4. *Introduce new technologies to improve Lead Firm efficiencies (and their products / services provided to producers)*

Illustrative facilitation activities include support to LFs to conduct exposure visits to identify new technologies, sources of tools and equipment, develop improved post-harvest and storage methods, and develop or improve their final products (quality, packaging, labelling, product diversification etc.). For example, small to medium scale enterprise (SME) tofu processors in NTB (Bima, Mataram) and Sampang (EJ) have heard about affordable technologies for improved fuel consumption in nearby regions and would like to learn more. Input supply distributors and producing companies have expressed interest in an SMS-based product verification scheme to help farmers buying their products verify authenticity, thereby mitigating problems caused by counterfeit products.

5. *Promote greater market access for Lead Firms (which in turn will purchase more from producers)*

Illustrative facilitation activities include working with LFs to develop promotional materials, participate in trade shows, conduct business-to-business (B2B) meetings, and build capacity to meet requirements of existing or potential markets. For example, certain tempeh and tofu processors in NTB and EJ would like to improve the branding of their products in order to reach upscale markets; peanut roasters in Lombok and EJ are interested in finding new markets and upgrading their processing technologies; and seed development companies seek to expand their private sector distribution networks and tailor their products to the needs of farmers and their input suppliers.

6. *Improve Lead Firm Quality Management Systems (allowing them to improve products and services to producers)*

Illustrative facilitation activities include helping LFs/processors to improve quality management systems and link them with quality management service providers and certification agencies. For example, peanut roasters/processors as well as soy cracker and tempeh processors would like support in upgrading their quality management and food safety systems in order to meet established quality standards.

The ultimate feasibility of these proposed activities, and the details of how they will be implemented, can only be determined closer to project implementation, once more in-depth discussions are held with the targeted market actors themselves. In order to generate sustainable and commercially viable results, the proposed providers of the MBS will need to take full ownership and responsibility for the proposed initiatives. Targeted companies are also likely to propose a wider range of innovative interventions that have not yet been canvassed. It is therefore important to retain flexibility at this stage, rather than to attempt to create a project blue print.

Moving towards implementation, more dialogue and discussions will be needed with the targeted providers of the MBSs (i.e. LFs) to determine their interest and identify incentives for providing them as part of their commercial relationships with targeted producers. A proposed participatory process for doing this is presented in the report. It will be important for the AIPD-Rural program to undertake this step before any facilitation activities are developed.

Gender and Environment Issues in Legumes

While men are the principal farmers of the targeted crops, women play a key role in many processes. Women were found, for example, to be performing most of the weeding in the field. For all three commodities examined, it was found that harvest labour is usually shared, but there are specific roles for men and women. The division of shucking and shelling tasks is an example of this. For soy and mungbean, both men and women harvest the pods. Then, men will wrap the pods in a blanket and beat the beans out of the pods. Thereafter, women will perform the sifting and cleaning.

The legume team found that while men were conducting most of the financial operations related to crop production, women were more often engaged in selling at the weekly and bi-weekly open markets, especially if the sales points were close by home. The heavy lifting and transport is mostly conducted by men. As for bazaars, women tend to be retailing products on an equal basis with men across all regions visited. However, men tend to be engaged more in wholesaling, and the larger the wholesale business, the more likely it is to be male-owned and operated.

Most retailers and wholesalers operating at bazaars and wet markets are trading in multiple items: spices, other beans and legumes, grains, root crops (e.g. ginger), tobacco, etc. Thus, it is often difficult to describe them exclusively as ‘legume retailers.’

Among tofu and tempeh processors there are several areas of gender division. In the majority of small-scale tofu processing enterprises, most of the hired labour and much of family labour is male; the team did not encounter a single woman-run tofu processing unit. This is due most likely to the highly physical nature of the process.

For tempeh processing, women are more present at all levels and are more likely to be running small businesses and directing both family and hired labour. This could be due to the fact that, other than transporting product to retail outlets, there is considerably lighter physical exertion involved in tempeh processing compared with tofu. However, in part because so much of this labour is family-based, it was difficult to discern strict segregation of roles and power.

It appears that almost all retailers of tofu and tempeh at wet markets are women. In general, the further away from the farm and closer to urban contexts, the more likely one is to find woman-owned and managed businesses, be it input suppliers, processors, or retailers.

Input supply environmental issues

An issue raised by some input distributors was the tendency for input supply companies to “push quantity over quality”, and that this has an effect on the increase in pesticide usage by farmers. Retailers counter this argument, saying that farmers tend to use less than the recommended dosages of pesticides and herbicides – mostly to save money, but perhaps also because they are wary of health effects. That said, some retailers and distributors, as well as company field agent agronomists, conduct safety campaigns with farmers on the need to use masks and protection while spraying crops. But this does not seem to be uniformly practiced as a standard.

In future follow-up with input supply companies, it will be important to find out which of the companies (East-West Seed, Petrokimia Gresik, Pertani, Syngenta, DuPont, Bayer, Biotek, and others) embed environmental (and health) safety in their extension and training practices.

As mentioned in the sections on value chain constraints, there is also the concern of low-quality, cheap, and environmentally toxic chemical inputs - which are sometime counterfeited - being sold by retailers. This is an issue with which AIPD-Rural might be able to work with input supply companies, in collaboration with mobile communications firms, as practiced in other countries.

The potential toxicity of waste from tofu processing businesses contaminating groundwater is another area of concern. While some of these businesses are using salt water (and dumping it into open sewers or streams), others are also using Sulphuric Acid to firm their tofu. Still others have reportedly been using formaldehyde - a known carcinogen, as a firming agent. The stench at tofu processing units is noxious and labourers work in high heat conditions. AIPD-Rural may need to have an environmental specialist explore this issue in further detail, as the effects on worker health and ground water/environment are unclear.

Potential Further Research Areas

The study team identified a range of additional issues that will need to be addressed as the program design moves forward. Despite the differences across the different legume value chains, there are some commonalities and recurrent themes. The following are some suggested research questions in relation to those cross cutting themes.

- To what extent is the promotion and expansion of maize and rice farming in EJ, NTB, and NTT affecting or providing disincentives for the expansion of legumes?
- What are the different reasons for farmers and collectors not following best practices in terms of post-harvest storage?
- What are the incentives or disincentives for snack food / processing companies to develop or expand outgrowing or other forms of direct procurement (that includes various forms of support to producers) with producers in the targeted areas?
- How can food safety be improved by minimising aflatoxin contamination risk in the supply chains across the AIPD-Rural districts of NTB and EJ?

Specific crop-related questions have also been identified as follows:

Soybean

- What are the management practices (e.g. introducing low-cost mechanical seed drills) that will achieve higher and more reliable yield of soybean varieties, and improve the cost-benefit ratio in both high and low input production environments (particularly in East Java)?
- What are some appropriate varietal and management practices for dryland soybean in tropical NTT environments?
- Are there new high yielding and pest-resistant dual purpose soybean varieties suitable for both food and feed markets?
- Are there cost-effective storage practices at farmer and LF levels that will minimise seed quality deterioration in storage?

Peanut

- Are there new high yielding and pest-resistant dual purpose soybean varieties suitable for both food and feed markets?

- What are the best management practices to improve cost-benefit ratios and crop rotation benefits for dual purpose legume varieties?
- What are the pre- and post-harvest interventions that will minimise aflatoxin contamination in the food and feed chains of peanut?
- What are the cost effective storage practices at LF level that will improve the viability and vigour of the planting seed, as well as minimise the occurrence of aflatoxin in storage?

Mungbean

- Exploring new high yielding and pest resistant mungbean varieties for NTT environments.
- What are the market place/consumer perceptions of the mungbean varieties recently tested in ACIAR's *Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia* study?
- What levels of soil nitrogen fixation can mungbeans achieve under varying management practices in NTT?
- What are the most cost effective traditional storage methods at the farmer level that will prevent pest attack and maintain seed viability in storage?

Potential Development Areas

Areas of potential further development were also identified by the team, including:

Soybean

- More seed companies doing seed multiplication on Sumbawa island - In Dompu and Sumbawa districts, at least one group of seed developers who are selling through private retail (Apotika Tani input supply shop in Dompu). It will be important to interview government certification agencies in Central Java, responsible for certifying the seed produced by such developers, as well as the government sponsored or private sector companies that are producing breeder seed (breeder seed is used to produce foundation seed which is then multiplied to produce certified seed).
- More input supply companies based in Java - Including Petrokimia Gresik, Bisi, PT Panah Merah/ East-West Seeds. More information will be needed to solicit ideas from them regarding any future collaboration. What constraints do they face in their dealings with distributors and retailers at the provincial and district levels? What strategies are they employing, if any, to prevent inappropriate use of agrochemicals? So far, only Syngenta has been interviewed, and several key informants and agronomists contacted in the field are agents for the other companies listed here.
- The three major importers of soybeans from the United States (U.S.) - Cargill, Teluk Intan, and Suryabudi - have been referenced by large-scale distributors in Surabaya. What are these companies doing to secure their market in Indonesia? Who are their main distributor or processor clients? What are the terms of their relations?
- Financial institutions - Of those offering loans to soybean wholesalers and processors in EJ and NTB, the two most quoted banks are BRI and Bank Jatim (the latter in EJ).
- KOPTI (National Association of Tempeh and Tofu Processors) - This is a highly political organization with national outreach. None of the small processors the legume team interviewed in target districts of NTB or in Sampang belong to this organization,

but they have collaborated with the American Soybean Association (ASA) in the past. It is important for AIPD-Rural to better understand all of their current activities and to assess what kind of collaboration (if any) might be feasible under the project. Also, why is KOPTI not active in NTB or Sampang?

- Market actors in the AIPD-Rural target district of Situbondo - As the team did not conduct field work there, there is little information on how that district fits into either the peanut or soybean value chains: farmers, input suppliers, wholesalers, etc.
- Marketing agencies or consultants based in EJ - Are there any marketing agencies which have collaborated at any level with small tofu/tempeh processor? Have they ever been approached for such work? Why or why not?

Peanut

Additional areas in the peanut sector where AIPD-Rural design can focus its attention are the actors in EJ, as most of the key players in the NTB target districts have been contacted. The following activities and interviews are essential to obtaining a more complete picture of value chain dynamics, constraints, and solutions:

- Travel to Tuban Province - This area appears to be the epicentre of peanut production in EJ. Not only is there significant production of a supposed top-quality peanut on the domestic market, but also the region's most important traders are present and the top processors are sourcing significant amounts from here. Three important traders in Tuban quoted by wholesale traders are Sumber Mutiara, Sumber Manis, and Sumber Rejeki. There also appear to be seed developers in Tuban, and possibly processors of peanut oil as well.
- Interviews with LF processors/exporters - These include Dua Kelinci, Mitra Foods, and perhaps Orang Tua Group. How do their sourcing models compare with Garuda, and what kind of relations do they have with suppliers in EJ or NTB?
- Oil and cake/animal feed processors - As up to 70,000 tonne of peanut kernels are estimated to be processed into animal feed, what role do these actors play in the value chain and what relations do they have with suppliers?

Mungbean

Although mungbeans received less attention during the study than the other value chains, the team was able to identify further areas of work which AIPD-Rural could explore in NTT. These include:

- Flores and Sumba islands - All indications are that the majority of mungbean production for NTT is on these two islands (in addition to Belu district). More seed developers and wholesale traders in these areas should be contacted to compare against the information gathered from West Timor.
- Follow-up with seed developers - Two seed multipliers in Atambua were interviewed, Yosefina Klaran and Toko Charisma Shop. Both expressed interest in working with AIPD-Rural to help solve the problem of access to quality seed for mungbean farmers by expanding private distribution networks through shops and input distributors. Their outreach alone might result in certified mungbean seed being made available to thousands of farmers in Belu and TTU districts. Are there other seed developers in Flores or Sumba Islands?

- Examine the possibility of transposing ACIAR's public-sector mungbean loan program model into the private sector. The current setup of the NTT bank loans, established via the initiatives of Mr. Fred Benu in Kupang, might benefit from involvement by more private sector actors. The legume team interviewed one other bank BRI Kupang[2], and it expressed interest in identifying a suitable contractual model with farmers and wholesale traders in NTT or EJ as guarantors, with the potential for input supply companies[3] to provide technical training to farmers. One input supply company with reported experience working in mungbeans in NTT is BISI International. Both financial institutions interviewed (NTT Bank and BRI) stressed the importance of assuring a guaranteed market for farmers before being willing to provide loans. So far, the local market appears able to absorb local production, but this might change if there was a sudden bounce in production levels. These same sources warned that if production levels increase too quickly, the market price could collapse. Their assertions were apparently based on experience with other unsubsidized commodities, but they would not specify which ones.

It is hoped that the AIPD-Rural program will collaborate with the MBS providers identified in this report to promote sustainable and commercially viable solutions to the constraints facing producers and the industry. With few exceptions, none of the targeted LFs/MBS providers have ever worked with international development programs before. From a market development perspective, this should indicate these value chain actors will be less likely to expect undue subsidies and more likely to invest their own resources to improve value chain dynamics for their own benefit, as well as for the target groups who depend on them for market access, training, and income. Thus, AIPD-Rural is in a strategic position to build on their good will.

[2] BRI Kupang also stated that they have been collaborating with GiZ (German Development Agency) on loans to the fishing sector's SMEs on Timor Island.

[3] The seed developers in Atambua are also a possibility to consider as input suppliers.

1 Introduction

1.1 Project Background

In 2011, AusAID invested in a program called Analysing Agribusiness Development Opportunities in Eastern Indonesia (EI-ADO) aimed at identifying agricultural value chains and private sector development opportunities with potential to decrease poverty in East Nusa Tenggara (NTT), West Nusa Tenggara (NTB) and East Java (EJ). The outcomes of this program will be the focus of a new AusAID program: Australia Indonesia Partnership for Decentralisation – Rural Economic Program (AIPD-Rural).

AIPD-Rural has the goal of increasing income of more than one million poor farmers in Eastern Indonesia by 30%. In particular, AIPD-Rural supports efforts to increase value chain competitiveness through better farm practices, improved access to input and output markets, and an enhanced business enabling environment for agribusiness.

The EI-ADO project is being delivered through ACIAR and comprises a number of short research activities undertaken in 2012 and early 2013 to inform the AIPD-Rural program. These studies aim to provide better understanding of the rural sector, market actors, potential lead commodities, ease of doing business (including local regulation/policy), infrastructure that supports the agricultural sector, access to finance and district profile.

In Phase 1 of the EI-ADO project, the project Reference Group identified five commodities to be studied in a detailed value chai analysis during a second phase. Legumes (soybean, peanut and mungbean) were one of those identified lead commodities.

1.2 Study Objectives

The objectives for the study included:

1. Complete detailed mapping, characterisation and market description of legume value chains.
2. Document and analyse the governance structures and linkages, costs and margins and estimate income and employment distribution in legume value chains.
3. Document and analyse technology, knowledge and upgrading opportunities with potential to increase net income of farmers and other stakeholders in legume value chains.
4. Analyse and document social issues likely to influence adoption of value chain management innovations aimed at improving market access and income.
5. Analyse the gender roles and important environmental impacts in legume value chain and potential implications of changes to value chain management or other innovations, as well as specific opportunities for women to benefit from future program interventions.
6. On the basis of the above analysis, identify the most promising legume value chain development opportunities for the individual Provinces and Districts covered in this study.
7. Identify researchable issues within the legume value chain and formulate a list of priority research questions for future investigation.

1.3 Analytical Framework

The value chain / market development approach (also referred to as ‘’making markets work for the poor or M4P’) was the framework used for collecting both quantitative and qualitative data. This approach involved interviews with representatives of all types of market actors (and supporting networks) along the value chain for each commodity: input suppliers (retailers, distributors, and field agents), farmers / farmer groups, village-level collectors, large-scale wholesale distributors, processors, importers / exporters, market retailers, and financial institutions, in addition to state agricultural support bodies (extension agents and local agricultural officials from BAPPEDA, DINAS, and BPTP). Through these interviews, information was solicited on end markets and demand, relations between value chain actors, value chain constraints, and strategies that value chain actors are taking to mitigate constraints.

Aside from providing comprehensive value chain analysis, this framework allowed the study team to identify existing or potential market based solutions (MBS) as well as market actors (also referred to as ‘Lead Firms’ (LFs) or ‘inclusive businesses’) with incentives and interest in providing these MBS as part of their commercial relationships with producers.

The study methodology included the following tasks:

- Lead a multidisciplinary team in applying the tools (based on M4P) for an in-depth value chain analysis.
- Lead the preparation of the field work by coordinating the teams to identify key industry stakeholders and conduct preliminary mapping of the soybean and peanut value chain in EJ, NTT and NTB.
- Lead the field work for value chain analysis and ensure all relevant data is collected using the predetermined checklists and tools.
- Provide analysis of data related to the soybean, peanut, and mungbean value chains and identify constraints and opportunities within each.
- Analyse options for demand-driven upgrading, knowledge, skills, technology and support services along the value chain.
- Ensure the study team identifies the costs and margins along each identified legume value chain to be studied in line with checklists.

1.4 Study Methodology

A team headed by AFE Consultant Steffen Cambon, with the assistance of International Crop Specialist Rao (RCN) Rachaputi and regional field coordinators Damianus Adar and Ketut Puspadi, conducted interviews and collected data in the field in three provinces targeted by AIPD-Rural (NTT, EJ, and NTB). Interviews with key informants from each value chain were conducted based on question guides tailored to each identifiable market actor (see Annex 1: Checklists/Structured Questionnaires). Where possible, quantitative data was collected (especially at farm level) to assess costs, margins, prices and market trends. Some of this data complemented secondary data provided to the study team.

It was important to relate information gathered in each province to specific target districts stipulated by AIPD-Rural and thus to compile as much value chain analysis information as possible applying to these districts. As the team composition and objectives differed by

province, a summary of study methodology and logistics employed is provided below by province.[4]

1.4.1 East Nusa Tenggara (NTT)

AIPD-Rural target districts: TTU, Ngada, East Flores, Sumba Barat

Research conducted in NTT was devoted exclusively to the mungbean value chain and all field work was conducted on Timor Island from September 28 - October 3, 2012. The study team, consisting of Steffen Cambon and local field coordinator Damianus Adar, met with key actors in Kupang, TTU, and Belu districts. Although not an AIPD target district, Kupang as a regional capital is important for this value chain as it represents the largest local market outlet for the commodity and is the headquarters of numerous potential support services, including input supply companies and financial institutions. Similarly, Belu is considered to be the 'epicentre' of mungbean cultivation on Timor Island with key market actors along the value chain present, who also interact with players in other NTT target districts, especially TTU. Following the initial field work, Damianus Adar conducted follow-up research in Betun (Belu district) with mungbean farmers and collectors on October 6-7, 2012.

1.4.2 East Java (EJ)

AIPD-Rural target districts: Malang, Trenggalek, Sampang, Situbondo

In EJ the primary focus was on soybeans, followed by peanuts and, to a less significant degree, on mungbeans. Owing to the extensive logistical spread of this province, two sub-teams were assisted by field coordinators to conduct field interviews in Surabaya, Malang, Trenggalek, and Sampang districts from October 6-12, 2012. Prior to visiting these areas, the team met in Jakarta to review interview strategies and to conduct two key meetings (with Garuda Foods and the American Soybean Association (ASA)). After extensive field visits, the sub-teams regrouped for feedback meetings.

Surabaya was deemed a focus for all three target legume commodities, as it features a cluster of importers, inter-island traders, distributors, and processors, through whom much Indonesian (and imported) product flows. In Malang, there was a stronger focus on peanut farmers and processors (roasted peanuts and peanut oil), in addition to tofu and tempeh processors. In both Trenggalek and Sampang, the teams interviewed actors all along both the soybean and peanut value chain.

1.4.3 West Nusa Tenggara (NTB)

AIPD-Rural target districts: West Lombok, North Lombok, Bima, Dompu

NTB is the only province where all four AIPD-Rural target districts were visited. Equal focus was paid to peanuts and soybeans (mungbeans were excluded in NTB – see field work rationale Annex 2), and the input supply network. In order to maximize outreach to key informants, the sub-team strategy used in EJ was also applied in NTB. In West Lombok, interviews with tofu and tempeh processors were the focus, along with wholesale traders of peanuts and soybeans. Important input supply companies (including Syngenta

[4] *See Annex 1 for a complete list of interviews and contacts*

and a large-scale local distributor) were also contacted. In North Lombok, the focus was on peanut cultivation and trade, as it was deemed a more important crop.

In Bima and Dompu districts, the focus was exclusively on the soybean value chain. There, interviews were conducted with seed developers, tofu / tempeh processors, input suppliers, and wholesale soybean traders. After returning to Lombok, one sub-team conducted interviews in Central Lombok with soybean farmers and traders, as key informants in Bima and Dompu had indicated the presence of a significant trading network there.

The three tables below show the types and number of actors that were interviewed in each province and district.

Table 1 Tally of interviews conducted in the soybean value chain

	Input suppliers	Producers / producer groups	Wholesale traders	Retailers	Tofu/ tempeh/ sauce processors	Govt./ BSO	Total
Jakarta						1	1
East Java							
Trenggalek	2	1	2		1	2	8
Surabaya			2			1	3
Malang			1		2		3
Sampang	2	1	2	1	3	1	10
NTB							
Mataram	2		1		5		8
N. Lombok	1						1
W. Lombok							
Bima	1	2	4		3		10
Dompu	3		1				4
Total							48

Table 2 Tally of interviews conducted in the mungbean value chain, NTT

	Input suppliers	Prod/ prod groups	Wholesale traders	Retailers	Banks/Fin organizations	Gov't/ BSO	Total
Kupang	2	1	2	2	2 + 1		10
TTU	2	1	2	4			9
Belu	2	1	2	3	1	1	10
Total							29

Table 3 Tally of interviews conducted in the peanut value chain

	Input suppliers	Producers / producer groups	Wholesale traders	Retailers	Snack food processors	Govt./ BSO	Total
Jakarta					1		1
East Java							
Trenggalek							
Surabaya			3	2			5
Malang		2			2		4
Sampang	2	2	3	2		1	10
NTB							
Mataram	2		1	5	1		9
N. Lombok	1	2	3				6
W. Lombok		2	1				3
Bima	1						1
Dompu	2		0				2
Total							41

1.5 Report Structure

This report is structured as follows:

Sections 2, 3 and 4 provide overviews of each legume value chain (soybean, peanut, and mungbean) and Indonesia's position in the global context for each. These sections will also detail markets and trends, socioeconomic importance, prices, policies and regulations at various levels, as well as any efforts to promote each legume by external organizations. Finally, the value chain constraints identified in each value chain, along with market-based solutions and market-based solution providers, are discussed.

- Section 5 specifies opportunities for development that could positively affect poor populations in the targeted legume value chains, with illustrative interventions that AIPD-Rural could carry out based on information gathered in the field.
- Section 6.1 briefly presents cross cutting issues with respect to poverty, gender, and environment as identified during field research.
- To conclude, Section 6.2 recommends next steps in research and program design.

Each legume commodity studied (soybean, peanut, and mungbean) is presented individually in the report, as each features its own technical issues, market actors, end market realities, and supply chain channels. More extensive analysis is devoted to soybeans and peanuts, while summarized information is provided for mungbean as it was only researched in one AIPD-Rural province (NTT).

1.6 Legume Overview

Legume crops are classified as a palawija crops, or secondary food crops in Indonesia, and they play an important economic and environmentally beneficial role in a farming system.

Legumes have the unique ability to fix atmospheric nitrogen to support their own growth, as well as provide residual nitrogen for use by subsequent cereal grain and fodder crops. Legumes are also a valuable component of food and feed industries globally and can be very profitable in their own right. Legume crops provide significant crop rotation benefits by reducing pests (including nematodes), soil-borne and foliar disease and weed pressure, and by enabling growers to optimise pesticide usage or rotate herbicide groups to control major weeds in their cropping systems.

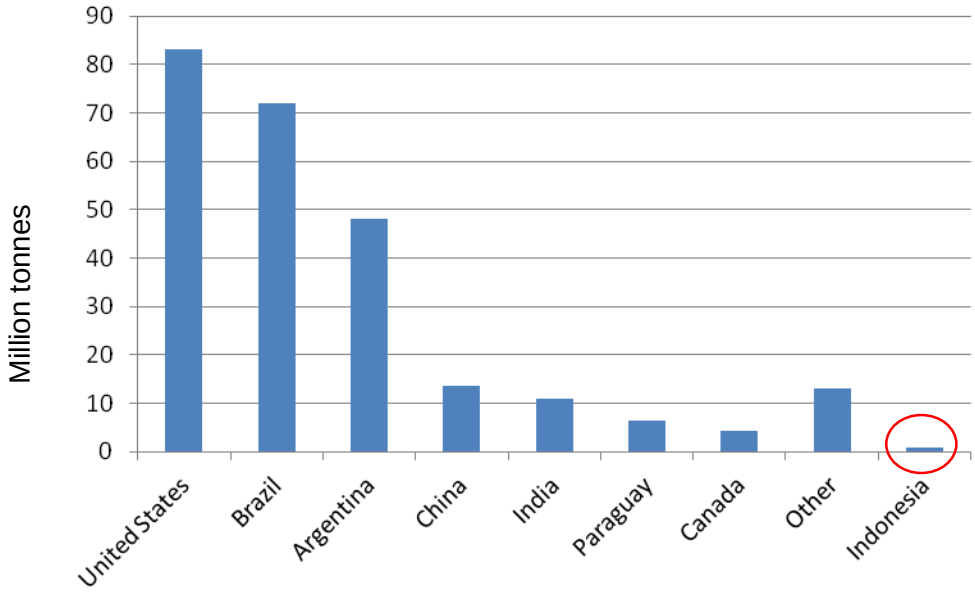
Despite significant rotational and potential economic benefits, adoption of legume crops in farming systems in Indonesia has been low. The contributing factors are: poor planting, seed quality/purity, a lack of farmer knowledge on best practices (both pre- and post-harvest), the risks associated with unreliable yield, variable grain quality and inconsistent market price. This report will attempt to analyse the issues and provide recommendations to overcome these constraints.

2 The Soybean Sub-Sector in Indonesia

2.1 Indonesia's Position in Global Production and Trade

Although a rising consumer of soybeans, Indonesia is not a major producer on a global scale. Figure 1 below shows the world's top soybeans producers in 2011 (in millions of tonnes).

Indonesian production of soybeans was just less than one million tonnes in 2009, fell below 900,000 million tonnes in 2012 and is expected to further decline in 2012-13 (see Figure 3). This is compared to a production of over 80 million tonnes by leading producer, the United States (US).



Source: USDA GAIN report and soystats.com

Figure 1 World soybean production (million tonnes), 2011

The productivity 'benchmark' of the leading global producers the U.S, China, and Latin America is almost 3.0 million tonnes/ha. Indonesia's productivity is less than half of the benchmark at 1.37 million tonnes/ha (BPS, 2012) (See Table 4).

Most of the leading producer countries are net exporters of soybeans, with Brazil the largest in 2011 (37.8 million tonnes), followed closely by the USA at 34.7 million tonnes. In contrast, Indonesia currently only produces one third of the soybeans it consumes. Thus, in global terms, it is strictly an importer of soybeans. Soybean imports will be discussed in greater detail in section 2.4.3 under *International Trade*.

Imported soybeans are used in both the food and animal feed industries. Within the food industry, (according to the ASA in Jakarta) approximately 50% of the beans are processed into tempeh, 40% into tofu, and up to 10% into sauces and other more high-end soy products, including commercialized soy milk. Much of the locally produced soybeans are used for the same processed products, with the majority of local production going to tofu rather than tempeh. The Indonesian food and animal feed industries also import a considerable amount of soy by-products: hydrolyzed soy protein, isolates, and concentrates; extruded full-fat soybean meal and dry cake.

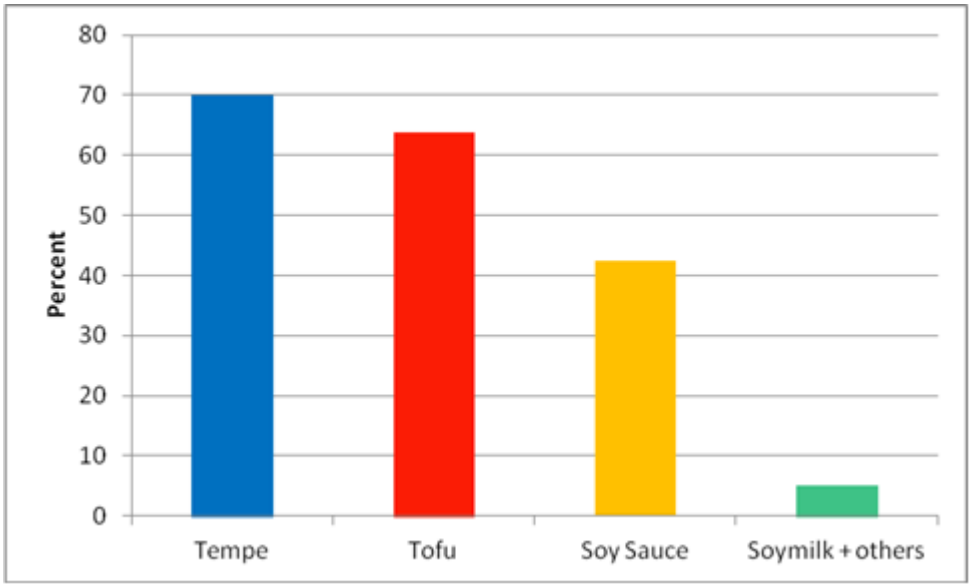
2.2 Socio-Economic Importance

As a rising staple commodity for the world's fourth most populous country, the cultural significance of soy and its importance for food security in Indonesia cannot be overstated. Along with peanuts, it is the third most important source of protein after cereals and fish for Indonesians in both rural and urban areas (BPS Susenas, 2010). Consumption of soy-based products is rising gradually for groups of the population.

In general, the urban and rural poor are the highest consumers of tofu and tempeh; most soybean farmers (more than 1 million on 600,000 ha) can be described as poor, as are the many thousands of people employed in the tempeh/tofu processing industry (up to 100,000 nationwide). This underscores soybean's importance as a 'pro-poor' commodity (ASA interview, October 5, 2012).

Soybean has deep historical roots in Indonesian culture. Tempeh is originally from Java and has been known as a food staple there since at least the 16th century, with a range of varieties developing over the centuries. Tofu, known locally as 'tahu' was introduced subsequently into the Indonesian diet by the Chinese.

Figure 2 below identifies the percentage of Indonesian households consuming various soy food products.



Source: BPS Susenas, 2010: Soy Foods Consumption in Indonesia

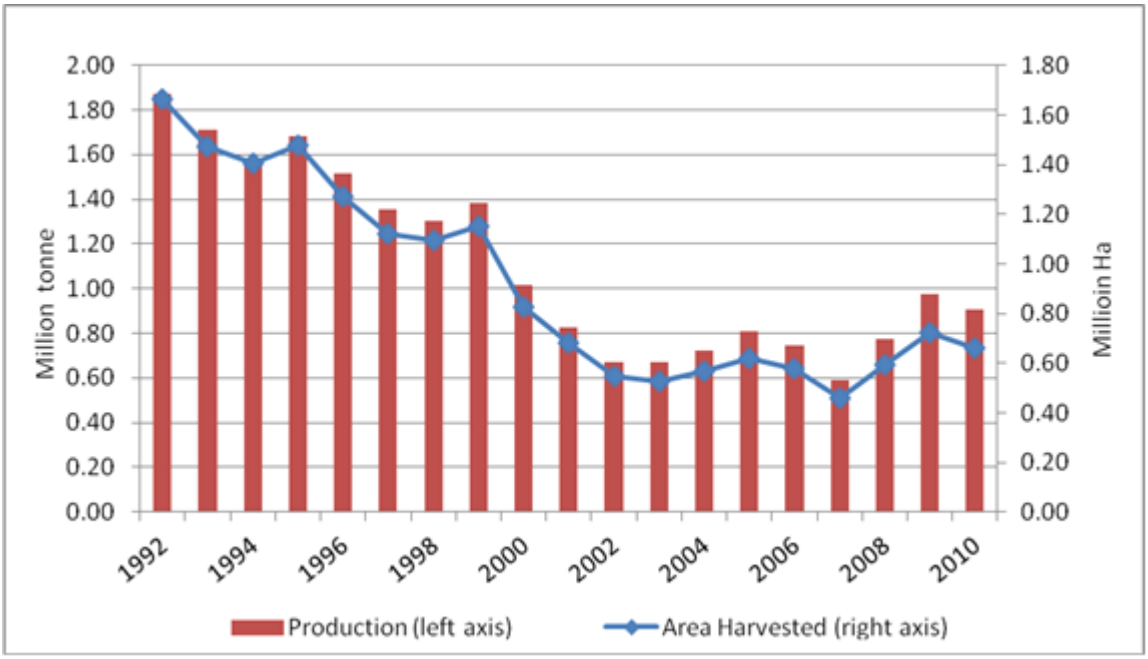
Figure 2 Consumption of soy foods by Indonesian households per year

During the colonial era and immediately following independence in the 1950s-60s, tempeh was regarded as an 'inferior' food and only for poor people. However, as soy-based foods became marked as an 'urban' middle class food worldwide, both tofu and tempeh became more acceptable, and consumption in Indonesia steadily increased. As consumption began to outstrip local supply, the Suharto government tried to promote local soybean production through international tariffs, subsidies for growers, and organizing tempeh and tofu processors into cooperatives (an initiative that ultimately failed). With the downfall of Suharto, the government adopted a 'laissez faire' policy toward soy producers and processors, liberalizing import markets while prioritizing other food crops deemed more strategic such as maize and rice (Interviews with processors, 2012). Currently, the Indonesian government has begun to reprioritize soybean cultivation: as of January, 2012,

it reinstated a 5% tariff on imported beans in an effort to support the production and trade of local beans (ASA Jakarta office and GAIN reports, 2012).

2.3 Production

Figure 3 below outlines the trend in soybean production from 1992 to 2010.



Source: FAOSTAT, 2010

Figure 3 Soybean production in Indonesia, 1992-2010

As a legume and a cash crop, soy is not the primary source of income for most Indonesian farmers: it usually complements the intensive cultivation of more highly valued primary crops such as rice and maize. As of 2012, Indonesia produces less than 850,000 tonnes of soybean on 600,000 ha. Production can vary significantly from year to year, depending on many factors, but in particular international prices (relative to other staple commodities) and climatic conditions. As discussed in more detail below, the lack of quality seed, irrigation, and knowledge/skills transfer have also been exerting downward pressure on soybean cultivation in most regions studied.

2.3.1 Geographical distribution

The epicentre of soybean production in Indonesia is EJ, followed by Central Java and then NTB. Together, these three regions account for two thirds of national production (Morey, P. et al, 2010). Table 4 below lists production statistics of soybeans in the AIPD-Rural districts of interest in EJ and NTB.

Table 4 Soybean production statistics by target district in EJ and NTB, 2011

EJ					
	Sampang	**Situbondo**	**Malang**	**Trenggalek**	**TOTAL-EJ**
Area Harvested (ha)	22,229	581	545	5,629	252,815
Production (tonnes)	31,031	592	677	6,789	366,999
Yield (tonnes/ha)	1.39	1.01	1.24	1.20	1.45
NTB					
	North Lombok	**West Lombok**	**Dompu**	**Bima**	**TOTAL-NTB**
Area Harvested (ha)	869	3,981	11,158	29,124	75,042
Production (tonnes)	1509	4,940	10,833	29,383	88,100
Yield (tonnes/ha)	1.73	1.24	0.97	1.00	1.17

Source: BPS, 2012

Of all the AIPD-Rural districts visited, the most vibrant soybean production areas were on Sumbawa Island in NTB (Bima and Dompu), and to a lesser degree in Trenggalek and Sampang. Some of the district-specific statistics in Table 4 were determined by the research team to be inflated (except in Situbondo). Therefore, while relative figures are still considered valid, absolute production numbers are somewhat lower in reality (although the figures for Sampang appear greatly inflated).

For NTB, the relatively higher production of soybeans can be attributed to the dry climate and a lack of land pressure (especially in Bima and Dompu). The quality of soybeans from this area is considered high by market wholesalers in Surabaya, many who theorize that the relatively larger land plot sizes and richer soil are more conducive to quality production.

2.3.2 Trends

Overall trends in local production during the last six years show a decline to 2008, followed by a gradual return to slightly above 2005 levels for EJ and Indonesia generally by 2012. Table 5 outlines the trend in local soybean production from 2005 to 2011. The fluctuation in production can be attributed to a lack of access to quality seed, few incentives for farming other than to grow primary crops such as rice or maize, poor farm-level infrastructure in terms of irrigation and post-harvest storage, and the influence of large-scale and regular imports. These factors prevent soybean production from spreading and increasing. Both the area planted and total production have declined substantially (from 1.7 million ha in 1991 to just over 600,000 ha in 2012). Meanwhile, imports have been increasing steadily by as much as 10% every year. Table 5 outlines the trend in local soybean production from 2005 to 2011.

Table 5 Trends in local soybean production (tonnes)

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
East Java	335,106	320,205	252,027	277,281	320,155	339,491	366,999	361,986
NTB	106,682	108,640	68,419	95,106	95,846	93,122	88,100	74,156
All Indonesia	808,353	747,611	592,534	775,710	924,511	907,031	851,286	851,647

Source: BPS, 2012

The consensus among farmers, traders, and input suppliers interviewed is that farmers increasingly prefer maize to soybean, especially due to the availability of inputs and the reliability of higher sales prices.

2.3.3 Production systems and seasonality

EJ and NTB are dominant producers of soybean in the Indonesian market, with EJ accounting for over 41% and NTB 9.5% of national production. Soybeans are grown in any of three seasons during the year, influenced by the availability of rainfall or irrigation, as well as the market prices of rice and maize. The three growing scenarios in EJ and NTB are as follows:

- Upland rainfed production – Grown over the wet season from November to February/March on clay loam to sandy loam soils with no irrigation (zero till).
- Lowland rainfed production – Grown in February/March – May/June) after the wet season rice crop on heavier clay soils.
- Lowland irrigated production – Grown on heavier clay soils following multiple rice crops which are grown between June/July – October/November.

Based on the available information, there seems to be little difference in yield between the three systems/seasons.

Soybean productivity has been stable for the past 5 - 6 years, in the order of 1.0 – 1.3 tonne/ha which is less than half the genetic potential of the cultivars currently available. A recent ACIAR-funded study by Rao Ratchaputi (2012) on tropical pulses found soybean yields in variety trials conducted in NTB were achieving yields in excess of 3.0 tonne/ha using pure seed of the local variety Anjasmoro (developed by Indonesian Legume and Tuber Crop Research Institute (ILETRI)). As discussed below, the disparity in yield potential and actual yields is due to factors such as poor farmer practices, lack of access to proper seed, training, and post-harvest storage.

2.4 End Markets / Demand

Demand for soybeans on the Indonesian market is steadily increasing. This demand, however, is being filled mostly by U.S. imports, which have increased on average by 10% each year since 1998. The following sub-sections examine aspects of this rising demand in further detail.

2.4.1 Product uses

Key product uses for soybean are tempeh, tofu and soy sauce. The largest market for soybeans is for tempeh production, and the majority of tempeh producers (outside of Sumbawa Island) use imported soybeans rather than locally produced varieties. However, local stakeholders in the tofu industries reported that local soybeans are preferred for use in tofu production, owing to their higher germ content (a component of the grain) and ‘fresh’ quality. One kilogram of locally produced soybeans is often judged to produce 10% more tofu than U.S. imports. The advantages normally attributed to imports, such as uniformity of size and hardness, are not relevant to tofu processing. The soy sauce processors reported that local soybeans are not only cheaper, but have an enhanced, fresher taste reflected in the sweet sauces they produce, and are thus preferred over imports.

A very small amount of soybeans (many of which are local) are used in the processing of 'kecap' soy sauce, but this is less than one percent of all soybeans traded, based on the figures provided by soy sauce processors. Typically different than tempeh and tofu producers that use yellow soybean, soy sauce producer use black soybean that specifically grow for soy sauce. Finally, for the purpose of this study, no figures were collected on the animal feed industry which, according to the ASA in Jakarta, uses approximately 10% of all traded beans to make lick blocks (for cattle), chicken feed, and fish farm food.

2.4.2 Demand structure and trends

Tofu and tempeh are processed and consumed all over Indonesia, but tempeh is especially popular among Javanese consumers. Several processors interviewed outside of Java (mostly NTB and Sampang) reported that tofu and tempeh consumption has increased markedly in the last 10-15 years as local populations have 'developed a taste for it', where they previously relied more on alternative protein sources.

The largest tempeh processor in Bima reported annual growth of 200 percent since 2009 accompanying his diversification strategies - offering different flavours, etc. (see Picture 1 below). Other processors reported more modest, but still robust, production and sales growth over the last five years, which they all attributed to increased consumption of the product.

With few exceptions, sales of tofu and tempeh are limited to the wet market in the AIPD-Rural provinces and districts. Marketing and outreach keep it as a household staple for poorer urban and rural populations; many processors feel that supermarkets are not an appropriate sales outlet as they are not considered comparable with the higher quality products that such supermarkets usually carry.

However, there are tofu and tempeh processors who target the steadily growing urban middle class - some charging higher premiums. While such processors are in the minority, several interviewed did express interest in expanding their market outreach to non-traditional market channels.

According to the retailers and processors interviewed, demand for tofu and tempeh experiences cyclical swings. Holidays - most notably Ramadan - are traditionally the times when demand is highest across Indonesia. This is because despite daytime fasting, there is a marked increase in consumption of family staples at night. Tofu processors and retailers interviewed in coastal target provinces of EJ and NTB reported that the only major barrier to sales is the high fishing season (generally when the moon is fuller during the dry season) when more fish is available on the market at affordable prices. Under such circumstances the locals prefer fish to tofu/tempeh.

Picture 1 (below left) is of Hendrik of UD Sumber Hidup, the largest tempeh processor in Bima district. He has expanded sales four-fold in the last four years, and expects to grow an additional 25%, before levelling off to 500 kg of soybeans processed daily. He explained that as more processors enter the market, there is a greater need to diversify product.

Picture 2 (below right) depicts a local Mataram tofu processor who works for an entity unique among local tofu processors, in that it caters strictly to urban middle- and upper-class consumers, charging a 30% higher premium and packaging in smartly-labelled baskets at its own retail outlet.

Picture 1 UD Sumber Hidup, tempeh processor

Picture 2 Tahu 151-A, tofu processor

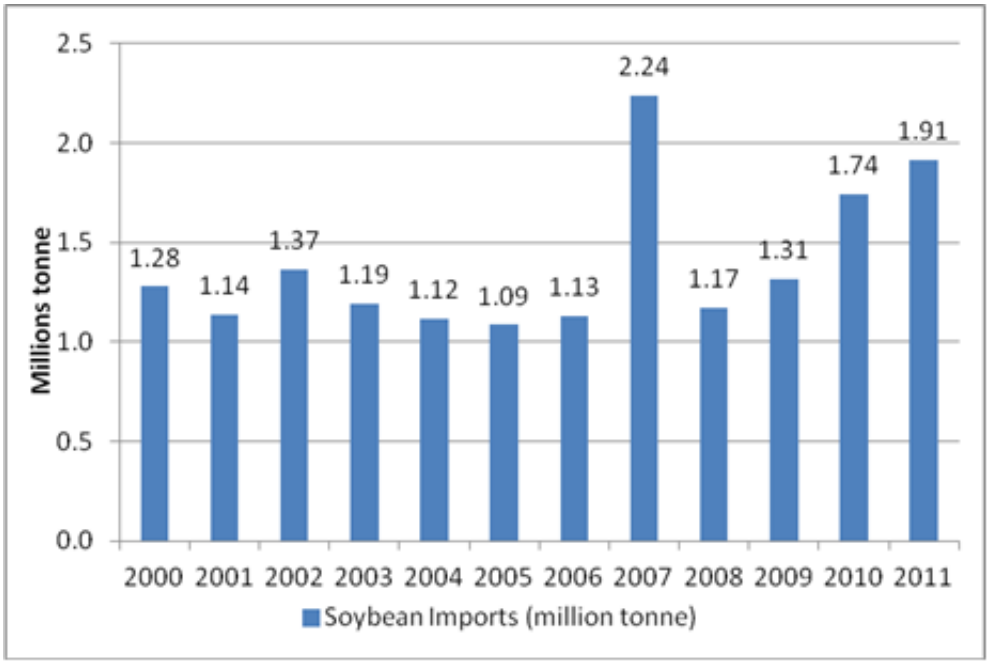
Source: Legume study team, North Lombok, Oct. 2012

2.4.3 International trade

Imports

Indonesia has been a net importer of soybeans since 1975. The volume of imports during the 2000s has consistently remained above 1 million tonnes per annum. Generally, since the year 2000, more than 50% of domestic demand has been met by imports, which is driven by the increased demand for soybean and soy derivatives.

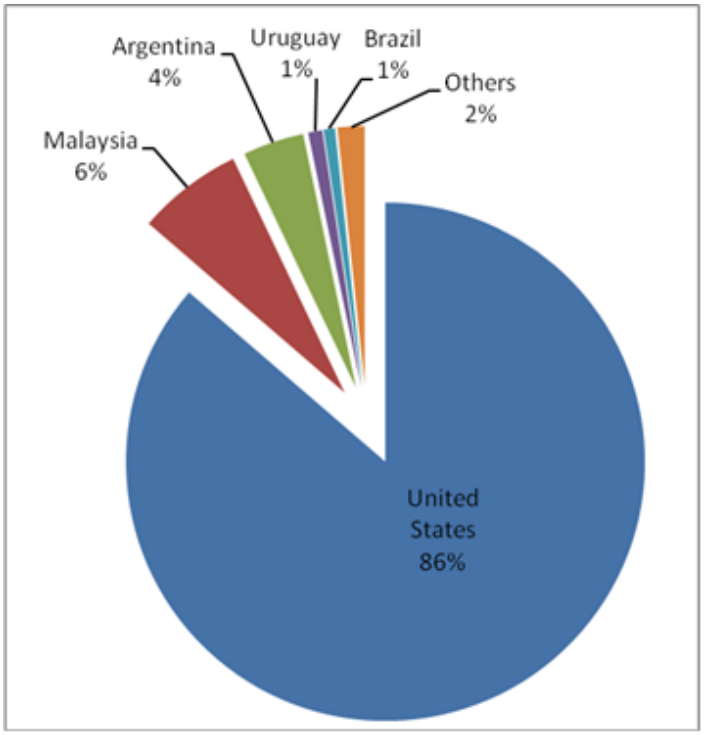
Figure 4 indicates that imports peaked in 2007 when the production of soybeans in Indonesia decreased by 18%, from 747,000 tonnes in 2006 to 608,000 tonnes in 2007. Imports have grown by almost 60% during the 2007- 2011 period, at an average growth rate of 18% per annum.



Source: FAOSTAT, 2012

Figure 4 Indonesian soybean imports, 2000-2010

Most of the soybeans imported to Indonesia are sourced from the U.S., which contributed approximately 85% of total imports in 2012 (see Figure 5 below). The U.S., along with Brazil, Argentina, China and India, are the major producers of soybean and collectively account for 90% of total world supply. The role of U.S. soybeans became increasingly important for Indonesia in 2000 when the U.S. government provided 6 months of interest-free loans for Indonesian importers of U.S. soybeans.

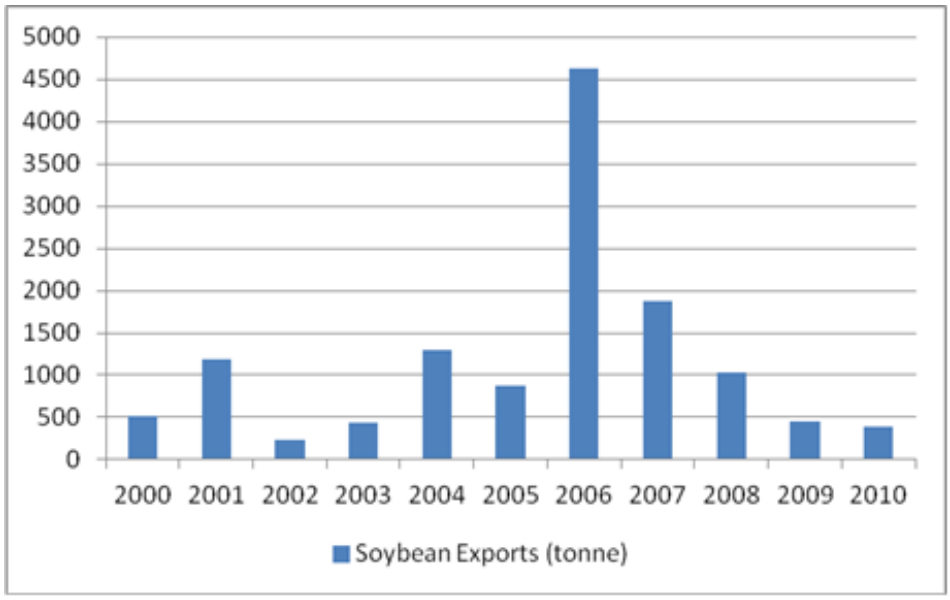


Source: Indonesian Ministry of Agriculture, 2012

Figure 5 Top 5 soybean importers to Indonesia, 2011

Exports

Indonesia does export some soybeans, as shown Figure 6 below, however the volumes are negligible compared to the millions of tonnes of imports. It is likely the exports are in the form of edamame, a vegetable soybean preparation of immature soybeans in the pod, which is mostly exported to the Japanese market.

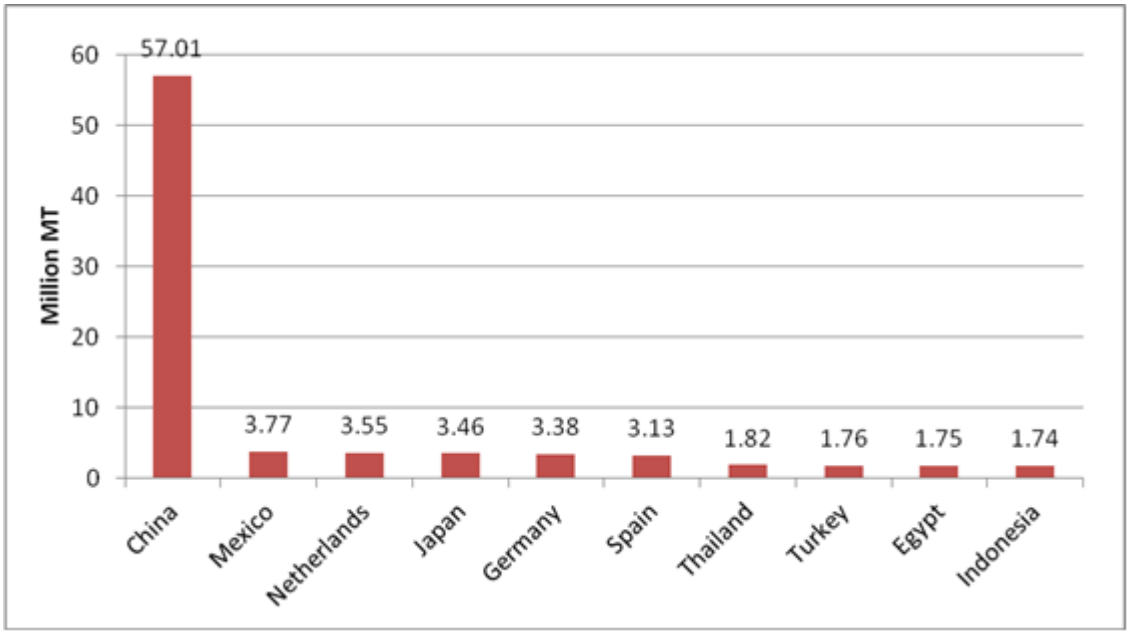


Source: FAOSTAT, 2012

Figure 6 Indonesian soybean exports, 2000-2010

2.5 Prices

In addition to the dollar/rupiah exchange rate, soybean prices tend to be dictated by international conditions that have little to do with demand in Indonesia itself. China is the world's primary consumer (and importer) of soybeans, with the U.S., Brazil and Argentina its primary suppliers (China absorbs more than 50% of U.S. soybean exports). As demand in China grows, this produces upward pressure on international soybean prices, which are determined at the Chicago Board of Trade (CBOT). This then puts upward pressure on prices in Indonesia. Figure 7 below illustrates the scale of China's share of world soybean imports.



Source: FAOSTAT 2010

Figure 7 World's ten largest soybean importers (million tonnes), 2010

It is important to note that margins all along the soybean value chain - from farmer to import distributor - are the lowest of the three legume commodities studied. Similar to urban distributors of imported soybeans, a local collector or wholesaler, after factoring in all expenses, will typically earn no more than 1.5% net margin, and thus needs to rely on trade of bulk quantities to offset costs. The margin breakdown for Sampang-grown soybeans is provided below in Table 6, as an example.

Table 6 Margin breakdown for Sampang-grown soybeans

Value chain actor	Sales price/kg (IDR)	Clean margin/kg (IDR)
Farmgate (10/2012)	6,400	-x-
Local collector on Madura island:	6,600	75-100
Inter-island wholesaler in Central Java:	6,950	100-150
Wet market retailers*	7,200	50-100

** typical sales outlet is to tofu processors*

Source: Legume study team, 2012

In a similar fashion, large-scale distributors purchasing from the primary importers (including Cargill) will earn no more than 50 IDR/kg net profit, which includes storage, labour, energy, and transport.

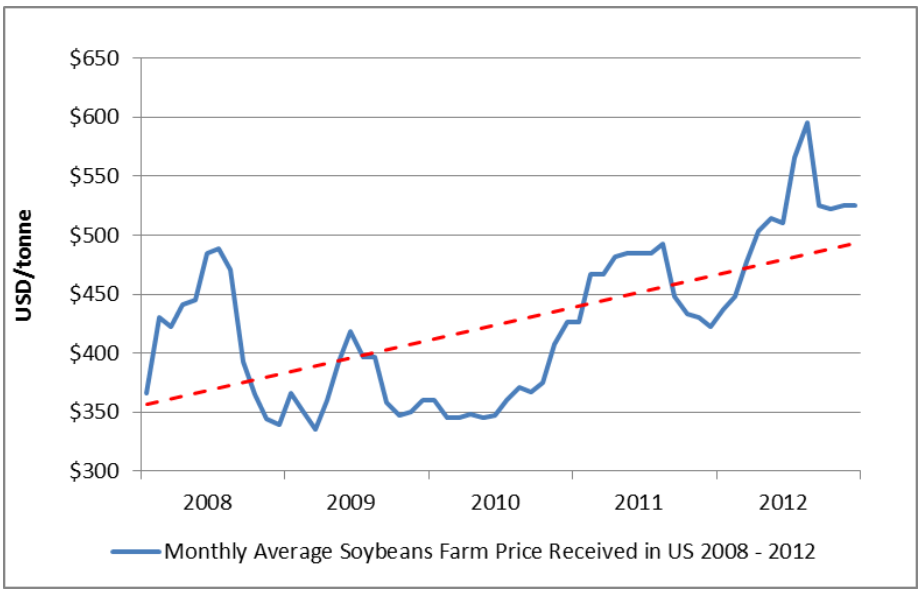
As widely consumed processed commodities, tofu and tempeh are highly sensitive to the price fluctuations experienced in the trade of soybeans. However, due to the sensitivity of low-income consumers to price increases, tofu and tempeh processors respond to price fluctuations by reducing the size of their products (which are not sold by weight) rather than increasing the nominal price to consumers. The recent price spike in June-July 2012, owing to futures market sensitivity to the drought in the U.S., resulted in tofu and tempeh processors protesting by boycotting production and demanding the government take action to remove its 5% tariff on imported soybeans.

2.5.1 Price trends

Soybeans are subject to both seasonal (see Section 2.5.3 below) and inter-annual price fluctuations. In general, world soybean prices continue to rise. In recent years there have been two large price spikes. The first, in 2008, was due to the world food price shock and in 2012 it was due to the unseasonably dry conditions in the U.S. and Europe reducing production (see Figure 8 below). At the time of writing, the international soybean price (CBOT) has declined off the peak to US$ 590/tonne.

The dollar-rupiah exchange rate impacts prices within Indonesia: the higher the rupiah, the lower the price in relative terms. That said, despite spiking in late 2008 -early 2009, the dollar/rupiah exchange rate has remained relatively stable over the last five years, but any swings will affect distributor prices for soybeans in Surabaya and Jakarta by an estimated 5-10%.

There is quite a clear correlation between U.S. and Indonesian price trends. Figure 8 illustrates the price received by U.S. soybean farmers at the farm gate from 2008 to 2012. Figure 9 depicts price trends in Kediri, EJ on a monthly basis from 2008 to 2012 for farmers, wholesalers, and consumers.



Source: US Department of Agriculture, National Agricultural Statistics Service (NASS), 2013

Figure 8 Monthly average soybeans farm price received in the U.S., 2008-2012

Source: Indonesian Ministry of Agriculture, 2012

Figure 9 Mean monthly soybean price, Kediri, EJ, 2008-2012

On average, local soybeans (when available) tend to be less expensive to the final Indonesian consumer (i.e. tofu and tempeh processors) than imports, often by as much as 400-500 IDR/kg during high season and harvest, which is one important factor driving their competitiveness for use by local processors.

2.5.2 Quality premiums

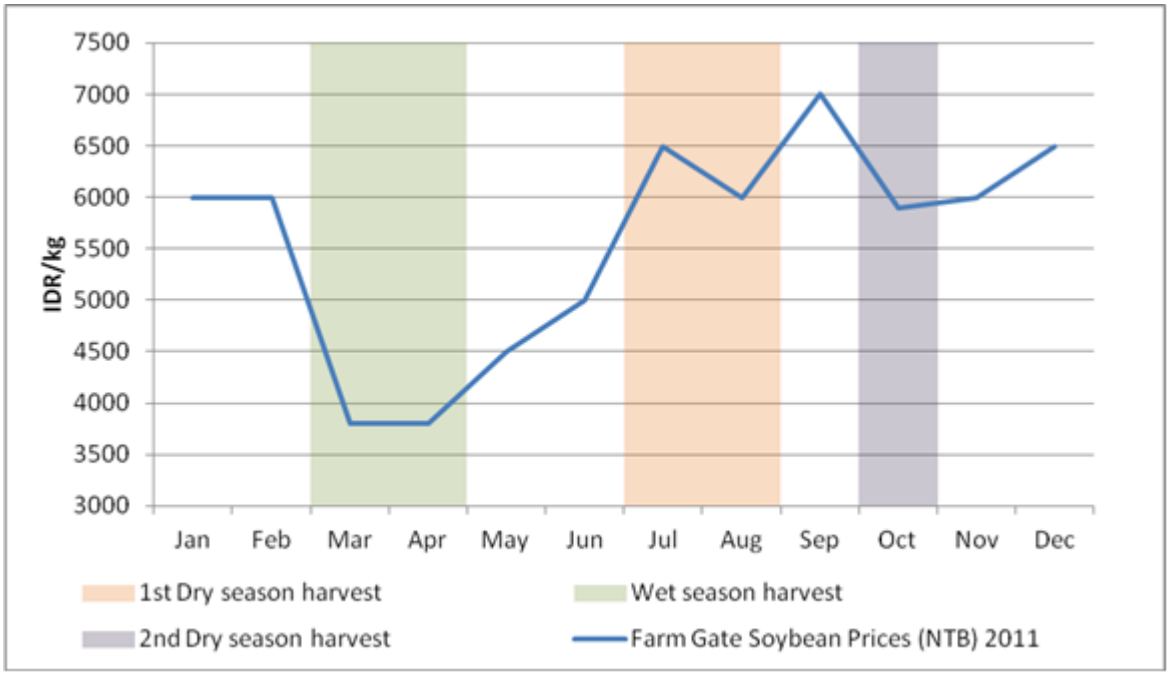
Overall, there are three different quality grades traded, with the first two attracting a higher price:

- *Grade 1* - Similar large size, yellow colour, no blackening, and relatively lower moisture content (below 15%, and 12% or lower is ideal). Grade 1 is often mixed by distributors into Grade 2, which makes it difficult to differentiate between the two grades. Thus, there are no price premiums known for Grade 1 over Grade 2.
- *Grade 2* - Often lumped together with Grade 1, it may be smaller in size with slight size variances, but still uniform in colour. This is the most commonly available grade sold by distributors of imported beans and used in tempeh processing.
- *Grade 3* - A term most often given to locally-grown soybeans by wholesalers and distributors. These soybeans are sold primarily to local tofu processors, and it is assumed they also make their way to animal feed companies as they are more difficult to market to tempeh processors.

Despite the grading system, farmers and collectors are not awarded premiums for any grade of beans.

2.5.3 Price seasonality

Though influenced by international prices as discussed above, price seasonality occurs based on local production. At the national level, price seasonality is affected by harvest cycles. In certain regions (NTB) it is possible to see as many as three soybean harvests: rainy season harvest (March-April), the first dry season harvest (July-August), and the second dry season harvest (October). These patterns differ depending on climatic conditions in different regions. Overall, availability of domestic soybean is highest during the rainy season harvest. Dryland farmers who are pressed to sell their crops quickly, due to humidity and financial constraints, receive lower prices for their harvest, which explains low farm gate prices during this time (see Figure 10 below).



Source: Interviews with wholesalers in Bima and Dompu, Oct. 2012

Figure 10 Farm gate soybean prices in NTB, 2012

Soybeans grown on irrigated land during the dry season attract a higher farm gate price because they contain lower moisture content and thus can be stored longer, removing the pressure to sell quickly from farmers and collectors. As can be seen in Figure 10, dry

season prices reached 7,000 IDR/kg and rainy season prices sank to just under 4,000 IDR/kg.

2.6 Policies and Regulations

The main policy currently affecting soybeans is a 5% tariff imposed on imports in January, 2012, which was revoked temporarily in July following protests by tempeh and tofu processors. Previously, there had been a 10% tariff on imports. This tariff was lifted in 2008, however, after tempeh and tofu processors protested and lobbied due to the significant negative effect it was having on their sales margins.

Today there are three private importers (Cargill, Teluk Intan, and Suryabudi) based in Jakarta. The Ministry of Trade has stated that it intends to make Indonesia 'self-sufficient' in soybean production by 2015 (a very ambitious goal) and intends to reintroduce steps to regulate imports. The specifics of these proposed regulations are still unknown but may involve reintroducing the Indonesian Bureau of Logistics (BULOG) as a monopolist importer (Interviews with market actors, 2012).

Additionally, in order to trade soybeans on the market, businesses are required to obtain a license.

2.7 Sub-Sector Development Programs

Currently, Mercy Corps is managing the Sustainable Consumption and Production in the Soybean Processing Industry in Indonesia Program (SCoPe Indonesia). The aim of the program is to drive change in tempeh and tofu production processes in order to develop a more eco-friendly and hygienic processing sector.

The program is part of the European Commission's (EC) 'Switch Asia' program, which runs from February 2012 until 2015, and is also supported by the Renewable Energy and Energy Efficiency Partnership (REEEP).

Other than the Mercy Corps SCoPe initiative, no other international development initiatives are currently focusing on the soybean value chain in Indonesia. In the past, the ASA has implemented programs with tempeh and tofu processor associations and cooperatives (including the National Association of Tempeh and Tofu Processors (KOPTI)), as well as major traders and animal feed industry representatives, to help them address:

- Improvement of hygiene at processing units;
- Training in accounting and management; and
- Organizing annual international buyers' conferences in the form of B2B meetings.

However, none of the tempeh and tofu processors interviewed in EJ or NTB were aware of these programs. There was no evidence of any other programs for the sector, except provincial-level initiatives such as assistance to tofu/tempeh processors in obtaining Halal certification. As explained below in Section 5, this represents a unique opportunity for AIPD-Rural to implement an effective program in this value chain that will not overlap with other initiatives.

2.8 Value Chain Structure

The focus of this study was limited geographically to three provinces and to the food industry product channel, which absorbs 88% of all imported and locally produced soybeans. Hence, most of the information gathered reflects the actors involved in production, trade, and processing of soybeans for the food industry. It does not include the animal feed industry, nor does it examine in any detail imported soy-based ingredients for higher-processed foods (for example extruded soy isolates). The value chain map below (Figure 11), while accounting for the different market channels, reflects this scope of research.

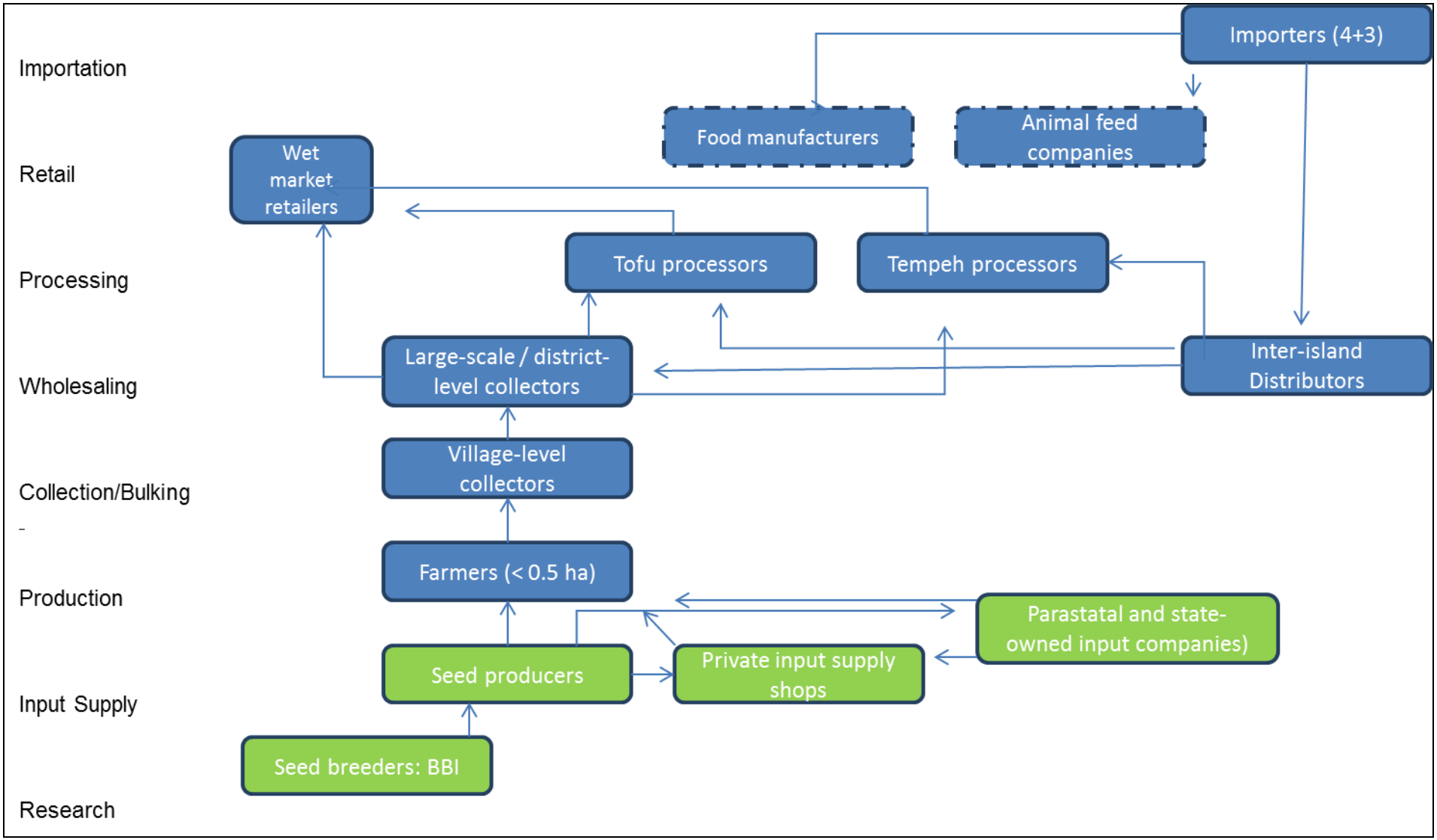


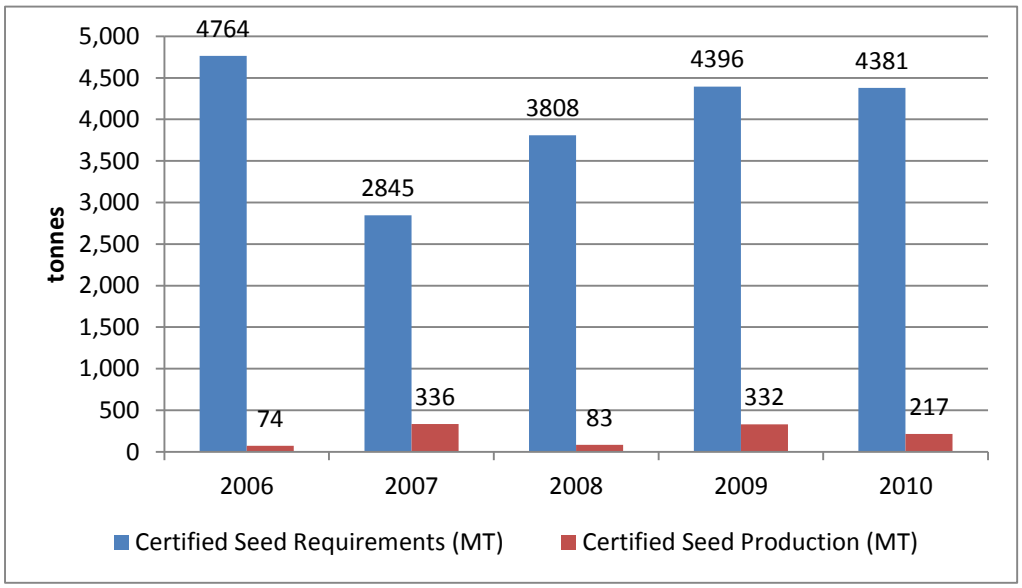
Figure 11 Indonesia soybean value chain map

2.8.1 Input distribution

ILETRI has a mandate for developing high yielding soybean varieties adapted to diverse production regions in Indonesia.

Unlike hybrids and rice crops, there are no agents for commercializing open-pollinated legume varieties. While ILETRI has been developing legume OPV with high yield potential and resistances to major biotic and abiotic stresses, the benefits of these new varieties is not being realised at the farm level due to lack of awareness amongst growers and LFs. There is also an absence of an efficiently functioning seed supply chain to supply certified seed of improved varieties to growers.

Figure 12 (below) highlights that certified seed contributes only 5.6% of total soybean planting seed requirements.



Source: ACIAR SMAR2007/68 Project- Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia

Figure 12 Certified soybean seed requirements vs actual production, 2006-2010

A conventional seed flow system has been operating for legume OPVs at different levels of production systems i.e. at village level and across lowland and upland regions involving distributors as agents of seed supply. It is this system that supplies more than 90% of the soybean seed market.

ACIAR soybean variety trials carried out in NTB in 2010 have shown that the 'locally bred' variety of Anjasmoro has 20% less yield potential compared to pure seeds of the same variety from ILETRI (Rachaputi, 2012).

Only one provincial soybean seed breeder entity was identified (BBI in Central Java) during field work. Its seeds are purchased by seed development companies (seed producers) who, at least in the areas visited, produce largely under contract with parastatal input supply companies. These seed companies are sometimes assisted by government extension initiatives (BPTP, and other government offices) but only to a limited degree in the areas covered. Typically, they sell a significant portion of the seed produced to the parastatal input supply companies, two of which were identified during the research (PT Pertani and PT Sang Hyang Sri). These companies are nominally private, but the government holds 100% share ownership. They sell the soybean seed either

directly to farmer groups, through their own retail outlets, BPTP, or various private input supply shops. The private input supply shops then sell to farmers, but many soybean farmers in NTB and EJ rely on their own seed banks (i.e. retaining seed from previous harvests or sharing), as availability of quality, certified seed is limited.

In general, there are two types of seed available for commercial sale: certified and uncertified, the former being considerably more expensive than the latter (by 20%). A final source of uncertified seed is from village-level collectors and wholesalers, who often sort what they determine to be seed-grade soybeans and sell back to supplier farmers. Sometimes they merely invite farmers to sort through their stocks themselves without necessarily charging a premium.

Picture 3 depicts a group of local collectors in Dompu, where farmers are allowed to select seed from their aggregated stocks for the next harvest. This is an example of informal seed selection and supply channels through which farmers obtain access to seed in the absence of availability of reliable certified seed.

Picture 3 Pak Darwis in Dompu, head of a group of local collectors

Source: Legume study team, North Lombok, Oct. 2012

Farmers purchase chemical inputs (fertilizer, pesticide, and herbicide) from private field agents, representing input supply companies, local retailers and distributors. Farmers and retailers that have questions about the proper usage of inputs can contact the field agents of these input supply companies**.** Field agents and the companies they represent also organize periodic village meetings, demonstration trials, and field days to demonstrate the use of their products. Most of these initiatives are targeted to maize and rice harvests, however, as soybean farmers (and input suppliers) put less emphasis on using chemical inputs for soybeans. Many farmers reportedly skip adding fertilizer to their crop altogether, relying instead on 'residual' fertilizer from the previous rice or maize harvest.

Distributors interviewed explained that private input supply companies are increasing in number and outreach across the AIPD-Rural provinces. These can be divided into multinational companies (DuPont, Bayer, Syngenta, and Nufarm), and mostly Java-based Indonesian companies (Petrokimia, Aman Asri, Royal Agro, Sari Kresna, and Biotek). In addition, there are several prominent input supply companies focusing mostly on seed (e.g. maize, vegetable, and sometimes rice): Bisi, East-West Seed, Pioneer Seed, and Primaseed, among others.

These companies all contract with provincial distributors who usually do not retail themselves. These distributors then sell to two levels of retailers (known in the industry as 'R1' and 'R2'). 'R1' retailers are typically larger and also act as distributors to smaller 'R2' retailers, which are typically small village-based shops. While there may be as many as 10-20 'R1' retailers in a given district, typically there are at least 1-2 'R2' retailers in every village, i.e. nearly ten times as many 'R1's than 'R2's.

Picture 4 below is an example of an 'R1' retailer distributor in North Lombok. This company 'test sells' new pesticides/herbicides with farmers and, based on their feedback, will either choose to promote them or not. In addition, they receive technical support from private supplier agents (Syngenta, Nufarm, Petrokimia Gresik, and Tanindo).

A system of credit extends from input supply manufacturing companies down to retail shops. As an embedded service between market actors along the value chain, this credit system is nominally interest-free. However, the research team found that both manufacturing companies and distributors often discourage 'R1' and 'R2' retailers from offering credit to client farmers, as they are considered high-risk, low-collateral clients.

As farmers are less likely to pay back in time, a payment bottleneck is created that affects input suppliers all along the value chain. Nevertheless, there are exceptions to this practice. Typically, a manufacturer will offer three to four months credit to their distributors, and the distributors will extend 1-2 months credit to their 'R1' or 'R2' retailer clients.

Picture 4 UD Kangen Bersama, 'R1' retailer distributor North Lombok

Source: Legume study team, North Lombok, Oct. 2012

2.8.2 Production

The farmers interviewed for this research participated in either informal groups or cooperatives, mainly to facilitate access to subsidized fertilizer and seed (mostly maize or rice). In some cases, farmers receive training from government extension offices (especially BPTP) but in most cases, they do not. It is more common for farmers to receive training on the use of proper seeding techniques and chemical and organic inputs (especially herbicides and pesticides) from private input supply company field agents. Through these field agents, companies also provide group trainings to farmers on safe application of pesticides with sprayers. Examples of such private extension services were reported throughout the areas visited. The most often cited companies involved were Syngenta, Nufarm, Bayer, and Petrokimia Gresik.

Some farmers receive seed through BPTP, which recommends a seeding rate of 40 kg/ha. Most farmers, however, were found to be seeding as much as 80-100 kg/ha and achieving higher yields than if they followed the GOI's recommended seeding rate.

The research team found limited gender-based separation of roles: women as well as men were found to be farming soybeans in EJ, Madura Island, and Bima. The only clear 'gender-based' roles identified by the research team - and this deserves more in-field follow-up conducted by a gender studies specialist - involved weeding, spreading of fertilizer, sorting and sifting of soybean pods after harvest. All of these activities are more likely to be conducted by women (but not exclusively so). Men were found to be more likely involved in ploughing soil and heavy labour (See Section 6.1.1 for further detail on gender issues).

Farmers depend heavily on local village-level collectors to assist with post-harvest protection of their soybean crops, as most lack appropriate facilities for drying and storing soybean seed pods. Those that do not save seed from a previous harvest purchase soybean seed (either certified or uncertified) from private input supply shops or through the government extension office. As seen earlier, collectors often allow farmers to hand pick seed-quality beans (from the previous season's harvest) to use for the next season.

2.8.3 Collection

Collectors buy soybean directly from farmers before selling it to larger-scale collectors or wholesalers. Village-level collectors may be trading other locally produced commodities as well, and may be working on behalf of larger-scale wholesalers based in urban areas. Sometimes they are farmers themselves. A typical village-level collector will collect up to 100-200 tonnes of soybeans per year (often less) from 50 to 100 small to medium scale enterprise (SME) farmers. Most of the time, payments to farmers are in cash, which the collectors may receive in part from their buyers further up the value chain. Collectors will agglomerate the soybeans from farmers at one spot (usually in front of their dwelling) and either hire a truck or make arrangements with wholesalers for pickup.

Collectors and wholesalers often extend credit (with low or no interest) to farmers in order for them to purchase inputs, either deducting from the final sales price (as an 'embedded' transaction) or charging by harvest time. This source of credit is important for farmers as they often have few other options to access it, either from input suppliers or financial institutions. None of the arrangements between collectors and farmers were found to be formalized in written contracts, and are usually trust-based in the context of longstanding relationships between buyers and suppliers.

2.8.4 Wholesaling

In the domestically grown soybean value chain, wholesaling is similar to collection. In the other legume value chains studied (peanuts and mungbean) the differences between these two were more pronounced. The main difference between a wholesaler and a village-level collector of soybeans is related to three parameters:

1. Scale of operation,
2. Availability of a warehouse, and
3. Links with buyers in other provinces/islands.

A wholesaler - especially in NTB - will be based near larger urban centres like Bima or Mataram and will be trading between 200 and 2,000 tonnes/year. They will source from farmers as well as collectors, either providing their own transportation or inviting collectors and farmers to deliver directly to their warehouse.

Their customers are either larger wholesalers in other provinces, otherwise known as inter-island distributors, or local tofu processors. As mentioned above, only on Sumbawa Island were local tempeh processors found to use significant amounts of domestic soybeans.

Picture 5 below is of Haji Shoupi in Mataram, one of the largest wholesalers in NTB. His workers clean debris from soybeans delivered from collectors on Sumbawa and Lombok. His clients include both local tofu processors as well as wholesalers in Bali. He also distributes imported soybeans to local tempeh processors.


Picture 5 Warehouse of Haji Shoupi in Mataram, one of the largest wholesalers in NTB

Source: Legume study team, North Lombok, Oct. 2012

Inter-island distributors are wholesalers mostly trading in imported soybeans, which they procure from importers. A smaller proportion of their trade is local soybeans, which are mostly acquired by tofu processors. There are up to 20 such distributors in EJ alone - the majority around Pabean market - and they trade upwards of 1,000 tonnes of soybeans. Inter-island distributors are removed from production areas, so they tend not to procure directly from local producers, serving merely as a market outlet for wholesalers. Some provide credit to their supplier wholesalers of up to two weeks, but none interviewed reported extending longer term loans to their suppliers, nor do they engage in any activities to encourage quality production.

Picture 6 below shows UD Mulya Abadi, one of the three soybean wholesalers in Trenggalek. He is interested in supplying seed and training to soybean farmers as local production is falling in comparison with maize and rice (which is their main business). Their new warehouse, with a 500 tonne capacity, was financed largely through their own capital.


Picture 6 UD Mulya Abadi, soybean trader in Trenggalek and warehouse

Source: Legume study team, Oct. 2012

2.8.5 Processing

The average tempeh and tofu processor in NTB processes between 50-100 kg of soybean/day. It is estimated that on Lombok Island there are upwards of 200-250 such processors, and in the target districts of Sumbawa up to 70 (with 30 in Bima alone). This represents a daily processing capacity of an estimated 22 tonnes for NTB alone, more than half of which is sourced from domestically-grown beans, an important difference from processors interviewed in EJ.

Picture 7 is of Ibu Kasmawati and her small-scale tempeh processing operation in Mataram (NTB). She stores the tempeh on racks and distributes to up to eight retailers in two local markets. Her tempeh brand packed for retail can be seen in the photos.

Picture 7 Ibu Kasmawati, small scale tempeh processor in Mataram (NTB)

Source: Legume study team, Oct. 2012

Another noticeable difference in processors from NTB, as compared to those in EJ, is that due to their use of local soybean, the larger-scale processors often source directly from farmers and farmer groups, building relationships with producers that are similar in scope to those the producers enjoy with wholesalers and collectors. Picture 8 (below) is from inside the tofu processing plant of 'Pak Rosul' in Sampang - the largest in the district.

Picture 8 The largest tofu processing plant in Sampang (EJ)

Source: Legume study team, EJ, Oct. 2012

In EJ, the situation is quite different, with the overwhelming majority (more than 90%) of processors (even tofu) using mostly imported beans. In Sampang there are an estimated

30 tempeh and tofu processors that use, on average, between 50-100 kg/soybeans/day. The majority of their beans are imported and sourced from local wholesalers or wholesalers in Surabaya. Most of the processors in all target areas have less than ten employees and can therefore be defined as micro, small, and medium-scale enterprises (MSMEs).

Many tempeh and tofu processors are members of KOPTI, a national cooperative association of tempeh and tofu processors. The stated objectives of KOPTI are to:

a) Facilitate the supply of soybeans;

b) Avoid extortion by middlemen;

c) Obtain government assistance for legal protection and advice;

d) Improve the poor image and status of tempeh makers, so that they may become respected members of society and their profession regarded as a craft passed through the generations;

e) Increase product quality and productivity, and;

f) Aim to produce tempeh and tofu at a price easily affordable by the general population (Shurtleff, W, and Aoyagi, A. 2011).

Processors interviewed stated that KOPTI has strong political clout and often lobbies the government to reduce import tariffs and provide other backstops to secure affordable soybeans. However, none of the tempeh or tofu processors interviewed in NTB or on Madura Island were members or had participated in KOPTI activities. Processors interviewed in Malang and Surabaya did belong and stated that KOPTI serves as a source for group purchasing of inputs (beans, packaging, etc.) and also as a sales node, especially for tempeh.

2.8.6 Retailing

'Retailing' of raw soybeans at local markets is limited. The study team never saw more than one or two retailers selling in wet markets and these retailers sold no more than 50 - 100 kg/week, usually to final consumers processing soy milk at home or cooking the beans for soup. Other forms of retail include boiled and salted beans still in their pods, sold by street vendors by the bag/cup.

Retailing is primarily understood as the sale of tempeh and tofu at wet markets. This is an activity carried out by micro retailers, most of whom are women, who buy directly from the processors. As it is a perishable product, turnaround for tofu is daily, whereas tempeh can be stocked for up to one week, depending on the climatic conditions.

Sales cycles are ongoing and many processors will extend credit to retailers for up to two to three days (i.e. until the retailer has had a chance to sell their entire product). Most processors interviewed reported transporting the finished products directly to retailers in the markets.

2.8.7 Product standards and coordination systems

Processors

Officially, all businesses involved in the processing of legumes are subject to hygiene inspections and certification on a three-year basis. Hygiene certification and registration costs the small-scale processors as much as 1,500,000 IDR (or US$ 500/year) and is

largely symbolic. None of the tofu and tempeh processors interviewed indicated that they were subject to rigorous inspections. Nor did they have Hazard Analysis and Critical Control Point (HACCP) plans or certification. One tofu processor (Tahu 151-A) exhibits a Halal certificate, obtained through provincial-level financing, but most processors do not opt for such quality standards owing to the traditional nature of their market and low capital investment.

Whenever sectoral issues arise, tempeh and tofu processors hold coordination meetings or organize lobbying/advocacy/protest activities, sometimes through KOPTI. For example, the informally organized processors in Mataram (numbering over 200) met in 2005 to discuss and address a crisis related to rumours of Formaldehyde usage among tofu processors, which led to a dramatic drop in sales in Jakarta from 2005-6 and threatened the image of the industry as a whole. Their actions were successful at raising awareness of the danger of the practice. However, the event's organizers (Haji Ripai - the largest tofu processor in Mataram) explained that it did not lead to further action or coordination among processors. Repeated attempts by the provincial governments on Madura Island (EJ - Sampang district) and NTB since the 1990s to form associations or cooperatives similar to KOPTI have failed.

Distributors

Certain inter-island distributors interviewed in EJ reported that due to the low margins and high volumes there is very little coordination or communication among them. This is attributable to a perceived lack of need and high competition. On the other hand, the major importers have been described by some sources to be operating in a ‘cartel’. But according to the ASA this is plainly false: soybean prices at the import level closely mirror international prices.

Input supply

With regard to the production, distribution, and sale of chemical pesticides, fungicides, and herbicides, the proliferation of products and manufacturers supplying them has, for the most part, erased exclusivity in relations between distributors and suppliers (including high-profile companies such as Syngenta and Bayer). Other than retailers and distributors picking and choosing which products they put on the market, there seems to be little coordination on the part of either the government or the private sector.

2.9 Costs and Margins

The cost and margin information presented below reflects information compiled during field interviews in EJ and NTB. A total of five grower group interviews (three in EJ and two in Bima in NTB) were conducted to assess gross margins of soybeans. All the soybean crops were grown with irrigation to realise high yields.

In general, the margins involved in soybeans are lower than those for peanut and mungbeans at all levels in the value chain.

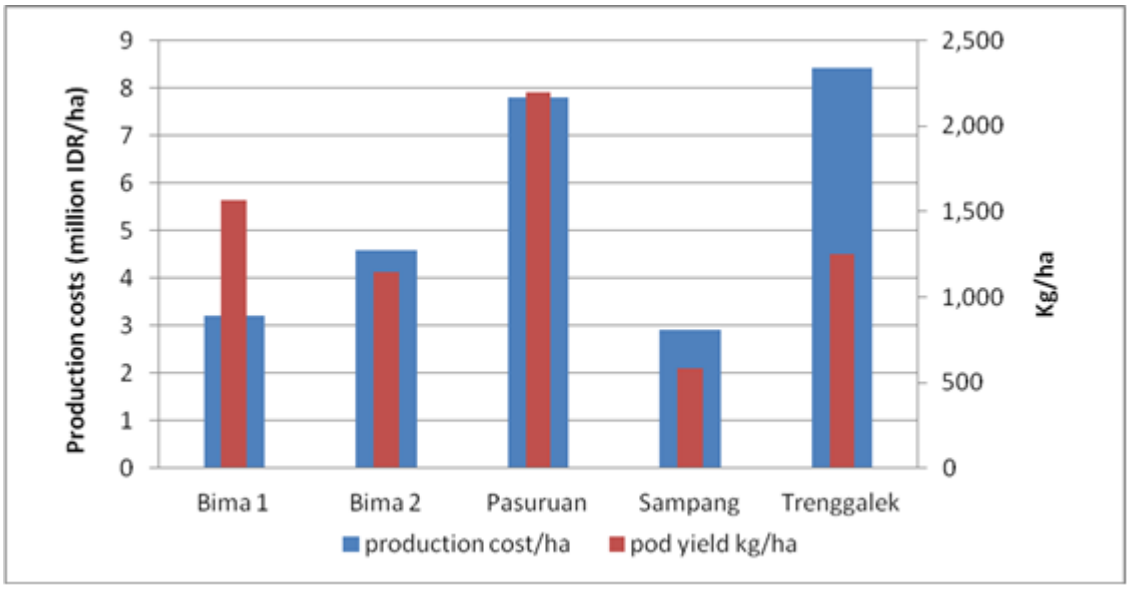
2.9.1 Farm level

There were significant differences in costs and net returns at the farm level between all five soybean growers interviewed. This is to be expected as soybean growers produce different varieties, follow different cultivation practices, use different quantities and

combinations of chemical inputs, and experience different weather conditions, thereby achieving different yields and cost structures (see Figure 13 below).

Production costs in Bima (NTB) range between IDR 3-4 million/ha, while they reach up to IDR 8 million/ha in EJ. The high costs of production in EJ locations can be associated with the use of irrigation (especially in Trenggalek), and labour (in Pasuruan), hiring costs of irrigated land, and also the unavailability of family labour.

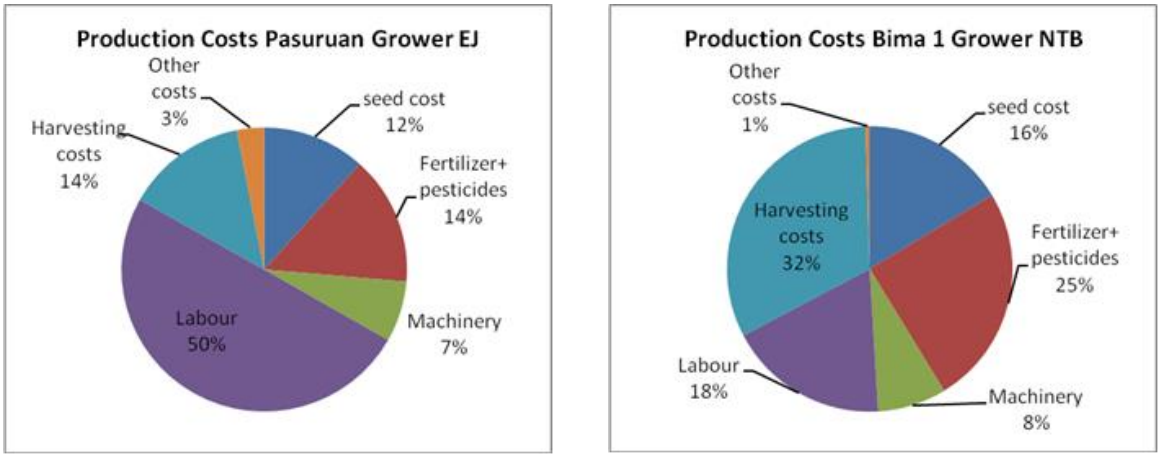
Local input suppliers also stated that plot sizes for Bima farmers tend to be several times larger than the relatively tiny land plots of EJ, an indicator of NTB farmers relying more on rain to supplement irrigation.



Source: Legume team field work and calculations 2012

Figure 13 Soybean yield and production costs in NTB and EJ

While the variation in costs and yield between growers and regions is high, some patterns emerge regarding the apportionment of costs. Figure 14 below represents the cost breakdown of a grower, Bima 1 in NTB and a grower from Pasuruan in EJ. Across all production systems, labour and harvesting costs, at 50% to 75%, represent the highest proportion of input costs. Labour costs are higher for both production systems in EJ compared to NTB. Most of the manual labour is spent on sowing, weeding, irrigation and harvesting. Seed and pesticide inputs represent 25% to 40% of costs while machinery hire accounts for less than 10%.

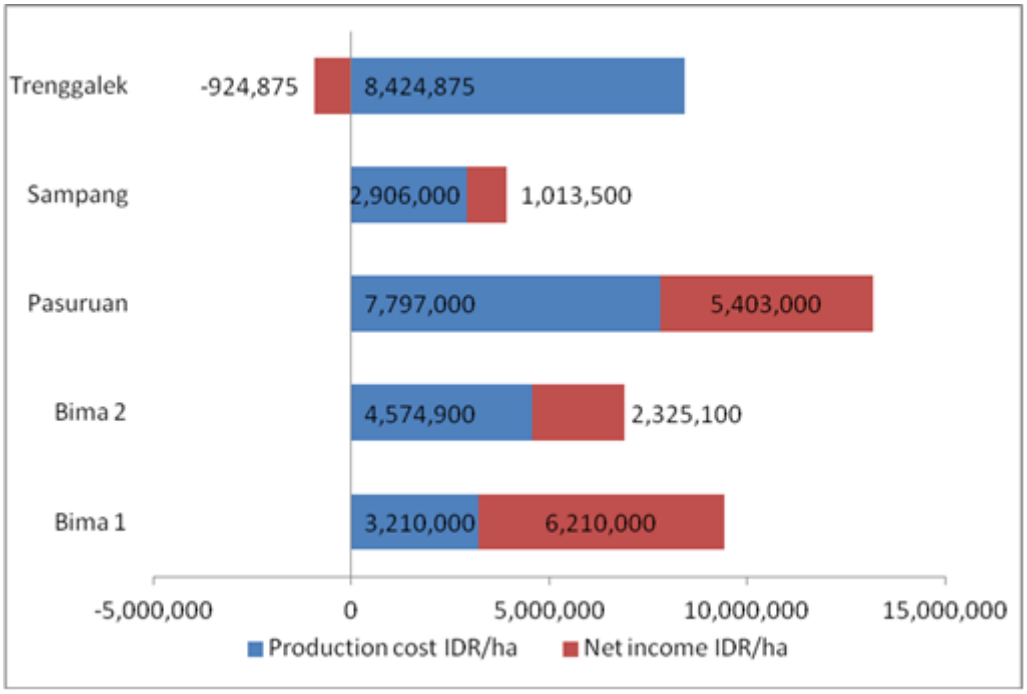


Source: Legume team field work and calculations 2012

Figure 14 Soybean production costs in NTB and EJ

Net returns for soybean production also vary from location to location (see Figure 15 below). While soybean production seems to be profitable for the growers in Bima and Pasuruan, the net returns are either very low or negative for the growers in Sampang and Trenggalek.

The prices received by all soybean growers were within a range of 6,000 IDR to 6,700 IDR per kg, therefore yield had the greatest influence on gross returns.



Source: Legume team field work and calculations, 2012

Figure 15 Production costs and net returns of soybean in NTB and EJ

While the costs and margins analysis performed in this study are highly varied and only represent a small subset, they are somewhat comparable to the recent socio-economic analysis of soybean in NTB that was conducted as part of the ACIAR project, *Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia* (Rachaputi et al, 2012).

For this study, detailed information was gathered from 87 soybean growers in Central and Western Lombok who had produced soybeans consistently for five years. The key findings from the research are highlighted below.

- The average farm size of soybean growers is approximately 0.4 ha with nearly 80% of farmers owning their own land.
- 88% of farmers grow the local soybean variety (29%) or Willis (59%).
- Only 8% of farmers currently produce the higher yielding variety Anjasmoro.
- Nearly 40% of farmers spread their seeds for planting with 60% practicing dibbling[5] in rows.
- Approximately 45% of farmers purchase their planting seeds from the local market, 32% purchase from the local shop and 14% purchase from seed developers.

[5] *placing seeds in a small hole in the ground made by a stick*

- 66% of are willing to adopt new technologies.
- Average yields were in the region of 1 tonne per ha. Variability between farmers was high, ranging from 3.0 tonne per ha to 0.3 tonne per ha.
- 60% of farmers currently use some form of fertilizer, namely urea and SP36 (36% superphosphate.
- A summary of the gross margin from 25.7 ha of soybean (87 growers) in 2012 is listed in Table 7 below. This data reflects the findings of field work in this value chain study with labour costs by far the greatest expense followed by seed and then chemicals.

Table 7 Soybean gross margin, Central and North Lombok, 2012

Yield (kg/ha)	1,040	
Price (IDR/kg)	5,859	
Revenue/ha (IDR)	6,093,174	
Costs	**Rate IDR/ha**	**Percent cost**
Seed	505,193	15%
Labour	2,566,537	77%
Fertiliser	148,926	4%
Pesticide	130,349	4%
Total cost	3,351,005	100%
Gross margin (IDR/ha)	2,742,169	
Gross margin (US$/ha)	280	

Source: ACIAR SMAR2007/68 Project- Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia

Hypothetical returns/farmer profiles

To illustrate the potential benefits soybean farmers stand to gain from AIPD-Rural interventions with LFs introducing improved technologies, input use, and especially improved certified seed varieties (also discussed in Section 5), the following 'farmer profile' is presented across three seasons for a hypothetical farmer.

The estimated gains are based on conservative extrapolations of findings from the ACIAR Study *Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia,* Rachaputi et al (2012). The on-farm adaptive trials for soybean found a two to three fold increase in soybean yield between farmers' current practices and the improved practices of planting in rows (40cm x 15cm), zero tillage and planting two seeds per hole. Increases in labour requirements for row planting would be offset by decreased requirements for planting seed.

Season 1: The farmer begins using improved agricultural input practices (but not improved seed varieties as commercial linkages have not yet been established). For the Bima and Trenggalek farmers, this results in 20% improvement in revenue with an 8% increase in costs (labour, not cash). Seed costs have been reduced in line with appropriate seeding rates and labour costs have been increased to account for dibble planting in rows.

Season 2: The farmer adds improved certified seed varieties (developed and tested by ILETRI, BPSP and BPTP and procured through LF input suppliers). These suppliers include wholesalers and retail shops. Field agents from seed companies in all target areas begin providing extension support to ensure best practices in crop management. These efforts complement those undertaken by BPTP and ILETRI. The resultant increase in productivity is a 50% increase in yield with a 10% increase in cash costs, due to the adoption of certified improved varieties. No change in fertilizer use has been introduced.

Season 3: The farmer has purchased the improved certified variety seed and inputs directly through LFs and is implementing best practices in crop management. The farmer's relations with LFs (including input supply wholesalers and retail shops) translates into increased access to improved variety seed, supported by an increase in fertilizer and chemical inputs. Yield increases an additional 20% through improved application of best practices. Fertilizer and chemical use is increased slightly (15% cost increase). The ACIAR Tropical Pulses study concluded that the use of fertilizer at any rate and type on soybean after rice did not significantly improve soybean agronomic performance

Over the three year intervention period, net returns to soybean producers are simulated to increase three-fold (assuming price remains constant) with a modest increase in yield from 1.0 tonnes/ha to 2.2 tonnes/ha. Yields of up to 3.0 tonnes/ha are achievable.

Table 8 below summarises the outcomes from this hypothetical exercise.

Table 8 Bima (NTB) soybean farmer profile with percentage increases in revenue

	Yield Increase			
	Present	**Year 1**	**Year 2**	**Year 3**
		20%	40%	20%
Yield	1,040	1,248	1,872	2,246
Total Revenue/ha	6,093,174	7,312,306	10,968,458	13,162,150
Total costs/ha	3,351,005	3,607,659	3,953,540	4,473,191
Net income/ha	2,742,169	3,704,647	7,014,918	8,688,959
US$/ha	**$280**	**$378**	**$716**	**$887**

Source: Author's calculations (From ACIAR SMAR2007/68 Project- Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia)

2.9.2 Collecting / wholesaling

Costs for collecting and wholesaling are based on transport/logistics and storage. The example below (Table 9) is derived from Dompu (NTB) and illustrates the thin margins on which these value chain actors operate.

Table 9 Cost / margin analysis: collectors/wholesalers in Dompu (NTB)

Expense component	Cost (IDR) (per kg)	Margin Calculation (per kg)
Delivered sales price in E. Lombok	6,500	6,500
Truck to Lombok on ferry (8 tonne)	(353)	6,147
Packaging in bags for transport (labour cost)	(25)	6,122
Transport and packing from farm gate to warehouse	(150)	5,972
Est. loss/dry weight/misc.	(30)	5,942
Farm gate price	(5,800)	Final margin (IDR) 142

Source: Field Interviews, 2012

Distributors of mostly imported soybeans based in Surabaya, who often trade in much higher volumes, sometimes have margins as low as 50 - 75 IDR/kg after sorting, vacuuming, storing, and paying for energy costs at their warehouses (Interviews with wholesalers, 2012).

2.9.3 Processing

Tofu and tempeh processors incur significant costs, some of which are related to technological inefficiencies. Although few tofu processors would divulge specific per-item costs, they unanimously ranked fuel as the single largest cost, followed by labour, water pumping (i.e. fuel), electricity, and firming agents (saltwater or Sulphuric Acid). As a result of high fuel costs, processors try to use alternative fuels when possible. Some processors will use wood to heat clay ovens, but the most cost-effective fuel available is peanut shells, coconut shells, corn husks, and rice hulls, all purchased from local commodity wholesalers and processors. Processors reported peanut shells to be an optimal source (where available in sufficient quantities) as they burn at a lower temperature and for a longer period of time than either wood or other sources.

One pricing analysis (Table 10) furnished by a larger-scale tofu processor in Sampang (800 kg/day) reveals the following revenue:

Table 10 Cost analysis: larger-scale tofu processor in Sampang

Expense component	IDR based on 800 kg beans
Daily revenue from tofu sales	7,700,000
Cost of beans + transport: 6,800+100/kg	5,520,000
Processing and labour costs:	1,180,000
Net margin from tofu	500,000
Net margin from soybean meal sales	500,000

Source: Field interviews, Oct 2012

The processors also stated that they receive income from the sale of soybean meal waste. This income can be as high as 50% of their margin. Each day, processors sell their soybean waste in bags to local cattle, duck, or hog farmers (depending on the location). Picture 9 (right) shows an image of soybean meal waste to be sold to local cattle farmers in Mataram and Sampang. Typically, soybean meal waste is not sold by weight but as 'cetak', or bag measurement.

In NTB, the average tofu processor of 100 kg soybeans will produce up to 90 cetaks of soybean meal waste, each sold at 1,250 IDR, which translates into 25% of their daily margin. Other processors reported even higher earnings of as much as 50% of margin from soybean meal waste.

One larger-scale tempeh processor in Bima provided an estimate of his costs, from which the following (outlined in Table 11) was deduced:

Picture 9 Soybean meal waste

Source: Legume study team, EJ, Oct. 2012

Table 11 Cost analysis: large-scale tempeh processor in Bima

Expense component	Cost/day (IDR)	Cost/kg (IDR)
Beans (400 kg/day) - locally grown and sourced directly	2,500,000	6,250
Packaging	400,000	1,000
Fuel (coconut and peanut shell)	50,000	125
Transport (of tempeh to markets/beans to unit)	50,000	125
Labour (one man for hired labour)	40,000	100
Electricity	22,000	55
Yeast	20,000	20
Tapioca starch	5,000	12.5
Misc. Costs [also applied to other ventures - tofu]	1,500,000	2,500
Total turnover/sales	5,000,000	12,500
Net margin from tempeh processing	600,000	1,500

Source: Legume Study Team, Oct 2012

Based on this data, and what was indicated by other smaller-scale tempeh processors, tempeh processors have lower processing costs than tofu processors. Packaging, however, is a cost to them that tofu processors do not factor in. Furthermore, outside of Sumbawa Island (where the target districts of Bima and Dompu are located), the costs for soybeans to tempeh processors are substantially higher at 7,200+ IDR/kg for imported U.S. beans. Local beans on Sumbawa Island, in contrast, only cost processors 6,250

IDR/kg. The proximity of producers to processors and lower costs to traders in terms of sorting and transporting, all play a role in the comparatively lower price per kg.

2.10 Value Chain Constraints

The major constraints identified at different levels in the value chain are listed in the left column of Table 12 below. Existing and potential market-based solutions (MBS) to these constraints are also presented. The MBS are not to be interpreted as interventions to be undertaken by AIPD-Rural; those suggestions are laid out in Section 5.1. Examples of MBS providers are also included, followed by a description of the challenges these entities face in providing the solutions in a commercially viable manner. Based on this information, specific recommendations will be made in Section 5.3 regarding how AIPD-Rural can facilitate the sustainable provision of these solutions by market-based providers.

Table 12 Value chain constraints and market-based solutions - soybeans

Value chain constraints /opportunities	Market-based solutions	Existing/ potential providers	Challenges to the provision and use of market-based solutions (by type of provider)
Input supply: 1. There is a lack of commercially-available certified seed for farmers; many are using seed from their own seed banks, and the yields decrease with time as a result. Often times the only 'quality' seed available is passed through state-run distribution schemes that do not reach the majority of farmers in a given area. Some farmers are hesitant to buy commercial seed available due to concerns about quality or because commercial seed they have received in the past through subsidy programs has been of poor quality. While there are seed developers producing seed in certain areas under contract with state-owned input supply firms for eventual redistribution, most farmers interviewed do not have access to these seeds. Some wholesale buyers try to sell 'seed-quality soybean' (soybean suitable for planting) to farmers as a way of guaranteeing supply with harvest, but their seed selection methods cannot be described as scientific or effective. Many of them are unaware of the existence of commercial seed developers. Growers reported that timely availability of	• Access to private sector market distribution channels to soybean seed developers • Access to improved quality seed for soybean farmers	• Input supply distributors and retailers • Wholesale buyers • Commercial seed developers	Commercial seed developers: Seed developers sell a limited amount of seed to private input supply networks (retail shops and distributors in more urban centers), but as they grow the seed on behalf of a government-sponsored buyback scheme (PT Pertani or PT Sang Hyang Sri in NTB or EJ), they have not been developing private sector distribution channels. They face difficulties in marketing seed through these channels, especially since private input suppliers cannot absorb the same high quantities that the state-sponsored companies can. Furthermore, these seed developers often cite bureaucracy and difficulty certifying their seed, and need access to state-of-the-art storage strategies and packaging to improve product quality. Input supply distributors and retailers: Many interviewed explained they would be willing to sell quality commercial seed if it were reliable, consistent, and well-packaged. Furthermore, their attention is mostly focused on rice or maize seed. Wholesale buyers: Many wholesale buyers and their agents are unfamiliar with marketing seed to farmers. They are unfamiliar with techniques such as

quality seed is a problem, which in some cases leads to delays in planting and crop establishment issues (due to poor quality). Some input suppliers sell soybean seed but there are no systems in place to assess germination and vigor of the seed before planting.			demonstration plots, seed selection and storage, etc.
2. While a problem for actors across the entire value chain, smallholder farmers in particular lack access to credit for agricultural inputs. This inhibits them from being able to purchase the inputs (seed, fertilizer - even though it is often subsidized - as well as pest control and herbicides). In certain cases, farmers enter into informal agreements with buyers as a way to mitigate the lack of commercial credit.	• Access to affordable credit for inputs to soybean farmers • Training in more formalized buyer-seller schemes including contracts and credit provisions to buyers and farmers/farmer groups	• Wholesale buyers and tofu/tempeh processors • Commercial banks	Wholesale buyers and processors: Many wholesale buyers are already providing a certain degree of credit to supplier farmers as an embedded service. But as indicated above, they lack familiarity with mechanisms for contract farming - or at least on how to formalize relations with farmers, despite a pronounced willingness to explore such possibilities with a market development program like AIPD-Rural. Commercial banks: Traditionally, these entities have never focused on farmers as potential clients and are unskilled at effective loan recovery or even designing appropriate loan packages tailored to the needs of specific farmers
3. There is reportedly a large amount of cheaper but inferior-quality, often counterfeit, seeds, pesticides, and herbicides. Input companies have no way of controlling the circulation of these products and farmers are unaware of the inauthenticity of the products. Retailers are often attracted to them because they are cheaper and consequently easier to sell. This not only results in ineffective use of	• Access to improved product quality verification and monitoring for input supply producers • Awareness training to input retailers on the implications of	• Input supply companies in collaboration with communications / technology companies	Input supply companies: Local input supply companies (distributors) are not familiar with innovative ICT- and mobile-phone-based technology schemes that facilitate product verification, which can involve barcodes or SMS verification.

poor quality inputs and reduced productivity, but they may be biologically hazardous. Their lack of effectiveness can also engender mistrust between farmers and input suppliers.	counterfeit or low quality inputs		
Wholesale: 4. Soybean wholesalers in Lombok express a lack of knowledge and communication with potential/existing buyers in Bali and Surabaya. At times they have tried to contact new buyers - even inviting wholesalers for informal business-to-business (B2B) meets, but to no avail. This represents missed sales opportunities for wholesalers in NTB upon whom farmers and collectors are dependent. It is also a significant missed opportunity to understand quality issues affecting all value chain actors.	• Access to buyers and marketing information to inter-island wholesalers	• Inter-island wholesale buyers and suppliers	These actors are not used to reaching out beyond mobile phone communication and often have not toured the markets in Denpasar or Surabaya. They have a somewhat limited view of the issues their buyers face and how competitive their products are vs. imports, etc.
Production, harvest, and post-harvest collection: 5. Farmers often apply unskilled methods for planting, weeding, and harvesting, which lowers their harvests and results in uneven product quality (e.g. beans of varying sizes, etc.). They often broadcast seed, rather than practice in-line pocket planting, an inefficient planting method that raises their input costs; for seed, it means they are applying up to four times more seed to sow the same hectarage. Similarly, many are reported to be broadcasting NPK and urea, rather than employing a 'targeted' application. 6. Farmers lack knowledge in, and access to, proper post-harvest storage methods for soybeans. As a result, especially for rainy-	• Access to training and information on best production practices and post-harvest handling to farmers	• Commercial input supply agents w/ input retailers	Input supply agents: These agents sometimes are unable to reach out to enough farmers as the products and materials they use are more geared toward maize and rice cultivation. Domestic input supply companies lack informational materials and strategies to promote soybean farming, as the market is heavily tilted toward maize and rice cultivation

season farming, local soybeans have higher moisture content than American imports.			
Processing: 7. Tofu processors often lack access to affordable fuel and more efficient processing techniques, which limits their ability to make higher amounts of tofu at lower cost. Several have reported that in other areas of southeast Asia there are affordable technologies available, but they have limited knowledge of them.	• Access to affordable improved processing technologies for tofu processors	• Engineering companies with tofu processors	Engineering companies: These companies, while able to design efficient fuel stoves, may not be familiar with the specific technologies and designs required by SME processors for higher fuel efficiency.
8. Many tofu and tempeh processors would like to purchase inputs collectively, but in most districts of NTB in EJ at least in Sampang, there is no formal venue in which they can communicate issues to each other.	• Access to economies of scale in purchasing inputs for farmers	• Consortia of tofu/tempeh processors	Tofu/tempeh processor groups: Several identified 'lead' processors in NTB and EJ have reported that they have made efforts in the past to create formal or informal groups for issues ranging from advocacy to environmental issues or coordinating on local markets.
9. Certain tofu/tempeh processors would like to diversify their buyers/markets and upgrade their branding, packaging, and marketing strategies in an increasingly tight market. But they are unskilled and unfamiliar with the business development possibilities available.	• Access to branding/ marketing services for tofu & tempeh processors.	• Marketing agencies and consultants	Processors and marketing agencies/consultants may have limited to no experience working with each other.

2.11 Chain Development Prospects

Both competitive advantages and disadvantages exist for Indonesian soybeans against imports. These comparisons are best summarized in an abbreviated SWOT analysis below. The weaknesses and opportunities will be examined in further detail in the section on value chain constraints; while Section 5 canvasses strategies for AIPD-Rural to help value chain actors mitigate these on a sustainable basis.

Strengths:

- Pricewise, Indonesian soybeans are as much as 5-10% less expensive than imports (especially in NTB where they are most available).
- Tofu producers interviewed acknowledge that Indonesian soybeans - especially those produced in NTB - offer advantages in terms of quantities of tofu produced, resulting in at least 10% more tofu than when tofu is processed from imported beans. (Interviews with tofu processors, 2012).

Picture 10 (right) offers a visual comparison of domestic beans (left) with imported (right) offered by a distributor in Surabaya and illustrates one reason why tempeh processors prefer the imported U.S. beans: they tend to be larger, of uniform size, and they keep their form when boiled prior to fermentation.

Picture 10 Visual comparison of domestic (left) vs imported soybeans (right).

Source: Legume study team, Oct. 2012

On the other hand, the local beans enjoy certain advantages for tofu processing: apart from a lower price, they produce higher quantities of tofu/kg. Moreover, tofu processors do not care about uniformity of size and appearance as much.

Weaknesses:

- The availability and supply of domestic soybeans is irregular; quantities are often not available for distributors and this encourages them to rely mostly on imports to fulfil demand. Tofu processors often have to purchase imported soybeans when local beans become unavailable.
- Local soybeans are reported to have, on average, higher moisture content -- as much as 15%; compared to imports with lower moisture content levels of between 10-12%. This means that distributors of local soybeans must sell quickly or risk more rapid degradation of their stock. Some elect to dry them out further, but this reduces their margins.
- Local soybeans are irregular in size and, on the whole, smaller than imports - a characteristic that influences tempeh processors to purchase imports.

- There is little quality control after the harvest as the soybeans are traded down the value chain. Local soybeans often arrive on the market with debris, discoloration and non-uniformity.
- At farm level, the value chain is threatened by low productivity. On average, 1.2 - 1.6 tonne/ha reported, whereas imports are produced at 3 tonne/ha.

Opportunities:

- There are opportunities for collaboration between value chain actors to spur local production and quality controls to fulfil unmet market demand.
- Farmers are consistently willing to purchase quality seed if this were available through market channels. Several private seed companies could generate substantial profits in supplying this market.
- Improved efficiencies by tofu and tempeh processors could result in healthier demand through lower sales prices and higher purchasing quantities.

Threats:

- High attention by GOI favouring maize and rice planting over soybeans encourages farmers to plant those crops instead of soybeans. The area of soybean production has declined steadily over the last 20 years; meanwhile, farmers are receiving guaranteed purchases for their maize and rice.
- Lack of attention by input supply companies to soybean-specific products (including seed, fungicide) and lack of training to farmers also inhibits farmers from planting.
- The declining soybean price for the last 3-4 years is dissuading farmers from planting.

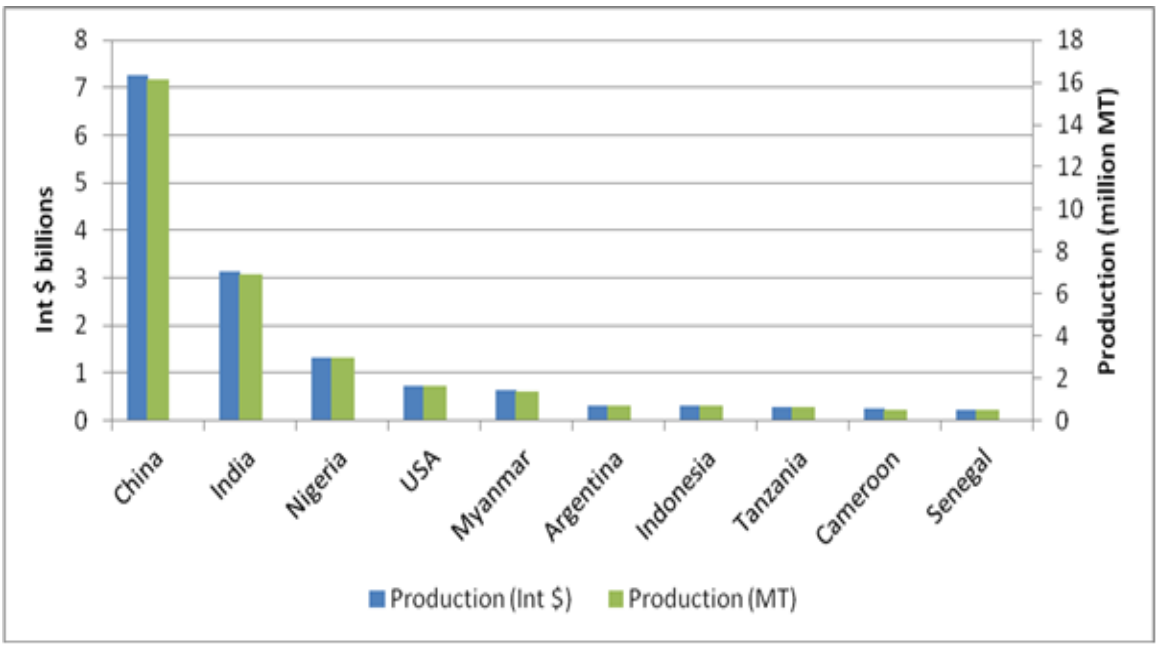
3 The Peanut Sub-Sector in Indonesia

3.1 Indonesia's Position in Global Production and Trade

Indonesia is one of the worlds top ten producers of peanuts, producing approximately 690,000 tonnes in-shell in 2011 (see Figure 16 below). Despite the comparatively high levels of production of peanuts by Indonesia, they are also a net importer of peanuts.

Indonesia is the world's largest importer of peanuts in-shell, with 94,727 tonnes in 2011. This is twice as much as the second largest importer, the Philippines. Over 130,000 tonne of kernel was imported into Indonesia in 2010 to satisfy growing domestic demand (FAOSTAT, 2012).

One difficulty with measuring overall production is the reality that Indonesian farmers tend to consume an undocumented portion of their yield, which may not show up in the official statistics. This is in contrast to soybeans, which are grown largely as a cash crop by farmers.



Source: FAOSTAT 2011

Figure 16 Global production of peanut in-shell, 2011

While a top-20 exporter of peanuts in-shell (Table 13) Indonesia imports a significantly higher quantity of kernel (Table 14), mostly from India and China. Kernel - as opposed to in-shell - is significantly more important to international trade.

Table 13 Top exporters of peanut in-shell, 2010

Rank	Country	Quantity (tonnes)	Value (US$ 1,000)
1	China	64,658	69,417
2	United States of America	29,654	39,906
3	Netherlands	27,317	67,027
4	India	10,778	7,660
5	United Arab Emirates	9,920	6,203
6	Israel	8,567	25,700
7	Germany	8,543	11,687
8	Egypt	8,317	14,510
9	Mozambique	5,963	3,149
10	United Republic of Tanzania	5,105	975
11	South Africa	4,516	6,257
12	Indonesia	3,794	4,806
13	Viet Nam	3,705	3,062
14	Lao People's Democratic Republic	3,179	623
15	Gambia	1556	1274
16	Luxembourg	1409	3893
17	Tajikistan	988	1238
18	Ghana	837	160
19	Mexico	792	1802
20	Chile	755	2094

Source: FAOSTAT, 2010

Table 14 Top exporters of peanut kernel, 2010

Rank	Country	Quantity (tonnes)	Value (US$ 1,000)
1	India	372,691	392,065
2	Argentina	217,796	203,382
3	United States of America	154,519	179,926
4	China	126,585	172,395
5	Netherlands	85,107	109,518
47	Indonesia	258	299

Source: FAOSTAT, 2010

Averaging just over 1 tonne/ha, Indonesia's peanut productivity per ha is only slightly lower than the global average of 1.1 tonne of kernel/ha. The highest productivity in the lead producing countries (U.S., China, and Argentina) is approximately 2.0 tonne kernel/ha. Nevertheless, some farmers interviewed in EJ (Malang) and NTB reported robust productivity approaching that of the leading producer countries. Much of this depends on farmer practices, soil fertility, and availability of inputs and training to farmers (see sections below for more information on farm level yields in Indonesia).

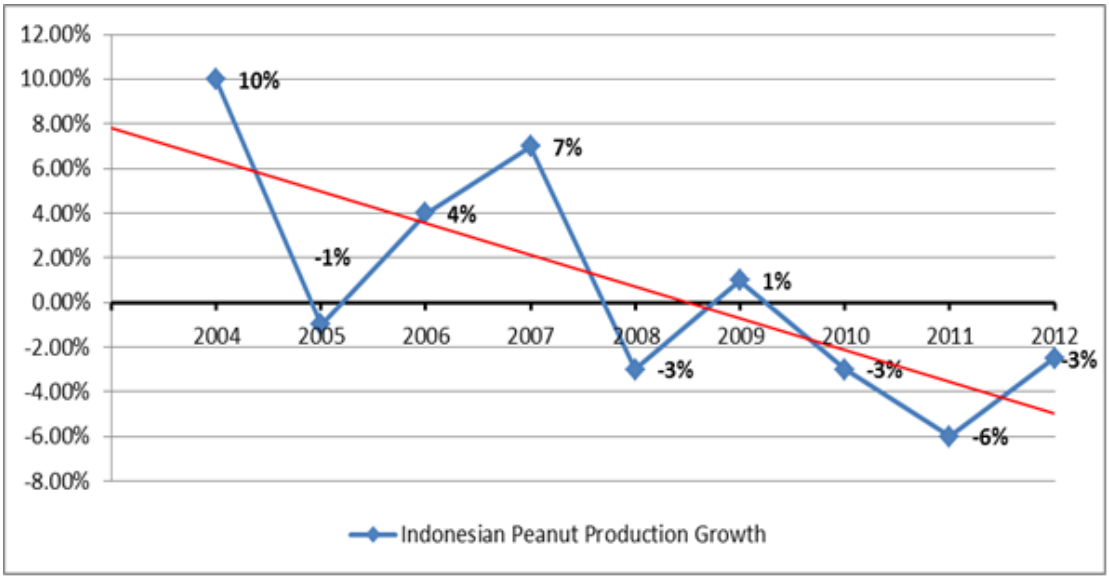
3.2 Socio Economic Importance

Peanuts are an important cash crop for smallholder farmers (0.5 ha or less), who make up the majority of Indonesian farmers. It is the fourth most commonly grown crop in Java and NTB after rice, maize, and cassava. Peanuts serve many purposes: they are a rich and cheap source of vegetable protein and are used to produce edible oil for cooking, oil cake for cattle feed, and peanut butter. Peanut shells are also used as a source of fuel. As a legume, peanuts help to reinvigorate the soil after intensive grain/rice harvests through nitrogen fixation (Interviews with market actors, October 2012).

3.3 Production

Peanuts are typically a dryland crop, although as much as 30% of the Indonesian peanut production is concentrated in irrigated paddy fields, supplementing income from rice. Like soybean, it is a 'secondary crop', often competing with non-legume cash crops such as cassava and maize.

Indonesian peanut production growth has trended downwards at a rate of approximately 1.5% per year over the last nine years (see Figure 17).



Source: Global Agricultural Information Network 2012

Figure 17 Indonesian peanut production growth (percent)

This assessment is supported by findings from the legume team in NTB and certain areas of EJ. While a more profitable crop for farmers and traders than soybeans, peanut farmers lack adequate farming infrastructure such as quality seed distribution networks. In contrast, farmers enjoy more widespread access to quality maize and rice seed, both through private and public distribution.

While peanut production growth is trending down, there is significant scope for improving productivity.

During 2008-2010, the ACIAR project, *Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia,* conducted a total of 12 small-plot on-farm trials to evaluate and develop improved management practices for peanuts. These trials, conducted on farmers' own production systems, demonstrated scope for achieving fresh pod yields of up to 8 tonne/ha by implementing improved practices, compared to less than

3 tonne/ha from conventional practices. A gross margin analysis showed that the benefit-cost ratio was highest (1.7-1.8) for the most promising practices, compared to 0.4-0.7 in the conventional practices. These observed yield differences between practices are underpinned by four major factors: seed quality, row planting and spacing, foliar disease control and nutrient management. Post-harvest management (including food safety) was not within the scope of this project, but should be addressed in future projects.

Geographical distribution

This study focused on the target districts of the AIPD-Rural provinces of EJ and NTB, where peanut production varies significantly district-by-district. This is due to a mixture of factors, including proximity to important trading centres, soil and climatic factors. Overall, the centre of peanut production for Indonesia is Java (followed by Sulawesi), especially in Central and EJ. The strongest centre of production in EJ is Tuban district, known for the quality of its kernels as well as the presence of several important traders there.

Among AIPD-Rural target districts visited, the legumes team found production to be highest in those areas where the climate is driest (Lombok/Bima and Madura/Sampang) (see Table 15). However, in more fertile and humid areas of EJ where farmers grow a wider variety of crops on smaller plots of land, there appeared to be more processing activity (especially Malang). This is most likely attributable to the proximity of larger urban markets in Surabaya and Malang. Of all the target districts, Sampang had the highest production, though as per the context for soybeans, the DINAS statistics for Sampang seemed to be inflated.

Table 15 Peanut production statistics by AIPD-Rural target districts in EJ and NTB, 2011

East Java					
AIPD target districts	**Sampang**	**Situbondo**	**Malang**	**Trenggalek**	**East Java TOTAL**
Area Harvested (ha):	26,451	411	29	2,213	164,921
Production (tonne) *in-shell*	27,685	462	37	2,186	211,416
NTB					
AIPD target districts	**North Lombok**	**West Lombok**	**Dompu**	**Bima**	**NTB TOTAL**
Area Harvested (ha)	6,342*	1,433	667	11,290	26,319
Production (tonne) *in-shell*	8,870*	667	828	14,913	37,964

**Note: In 2010 the district of West Lombok was split into both West Lombok and North Lombok. The data presented is for N.Lombok, 2010. 2011 data for N. Lombok not available.*

Source: BPS, 2012

3.3.1 Trends

As mentioned above, overall production levels in Indonesia are falling. According to the Indonesian Statistics Agency, however, production in NTB and EJ has seen a slight increase overall since 2007 (see Table 16).

Table 16 Peanut in-shell production (tonne) by AIPD-Rural province

	2007	2008	2009	2010	2011
Indonesia	789,089	770,054	777,888	779,228	676,899
EJ	196,886	202,345	216,474	207,796	203,493
NTB	32,913	32,348	38,615	33,666	37,331

Source: BPS, 2012

Meanwhile, the Indonesian National Bureau of Statistics reports that hectares planted in these districts have actually decreased over the same time period, which can be explained by increases in yield productivity from 1.19 tonnes/ha in 2007 to 1.25 in 2011. Some of those interviewed stated that improvements in NTB took place in areas where government extension was provided, while others stated that improvements took place among farmers enjoying contractual relations with, and receiving some technical support from, large snack food companies like Garuda Foods and Dua Kelinci.

Contractual relations between these companies and farmers have expanded over the last five years, in an effort to secure quality and quantity of production. However, only about 10% of peanut farmers in EJ supply these companies (Interviews with suppliers, October 2012). As for NTB, neither company is currently sourcing peanuts under a contractual model to a significant degree anymore. Farmers in Sampang stated that they were increasing their hectares, as they have been abandoning their traditional tobacco crops over the last five years.

3.3.2 Seasonality of supply

In Sampang, the largest peanut producing district under AIPD-Rural in EJ, there are two peak seasons for peanut production: January-March (rain-fed harvest) and June-October (irrigated farm harvest). According to farmers interviewed, there can be two or even three crops harvested during the June-October period. Prices tend to fall during the harvest time of these crops.

In Trenggalek, the two main peanut seasons occur one to two months earlier than in Sampang: May-August and then September-November. While peanuts are farmed throughout the dry season, farmers intercrop extensively on their small plots with other legumes (soybeans), chillies, maize, and cassava.

Farmers interviewed around Malang district enjoy immediate and reliable trading relationships with peanut roasting companies. Farmers there report peanuts as a good second dry season crop (August-October) on irrigated rice and maize fields.

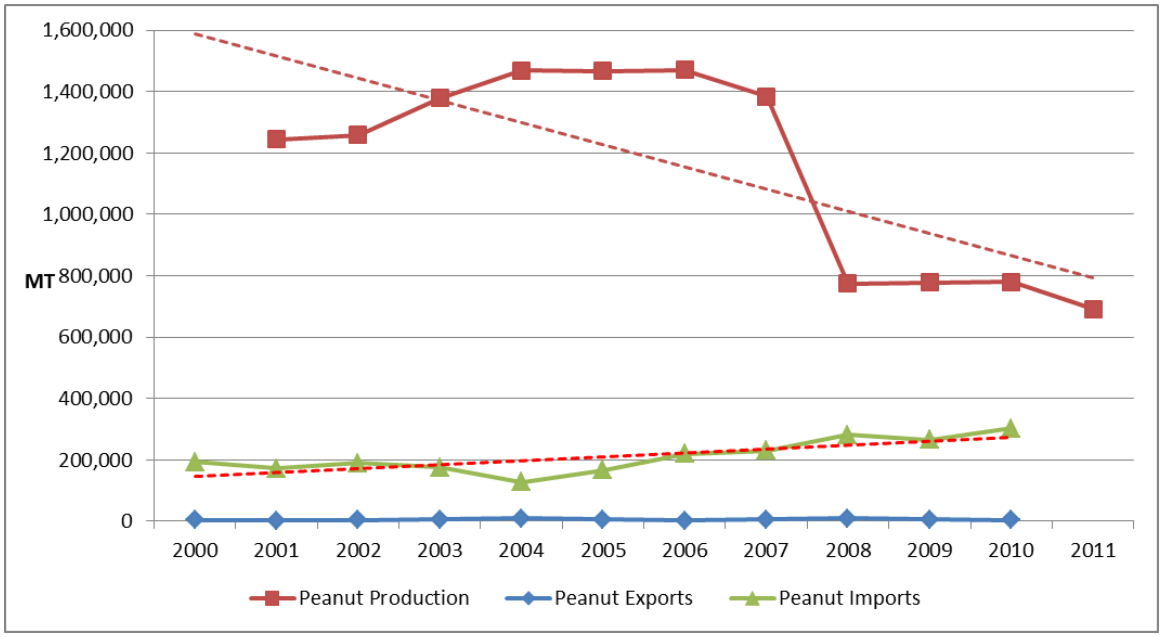
Meanwhile, in North Lombok, peanuts are grown extensively with three peak harvest seasons: March/April (rainy season harvest), July/August (first dry season), and September/October (second dry season).

In Pabean market in Surabaya, the main central trading markets for peanuts in the area where AIPD-Rural is to be involved (NTB and EJ), imports are available year-round and become more prevalent in the months prior to and during the rainy season (November - April). Indian kernel is especially useful to traders as it typically exhibits lower moisture content than local peanuts and can be stocked during the rainy season and over longer periods of time. This does not mean they are preferred to the local peanuts: they merely exhibit different characteristics than local varieties and have different uses. As the Indian

kernel tends to be smaller and rounder, snack food companies like Garuda Foods use them for their 'candied' peanut snacks. The largest sambal pecel (chilli-peanut sauce) producer in EJ claimed that they prefer to use Indian kernel due to their low moisture content although they are not happy with the oil content.

3.4 End Markets / Demand

Peanuts are an important staple food for most Indonesians and feature prominently in local cuisine. Indonesian peanut consumption for food was estimated at 1.35 million tonnes peanut-in-shell equivalents in 2011/2012 (GAIN Report, 2012). Animal feed use for peanuts in the same year was approximately 70,000 tonne in-shell. Indonesian export volumes of peanuts are negligible in comparison to imports (see Figure 18). Peanut imports have been increasing consistently over the past ten years. Peanut consumption per capita has remained static at approximately 5.5 kg per year in 2011/2012 (GAIN Report, 2012). The growing demand and consumption of peanuts is linked to the growing Indonesian population, growing at a rate of approximately 1.0% per year (World Bank Data, 2012).



Source: Authors calculations and FAOSTAT 2012

Figure 18 Trends in Indonesian peanut production, exports and imports, (in-shell equivalents), 2000-2011

Market retailers interviewed stated that peanut kernel, retailed at traditional markets for home consumption and cooking, are the largest single sales outlets. These retailers in all provinces also reported their typical daily customers to be home consumers, street vendor MSMEs and restaurants.

The main driver of demand in urban and wealthier markets, however, is consumption of roasted peanuts as a snack food (see next sub-section). These products are found in small shops, supermarkets, petrol stations, shopping malls, and other formal retail outlets.

Garuda Foods alone claims to have processed 15,000 tonne of in-shell, roasted peanuts and an equal amount of kernel, candied or roasted kernels, most of which are imported from India. Traders and retailers in EJ reported that when Garuda Foods and their rivals

Dua Kelinci are purchasing in-shell peanuts from farmers, the market price increases in the short-term and provide a stimulus to farmers to plant peanuts in subsequent crop cycles.

3.4.1 Product uses for peanuts in Indonesia and demand structure

In addition to being consumed by farmers, peanuts are used in cooking in the form of sauces (for traditional dishes such as 'gado gado') sold by street vendors and restaurants/eateries, or roasted as snacks in the form of brittle, in-shell, or kernel. Up to 10% of peanuts on the market are processed into peanut oil and dry cake, the latter for the animal feed industry (USDA GAIN Report: Oilseeds, 2012). As indicated in the previous sub-section, peanut consumption for food is expected to increase as the Indonesian population grows.

In addition to commercialized kernel products, every component of the peanut plant has some commercial use: peanut shells are sold by wholesalers as combustible fuel to tofu/tempeh processors and are reported to be a preferred fuel source by those processors interviewed in NTB. They are also used as a component in animal feed (peanut processors in Malang).

The peanut plant 'straw' is used as on-farm cattle feed and traded or even sold or bartered by farmers. Peanut shells in North Lombok are sold as fuel to tofu and tempeh processors in Mataram, and the shells at a roasted processing plant in Malang are sold to local farmers for animal feed for up to 7,000 IDR for a 50 kg sack (see Picture 11 below).

Picture 11 Left: Peanut shells in North Lombok; Right: Peanut shells in Malang

Source: Legume study team, Oct. 2012

The main market drivers of peanuts-for-food-consumption are snack food companies such as Garuda Foods, PT Dua Kelinci (both based in Central Java but sourcing peanuts from all over Indonesia, including the target provinces), Mitra Foods, and Orang Tua Group.

Together, these companies account for the majority of peanut use as a snack food in Indonesia. In just one peanut-growing village in Malang district (Taloh village), there are four SME roasters of peanuts, who together purchase the majority of local production - either for their own processing or for further sale to larger processors, including Dua Kelinci.

The presence of formal retail outlets as the end market for a significant portion of peanuts, in addition to more informal outlets at bazaars, is in marked contrast to the other two

legume crops in this study. It offers opportunities for AIPD-Rural's program development, and will be discussed in Section 5.

3.4.2 Indonesian peanut exports/imports

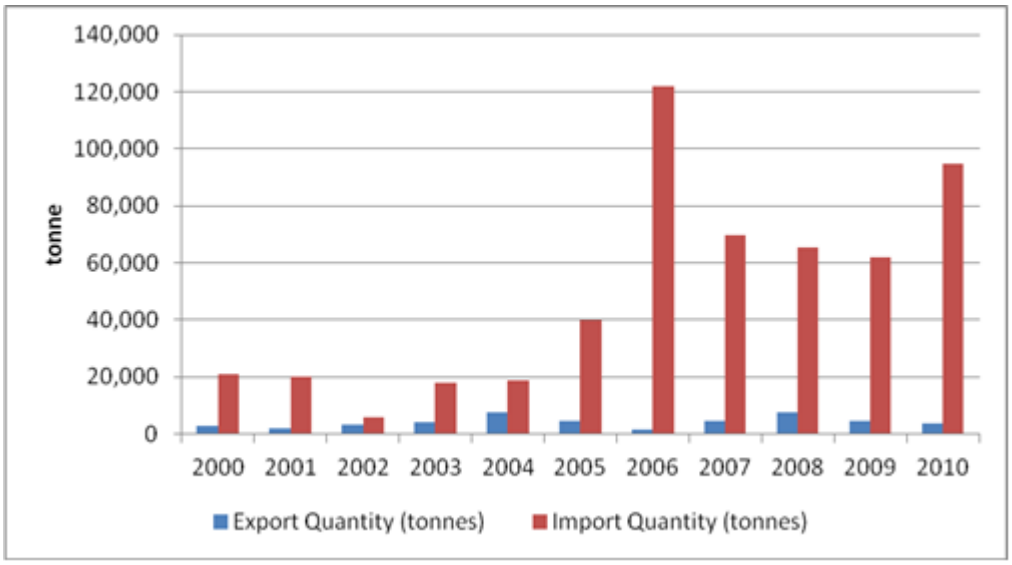
According to the FAO there was 258 tonnes of in-shell peanuts exported from Indonesia in 2010. Peanut kernel cultivated in Central and EJ, which traders in Surabaya refer to as the *Tuban* kernel, are a popular export. The figure quoted above does not reflect, however, exports of peanut-based snack foods that Indonesian snack food companies are marketing in other ASEAN markets, such as China and India (e.g. 'Ting-Ting' peanut candy by Garuda Foods).

Indonesia's export of peanuts has not grown over the last ten years. One of the reasons stated by wholesalers is limited domestic production. While peanuts provide farmers with a better income than soybeans, limited availability of good planting materials lead the farmers to grow other profitable crops such as corn and cassava (USDA GAIN Report, 2012).

The study team surmised that peanut exports could also be affected by international concerns regarding aflatoxin contamination. None of the traders, farmers, or wholesalers interviewed knew of any active campaigns to ensure that Indonesian peanuts comply with both domestic and international limits on aflatoxin contamination. One of these wholesalers specified that the only area where there appears to be any monitoring by the Indonesian Ministry of Trade or Ministry of Health is at the import level, where Indian and Chinese imports are checked for quality standards that are overlooked in domestic kernel.

As stated earlier, Indonesian peanut production is expected to continue to decline, which indicates a growing dependency on imports to satisfy domestic demand. There is little reason to expect exports to grow.

To illustrate Indonesia's growing dependence on imports since 2000, Figure 19 below shows the quantities of peanut kernel imported and exported in the ten year period from 2000 – 2010. Export quantity has remained static over this period.



Source: FAOSTAT, 2010

Figure 19 Indonesian peanut kernel imports and export volumes, 2000-2010

3.5 Prices

Prices are based on different farm gate peanut 'products': wet in-shell, dry in-shell, and kernel. Furthermore, as will be explained below, there are three 'grades' with different pricing, in addition to different varieties.

3.5.1 Price trends and seasonality

Price fluctuations vary in each district and province and are based on planting seasons, harvest cycles, and peanut form (wet in-shell, dry in-shell, shelled and graded kernel, etc.). In Malang and Trenggalek, for example, price patterns for wet in-shell peanuts at farm gate are reported as follows:

- *December/January*: highest prices at 4,500 IDR/kg [local stocks are lowest, during planting],
- *February/March*: price dips to 4,000 IDR/kg, and
- April/May: price slips to 3,500 IDR/kg as first major rainy season harvest is underway. Prices will slowly rise to 4,000 - 4,500 IDR/kg and remain there for the rest of the year.

Prices also tend to increase around Ramadan, when demand for peanuts spikes.

Traders interviewed in Sampang stated that prices are lowest in January/February as well as June/July as these are harvest times. They stated that some farmers around Sampang are even planting three peanut crops, with no rotation.

In Lombok, the farm gate prices were reported to be slightly lower for the same wet in-shell peanuts, starting at 3,200 IDR/kg.

As for kernel prices, top grade domestic peanuts were retailing for 14,500-15,000 IDR/kg during the most recent low seasons (non-harvest periods). The price for Indian imports tends to range between 16,000 - 17,000 IDR/kg retail. Retailers report a significant margin on peanut kernel of up to 1,000 IDR/kg. Meanwhile, the peak farm gate price in the same region has been reported at 13,000 IDR/kg (provided the farmers are shelling their own peanuts, which they do not always elect to do).

3.5.2 Quality premiums

A loose grading system exists that is based on visual and tactile inspection of kernels by wholesalers who look at size, moisture content, discoloration, and presence of foreign materials. At Pabean market Surabaya, grade 1 kernel sells for 16,000 IDR/kg, middle grade for 14,500 - 15,000 IDR/kg, and low grade for 13,500 IDR/kg (see Picture 12 below). In Lombok, wholesale retailers reported a lowest grade price approaching 8,000 IDR/kg. This low quality was sold only to street vendors or home cookers of peanut sauces and was not evident among Pabean market traders in EJ. An even lower grade of reject peanut kernel, which could not be sold retail at any market (see caption below) is sold at a throwaway price of between 1,000-1,500 IDR/kg to peanut oil processors (see Section 3.8.4).

Picture 12 Left to right: Low, medium and high grade peanuts as presented by a retailer in Pabean market, Surabaya

Source: Legume study team, Oct. 2012

3.6 Policies and Regulations

Even though peanuts were identified as a target secondary crop by the Indonesian government, there is no evidence in the field of any concerted effort to promote production and marketing. Farmers in EJ and NTB explained that while peanuts offer good returns as a secondary legume crop, their efforts are focused mostly on rice and corn. With rice and corn they do not face any problems selling their crops and they have access to government and privately promoted seed.

As recently as December 2010, the Indonesian Ministry of Trade announced a 5% tariff on imports of peanut-based products including unrefined oil, flour/meal, and peanut cake. The GOI rescinded this tariff in January 2011 for products targeted to the animal feed industry due to protests, but the tariffs resumed in 2012 (Ministry of Finance Regulation *241 PMK 011 2010 and 2011).* There is no indication these tariffs effect the levels of imported peanut kernel.

A principle concern in the industry is the evidence of insufficient government controls regarding aflatoxin, from harvest through to retail. Rachaputi and Wright (2006) found that high *A. flavus* contamination in fresh peanut kernel at the farm and collector level can subsequently lead to a rapid increase in aflatoxin levels under poor storage conditions. There are laws being considered and agencies working to spread awareness on acceptable levels and best practices to avoid aflatoxin contamination right through the chain, but few market actors interviewed indicated any knowledge of the problem and associated risks. This is concerning as Rachaputi and Wright's results clearly showed that the main point of aflatoxin contamination occurs in the retail sector and particularly in the 'wet' markets. Evidence of contaminated peanuts can be found in storage warehouses, but these stocks are rarely subjected to government controls. According to wholesale traders in Surabaya, only imported peanuts undergo health/phytosanitary inspections at customs.

SME processors (roasters) indicated that they are subject to health inspections and certification but there is no specific mention of aflatoxin in these inspections. Garuda Foods, the only major flagship processor interviewed so far, implements its own safety system, along with HACCP controls at their processing centre, to minimize aflatoxin mould.

In the peanut supply chain, aflatoxin contamination can negatively impact the health of consumers and livestock and the exposure to/ingestion of contaminated peanuts is often ignored. This is due to a lack of awareness about the health risks involved, as well as poorly developed food safety systems.

A number of independent studies conducted in Indonesia revealed extremely high levels of aflatoxin (up to 1,000 parts per billion (ppb) in peanut and maize products – well beyond acceptable levels of 20 ppb for peanut and 50 ppb for maize. The studies also showed that most of the aflatoxin contamination occurred in the post-harvest product handling phase, as the product moves through the supply chain into the retail traditional 'wet' markets (Chauan Y.S., Wright G.C, et al, 2010).

While the recent advances in crop varietal and management technologies have resulted in productivity gains in peanuts, ignoring the food safety aspect in the peanut food and feed chain can result in a significant but largely undetectable negative impact on human and animal health. As such, there is a strong need to develop and implement aflatoxin risk management practices and market policy interventions to minimise the aflatoxin risk to humans and livestock.

3.7 Sub-Sector Development Programs

In partnership with AusAID, the International Finance Corporation (IFC) worked with Garuda Foods on implementing contract schemes with farmers in NTB from 2007-2009. Activities included:

- training of company staff with study visits to Australia;
- training in farm management for Garuda Food staff;
- training in presentation skills to field staff, and
- training in implementation of demonstration plots to field staff.

Despite reported satisfaction with the training outcomes on the part of Garuda Foods, they have not sourced peanuts from NTB since 2011. Reportedly, the quantities required could not be delivered to their production facilities. Wholesalers and collectors in NTB reported that the varieties Garuda Foods required were not as productive (including the variety with four kernels/pod), and due to the resulting lower revenues, farmers saw no incentive in farming them.

Box 1 Garuda Foods- Lessons Learnt in NTB

Garuda Foods is a large scale food processor, with its headquarters in Jakarta. In 2005/6 a peanut processing initiative commenced in Lombok to promote nut-in-shell products for the snack food market. A peanut processing facility was built in Mataram, capable of processing 130 tons of fresh peanut pods per day. Garuda Foods relied on the supply of fresh product directly from growers.

In a new initiative, a 'contract grower model' was established. Under this scheme, farmers were provided with seeds, implements and technical advice as well as a fixed price for their product, subject to quality.

Garuda Foods provided a written buy-back agreement to peanut growers before planting, along with seeds and some technical assistance. The contract included a standard market price at planting but the price of the product was decided at the time of delivery at factory, based on the visual assessment of extraneous matter, mature and immature pods in the product.

However, procurement from contracted growers was only able to meet 30% of the processing

capacity of the plant, due to insufficient supply of the varieties that Garuda Foods preferred.

In 2007 ACIAR collaborated with Garuda Foods to commission a study to investigate the constraints limiting productivity of peanuts at the farmer level in NTB (ACIAR Tropical Pulses project). Garuda Foods has played an active role in this study, proactively providing peanut industry statistics and details about their business capacity and limitations in Lombok.

A key aspect of the Garuda Foods collaboration in the ACIAR project was to capitalize on their vast grower network and their extension service, to test and facilitate rapid adoption of 'best-bet' practices by as many small holders as possible.

BPTP-NTB played a key role in evaluating and demonstrating the 'best-bet' practices on growers' fields. BPTP also implemented some demonstration trials in non-Garuda Foods farms to engage a greater number of smallholders.

It is evident that between 2008 and 2011, Garuda Foods played a significant role in connecting researchers and peanut farmers in Lombok.

Garuda Foods has also shown significant interest in establishing business links with the Peanut Company of Australia (PCA) to investigate various aspects of peanut processing. At the same time as the ACIAR study, Garuda Foods also had an IFC-funded industry development project (full details are not known), in which two senior staff from Garuda Foods visited Australia to learn about the peanut industry. This trip included visiting PCA's peanut processing plant at Kingaroy.

Garuda Foods's procurement area expanded from 550 ha in 2007 to more than 1,100 ha by 2009/10 and a further 10,000 ha was the target for the next five years. Despite increases in procurement area, the supply to the factory still varied from 1,000 to 3,000 tons of fresh pods per annum during this period.

Reasons behind Garuda Food's withdrawal from Lombok are not entirely clear. Discussions with a range of peanut industry stakeholders, including Garuda Foods Managers, indicate a range of market and production related issues contributed to the move, such as increasing competition with independents, inconsistent supply, poor quality, and growing unrest amongst Garuda Food Partnership growers over the quality-based payment procedure. Some deep-rooted political conflict with provincial Government was also cited as a possible influencing factor.

The collaboration on the ACIAR Tropical Pulses project with Garuda Foods highlighted a number of lessons for future projects:

- Having an industry partner makes research projects more effective.
- The involvement of multiple private agencies would strengthen the process (recognising the difficulties in bringing two larger private entities together). Issues based collaboration could be considered in this instance.
- Contracts need to be prepared in such a way that sufficient notice needs to be given should the industry partner need to break the contract (the sudden withdrawal of Garuda Foods from Lombok caught the project team by surprise).
- Regular communications with heads of agencies is necessary (but very difficult in practice).

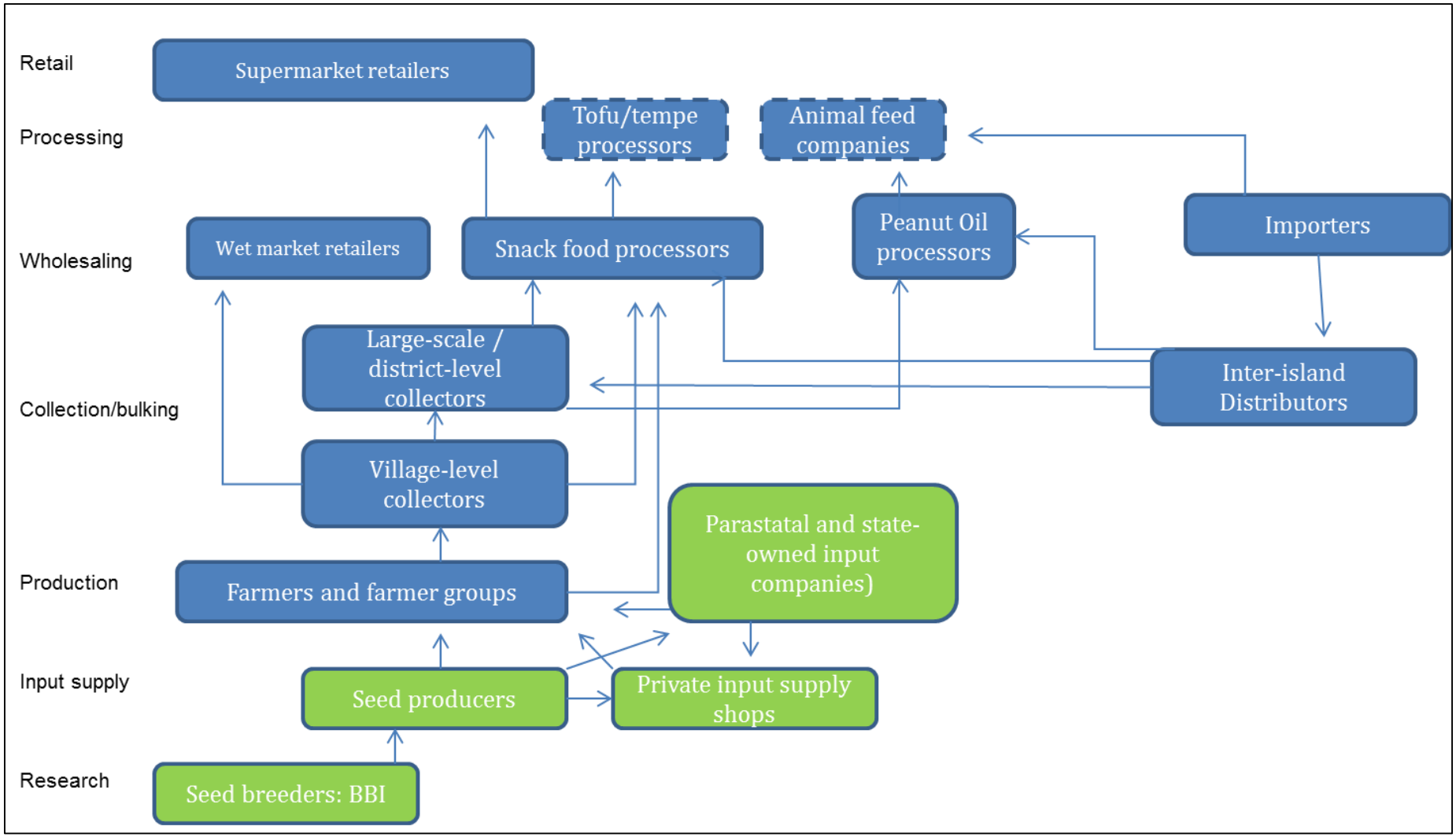
As far as the peanut industry in Lombok is concerned, the departure of Garuda Foods did not cause either significant or long lasting damage to farmer production and marketing of peanuts. However, collaboration with a strong Lead Firm is necessary to implement Research development and extension and to promote best management practices, including a pure seed supply system.

In collaboration with the University of Queensland and various Indonesian research institutes, ACIAR is in the final stages of completing a project to research the development of new seed varieties, on-farm best practices, post-harvest management, and market development in NTB and NTT. Preliminary results from this study have been cited in this report.

Aside from these examples, no market actors interviewed have participated in international or government programs to promote value chain development in the peanut sector. Thus, as with soybeans, project crowding presents little risk to an eventual AIPD-Rural program.

3.8 Value Chain Structure

The value chain map and dynamics of peanuts are different from those of soybeans, especially due to the presence of formal retailers of peanuts and the absence of significant commercialized seed development on the input end. Figure 20 below outlines the peanut value chain in Indonesia. Whilst displaying them as actors in the value chain map, this study does not examine animal feed companies or peanut oil processors in great detail as most peanut kernel is sold for human consumption.



Source: Author

Figure 20 Indonesian peanut value chain map

3.8.1 Input distribution

The major difference between the peanut and soybean value chains in NTB and EJ is a greater lack of quality seed in the peanut chain (there is also a lack of quality soybean seed, but not as pronounced). Availability and use of chemical inputs is comparable. Thus, farmers engage in the following strategies for sourcing their planting material:

- Drawing from their own seed banks: Many farmers reproduce their own seed from harvests and store it;
- Purchasing seed from buyers (in cash or as an embedded service): A typical practice observed among farmers in the field has been to select and purchase seed-quality pods from both village-level collectors and wholesalers. Some wholesalers perform the selection and bagging of seed themselves prior to selling back to farmers from whom they source (observed between roasters and farmer groups in EJ). Others simply invite farmers to 'sort' through and pick out what they determine to be seed-quality pods immediately after collection (found to be more prevalent between wholesale traders and farmers in NTB);
- Trading/bartering seed: many farmers practice a specific kind of trading - The dry season farmers (who are irrigators) store the seed that is produced in the dry season for the non-irrigated farmers to use in the wet season. Non-irrigated wet season farmers then supply the dry season irrigation farmers with their seed.

Peanut farmers access fungicides, herbicides, and fertilizers using the same network of private input suppliers as other crops. As with soybean farmers, they frequently access inputs/finance on credit from buyers further up the value chain in order to purchase the required inputs (refer to section 2.8.1 on input distribution in the soybean value chain for further details). Peanut farmers face different challenges according to the environments in which they live. In Lombok, one of the larger input distributors reported that a leaf blight of unknown origin - possibly leaf rust - is the single largest threat to the peanut crop. Therefore, he promotes the use of various multiple pesticide/fungicide combinations, including Winder (from BISI International) and Explore (a Malaysian brand).

Some farmers in EJ are engaged in collaborative agreements with Garuda Foods. The company works closely with farmers and local input supply shops to provide technical support and advice on planting practices in exchange for guaranteed purchasing.

Farmers interviewed estimate that approximately 10% of peanut farmers in EJ are selling to Garuda Foods, though none of the farmers interviewed in the EJ target districts (Malang, Sampang, and Trenggalek) were selling to them.

The dominant local seed variety in NTB is called 'Local Lombok', a small variety with two seeds per pod, although other varieties such as Kelinci, Bima, Panther, Kidang, Singa and Macan are also grown. All varieties are of 90-110 days maturation.

Peanuts are cultivated and harvested manually, although land preparation (where practiced) is done using small power tillers. Garuda Foods had introduced manually operated planters, weeding and shelling implements to their grower groups. However, there was no evidence of these implements being used after Garuda Foods relocated its outgrowing activities from NTB to Sulawesi and elsewhere after 2011.

Planting seed is sourced from various sources (as described in the previous section). Prior to planting, peanuts are shelled (manually). While some growers were found to plant dry seeds, others are soaking seeds in water overnight and hand-dibbling at a rate of two

to three seeds per seed pocket. Generally a seed rate of about 100 kg of pods/ha (70-80 kg of seed/ha) is used. No seed treatment was applied to protect seed from soil insects or diseases.

Similar to soybean cultivation, it is difficult to separate gender-based roles at the farm level. However, the legume team did identify that manual shelling (for seed preparation), seed sorting, planting, and weeding are performed by women, while men perform labour involving heavier lifting, such as ploughing and carting the seed around the field for planting. In lowland systems where peanut is planted in rotation with rice, most peanut crops are planted soon after the rice harvest with little land preparation (i.e. 'zero-till' farming) which is seen by peanut growers as a cost-saving measure.

Many farmers do not dry their crop. Instead, as described in the next sub-section, most farmers sell their crop either in the ground or 'wet harvested' to traders and collectors who then dry, shell, and grade the product themselves prior to selling to the larger market players. For growers, selling the crop in the ground results in faster payment, less risk, and provides a savings in terms of effort or cost of harvest labour.

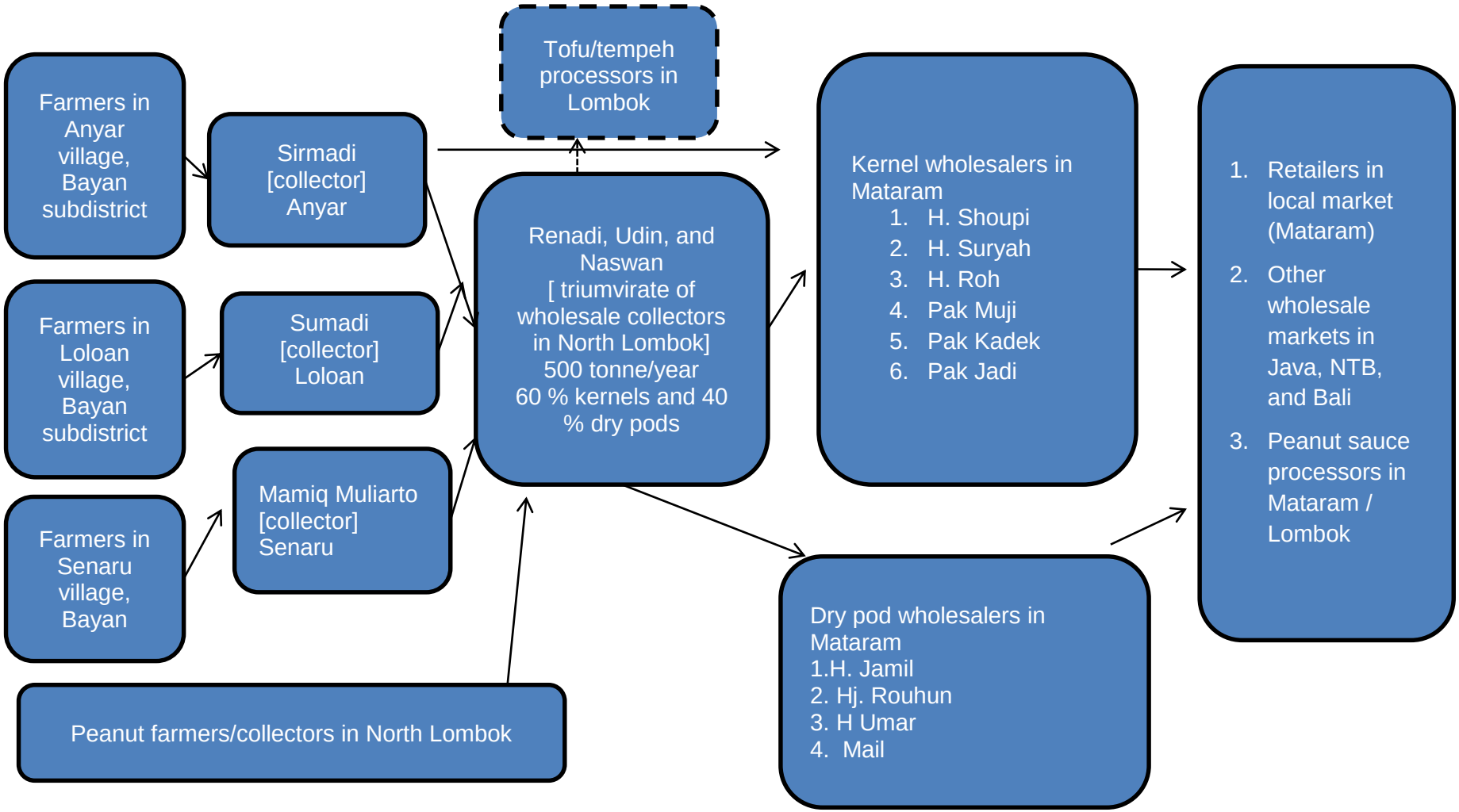
Exporters and some processors generally require peanuts to be dried below 10% moisture, requiring five to six days of sun drying (or faster in artificial drying facilities). In Malang district farmers sold immediately to peanut processors with drying facilities, however NTB farmers interviewed do not have the facilities to dry peanuts to this level.

3.8.2 Collection

Collection from farmers in EJ and NTB takes place according to two different models:

1. Buyers perform the harvest - In this scenario, a farmer elects to allow the buyer to send in a crew and harvest the wet pods directly. The farmer is paid a specific amount per kg of wet pod. This is more likely to occur between peanut roasters, collectors or traders and farmers (observed in Malang). It is an important arrangement to mitigate both lack of on-farm labour for farmers, and quality control for buyers who are trying to ensure they obtain fresh pods in time to dry them before mould sets in.
2. Farmers harvest independently before selling to collectors - Under this arrangement, farmers may risk lower payments due to quality controls implemented by roasters and collectors, who typically elect to dry the peanuts themselves or buy the pods already dried from the farmers. At least one buyer reported deducting 10% of the market price for the delivered peanuts to factor in dirt, empty pods, and the like, which most farmers do not filter out themselves.

There are two levels of collection: large wholesalers (see sub-section below) and village-level collectors that collaborate closely with the former. Village-level collectors typically source between 10 and 100 tonnes of peanuts/year and often obtain capital from the wholesalers in order to pay farmers in cash. Much of the drying takes place at the village-level collector's facilities. Typically, wet pods are delivered by farmers and then spread out on the ground or concrete for up to three days to dry, or else they are transported immediately to a buyer. In North Lombok, perhaps the most important peanut-producing AIPD-Rural target district, there are as many as ten village-level collectors in each sub-district. Figure 21 below lists a few of these by name and illustrates the major actors in Bayan sub-district, an important centre of peanut production in North Lombok.



Source: BPTP/ACIAR and legume team research

Figure 21 Peanut market chain in Bayan sub-district, North Lombok

The map above illustrates the market chain within a specific context in one major subdistrict of North Lombok. In EJ, a similar map would be filled with peanut roasters/processors at the same level with wholesale collectors. The tempeh/tofu processors are the primary buyers of peanut shells as reported in NTB, whereas in EJ, peanut processors also reported selling peanut shells as cattle feed to local herders. This interesting tie-in to the soybean value chain will be examined for the further development of the AIPD-Rural program in Section 5.

3.8.3 Wholesaling

Wholesalers are either located at sub-district or district levels. They typically trade between 100 and 2,000 tonnes of peanut kernel and pods. They are based in and around urban wet markets (e.g. Mataram or Sampang) or in more rural, sub-district level centres. For North Lombok, there appears to be a very tight node of three unified wholesalers at the sub-district level. All the peanuts they source are then forwarded to a relatively larger group of wholesalers in Mataram with broader inter-island sales connections. A similar situation was found in Sampang (EJ), where the sub-district level wholesalers forwarded to no more than two major inter-island wholesalers at the district level.

Wet market wholesalers can be further characterized as inter-island traders, and they often pre-finance both village-level collectors and sub-district-level wholesalers to secure their product. In Lombok, they are concentrated in two Mataram wet markets, and either send on to other inter-island wholesalers in Surabaya, Makassar, or Denpasar, or sell on to wet market kernel retailers. In Malang and Sampang, similar-sized wholesalers forward much of their production to larger inter-island wholesalers in Tuban, Pabean market (Surabaya), or to large-scale and SME snack food processors in Central and East Java.

Many of the wholesalers perform a certain degree of primary processing themselves. In addition to drying wet pods, they also shell and sort/grade peanuts before selling on to other wholesalers, processors, or wet market retailers. The wet market wholesalers interviewed in Lombok (refer Figure 21 above) also purchase imported peanut kernel (either of Javanese origin or imported from India and China) when local production is unavailable. In Sampang, this function is performed often by the wet market retailers themselves who travel to nearby Surabaya and source directly from the wholesalers there.

Haji ‘Cung’ Azrahi, is the largest district level wholesaler of peanuts in Sampang, operating two eight tonne trucks. His main market is a major wholesale trader in Tuban district. Renadi and Nuswan are two of a consortium of three wholesalers in Bayan sub-district who recently built their own warehouse and expanded concrete drying floor (see Picture 13).


Picture 13 Left; Haji 'Cung' Azrahi, the largest district level wholesaler of peanuts in Sampang. Right; Renadi and Nuswan, two of a consortium of three wholesalers in Bayan sub-district.

Source: Legume study team, North Lombok, Oct. 2012

3.8.4 Processing

Peanut processing can be subdivided into the following activities:

- Roasting of kernels and pods for snack foods - The most prominent of these are the major peanut snack companies Garuda, Dua Kelinci and Mitra Foods ('Mr. P' brand). These companies, all based in West or Central Java and focusing mostly on the domestic market, also export a relatively high-end, well-packaged peanut product to other ASEAN countries. On a more informal level are the SME and MSME peanut processing companies such as Kacang Goreng, which operate in EJ and in NTB, although to a larger degree in the former province. Up to four SME peanut processors were identified in one village of Malang district alone, but less than five were identified in all of NTB.
- Preparation of peanut sauce for restaurants and street food - These can be street vendors cooking sauces at home or local restaurants. The industry is relatively small (house-hold level), but a facility near Surabaya that also processes fried shallot, produces up to a ton per day of pre-packed peanut sauce and distributes their product nationally via modern retailers and even ships some of their product to other Asian countries.
- Oil extraction - Less than 3% of peanuts produced or imported to Indonesia (approximately 20,000 tonne/year) are processed into unrefined peanut oil, with cake residues forwarded to the animal feed industry[6] (USDA GAIN Report, 2012). This industry is less sophisticated than that of the snack foods industry in terms of market outreach or product development, although peanut oil also has industrial uses (see below). Its main competitor as a food ingredient is the ubiquitous and more competitive palm oil.

[6] *As much as 70,000 tonne of peanuts are processed by the animal feed industry.*

All of the peanut roasters interviewed in EJ and NTB enjoy direct relations with producers or village-level collectors in order to secure the quality supply they require for a presentable packaged snack. Kacang Goreng in Taloh village (Malang district) is a major supplier of seeds (uncertified) to as many as 200 farmers in EJ from whom they source product. Sikat, one of only three SME peanut-based snack food processors identified in NTB, sources kernel from village-based collectors in North Lombok and pays a 40% premium for hand-shelled peanuts.

Oil extractors tend to use only inferior grade, rejected peanuts, which they source from wholesalers at a significantly lower price (as little as 10% of the wholesale price for peanut kernel). Masyo Renggo, a peanut oil processor in Malang district, employs as many as 30 employees to extract oil and peanut cake, sourcing all of its raw material from wholesalers in Lombok, EJ, and even Aceh.

While high-end snack food processors such as Garuda and Dua Kelinci supply the formal retail market (including supermarkets, gas stations, or distributorships), the SME processors use either distributor channels to reach a final market (e.g. Kacang Goreng) or even supply to the high-end snack food companies. The smallest of them, such as Sikat, supply retail shops with their simply-packaged roasted kernel.

The oil extractors sell their unrefined oil in plastic jugs for distribution to wet market retailers and industrial clients in Java. Applications include cosmetics (peanut soap and shampoo), textiles (as a dye base), and pharmaceuticals (as a laxative ingredient). The residual peanut cake is sold either to animal food processors or, in certain cases, to tempeh processors making ‘peanut tempeh’ (as reported by oil extractor Madyo Renggo in Malang, EJ).

3.8.5 Retailing

Packaged snack food peanuts are typically retailed in small shops, petrol stations, or supermarkets. The most frequently seen at any of these locations are either PVC-lined snack packs from Garuda Foods or Dua Kelinci, as well as simple shrink-wrapped roasted kernels from local SME processors. Most of these items are supplied through distributors, although the few roasted kernel processors in NTB reported selling directly to small shops.

The majority of kernel is retailed at wet markets by MSME retailers selling between 50-500 kg/week, mostly to gado gado processors and home sauce cookers. Retailers are nearly always sourcing kernel from wholesalers. Sampang retailers have the option of sourcing from wholesalers appearing twice weekly at the bazaar, or from wholesalers in Pabean market in Surabaya. In Lombok, all kernel retailers are sourcing from the wet market wholesalers in Mataram.

Most retailers do not sell peanuts alone, although in many cases peanuts are their single most important product on offer. Typically, they also sell beans and other legumes, grains, spices, cassava flour, and other non-perishables.

Several small-scale retailers reported accessing bank loans for operating capital, while others expressed that accessing such loans can be too complicated, hence their inability to expand volumes sold of any products.

3.8.6 Product standards and coordination systems

The only official 'standard' involved in the peanut value chain is related to aflatoxin controls. Officially, the Indonesian government allows 20 ppb in nuts/foodstuffs for human consumption (compared with 15 ppb for Australia or the EU (Almond Board of California, 2009). There are numerous public institution-based initiatives attempting to raise awareness of the dangers of aflatoxin contamination, including those involving ACIAR, Gadjah Mada University, DINAS, and even Garuda Foods. Except for imported peanuts at customs, the official limits do not appear to be enforced at any level of the value chain from farm through to wholesale trade or processing, despite studies showing highly elevated aflatoxin levels in many cases.

Most value chain actors interviewed did not know about aflatoxins or the dangers of contamination. However, these actors focus mostly on controlling moisture, the presence of which can facilitate growth of *Aspergillus flavus* and *Aspergillus parasiticus*, the main aflatoxin-producing fungal pathogens.

Some processors reported being subject to annual health inspections of their facilities and having to apply for a hygiene certificate every three years. Others indicated they have never undergone a health inspection, but some of their clients have asked for quality control certificates (including HACCP, ISO and other food safety certifications).

Product standards are enforced mostly by visual spot inspections conducted by collectors, wholesalers, and other actors. If quality does not meet the buyer's expectations, then delivery will be rejected. In certain cases, the buyers may embed a quality discount into their purchase price: one processor explained that they automatically pay 10% less than the typical buying price to suppliers to account for debris, mould, and other quality losses at delivery. Rejected peanuts are sold to sauce and peanut oil processors, as well as for peanut tempeh. This is cause for concern, as kernels with very high levels of aflatoxin contamination can still make their way back into the food chain.

3.9 Costs and Margins

3.9.1 Farm level

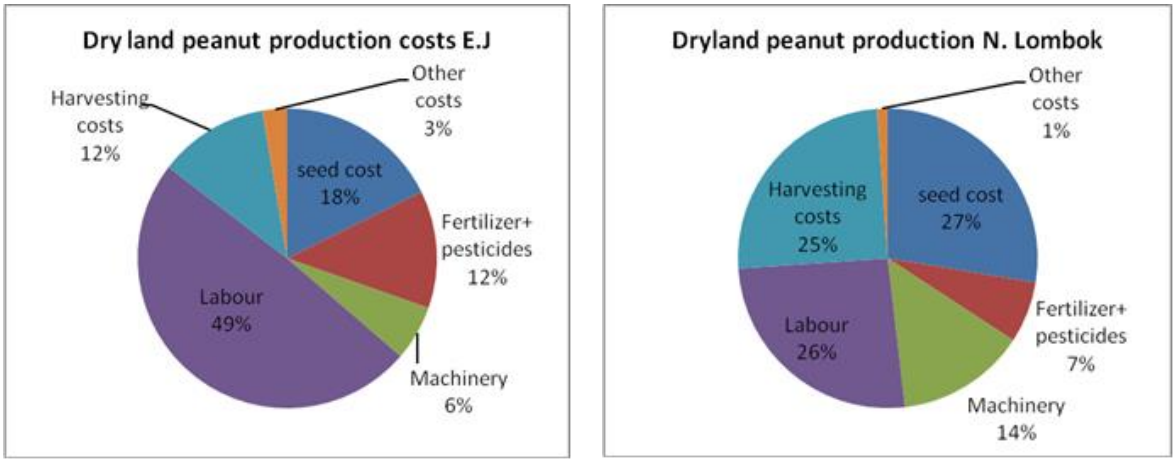
A total of eight grower group interviews (four each in EJ and North Lombok) were conducted to assess grower practices and gross margins of peanuts in both dryland and irrigation production systems (see Table 17). As expected there was a high degree of variation in yield and production costs associated with individual growers.

Table 17 Peanut grower group interviews held in East Java and North Lombok provinces

Province	Main product	System	Pod yield kg/ha	Adj. Pod yield* kg/ha
E. Java	Dry pod	Dryland	630	630
E. Java	Fresh pod	Irrigated	6000	2400
E. Java	Fresh pod	Irrigated	6000	2400
E. Java	Dry pod	Irrigated	900	900
N. Lombok	Dry pod	Irrigated	1350	1350
N. Lombok	Dry pod	Irrigated	2700	2700
N. Lombok	Fresh pod	Dryland	1750	700
N. Lombok	Dry pod	Dryland	1575	1575
** After moisture correction assuming 40% moisture in fresh pods*				

Source: Author's calculations based on field interviews, Oct 2012

Labour costs (for land preparation, weeding and post-harvest handling) in EJ and NTB account for up to 60% of total costs (see Figure 22 below). Given the high labour costs involved, many dryland farmers explained that they forgo weeding as a result, which lowers yields.



Source: Legume study team, North Lombok, Oct. 2012

Figure 22 Production costs for dryland peanuts in East Java and North Lombok

The labour costs are higher (by 23%) in EJ compared to North Lombok. However, the harvesting costs (harvesting, pod picking and drying) in Lombok are twice as high as those in EJ. While growers from both systems are using machinery (tractors or power tillers for land preparation, and water pumping for irrigation), the usage is limited by availability and access to the machinery at the local level. There is good scope to minimise labours costs through more cost-effective use of herbicides and machinery options.

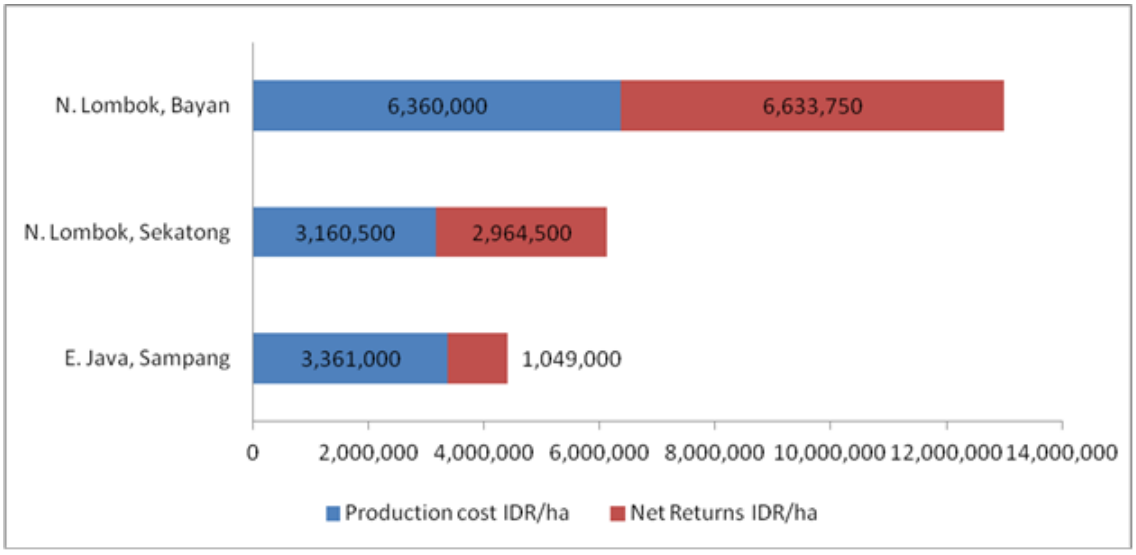
The next highest input cost is seed (18% in EJ and 27% in Lombok). Due to the high cost (as well as limited availability in many cases), farmers are less likely to purchase seed and many growers (for example, Sekatong, NTB and Sampang, EJ) have developed their own seed banks and seed supply system by circulating seed between irrigated and dryland crops. However, a majority of the growers access their planting seed from buyers

(collectors). This kind of seed supply situation is comparable to a 'closed loop' system, where new genetic material is not introduced into a supply chain, resulting in decreased yields over time.

Fertilizer and pesticide inputs account for up to 12% of total costs in EJ compared to 7% in NTB (Lombok Island). While growers in Lombok were found to use few chemical inputs, growers in EJ use a range of chemicals including fertilizers, herbicides, and pest control. However, input use efficiency (i.e. yield realised per unit input cost) was found to be lower in EJ compared to Lombok.

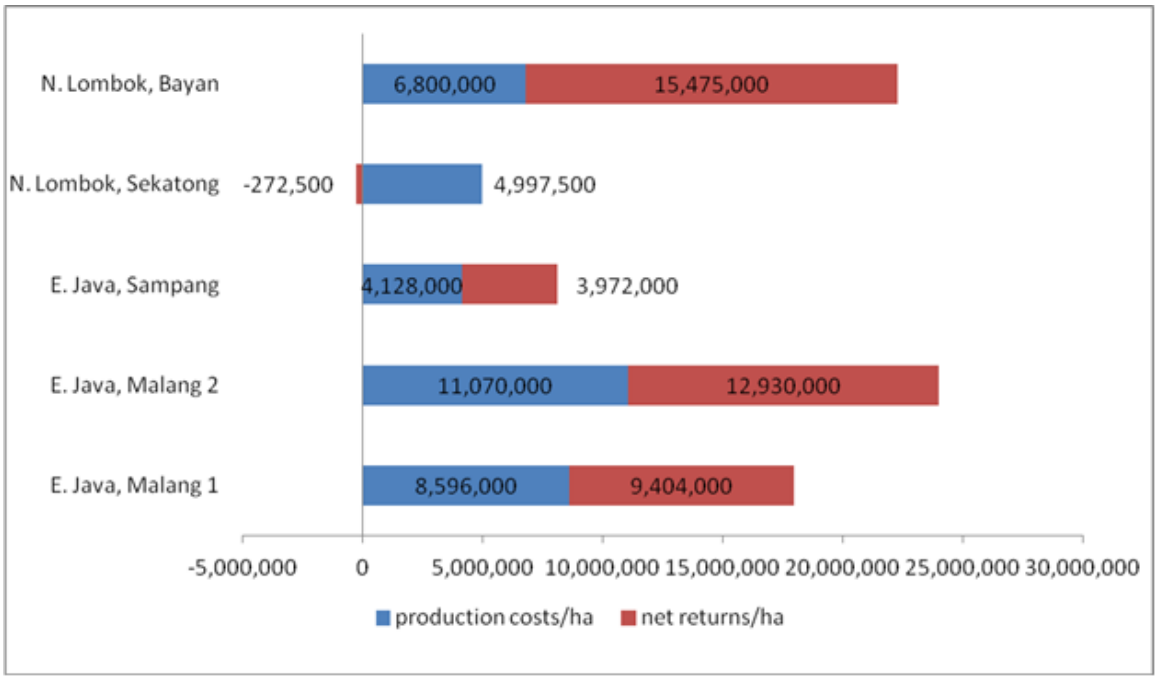
The investment required for irrigated peanut production is of course higher than that for dryland. The net returns on this investment tend to be higher in North Lombok than in EJ in both dryland and irrigated systems (see Figure 23 and Figure 24).

One exceptional case in North Lombok where growers reported losses was at Sekatong, where the peanuts were cultivated on heavy black soil, which is not suitable for peanuts due to soil cracking under dry conditions. This resulted in root damage, poor pod growth, and pod losses at harvest.



Source: Legume study team, North Lombok, Oct. 2012

Figure 23 Production costs and net returns from dryland peanut



Source: Legume study team, North Lombok, Oct. 2012

Figure 24 Production costs and net returns from irrigated peanut

Based on figures obtained from ACIAR and ILETRI, the expected improvements in net returns for farmers from the hypothetical implementation of AIPD-Rural facilitation activities with LFs (discussed in further detail in section 5.3) are nearly double (see Table 18).

As per soybeans, these projections are hypothetical and show expected per-hectare revenue increases over three seasons with two farmer types: one in North Lombok and the other in Malang. Both farmers are practicing dryland peanut cultivation, and prices are assumed to remain equal.

Table 18 North Lombok (NTB) peanut farmer profile with percent increases in revenue

Cost component (IDR)	Unit of measure	Current period	Yield increase	Yield increase	Yield increase
Revenue			20%	40%	20%
Yield	Dry pod (kg/ha)	2,700	3,240	5,184	8,748
Total Revenue/ha	IDR/ha	22,275,000	26,730,000	35,640,000	40,095,000
Total costs/ha	IDR/ha	6,800,000	6,800,000	7,480,000	8,160,000
Net income/ha	IDR/ha	15,475,000	19,930,000	28,160,000	31,935,000
Net income	(US$/ha)	$1,579	$2,034	$2,873	$3,259

Source: Author's calculations *(based on findings from ACIAR SMAR2007/68 Project- Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia)*

Season 1: The farmer begins using improved agricultural input practices and seed selection (but improved variety seed access is still limited in both North Lombok and Malang). For the North Lombok and Malang farmers, this results in a 20% improvement in revenue with no additional increase in costs.

Season 2: The farmer adds improved certified seed (developed and tested by ILETRI and BPTP and procured through LF input suppliers). For Lombok farmers, these suppliers

include wholesalers in Lombok as well as retail shops. For Malang, they include processor-buyers who have already been practicing extensive seed selection with their vendor farmers. Field agents from seed companies in all target areas begin helping to ensure best practices in crop management. These efforts complement those undertaken by BPTP and ILETRI. The resultant increase in productivity is 60% in North Lombok, while in Trenggalek (owing to a certain level of saturation from input use and land pressure) the revenue improvement is 40%. For both areas, the resultant increase in costs is 10%.

Season 3: The farmer has purchased the improved certified seed and inputs directly through LFs and is implementing best practices in crop management. The farmer's relations with LFs (including input supply wholesalers and retail shops) translates into access to improved variety seed with a total increase from the baseline of 80% in North Lombok and 60% in Malang (for certain farmers, improvements could be expected to top 100%). The increase in costs is 20% for both areas.

3.9.2 Collection / wholesale

Collectors and wholesalers are able to sustain relatively higher monetary margins due to the fact that often they apply more labour - including drying, shelling, and sorting - than is the case for soybeans. To illustrate the margins incurred, a village-level collector's costs/margins (self-reported) are presented below in Table 19.

Table 19 Village-level collector's costs/margins

Cost component/kg	Amount (IDR)/kg
Farm gate price (10/2012)	3,500*
Transport to facilities	30
Drying factor (40%)	1,330
Drying costs (labour)	100
Sales price to wholesaler in Mataram (dry factor)	8,000
Loss/dry weight	100 - 1,000/kg
Margin/kg for collector	> 2,000

** The farmgate price in North Lombok appears substantially lower than that reported in EJ, by between 500-1,000/kg.*

Source: Author's calculations, field work 2012

It is possible that the collector neglected to mention additional costs, but it is still reasonable to expect margins well in excess of 1,000 IDR/kg. Further shelling - if performed at all - results in a final sales price of approximately 13,500 IDR/kg for dry kernel. If 50-100 IDR/kg in transport is factored in, a further 100 IDR/kg processing costs for the shelling, 70% kernel-shell weight loss, and 100-200 IDR/kg transport to wet markets within NTB, the wholesaler can expect a margin of approximately 800 - 1,000 IDR/kg.

3.9.3 Processing / roasting

Processor costs vary considerably depending on the form of peanut purchased. Some roasters purchase kernel (Sikat in Mataram), whereas others such as Kacang Goreng in EJ purchase only the wet pods. Nevertheless, for illustrative purposes it is interesting to present Kacang Goreng's cost breakdown (self-reported) as an example of what an SME processor might be facing (Table 20).

Table 20 Example SME processor (pan fried peanut) cost breakdown

Cost component/kg	Amount (IDR)/kg
Farm gate price, wet pods (10/2012)	4,500
Drying + roasting cost (incl. Fuel)	6,000
Roasting (labour)	150
Blanching (est.)	600
Sorting (labour)	300
Packaging	250
Misc. Labour	1,450
Transport to distributors (est.)	150
Costs of goods sold	13,400
Sales price to wholesaler in Malang or Surabaya	15,000
Margin (not factoring in fixed capital)	1,650

Source: Legume team field interviews, Oct 2012

While these figures are rough estimates supplied mostly by the processor, they illustrate how the highest costs are related to labour and drying/roasting - due primarily to the rudimentary and manual technologies applied by these processors. The processors interviewed acknowledged that upgrading to higher forms of roasting technology could help them increase volumes, but they were unsure where to access this technology and specifically what options are affordable and/or available.

3.10 Constraints

Several of the constraints identified for peanut value chain actors are similar to those experienced by soy and mungbean farmers, especially at the input supply level.

Table 21 outlines the value chain constraints and opportunities in the peanut sector in NTB and EJ.

Table 21 Value chain constraints and market-based solutions, peanuts (NTB and EJ)			
Value chain constraints /opportunities	**Market-based solutions**	**Potential providers**	**Challenges to the provision and use of market-based solutions (by type of provider)**
Input supply: 1. There is a lack of commercially-available certified seed to farmers; many are using seed from their own seed banks or buying unofficial commercial seed from other farmers. There is a perceived lack of availability of quality, improved peanut seed through commercial channels. Some wholesale buyers and peanut roasters/processors in East Java sell selected peanut pods or kernels to their own supplying farmers as a way of guaranteeing supply with harvest. But, as with other legume crops, their seed selection methods are not necessarily scientific or effective. Many of them are unaware of the existence of commercial seed developers.	• Access to private sector market distribution channels to peanut seed developers • Access to improved quality seed to peanut farmers	• Input supply distributors and retailers • Wholesale buyers and processors • Commercial seed developers	Commercial seed developers: Seed developers face difficulties in marketing seed through private input supply networks (retail shops and distributors in more urban centers). They need access to state-of-the-art storage strategies and packaging to improve product quality. Many cite difficulties with the certification process. Furthermore, certified seed may not necessarily be of superior quality to uncertified seed. Input supply distributors and retailers: Many interviewed explained they would be willing to sell quality commercial seed if it were reliable, consistent, and well-packaged. They may not be aware of the presence of commercial seed developers. Their attention is more focused on rice and maize seed. Wholesale buyers: Many wholesale buyers and their agents are unfamiliar with formal seed selection and the availability of various improved varieties that could be propagated. They are unfamiliar with techniques such as demonstration plots, seed selection and storage, etc. Most merely invite farmers

			to sort through their collected harvest and pick out planting material, often charging the same price to farmers as they would for regular pods, rather than exacting a premium.
Producers lack access to inputs on credit which prevents them from being able to purchase inputs (seed, fertilizer, pest control products and herbicides). In certain cases, farmers enter into informal agreements with buyers to mitigate the lack of commercial credit. These buyer/seller schemes appear to be more advanced between peanut processors and farmers in areas visited in EJ (especially Malang). In NTB, particularly North Lombok, some wholesalers at the village level are supplying credit to peanut farmers.	• Access to input credit for peanut farmers • Training in more formalized buyer-seller schemes including contracts and credit provisions to buyers and farmers/farmer groups	• Wholesale buyers and tofu/tempeh processors • Commercial banks	Wholesale buyers and processors: Many wholesale buyers are already providing some credit to supplier farmers, but they lack familiarity with mechanisms for contract farming - or at least on how to formalize relations with farmers - despite a pronounced willingness to explore such possibilities with a market development program like AIPD-Rural. Commercial banks: Traditionally, these entities have never focused on farmers as potential clients and are unskilled at effective loan recovery or designing appropriate loan packages tailored to the needs of specific farmers (i.e. soybeans).
2. There is reportedly a large amount of cheaper but inferior quality, often counterfeit, seeds, pesticides, and herbicides. Input companies have no way of controlling the circulation of these products and farmers are unaware of the inauthenticity of the products. Retailers are often attracted to them because they are cheaper and consequently easier to sell. This not only results in ineffective use of poor quality inputs and reduced productivity, but they may be biologically hazardous. Their	• Improved product quality verification and monitoring to input supply producers • Awareness training to input retailers (L2) on the implications of counterfeit or low quality inputs	• Input supply companies in collaboration with communications/technology companies	Input supply companies: Local input supply companies (distributors) are not familiar with schemes that facilitate product verification, which can involve SMS messaging systems and mechanisms to verify product authenticity.

lack of effectiveness can also engender mistrust between farmers and input suppliers.			
Production, harvest, and post-harvest collection: 3. Farmers often apply unskilled methods for planting, weeding, and harvesting, which not only lowers their harvests but results in uneven product quality (e.g. beans of varying sizes, etc.). They often broadcast seed - an inefficient planting method that raises input costs. Many are reported to be broadcasting NPK and urea, rather than 'targeted' application. 4. Actors across the entire value chain are unaware of (or not expressing concern about) the hazards associated with aflatoxin contamination of peanuts. Farmers lack knowledge about, and access to, proper post-harvest storage methods for peanuts which, especially for rainy-season farming, results in peanuts with higher moisture content and susceptibility to Aspergillus contamination. There are government standards on a national level but these are not being enforced, so market actors are left to their own standards of quality control.	• Access to training and information on best farming practices and post-harvest storage to farmers, collectors, wholesalers, and processors. • Awareness building to quality controls to wholesalers and processors	• Commercial input supply agents w/ input retailers • Wholesalers • Processors	Input supply agents: These agents sometimes are unable to reach out to farmers as products and materials they use are more geared toward maize and rice cultivation. Domestic input supply companies lack information materials and strategies to promote soybean farming. The market is heavily tilted toward maize and rice cultivation. Wholesalers and processors: Neither processors nor wholesalers and their collector agents are aware of the dangers of aflatoxin contamination. It is essential to control humidity, which is only checked with visual inspection, not instrumentation.
Processing: 5. As annual peanut production falls across Java and NTB, larger-scale peanut processors	• Access to raw material supply to Lead Firm peanut processors	• Lead Firm processors, collectors/agents, and farmer groups	Garuda Foods' Operations Management expressed a lack of skills in proper seed development and extension, which the company (and its competitors) would like

(Garuda, Dua Kelinci etc) do not have sufficient access to quality peanuts and are forced to import kernels from India. These are ultimately more expensive. Garuda has attempted to source peanuts from farmers in NTB, but was unable to fulfill target quantities. Key informants claimed that the varieties Garuda was requiring (e.g. 4 kernels per pod) did not produce high enough yields to justify cultivation.			to improve.

3.11 Chain Development Prospects

As with soybeans, there are both competitive advantages and disadvantages for Indonesian peanuts over imports. These comparisons are summarized in the abbreviated SWOT analysis below. Weaknesses and opportunities will be examined in further detail, and Section 5 outlines some suggested strategies through which AIPD-Rural may help value chain actors on a sustainable basis.

Strengths:

- Indonesian peanuts are priced lower than Indian imports at retail level, sometimes by as much as 20% (Wholesalers in Surabaya, 2012).
- Indonesian peanuts from Tuban and NTB are often cited as the benchmark in terms of quality and taste.
- Relative to other legume crops, peanut farmers and traders enjoy higher margins and have a ready market able to absorb production.
- The presence of LFs such as Garuda and Dua Kelinci in the peanut value chain can be an asset in driving export demand and quality.

Weaknesses:

- There are limited quality controls at the farm gate as well as insufficient post-harvest management.
- Indonesian peanuts exhibit a higher moisture content than imports, which limits storage time.
- There is a lack of quality, certified seed of appropriate varieties available to farmers, which limits productivity.
- Most processors lack efficient processing equipment, which hinders their productivity and competitiveness.
- Many farmers are not utilizing good quality seed, fertilizers, and chemical inputs, which limits yields.
- The government provides less support to the peanut sector as it is seen as a secondary crop, compared to rice and maize.

Opportunities:

- Farmers have indicated a willingness to purchase quality seed if this were available through market channels; private seed companies could introduce such seeds into their product lines.
- Product diversification could find ready consumers on the domestic market.

Threats:

- The GOI favouring maize and rice planting creates incentives for farmers to grow those crops instead of peanuts; land area for cultivating peanuts has steadily declined over the last ten years.

- There is an insufficient supply of domestically grown peanuts to larger processors, who are the drivers of the peanut value chain. Despite increasing demand, share of imports on the domestic market is steadily growing in order to satisfy demand.

4 The Mungbean Sub-Sector in Indonesia

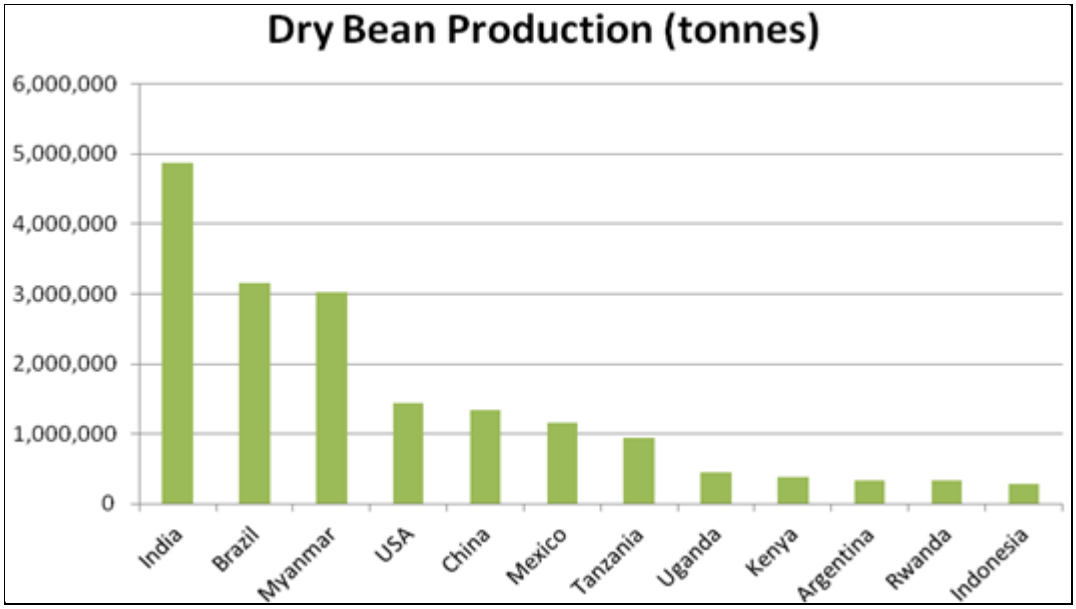
The third legume value chain examined in this study is mungbean. The area covered was limited to two districts of NTT (TTU - an AIPD-Rural target district - and Belu, both on Timor Island). Mungbeans are abundant in wet markets throughout NTB, NTT, and EJ, either as fresh sprouts or dry beans. They are often cooked at home as porridge. They are even processed by companies into popular drinks such as mungbean tea.

Similar to peanuts and soybeans, they are regarded as a profitable secondary legume crop, and in some cases they were the primary source of income for farmers interviewed in NTT. Many traders and retailers in NTT reported respectable margins on their mungbean trade, as well as strong demand and relative ease of storage. The sections below provide an overview of the mungbean sector as it relates to opportunities for growth in AIPD-Rural target districts in NTT.

4.1 Indonesia's Position in Global Production and Trade

There are few clear statistics available on global mungbean cultivation, but for dry beans (which also include other pulses as well as pigeon peas, etc.), Indonesia ranks twelfth among the world's producers, producing approximately 250,000 tonnes in 2010 (FAOSTAT, 2010). According to the Indonesian National Bureau of Statistics, this figure exceeds 300,000 tonnes. It is reasonable to assume, however, that mungbeans do not constitute a majority of the dry bean crop sector and that production is closer to 50,000 tonnes of mungbeans/year.

The world's largest producer of mungbeans is India, but China is the largest exporter at approximately 200,000 tonnes/year (Xuzhen Chen, Jing Tian, 2009). Figure 25 below outlines the world's top 12 dry bean producers in 2010.



Source: FAOSTAT, 2010

Figure 25 Global dry bean production (tonnes)

A relatively small amount of mungbeans are exported from Indonesia annually. The most prominent exporter interviewed in Surabaya reported sending up to 4,000 tonnes/year to other ASEAN countries. This exporter was quick to point out that only the large, dull-green

mungbeans from Central Java are exported, and none from NTT or elsewhere. He also stated that Indonesia imports mungbeans from China and India, but the majority of mungbeans consumed in Indonesia are grown in Java.

In recent years, Indonesia has imported over 50,000 tonnes of dry beans, 44% of which are mungbeans (20,000 tonnes), representing only 10% of its consumption needs (Canadian Embassy, Jakarta).

4.2 Socio-Economic Importance

Mungbeans are a useful source of protein to consumers in Java, NTB, and NTT, and they enjoy relatively high demand among the urban and rural poor. Mungbean stover is also used as an ingredient in animal feed as a source of protein.

For certain farmers in NTT, especially those with access to irrigation, mungbeans are seen as a reliable crop and source of income. Several farmer groups interviewed reported eagerness to plant at least two crops per year. A few traders even mentioned that it is being grown increasingly as a rainy season crop in Belu district.

The majority of mungbeans (75%) are grown as a cash crop with the remaining 25% used for household consumption and social purposes (Adar, et al 2009).

4.3 Production

Across Indonesia, NTT ranks fifth in production of mungbeans behind Central Java, EJ, Sulawesi, and NTB. Centres of production in NTT are Belu, followed by Manggarai (Flores), Sikka (Flores), and Kupang - none of which are AIPD-Rural target districts. There is some production in the target district of TTU which is adjacent to Belu (see Table 22 below).

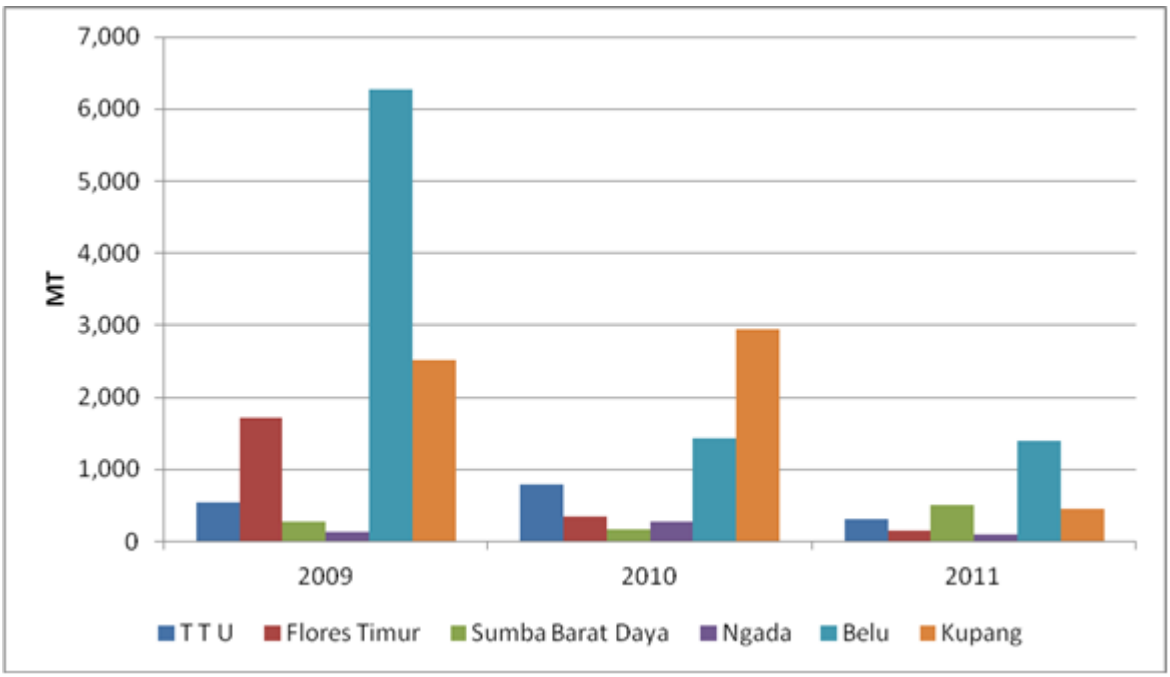
Table 22 Mungbean production statistics by target district in NTT, 2011

NTT						
	SBD	**TTU**	**East Flores**	**Ngada**	**Belu***	**Total NTT**
Area Harvested (ha):	282	825	418	280	1,869	15,767
Production (tonne):	271	848	466	316	1,761	13,462

**Not an AIPD-Rural target district however it is a major production center, located adjacent to TTU.*

Source: BPS, 2011

According to the Indonesian National Bureau of Statistics, while mungbean production has remained stable or even grown in other provinces, it has fallen by 50% in NTT since 2007. One reason offered by key informants is the lack of on-farm labour and opportunities for farmers to seek alternative employment in newly emerging cities in NTT. For the target district of TTU, other reasons were cited including unpredictable rain patterns, coupled with a lack of access to good seed varieties. Farmers interviewed in Belu district reported difficulties with excessive rainfall since 2011, resulting in trade of mungbeans falling by as much as 40%. Figure 26 below illustrates a precipitous fall in production since 2009, particularly in Belu and Kupang districts.



Source: BPS, 2009-2011

Figure 26 Mungbean production in AIPD-Rural districts, 2009-2011

As with the other legumes crops examined in this study, there are several major production systems which also reflect diverse climate conditions on Timor Island: upland and lowland rain-fed production (December-March); lowland irrigated production in rice paddies (May-July), and upland second rainy season farming (July-September) in Belu district.

Wherever there is sufficient rainfall, as in Belu district, farmers can plant mungbean immediately after harvesting primary crops such as maize and wetland rice, using residual moisture in the soil and with no need for external irrigation. In many areas of TTU, this is not an option. Most key informants interviewed indicated that rainfall patterns in that district do not accommodate this system, given the long-maturing varieties used by farmers.

4.4 End Markets / Demand

4.4.1 Product uses for mungbeans

Most raw mungbeans are sold at wet markets, bazaars, and rural markets. A small amount is used to make more processed end products. Their final uses in Indonesia include the following:

- Fresh sprouts - the majority of small and shiny mungbeans in EJ are processed into sprouts. It appears the dull beans in Timor Island are also used for that purpose. Sprouts are sold mostly at wet markets by small-scale retailer-processors.
- Sweet porridge - typically produced at home or by street vendors, this is a common breakfast food or dessert (called ‘es kacang hijau’).
- Cakes and snacks - available for sale by street vendors, but most often cooked at home.

- Mungbean starch and flour - this can be used by processors (see below) to make infant formula.
- Mungbean drink - this is a milk substitute produced by two large companies in Indonesia: PT Heinz (ABC brand) and Ultrajaya. Processed in West Java, these are the most high-end, smartly packaged commercialized products produced from mungbeans available on the market. A variant of this is mungbean drink powder, which is produced under the Nurela brand by Nutri Reka Laksana in West Java.

Pre-packaged mungbean drinks are sold in supermarkets and small urban shops. It is unknown how much of the mungbean market these drinks constitute, but the majority of the beans sourced are from Central Java, considered the epicentre of Indonesian mungbean production. None of these processing companies were interviewed for this study; it is recommended they be contacted for future program development. These companies are potential drivers of expanding demand for mungbeans and introducing new varieties into NTT and other eventual AIPD-Rural project areas.

4.4.2 Competitiveness of mungbeans from NTT

Retailers at wet markets in NTT reported that demand for mungbeans is constant year-round. This is a primary incentive cited by these retailers for trading in mungbeans - they are also selling various grains, staples, vegetables, and locally traded spices.

Some wholesalers in Surabaya reported that mungbeans from NTT - specifically those from Atambua district – exhibit quality issues caused by suppliers mixing old harvests with fresh ones. This sometimes results in insect infestations, to which mungbeans are highly susceptible if not stored under proper conditions.

However, the information provided by wholesalers in Surabaya contradicts that of all retailers and wholesalers interviewed in Kupang, Kefa, and Atambua. According to these market actors, local beans (mostly from Belu district) sell quite rapidly when available. In comparison, the beans shipped in from Surabaya, which are of unknown origin, are often of comparatively inferior quality and presentation (see Picture 14 below). A local retailer-wholesaler in Kupang explained how local beans (right) and those from Surabaya (left) compared in terms of quality: the local beans exhibit more uniformity of size and less red-brown discolouration, the latter being an indication of staleness.

Picture 14 Local vs imported mungbeans in NTT

Source: Legume field work, Oct 2012

4.4.3 Export competitiveness

Indonesian mungbeans (in particular the large, dull variety from Central Java) are sought after by other ASEAN nations - in particular, the Philippines - according to one exporter interviewed for this research. The prices paid by international buyers are the same as those paid by wholesale buyers (currently between 8,000-8,300 IDR/kg).

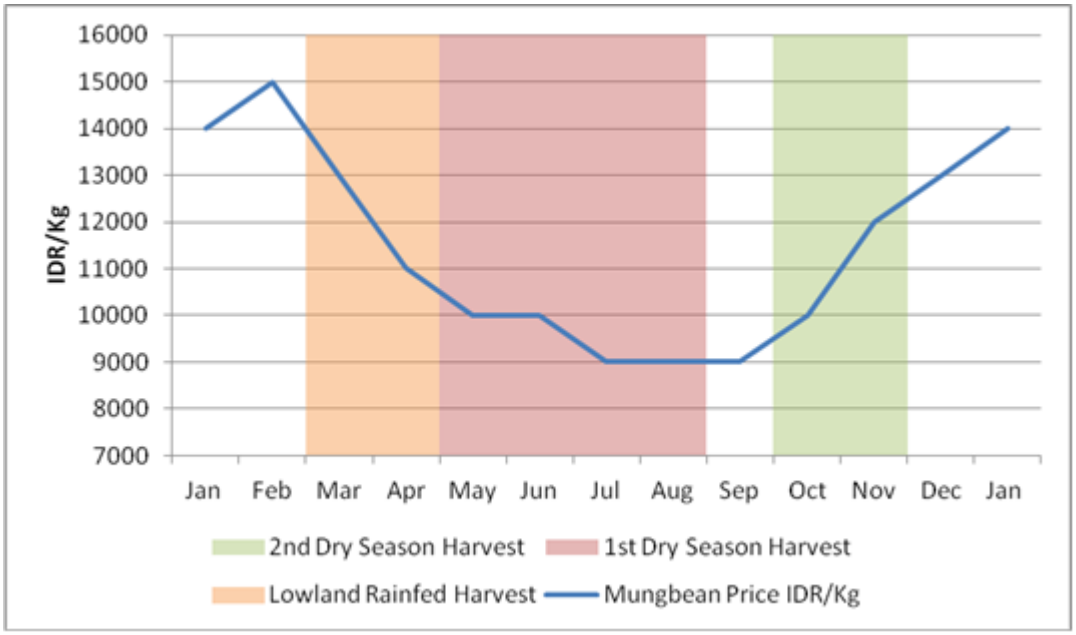
More research is required to assess the long-term competitiveness of Indonesian mungbeans on export markets. Globally, especially in East Asia, mungbean consumption appears to be increasing - notably in China - where it is viewed and marketed as a healthy source of protein. At one point in 2010, mungbean prices in China increased three-fold due to demand and limited availability (Christian Science Monitor, 2010). As for NTT mungbeans, even though prices have increased three-fold since 2007, it does not appear that enough beans are being grown in the AIPD-Rural areas to justify promoting them for export, at least in the short term.

4.5 Prices

The price trends on local markets in TTU and Kupang generally reflect the seasonal supply of mungbeans, as shown in Figure 27 below.

This price trend is based on 2011-2012, and overall mungbean prices have increased year-on-year since 2007 by a factor of three. The highest prices typically occur in January-February during the rainy season, when local stocks run out and traders bring in mungbeans from Surabaya. Local beans from rainy season harvests become available after February (and prices fall steeply as a result).

The first dry-season harvests in Belu between May and August keep the availability of local production high (and prices relatively low). During this period, many traders also source mungbeans from East Timor (illegally), which also keeps prices down. Prices begin to rise again as local supplies start to dwindle before the second dry season harvests (starting in October-November).



Source: Legume team interviews with wet market wholesalers and retailers in Kupang, September 2012

Figure 27 Wholesale price trends in Kupang wet market, 2012

There does not seem to be a quality premium for mungbeans per se, nor are they sorted for size or quality. The only distinction is between the smaller, shiny variety and the larger, dull variety. The latter, which commands a price at all levels of 1,000 IDR more than the

former in NTT, is often associated with newer and more productive seed varieties. Table 23 below outlines the price difference as reported in Oeba market, in Kupang.

Table 23 Mungbean varieties: shiny vs. dull

	Retail price/kg (IDR) (Oeba market, 10/2011)	Village collector sales price/kg (IDR)	Farmgate price/kg (IDR)
shiny variety*	13,000	11,000	7-8,000
dull variety	14,000	10,000	9-10,000

** the shiny variety is not typically grown in the districts of Timor Island visited by the legumes team. It is reportedly more commonly found in NTB and Flores Island where there are two AIPD-Rural target districts.*

Source: legumes team interviews with market retailers and wholesalers in Kupang, 2012

4.6 Policies and Regulations

The only policies and regulations known to affect mungbeans in Indonesia involve imports of plant products, overseen by the Department of Agriculture. Importers are required to obtain phytosanitary certification for pests and residues, issued by the Indonesian National Agency for Drug and Food Control (BPOM). An importer's license is also required.

There are no known tariffs on imported mungbeans presently from other ASEAN nations, China, Australia, or New Zealand. However, a 5% import tariff applies for dried beans (including mungbeans) from India, a major mungbean exporter.

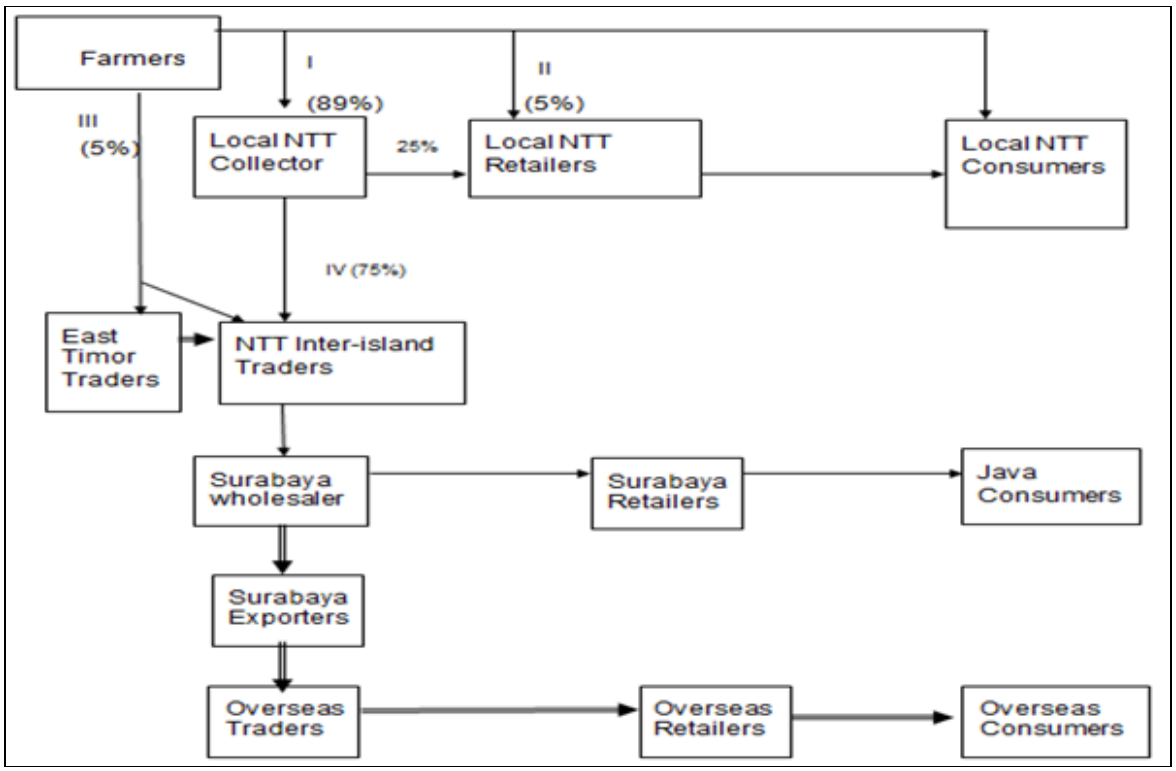
4.7 Mungbean Value Chain - NTT

The NTT mungbean value chain was comprehensively mapped in a previous ACIAR project in 2009 (ACIAR SMAR 2007/68) (see Figure 28 below). The key market players in the NTT mungbean chain are producers, collectors (village, sub-district and district), retailers, inter-island traders and exporters.

Roughly 80-85% of mungbeans produced in NTT are traded. The remaining percentage is for private consumption. Ninety percent of mungbeans traded in NTT are sold to local collectors. The remaining 10% is divided equally between farmers selling directly to either retailers or local market consumers.

The local mungbean collectors sell the majority of their mungbeans (75%) to interisland traders with the remaining 25% sold to local retailers who sell through the wet markets to consumers. Nearly 70% of all mungbeans produced in NTT are sold to inter-island traders or collectors based in Surabaya, who either trade locally to consumers in Java or export overseas.

Consumer preferences for mungbeans in Indonesia are for small - medium sized beans with a dull green colour, low dirt content and are easy and fast to cook. Moisture content must be no greater than 15%.



Source: Adar, D., Basuki, T., Benu, F., Augustina, H., 'Mungbean Value Chain Analysis in East Nusa Tengarra Province and Potential for Linkages with other Major Mungbean Markets in Indonesia', (From ACIAR SMAR2007/68 Project- Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia)

Figure 28 Mungbean value chain map, NTT

4.8 Costs and Margins

4.8.1 Farm gate costs / margins

The costs and margins for mungbeans differ for rainy season cultivation verses lowland irrigation, as well as by geographic area within NTT. Table 24 below lists the costs incurred by an upland mungbean farmer taking advantage of residual soil moisture/bimodal rain patterns during June-September in the central growing area of South Belu.

Table 24 Costs and margins - mungbeans (upland production)

Yield (kg/ha)	780	
Price (IDR/kg)	12,500	
Revenue/ha (IDR)	9,750,000	
Costs	**Rate IDR/ha**	**Percent Cost**
Seed	440,000	24%
Labour	1,232,500	68%
Fertiliser	0	0%
Pesticide	108,000	6%
Transport	22,500	1%
Total cost	1,803,000	100%
Gross margin (IDR/ha)	7,947,000	
Gross margin (US$/ha)	811	

Source: Legume team interviews in NTT, Oct 2012

As can be seen, the largest capital cost for these farmers is seed and labour in land preparation. They are not using fertilizers, which would increase their costs but could also raise their productivity. As these farmers in South Belu are taking advantage of rain-fed conditions, they incur no costs for irrigation – which, for lowland farmers, is the single largest cost after labour.

4.8.2 A limited number of farmers that receive assistance from BPTP and other GOI institutions enjoy higher productivity returns of over 1 tonne/ha, as well as access to improved variety seed, and thus have higher net returns, sometimes approaching 10,000,000 IDR/ha. As will be argued in the next section, it is crucial to identify market based solutions whereby the same products and services that a small number of farmers receive for free from public agencies might be offered on a much broader scale, and in a commercially viable and sustainable manner, by the private sector.Error! Reference source not found.Hypothetical returns

Recent studies conducted in 2010-2012 by Adar et al. under the ACIAR *Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia Project,* indicate that with implementation of improved variety seed among mungbean farmers, and low-cost enhancements to farming practices ('LCT' - low-cost technologies), increases in on-farm productivity (with minimal increases in costs) have already reached between 50-66% in Kupang and Belu grower groups.

In a hypothetical scenario over three seasons, it is possible to envisage similar returns to productivity and income (assuming prices remain stable) in an AIPD-Rural program of facilitation activities involving value chain participants in TTU and Belu (as outlined in Section 5.3)

Season 1: Farmers are purchasing improved variety mungbean seed through input supply retail shops in Kefa (supplied by grower businesses based in Atambua). The resultant increase in costs and productivity is approximately 20%.

Season 2: In addition to improved variety seed, the farmer is applying LCT, provided by LF buyers (training by AIPD-Rural) in collaboration with BPTP. The resultant increase in revenue from baseline is 50%, and the cost increase remains at 20% from baseline.

Season 3: Improved farmer practices, use of improved variety seed, and access to extension / information from both LF buyers and input suppliers translate into a 65% revenue increase and a 30% total increase in costs, as the farmer is purchasing more improved-variety 'Vima-1' seed.

As seen in Table 25 below, revenues are expected to almost double with the introduction of new varieties already tested by ILETRI and BPTP within the ACIAR SMAR project. The challenge will be to implement a sustainable private-sector-based distribution model for improved inputs and extension to complement the efforts of BPTP and ILETRI.

Table 25 TTU (NTT) Mungbean farmer profile with percentage increases in revenue over three seasons

Cost component	Unit of measure	Current period	Yield increase	Yield increase	Yield increase
Revenue			20%	50%	65%
Total Revenue/ha	IDR/ha	9,750,000	11,700,000	14,625,000	16,087,500
Total costs/ha	IDR/ha	1,780,500	2,136,000	2,136,000	2,314,000
Net income/ha	IDR/ha	7,969,500	9,564,000	12,489,000	13,773,500
Net income/ha	US$/ha	813	975	1,274	1,405

Source: Author's calculations (From ACIAR SMAR 2007/68 Project- Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia)

Collection and wholesale

After farm gate collection, village-level collectors - some whom are farmers themselves - incur costs that are associated mostly with transportation and loss from storage. For Belu district, the majority of mungbeans are brought to one of two major inter-island wholesalers based in Atambua ('Gadjah Mada' and 'Paris Indah'), or to other smaller-scale wholesalers at the wet market in Kupang or Kefa. One village-level collector in Halilulik (Belu district) who collects as much as 20-25 tonne/season explained that his margins can be as little as 100 IDR/kg after factoring in all transport costs and losses due to insect infestation. His normal costs are listed in Table 26 for illustrative purposes, and they show a relatively healthy margin.

Table 26 Belu district village collector costs

Cost item	Gross cost (IDR)	Per kg cost (IDR)
Farm gate price in South Belu	7,000	(7,000)
Truck rental	700,000 total price (4 tonne)	(175)
50 kg plastic bag packaging		(200)
Transport to Atambua market (30 km)	175,000 (4 tonne)	(44)
Sales price	-	8,000
Clean margin (assuming no losses during storage)	-	581

Source: Legume team interviews in NTT, Oct 2012

5 Pro-Poor Value Chain Development Opportunities

5.1 Market Based Solutions

Market-based solutions are provided by the private sector in a commercially viable manner as part of their commercial relationships with producers, from whom they buy and to whom they sell, in an attempt to address and help resolve the key constraints facing producers and other market actors in the targeted value chains.

AIPD-Rural can play a key facilitation role in creating incentives and building the capacity of MBS providers (also referred to as 'LFs' or 'inclusive businesses') to invest in MBS for the producers in their supply chain or distribution network. Examples of investments or initiatives that these businesses can potentially carry out, with a view to improving their capacity to source from, or provide products to, low income producers in their value chain, include:

- Developing or adapting products (seed, inputs, etc.) for low income farmers,
- Carrying out procurement from low income farmers,
- Accessing finance for procurement and investments,
- Promoting training and technologies with farmers,
- Improving management and organization,
- Resolving policy and regulatory issues, and
- Improving access to markets (that will increase their sourcing from farmers).

By making these investments, businesses can improve their competitiveness and also provide products, services and technical support that are needed by farmers in their value chain. By supporting these initiatives and MBS, AIPD-Rural can achieve:

- Sustainability of Impact: As the targeted 'inclusive businesses' have commercial interests to invest in, and sustain relationships with, the suppliers and consumers in their value chain, the impact will continue beyond the life of the project.
- Scale of Impact: By working with many inclusive businesses in the legume value chains, the project will be able to multiply the scale of its impact with farmers.
- Greater Industry Competiveness: Inclusive businesses can serve as models for other firms and drive increased growth and competitiveness in their industries.

As per previous sections, the study team identified a wide variety of MBS that may help address the constraints facing producers and other market actors in the soybean, peanut and mungbean value chains (see tables entitled '*Value chain constraints and market-based solutions*'). By supporting the development of existing or potential providers of these solutions, the project will achieve sustainable impact.

Moving towards implementation, more dialogue and discussions are needed with the targeted providers of MBS to determine their interest and incentives for providing MBS as part of their commercial relationships with targeted producers. It will be important for the AIPD-Rural program to complete this before any facilitation activities are developed, as all

too often development programs tend to impose ideas on target groups and market actors, designing program interventions before verifying interest on the part of market actors, or indeed the commercial viability of such solutions.

5.2 Collaboration with Government support agencies

There are several government-funded agricultural research and development agencies with which the AIPD-Rural program will need to collaborate, especially for the certification of improved seed varieties. Through AIPD-Rural activities, these government agencies will be better linked to private market actors and together they will promote the introduction of improved strains and practices within a three-year timeframe. Below is a brief description of the key agencies that AIPD-Rural will need to coordinate with.

Indonesian Agency for Agricultural Research and Development (IAARD)

The IAARD is a unit within the Ministry of Agriculture. Its functions are performed by eleven research centres and institutes which are tasked to manage research and development on food crops, horticulture, estate crops, livestock, veterinary, soil and agro-climate, agro-socio economics, machinery development, post-harvest, biotechnology and agricultural technology assessment.

Indonesian Legumes and Tuber Crops Research Institute (ILETRI)

This is an institution under the Indonesian Ministry of Agriculture and its main purpose, according to its mandate, is ‘to conduct advanced technological research and strategic research for legumes and tuber crops, as well as to carry out monitoring and evaluation of its implementation’. ILETRI has helped to develop new legume seed varieties and, through both public and private partners, has researched the best methods for their cultivation, pest and disease management, and post-harvest handling. ILETRI has been key in collaborating with Garuda Foods' initiatives to expand peanut cultivation and test new varieties. It has also been working in the development of soybeans and mungbeans in some of the AIPD-Rural target areas.

Assessment Institute for Agricultural Technology (BPTP)

Another agency under the Indonesian Ministry of Agriculture, BPTP, with its offices and field agents in every major Indonesian province, is involved in the extension and testing of seed varieties and appropriate methods/technologies for cultivation and post-harvest storage. In many cases, BPTP has been the only agency or organization actively testing appropriate varieties of legume (via demonstration plots) in the AIPD-Rural target districts of Eastern Indonesia; AIPD-Rural's efforts to promote improved variety seed and cultivation techniques, together with LFs, should be viewed as complementary to BPTP's existing efforts. BPTP offices in EJ and NTB will work with selected LFs and their target grower groups to promote best management practices. For example, in NTT, it is envisaged that BPTP will be partnering with Syngenta Foundation and Bank NTT to support credit schemes for mungbean growers by helping to develop seed production, supply, and extension of best management practices to target groups.

National Seed Corporation (PT Sang Hyang Seri)

This corporation was established by the Indonesian government in 1971 as part of a World Bank project, with the primary objective of supplying high quality seeds to farmers. It produces and distributes improved quality seeds directly to farmers.

Indonesian Center for Food Crops Research and Development (ICFORD)

ICFORD falls under the purview of IAARD. This agency is responsible for coordinating the research and development of food crops, including legumes. The work of the centre also includes plant genetics (management of germplasm and breeding) and resource management to improve production systems, harvest and post-harvest handling.

Directorate of Food Crops

This entity is under the Directorate General for Food Crops, and is responsible for delivering breeder seed to 'central seed farms' in the provinces. These farms then produce the breeder seed into foundation seed, at which point they are distributed to 'main seed farms' in the districts that produce stock seed from foundation seed. The provincial agricultural extension service manages the central and main farms. Farmers, or the seed growers, work with seed producers such as government seed companies PT San Hyang Seri and PT Pertani, private firms or cooperatives to produce extension seed from stock seed.

The Seed Control and Certification Agency (BPSB)

BPSB is government funded with a mandate to control seed quality produced by seed developers. It is managed by DINAS at the provincial level and charges a fee to seed developers of 300 IDR for each kilogram of seed certified.

The role of BPSB is to verifying that certified seeds comply with government standards. Any seeds producer or government agency that produces seed must go through a certification process done by BPSB which includes:

- Field examination;
- Seed quality testing in the laboratory and / or seed quality inspection in storage;
- The issuance of seed certificates, (yellow for seed producer seeds; white for foundation seed; purple for stock seed, and blue for extension seed).

Seed certified by BPSP is labelled before it is delivered to seed distributors, where farmers purchase the seed.

Indonesian Bureau of Logistics (BULOG)

This government-owned company is responsible for implementing food distribution and price controls for legume crops, most notably soybeans.

The task of developing robust pure seed production systems requires significant capital and skilled labour investments (up to AUD $1M for even a small scale pure seed production program). The challenge for future project activity in this area will be to encourage such investment by the private sector. For peanuts, it is possible that several major peanut procurers/processors (e.g. Garuda Foods, Dua Kelinci) will become LFs to take on this role, as per the experience of nearly all other countries where large scale peanut production occurs. It is likely that partnerships, and even variety licensing agreements between the variety developers (e.g. ILETRI) and the LFs, will need to be established to ensure the LFs' investments are secure and protectable. The Plant Breeders' Rights (PBR) legislation in Indonesia should be explored within any future project, as protection of variety intellectual property is the cornerstone of any substantial future private investment. For soybeans and mungbeans, it is likely that new seed producing companies will need to be established. These could be part of other

agribusinesses (e.g. Syngenta and others), or larger processors of tempeh and tofu, if such investment in seed production systems would serve to secure their supply base.

5.3 Illustrative Project Facilitation Activities

The illustrative project facilitation activities presented below are offered as supports to the development of the MBS referenced in this report. These activities are not exhaustive, and will need to be fine-tuned as part of the ongoing program design process.

Any intervention or initiative proposed by a targeted MBS provider should contribute to the company's ability to improve, expand or develop the products and support they provide to producers to whom they buy, or from whom they sell. Based on the constraints and MBS analysed in previous sections, as well as discussions with targeted MBS providers, some illustrative facilitation activities for the legumes value chain might include the following:

5.3.1 Illustrative facilitation activity: develop capacity of Lead Firms to conduct producer training and extension activities

Facilitation activities can build the capacity of LFs to develop training modules, organize demonstration plots to expose producers to improved production practices and/or new varieties, and to introduce high-yielding and sustainable production methods.

Market-based solutions addressed:

Training in more formalized buyer-seller schemes including contracts and credit provisions for buyers and farmers/farmer groups; access to training and information on best farming practices and post-harvest storage for farmers.

Specific examples for legumes:

- Several soybean and peanut wholesalers in EJ, NTB, and NTT have expressed willingness to improve their sourcing abilities and build better relations with farmers, and would like support in developing training materials that may result in improved trust as well as product quantity and quality available to them.
- Contacts: Darwis (peanut soybean wholesaler, Dompu), Firdaus (soybean wholesaler, Bima), Pak Renadi and Udin (peanut and maize wholesalers, North Lombok), Haji Azahri (peanut wholesale collector, Sampang), UD Mulya Abadi (soybean wholesale collector, Trengalekk) Paris Indah (mungbean wholesaler, NTT), Chakhra shop (wholesale collector, Kefa, NTT).
- The potential outreach and impact of a 'best practice' LF training and extension intervention for soybean and peanut growers in AIPD-Rural districts of EJ and NTB has been estimated at 20,000 soybean producers in EJ and NTB and 20,000 peanut producers in EJ and 10,000 peanut producers in NTB. See Table 33 and Table 34 in Annex 3 for simulations including broad assumptions.

5.3.2 Illustrative facilitation activity: Support the Seed Control and Certification Agency (BPSP) and Lead Firms to introduce improved/certified varieties of seed to producers

The task of developing a robust pure seed production system is certainly a challenge. According to Graeme Wright[7], it would require quite large capital and skilled labour investments (e.g. up to AU$ 1M for even a small scale pure seed production program).

Fortunately, improved soybean, peanut and mungbean varieties are already available and tested in Indonesia as provided by ILETRI (and possibly some other research and development providers). The recent ACIAR study *Productivity and Profitability Enhancement of Tropic Pulses in Indonesia (*2013) clearly identifies the legume varieties and supporting best practices required to achieve significantly higher yields.

The current 'choke' in the seed system is the disjoint between the 'distributors' (LFs), who actually supply planting seed to farmers, and the lack of capacity of Government agencies ILETRI (seed breeding), BPSB (seed certification), and BPTPs (extension of best practices) to satisfy the demand for improved certified seed in sufficient quantity, quality and in a timely manner.

Establishing BPSB at the centre of an intervention model to work with seed breeders (ILETRI) and with LFs (seed developers) at the district level, who in turn work closely with growers, would facilitate systematic adoption of improved certified varieties, as well as encourage business investment by numerous LFs in a non-competitive business environment.

The key to this potential intervention model is BPSB is supported to review its governance and funding structure to ensure its industry-led funding incentive (300 IDR/kg) is strengthened and is the key driver of operations.

The LFs will also be supported by extension technologies, to ensure supply of quality and purity of planting seed to growers. The challenge facing future project activity in this area is the encouragement of investment by the private sector. For peanuts, the two to three major peanut procurers/processors (e.g. Garuda Foods, Dua Kelinci) are the likely LF to take on this role. For soybeans and mungbeans, it is likely that new seed producing companies will need to be established.

Market-based solutions addressed:

Better access to improved quality and new existing varieties of certified seed to farmers, along with access to training and information on best farming practices and post-harvest storage to farmers.

Seed developers improve their ability to market seed through private input supply networks (retail shops and distributors).

The certification process is streamlined and actual costs of certification to seed developers and growers are reduced.

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[7] *Graeme Wright is the head of the plant breeding division for the Peanut Company of Australia (PCA). He was a technical reviewer of the legume report and his comments and recommendations have been included in the project facilitation activities, particularly for the development of improved and certified legume varieties.*

Specific examples for legumes:

- Support BPSB to identify three to five case studies on the preferred models/mechanism that may be relevant for BPSP to apply to ensure its industry-led funding structures are sustainable and sufficient market incentive exists for them to deliver quality timely services to seed developers. Lessons learned can be drawn from established crops (e.g. Forum Kerjasama Produsen Benih Kelapa Sawit (FKPB-KS) - palm oil Indonesia; potatoes in Australia)
- Garuda Foods, which has already worked with the IFC and ACIAR on improving its sourcing capabilities in NTB, expressed interest in developing its ability to test and extend new and improved peanut seed to its sourcing areas, including target districts in NTB. It would also be instructive to determine how other similarly-sized LFs like Dua Kelinci and PT Heinz might be willing to collaborate with AIPD-Rural.
- Government agencies (ILETRI, BPTP and DINAS) have played a key role in developing new varieties of legumes and targeted best management technologies. They will continue to play a role in facilitating the MBS intervention in partnership with the private LFs. For example, in NTT it is envisaged that BPTP–NTT, NTT Bank and Syngenta Foundation will work together in organising credit schemes, progressing seed production, supply, evaluating/extending best management practices to target groups. This intervention model requires further exploration.
- It is expected that ILETRI will play a crucial role in a seed intervention strategy by supplying pure seed of new varieties in sufficient quantities to seed developers. BPTPs in EJ and NTB will work with selected LFs and their target grower groups to promote best management practices.
- The potential outreach and impact of improved certified varieties for soybean peanut growers in AIPD-Rural districts and beyond has been estimated at 50,000 soybean producers in EJ and NTB and 50,000 peanut producers in EJ and 20,000 peanut producers in NTB. See Table 35 and Table 36 in Annex 3 for simulations including broad assumptions.
- The estimated outreach for the Bank NTT/BPTP/Syngenta Foundation mungbean production model is in the vicinity of 100 ha or 100 growers in the short term expanding to thousands of growers of multiple commodities over time.

5.3.3 Illustrative facilitation activity: build the capacity of Lead Firms to improve and expand their procurement from producers

Facilitation activities may involve helping wholesalers, processors and LFs to develop or expand innovative outgrowing and direct procurement models with poor farmers, including providing those farmers with technical support, inputs, and an assured market.

Market-based solutions addressed:

Training in more formalized buyer-seller schemes including contracts and credit provisions to buyers and farmers; access to training and information on best farming practices and post-harvest storage to farmers; training in group purchasing of soybeans/inputs to tempeh/tofu processors.

Specific examples for legumes:

Several of the large snack food companies (Garuda Foods, Dua Kelinci, and PT Heinz) and/or their wholesale suppliers already have experience with outgrowing operations and could be supported to expand these operations into (or return to) the targeted areas. Tofu/tempeh processors in Mataram (Lombok) have expressed an interest in receiving support in trying to organize into informal groups to facilitate group purchasing of soybeans.

Such activities, they believe, could lower the price they get from wholesalers and increase their leverage. Up to 300 processors and their employees in Lombok could benefit directly.

- Contacts: Haji Ripai (soybean trader and largest tofu processor in Mataram), Tahu 151 (tofu processor-retailer in Mataram).
- A wholesale mungbean collector in NTB (Chakhra Shop) is interested in extending mungbean farming of improved varieties to farmers in TTU. The company already sources rice from this region as well as mungbean from Belu district, and has significant experience in extension, embedded credit and (informal) contract schemes. It could work with up to 300 farmers in TTU initially.

5.3.4 Illustrative facilitation activity: introduction of new technologies to improve Lead Firm efficiencies (and their products / services provided to producers)

Facilitation activities include: introducing new or improved tools/equipment to processors or producers (not buying them for them), offering technical support in developing improved post-harvest techniques and new methods of post-harvest storage, or support for a company in its efforts to develop or improve its final products (quality, packaging, labelling, product diversification etc.).

Market-based solutions addressed:

Access to affordable improved processing technologies to tofu processors, improved product quality verification and monitoring to input supply companies.

Specific examples for legumes:

- SME tofu processors in NTB (Bima, Mataram) and Sampang (EJ) cited interest in improving efficiencies in their fuel usage. Some mentioned that in nearby regions and ASEAN countries, similar tofu processors are using better but affordable technologies from which they would like to learn. Potential outreach would be up to 500 processors and employees in Bima, Mataram, and Sampang.
- Contacts: all tofu processors interviewed in NTB and Sampang.
- Input supply distributors and producing companies may be interested in implementing an SMS-based product verification scheme to help farmers buying their products to verify authenticity, thereby mitigating the problems caused by counterfeit products. Implemented successfully in other countries (including Bangladesh, Zambia, and Kenya), this would involve collaborating with one or more mobile phone operators. The potential outreach and impact of such a program is difficult to estimate as it would not only be limited to the legume sector. Very rough estimates, based on

previous experience in other countries such as Bangladesh, would be up to 100,000 farmers in NTB, 300,000 in EJ, and 5,000 in NTT.

5.3.5 Illustrative facilitation activity: exposure visits/ business-to-business meetings

Facilitation activities include inter-regional or international learning visits to LFs or processors to identify new technologies, sources of useful tools, equipment, or skills, etc.

Specific examples for legumes:

- [see example of tofu processors in NTB above]

5.3.6 Illustrative facilitation activity: facilitating market access for Lead Firms (which in turn will purchase more from producers)

Facilitation activities include: development of promotional materials, facilitation of trade show participation to Lead Firms, business-to-business meetings, and technical support to meet requirements of existing or potential markets.

Market-based solutions addressed:

Access to branding/marketing and business development services to tofu & tempeh processors.

Specific examples for legumes:

Note: there are more LFs in the targeted value chains than will need to be contacted to explore market development opportunities. These firms would include PT Heinz (mungbean drink) and Dua Kelinci (peanut).

- Certain tempeh and tofu processors in NTB and EJ wish to improve their product in order to reach out to new and more upscale markets. Activities might include cost-share programs to link processors with marketing agencies and consultants. Potential number of beneficiaries: up to 50 tofu and tempeh processors, plus employees (= 500 people) directly benefiting from this activity.
- Contacts: Tempeh processors in Sampang, Tahu 151-A (Mataram).
- Peanut roasters in Lombok and EJ contacted so far are interested in finding new markets and upgrading their processing technologies. Potential direct beneficiaries include more than 250 peanut processor owners and employees in target districts of EJ.
- Contacts: Kacang Goreng (Malang), Sikat (Mataram).
- Seed development companies across all three commodities have little to no experience in marketing through private sector channels. Thus they would benefit from AIPD-Rural facilitating connections with potential distribution networks in the private sector, including input supply shops and wholesaler agribusiness operations. The activities will require the seed developers to tailor their products and packaging to their input supply shops and farmer/wholesaler clients, perhaps with the introduction of new, improved varieties more suitable to the local market. As many as 12 seed companies in or near the target districts (two for mungbean, and an estimated six each for peanuts and soybeans) would benefit, with a resultant impact reaching over 100,000 legume farmers.

- Contacts: Toko Charisma shop and Yosefina Klaran (mungbean seed developers in Atambua, Belu); Usahabaru seed producers (Dompu, NTB).

5.3.7 Illustrative facilitation activity: improving Lead Firm quality management systems (allowing them to improve products and services to producers)

Closer collaboration with the group at Gajah Mada University (Professor Endang Rahayu) and the Aflatoxin Forum Indonesia (AFI) project, as well as scientists at ILETRI (Dr Anna Augustina) is strongly recommended, as these groups have the necessary (Indonesian) expertise on aflatoxin to make some important progress on this significant health problem.

Indeed, a dedicated component of work on aflatoxin could be conducted on a small regional scale within the AIPD-Rural project, including community awareness, regulatory systems, measurement systems and its management in the peanut food chain. Outputs and impacts could be extended to the wider Indonesian community at a later date.

Facilitation activities include: helping LFs or processors to improve quality management systems, linking businesses with market development or quality management service providers.

- Peanut roasters/processors as well as soy cracker and tempeh processors often lack hygiene certification. One peanut processor has admitted to not being able to sell to certain clients due to a lack of food safety documentation and systems. The processor expressed interest in some technical support in upgrading their QM systems and food safety. This should involve identifying food safety consultancies and developing cost share agreements with the processors, as well as training programs (QM). Potential beneficiaries include over 150 SME snack food processors and employees, with significant benefits for consumers in the form of hygiene improvements.
- Contacts: Gajah Mada University (Professor Endang Rahayu) and the Aflatoxin Forum Indonesia (AFI) project, as well as scientists at ILETRI (Dr Anna Augustina).

5.2.8 Summary

It is important to note that the ultimate feasibility of these proposed activities, and the details of how they will be implemented, will only be able to be determined once further in-depth discussions are held with the targeted market actors themselves (a description of this process and the use of ‘invitations for applications’ with targeted firms is presented below and in Annex 2). In order to achieve sustainable and commercially viable results, the proposed providers of the market based solutions will need to take full ownership and responsibility for the proposed initiatives

Invitations for Applications

To follow-up on this value chain analysis and begin implementation of AIPD-Rural facilitation activities, it is recommended that the project distribute ‘Invitation for Applications’ (IFAs) to targeted MBS providers / LFs. These applications are designed to solicit input from the targeted MBS providers / LFs whereby they propose initiatives and activities that will help them develop/ expand the MBS (products, support and market access) they provide to producers.

The IFA includes clear guidelines and parameters that stipulate the potential size and nature of project technical and cost share activities. Once applications are submitted, the

project can enter into discussions and negotiations with the MBS providers to determine the most appropriate activities to support. This can be viewed as useful follow-up to the intervention ideas discussed with market actors, and it provides an opportunity to develop further details about proposed activities. It is recommended that IFAs be distributed to as many MBS providers as possible.

Once activities are identified and mechanisms agreed upon, the project can develop Memorandum of Understandings (MOUs) and agreements with the targeted MBS providers / LFs. These will clearly describe the nature of the collaboration between the project and the MBS provider, roles and responsibilities for interventions, and technical support / cost share budgets. Once these are established, the project will then provide technical support as needed to the MBS providers in implementing interventions.

6 Key Findings and Recommendations

6.1 Cross Cutting Issues: Poverty, Gender and the Environment

6.1.1 Gender roles

Production

While men are the principal farmers of the targeted crops, women play a key role in many processes. According to several informants, including government officials, extension workers, input sellers and farmers, in soybean production, men buy inputs, and they traditionally prepare the land and seeds. They dig the hole where the seeds will be planted, while typically women follow the men and throw the seeds.

For soybeans, little to no weeding (the activity in which women usually participate) is undertaken, according to farmers interviewed. Men and women both participate in harvesting of legumes (for example, see Table 27). Men usually negotiate with collectors at the farm gate. For instance, in North Lombok the research team interviewed a group of farmers that organize to find the collector paying the best price. Women seem to have little participation in this activity.

Table 27 Gender roles in soybean production in NTB

Activities	Men	Women	Total	Percent of operations	Percent men	Percent women
Land preparation	45	0	45	3	100	0
Sowing	165	331	496	30	33	67
Weeding	18	269	287	17	6	94
Fertilizer/pest	83	1	84	5	99	1
Harvesting	110	627	737	45	15	85
Total	421	1228	1649	100	26	74

Note: based on a survey of 87 farmers in Lombok, NTB

Source: Halil Hamzah and Abdullah Usman (2013) (From ACIAR SMAR2007/68 Project-Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia)

For all three commodities examined, it was found that harvest labour is usually shared, but there are specific roles for men and women. For example, the task of shucking and shelling is divided. For soybeans and mungbeans, men and women both harvest the pods. Then, men will wrap the pods in a blanket and beat the beans out of the pods. Thereafter, women will perform the sifting and cleaning.

According to informants in the areas studied, in peanut production, men have traditionally participated more than women. Women participate in the preparation of seeds and sowing, whereas men prepare the land. Men are also in charge of pest management and application of inputs.

Women are claimed to be active in the weeding and drying of peanuts, and are also involved in post-harvest activities.

Markets

According to an expert in NTB, buyers come to farmers of peanuts and maize and conduct negotiations 'man to man'. There are also collectors that operate at the village, sub-district and district level.

According to another informant in NTB, some farmers have the opportunity to sell their peanuts to companies if they fulfil certain quality and volume requirements. In these cases, for instance in NTB, PT Garuda Foods previously bought peanuts grown by local farmers from local agents (collectors), and male peanut farmers received payments from the agent. However, the price is determined by the agent. If this process is still occurring, it represents an opportunity to facilitate the involvement of women into more activities in the production and processing of peanuts. Ideally the intervention would be managed by a third party (such as a non-government organisation (NGO)) that trains women in processing and even negotiating with buyers, and also facilitates relationships between female farmers and the buying company.

Women are more often present selling at the weekly and bi-weekly open markets, especially if the sales points were close by. The heavy lifting and transport is mostly conducted by men. As for bazaars, women tend to be retailing products at least on an equal basis with men across all regions visited. However, men tend to be involved in wholesaling to a greater extent and the larger the wholesale business, the more likely it is to be male-owned and operated.

Processing enterprises

Among tofu and tempeh processors there are several areas of gender division. In the majority of small-scale tofu processing enterprises, most of the hired labour and much of family labour is male; the team did not encounter a single female-run tofu processing unit. This is most likely due to the highly physical nature of the process.

For tempeh processing, women are more present at all levels and are more likely to be running small businesses and directing both family and hired labour. This could be due to the fact that, other than transporting product to retail outlets, there is considerably lighter physical exertion involved in tempeh processing compared with tofu. However, in part because so much of this labour is family-based, it was difficult to discern strict segregation of roles and power.

It appears that all retailers of tofu and tempeh are women at bazaars and wet markets. In general, the further away from the farm and closer to urban contexts, the more likely one is to find woman-owned and managed businesses, be it input suppliers, processors, or retailers.

Access and control over resources

Men are the main recipients of training and knowledge on better farming practices and use of inputs for legume production. The only exception seems to be when training is provided by an NGO, as was the case of NGOs subcontracted by Garuda Foods, to provide training to their suppliers.

Men are reported to be paid higher wages than women in peanut cultivation. For example, a sector expert claimed that in NTB, men are usually paid 30,000 IDR per day while women receive 20,000 IDR per day. However, most informants claimed that wage differences are generally declining.

Men, as the heads of households, usually bargain and sell their peanuts to collectors or companies, and also receive the payment. This gives them power over household resources.

Decision making

According to our informants, as with most commodities, men usually decide if and when to plant legumes. However, a recent study conducted in Lombok, NTB revealed that women can have, in some situations and in certain aspects of legume production, an important say in how legumes are produced. Table 28 shows that, in the study location, women have input upon the seed planting technique (i.e. dibble in rows or random planting) of soybean.

Table 28 Decision making in seed planting technique in Lombok, NTB

No	Decision	Number of respondents	Percent
1	Husband	40	46
2	Wife	17	20
3	Together	30	34
	Total	87	100

Note: based on a survey of 87 farmers in Lombok, NTB

Source: Halil Hamzah and Abdullah Usman (2013) From ACIAR SMAR2007/68 Project- Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia)

Factors to consider during the implementation of interventions

The legume value chain study has recommended the development of activities that build the capacity of LFs, such as Garuda Foods and others, to improve their procurement from small-scale producers. This could include involving wholesalers, processors and LFs to develop or expand innovative outgrowing and direct procurement models with poor farmers, encompassing technical support, inputs, and an assured market.

This would also represent an opportunity to encourage women to participate in activities like training on best farming practices and post-harvest storage, and training in group purchasing of soybeans/inputs to tempeh/tofu processors. Through training and access to knowledge on the use of inputs and market information, and with the right support, women can be encouraged to increase their participation in post-harvest activities and negotiate directly with buyers. If done properly, and if the constraints of women to attend and participate in trainings are addressed, this could increase the power of women in intra-household decision making by increasing their skills and income.

The legume value chain report highlights training opportunities for more formalised buyer-seller schemes, including contracts and credit provisions for buyers and farmers/farmers' groups; access to training and information on best farming practices and post-harvest storage for farmers. This includes collaborating with soybean and peanut wholesalers to improve their relationships with farmers through dialogue and training.

A further recommendation by the legume value chain report where (a relatively smaller number of) women can greatly benefit is by introducing new or improved tools/equipment to processors (e.g. tofu and tempeh) or producers, offering technical support in developing

improved post-harvest techniques and new methods of post-harvest storage, or providing support for a company in its efforts to develop or improve its final products (quality, packaging, labelling, product diversification, etc.). This would require financial support from an external stakeholder and more comprehensive analysis of women's time allocation in and outside the household. These and any other new proposed activities will likely compete with the already busy schedules of many women in rural areas.

6.1.2 Environment

Tofu processing units

One area of concern encountered by the legumes study team is the potential toxicity of waste from tofu processing businesses into ground water. While some of these businesses are using salt water (and dumping into open sewers or streams), others are also using Sulphuric Acid to firm their tofu. Others have reportedly been using Formaldehyde as a firming agent. AIPD-Rural may need to have an environmental specialist explore this issue in further detail, as the effects on worker health and ground water/environment are unclear.

Input supply environmental issues

An issue was also raised by some input distributors regarding the tendency for input supply companies to push quantity over quality, and that this has an effect on the increase in use of pesticides by farmers. Retailers counter this argument, saying that farmers tend to use less than the recommended dosages of chemical pesticides and herbicides – mostly to save money but perhaps also because they are wary of health effects. That said, some retailers and distributors, as well as company field agent agronomists, conduct safety campaigns with farmers on the need to use masks and protection while spraying crops. But this does not seem to be uniformly practiced as a standard by all.

In subsequent follow-up with input supply companies, it is important to find out which of the companies (East-West Seed, Petrokimia Gresik, Pertani, Syngenta, DuPont, Bayer, Biotek, and others) embed environmental safety in their extension and training practices.

As mentioned in the sections on value chain constraints, there is also the concern of low-quality, cheap, and environmentally toxic chemical inputs - which are sometime counterfeited - proliferating in the field and being sold by retailers. This is an issue which AIPD-Rural might be able to work with input supply companies in collaboration with mobile communications firms, as practiced in other countries but still unknown in the target provinces visited by the legumes study team.

Other social factors, common across all legumes studied in this value chain, influencing the adoption of new technologies include:

- Knowledge about and economic ability of LF key staff to procure seed of improved varieties from seed breeding agencies (ILETRI).
- Resistance to change at LF and primary seed growers' level, and a lack of confidence in the perceived performance of new varieties compared to the conventional varieties.
- Grower's access to and knowledge about production practices, including the most effective chemicals (particularly during incidence of pests and diseases) to deliver profitable yields.
- Business relationships between LFs and their grower customers.

6.2 Areas Requiring Further Research and Analysis

Despite the differences across the three legume value chains, there are also commonalities and recurrent themes. The following are some suggested research questions in relation to those cross cutting themes.

- What are the different reasons that farmers and collectors are not following best practices in terms of post-harvest storage?
- What are the incentives or disincentives for processing companies (e.g., snack food, sauces, to develop or expand outgrowing or other forms of direct procurement (including various forms of support to producers) with producers in the targeted areas?

More specific crop related questions are outlined below.

Soybean

- What are the management practices (e.g. introducing low cost mechanical seed drills) that will achieve higher and more reliable yields of soybean varieties, and improve benefit- cost ratio under high and low input production environments (particularly in EJ)?
- Exploring new high yielding and pest resistant dual purpose soybean varieties suitable for both food and feed markets
- Are there cost effective storage practices at farmer and LF level that will minimise seed quality deterioration in storage?

Peanut

- Are there new high yielding and pest resistant dual purpose soybean varieties suitable for both food and feed markets?
- What are the costs/benefits of peanut stover in a legume/livestock production system?
- What are the cost effective storage practices at LF level that will improve the viability and vigor of the planting seed, as well as minimise the occurrence of aflatoxin in storage?

Mungbean

- Exploring new high yielding and pest resistant mungbean varieties for NTT environments.
- What are the market place/consumer perceptions of the mungbean varieties recently tested in ACIAR's *Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia* study?
- What levels of soil nitrogen fixation can mungbeans achieve under varying management practices in NTT?
- What are the most cost effective traditional storage methods at the farmer level that will prevent pest attack and maintain seed viability in storage?

6.2.1 Soybeans - next steps in program design

In this study, more attention was paid to identifying key market actors for the soybean value chain. As such, a broader picture of the constraints and opportunities inherent at different levels was obtained - at least for the areas the legume team visited. However, for

a more complete picture, it is important to canvass other market actors as well as any potential business support organizations, including:

- Seed companies doing seed multiplication on Sumbawa island - In Dompu and Sumbawa districts, at least one group of seed developers is selling through private retail (contact: Apotika Tani input supply shop in Dompu). It will be important to interview government certification agencies in Central Java responsible for certifying the seed produced by those developers, as well as the government sponsored or private sector companies that are producing breeder seed.
- Input supply companies based in East and Central Java, including Petrokimia Gresik, Bisi, and PT Panah Merah/ East-West Seeds. More information is needed to solicit ideas for future collaboration. What constraints do they face in their dealings with distributors and retailers at the provincial and district levels? What strategies are they employing, if any, to prevent inappropriate use of agrochemicals? So far, only Syngenta has been interviewed, and several key informants and agronomists contacted in the field are agents for other companies listed here.
- The three major importers of U.S. soybeans have been referenced by large-scale distributors in Surabaya: Cargill, Teluk Intan, and Suryabudi. What are these companies doing to secure their market in Indonesia? Who are their main distributor or processor clients? What are the terms of their relations?
- Financial institutions - Of those offering loans to soybean wholesalers and processors in EJ and NTB, the two most quoted banks are BRI and Bank Jatim (the latter in EJ).
- KOPTI - a highly political organization with national outreach. None of the small processors the legume team interviewed in target districts of NTB or in Sampang belong to this organization. They have collaborated with the ASA in the past. It is important for AIPD-Rural to better understand all of their current activities to assess what kind of collaboration (if any) might be feasible under the project. Also, why is KOPTI not active in NTB or Sampang?
- Market actors in the AIPD-Rural target district of Situbondo. As the team did not make a visit there little information was obtained regarding how that district fits into either the peanut or soybean value chains: farmers, input suppliers, wholesalers, etc.
- Marketing agencies or consultants based in EJ - are there any marketing agencies who have collaborated at any level with small tofu/tempeh processor? Have they ever been approached for such work? Why or why not?

6.2.2 Peanuts - next steps in program design

Additional peanut research should focus on actors in EJ, as most of the key players in the NTB target districts have been contacted already. The following activities and interviews are essential to obtaining a more complete picture of value chain dynamics, constraints, and solutions:

- Travel to Tuban Province - This area appears to be the epicentre of peanut production in EJ. Not only is there significant production of a supposed top-quality peanut on the domestic market, but also the region's most important traders are present and the top processors are sourcing significant amounts there. Three important traders in Tuban quoted by wholesale traders are Sumber Mutiara, Sumber Manis, and Sumber Rejeki. There also appear to be seed developers in Tuban, and possibly processors of peanut oil as well.

- Interviews with LF processors/exporters - These include Dua Kelinci, Mitra Foods, and perhaps Orang Tua Group. How do their sourcing models compare with Garuda Foods, and what kind of relations do they have with suppliers in EJ or NTB?
- Oil and cake/animal feed processors - As up to 70,000 tonne of peanut kernel are estimated to be processed into animal feed, what role do these actors play in the value chain and what relations do they have with suppliers?

6.2.3 Mungbeans - next steps in program design

Mungbeans received less attention during the study; however, the team was able to identify further areas of work which AIPD-Rural could explore in NTT. These are:

- Flores and Sumba islands - All indications are that the majority of mungbean production for NTT is on these two islands (in addition to Belu district). More seed developers and wholesale traders in these areas should be contacted to compare with the information gathered from West Timor.
- Follow-up with seed developers - Two seed multipliers in Atambua, Yosefina Klaran and Toko Charisma Shop, were interviewed. Both expressed interest in working with AIPD-Rural to help solve the problem of access to quality seed for mungbean farmers by expanding private distribution networks through shops and input distributors. Their outreach alone might result in certified mungbean seed being made available to thousands of farmers in Belu and TTU districts. Are there other seed developers in Flores or Sumba Islands?
- Examine the possibility of transposing ACIAR's public-sector mungbean loan program model into the private sector - The current NTT bank loans set up through the initiatives of Mr. Fred Benu in Kupang might be improved if implemented by private sector actors. The legume study team interviewed one other bank BRI Kupang[8] - expressed an interest in identifying a suitable contractual model with farmers and wholesale traders in NTT or EJ as guarantors, with the potential for input supply companies[9] to provide technical training to farmers. One input supply company with reported experience working in mungbeans in NTT is BISI International. Both financial institutions interviewed (NTT Bank and BRI) stressed the importance of assuring a guaranteed market for farmers before being willing to provide loans. So far, the local market appears able to absorb local production, but this might change if there is a sudden bounce in production levels. These same sources warned that if production levels increase too quickly, the market price could collapse. They based their assertions on experience with other unsubsidized commodities, but would not specify which ones.

Chakhra Shop in Kefa, which acts as a go-between commodity wholesaler for Paris Indah in Atambua, suggested it could work with AIPD-Rural to extend mungbean farming with credit and technical support to local farmers in TTU.

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[8] *BRI Kupang also stated that they have been collaborating with GiZ (German Development Agency) on loans to fishing sector SMEs on Timor Island.*

[9] *The seed developers in Atambua are also a possibility to consider as input suppliers.*

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8 Annexes

Annex 1: Checklists/Structured Questionnaires

	CERTIFIED LEGUME SEED RETAILER	INPUT RETAILER	FARMERS	COLLECTOR (LEGUMES)	PROCESSORS
1. Background information	▪ Location/address/ contact ▪ Number of employees ▪ Other businesses involved in? ▪ Other background information	▪ Location/address/contact ▪ Number of employees ▪ Other businesses involved in? ▪ Other background information	▪ Village/district/ province ▪ Number of households living in village ▪ Typical incomes of different household categories (poorer, medium, wealthier) ▪ Rank main sources of household income (farm and non-farm) in village ▪ Rank main crops grown in village (in terms of area/income) and uses	▪ Location/address/ contact (last) ▪ Main business ▪ No. years trading legumes ▪ Other crop trading, if any ▪ Number of employees ▪ Other background information	▪ Location/address/ contact ▪ Geographical presence in Indonesia ▪ Key products produced (tempe, tofu, vermicelli, roasted peanut, peanut sauce, etc) ▪ Who are major clients?
	Total Sales in 2011? ▪ percent certified [specific legume] seed sales out of total sales? How many distributors do you have?	Total Sales in 2011? ▪ percent of agro-chemical sales out of total sales? ▪ percent legume seed sales out of total sales?	▪ percent of household income from legumes (> 10%; >20%; >30%,..) ▪ avg. no. of legume farms in village (percent legume ha. out of total ha. in village) ▪ What is average legume farm size in village? ▪ Changes in scale of legume farmers (last	▪ Total Turnover in 2011? ▪ Quantity of legumes expected to trade in 2012 ▪ Quantity of legumes traded in past 3 years? Why inter-annual variations (in ton?)	▪ Sales trends over past 3 years (by key product) ▪ No. of processing facilities, capacity? where are they? ▪ No. of staff ▪ Other background information

			five years)? ▪ No. relatively large legume farmers in village (in ha)? ▪ Is village typical/atypical for importance of legumes?		
			Socio-economic importance of legumes ▪ Which activities do women participate? How? (labor, inputs, marketing, etc) ▪ Are they paid? Is it same as men? ▪ Changes in gender roles over past 5 years? Why? ▪ Do you hire labour (outside of household (hh))? What is gender composition of hired labour?	***Other Businesses/Support*** Do you provide other services including: – Transportation? How many trucks? From where to where? – Shelling service? – Legume drying facility? (capacity? Vol. processed per year? technology? how often operational?) – Packaging? how? – Provide loans? How (i.e. in kind, cash) To whom? (men, women, hhs). Explain system	
2. Technical know-how	Do you have knowledge of: – [specific legume] farming and post-harvest systems? – certified [specific legume] seeds, their pros and cons Where did you get this knowledge? (which is best source?)	Do you have knowledge of: – legume farming and post-harvest systems? – agro-chemicals used legume farming/post-harvest treatments (pros and cons)? – legume seed varieties (pros and cons)? ▪ Where did you get this knowledge? (which is best source?)	What are your practices for: – land preparation – fertilization (by season) – disease control (by season) – pest control (by season) – weed control – harvesting: How do you decide when to harvest? – post-harvest:	▪ How is product stored (bulked? segregated by variety/quality?) ▪ Storage conditions (min/ max period kept before delivery to next level) ▪ How do you check and assess product quality in storage? is there potential for development	

	What is missing or gaps in your technical know-how?	▪ Do you know environmental and human safety issues of different agro-chemicals? ▪ Are farmers aware of these issues? Do you discuss them with buyers? How? (i.e., one-to-one, group training) What is missing or gaps in your technical know-how?	practices (shelling, drying, storage, grading, packaging, other) ▪ What are your criteria for making decisions about planting times? ▪ What seed rates are used? ▪ Is seed treated with pesticides before planting? ▪ Changes in legume farming/post-harvest practices (last 5 years)? Why? ▪ What are Quality standards of buyers (Who sets standards?) ▪ How do you know and assess quality of legumes?		
3. Enterprise Operations	***[specific legume] seed sales*** ▪ What is seasonality and availability of certified seed? ▪ What range of certified [specific legume] seed varieties do you sell? ▪ What were your sales of certified/non-certified [specific legume] seeds in 2011? ▪ Sales trends for certified/ uncertified [specific legume] seed (last 3 years)? Why? ▪	***Agro-input sales*** ▪ What agro-chemicals are being sold for legume cultivation/ post-harvest treatments by retailer (including brands)? ▪ Sales of agro-chemicals and brands in 2011? ▪ Sales trends for agro-chemicals and brands (last 3 years)? Why? ▪ Names of legume varieties sold as seed by (including brands)? Volume sold in 2011? ▪ Which seed varieties do most farmers prefer? ▪ Is seed segregated by quality? Does price of seed vary by quality?	***Legume production systems*** ▪ Legume varieties grown in village for each season? Ranking of varieties by importance and differences with other villages in area? ▪ What is source of planting seed? (market?, seed producer or own seed kept for next planting) ▪ Are you aware of any new varieties? What is source of this information?	***Legume trading*** ▪ Trends in legume trading (volume, quality)? Why? ▪ Strengths/weaknesses of district/province as legume exporter? ▪ Timing of legume trading (months)? ▪ Domestic supply vs. market gaps in importing provinces/districts? ***Costs*** ▪ Main costs (variable and fixed) ▪ Costs per ton traded	▪ What are legume quality standards of processing facility? How have they changed over past 3 years? ▪ How is legume quality received from suppliers? Changes (last 3 years) ▪ Rewards/sanctions for compliance/non-compliance with product standards? ▪ Is processor aware of aflatoxin contamination in peanuts? If yes, how is it monitored and managed in products?

		▪ How is seed quality assessed? ▪ Time trends for sale of different legume seeds (last 3 years) and reasons ▪ How is seed stock stored? (storage conditions, period) ▪ Seasonality of acquiring and sale of seed stock	▪ Can you access pure seed of new varieties? How? ▪ Reasons behind commodity/varietal choices (advantages, disadvantages of different varieties) ▪ Timeline of legume production/marketing processes in village? Same as other villages in district? ▪ Factors driving/hindering technology adoption (e.g. price incentives, technical know-how, physical access to inputs, post-harvest application, grading system, other)?		
4. Linkages with suppliers		▪ Suppliers of agro-inputs for retailer? ▪ Technical/other information provided by agro-input suppliers ▪ Services provided by agro-input suppliers (training, technical information, samples, credit, etc) ▪ Strengths/weaknesses in relationship with suppliers (e.g. trust, guarantees, deterrents, rewards for compliance, sanctions for not) ▪ Strategies to address weaknesses in supplier relationships	***Input Purchases*** ▪ Number of input suppliers in area (distance to shop)? Changes in last 3 years? ▪ Main external inputs used? Changes during last 3 years? ▪ Variability of inputs by season? (e.g. input X dry season , input Y @ wet season) ▪ Service provided by input suppliers (type of service and how often - e.g. credit, trial agro-chemical	▪ Who supplies legumes to you? ▪ What is supplier profile (gender, location, business activities, scale, legal status, etc.)? ▪ What are functions performed by suppliers (e.g. grading, treatments, packaging, other)? Do women participate in any of these activities? ▪ What services do you provide to suppliers? (e.g. technical, inputs, credit, etc.) ▪ Any services directly provided to women?	▪ Who supplies legume to processor? Changes over past 3 years? ▪ What is supplier profile (location, business activities, scale, legal status, etc)? ▪ How long has processor had business relationship with different suppliers? ▪ What are functions performed by suppliers (e.g., sorting, grading, treatments, packaging, other) ▪ What is information flows between

			samples) ▪ Amount and type of technical information provided by input suppliers ▪ Input payment procedures (prompt payment versus delayed payment; payment in kind; interest payments) and changes during the last three years ▪ Constraints in access to inputs (including price incentive, availability, quantity and quality , cost of inputs, other) ***Market for Crop By-Products*** ▪ Is vegetative part of plants kept/sold as cattle feed? ▪ What proportion of crop harvested is sold as stock feed? At what price? ▪ Any incentives for good quality of plants (with green leaf) as cattle feed	Which ones? What information flows: ▪ <u>from you to suppliers</u>? (e.g. variety, cultivation, quality, delivery times, other) ▪ <u>from suppliers to you</u>? ▪ What are conditions set by you (quality, volumes, delivery times, pricing, payment procedures, other)? ▪ Do you have contractual relationship with suppliers? If yes, what are terms of contract? If not, how do you link with supplier? ▪ How is negotiation with suppliers conducted? (Trust, guarantees, deterrents, rewards/sanctions for compliance/non-compliance) ▪ Strengths/weaknesses in the supplier relationships	processor and suppliers? ▪ What are terms of contract between processor and suppliers? (e.g. quality, volumes, delivery times, pricing, payment procedures, other) – Ex. of contract/purchase order? ▪ Strengths/weaknesses in supplier relationships ***Grain Procurement*** ▪ Annual legume procurement? Monthly procurement? ▪ Storage conditions of raw product and turnover period ▪ Recent trends in legume procurement (over past 3 years) and drivers ▪ Share of locally procured and imported legume in total procurement, key changes (last 3 years) ▪ Origin of local legume (volumes/per annum) ▪ Origin of imported legume (volumes/per annum ▪ Advantages/disadvantages (in quality, prices) of locally procured versus imported legumes ▪ How important are Eastern Indonesia products to total

					procurement? ▪ Expectations about future legume supply trends (more local products or imports?)
5. Linkages with buyers	▪ Profile of buyers (farmers, input shop/retailers vs govt project, location, etc) ▪ What services does seed retailer provide to buyers (technical advice, information about new products, product promotion, credit, …) ▪ Information flows from seed retailer to buyers, and vice-versa ▪ Strengths/weaknesses in relationship with buyers (Trust, guarantees, deterrents, rewards/ sanctions for compliance/non-compliance) ▪ Strategies to address weaknesses in buyer relationships ▪ Main constraints in certified [specific legume] seed sales ▪ Strategies to increase certified seeds sales	▪ Agro-chemical sales: main constraints? Strategies to increase sales? ▪ Legume seed sales: main constraints? Strategies to increase sales? ▪ Profile of buyers (farmers vs govt project, gender patterns, location, etc.) ▪ What services does input retailer provide to buyers (technical advice, information about new products, product promotion, credit, …) ▪ Information flows from retailer to buyers, and vice-versa ▪ Strengths/weaknesses in relationship with buyers ▪ Strategies to address weaknesses in buyer relationships	▪ Number of legume collectors/buyers in area (Any female collectors?) ▪ Forms of payment (advance payments, on the spot, delayed payments) ▪ Typical number of collectors buying from one single household per year ▪ Stability in farmer-collector/ buyer relations (Trust, guarantees, deterrents, rewards/sanctions for compliance/non-compliance of formal and informal contracts) (can women negotiate with collectors?) ▪ Services provided by collectors and other buyers (input provision, credit, technical know-how, market information) ▪ Key changes in type of buyer and relationship between farmers and buyers (last 3 years)	▪ Who buys from you? What is nature of their business (farmers, larger collector, wholesaler, snack/food producer/processor, households)? ▪ What services do they provide to you? (e.g. advisory, market information, product promotion, quality standards, etc) ▪ What information flows from you to buyers? ▪ What information flows from buyers to you? ▪ What conditions are set by buyers (quality, volumes, delivery times, pricing, payment procedures, other)? ▪ Do you have a contractual relationship with buyers? If yes, what are contract terms? If not, how do you link with your buyers? ▪ How are transactions negotiated? (Trust, guarantees, deterrents, rewards/sanctions for compliance/non-compliance) ▪ Strengths/weaknesses in the buyer relationships	

6. Market information/ Prices	▪ How does the seed retailer assess the demand or market potential for different seeds?	▪ How does the retailer find out about new agro-chemicals/seeds in the market? Which of these sources of information is the best and why? ▪ How does the retailer assess the demand or market potential for different agro-chemicals/seeds?	▪ Farmers' assessment of their access to technical information ▪ Main sources of technical information about legume (ranking) ▪ Assessment of different sources of technical information (regularity of interaction, type and reliability of info. provided) ▪ Farmers' assessment of their access to information about legume price/market information ▪ Main sources of information about legume price/market information (ranking) ▪ Assessment of different sources of price/market information (regularity of interaction, type and reliability of info. provided) ***Prices*** ▪ How is price determined? (negotiation, set by traders, auction, government standards) ▪ What factors set the price (colour, moisture contents, foreign material,	▪ Current prices in your location? ▪ Who sets price in purchasing? What are determining factors? Are women able to negotiate with collectors? ▪ Who sets price in sales? What are determining factors? ▪ Price seasonality ▪ Price trends (over past 3-5 years) ▪ Expectations about future price trends in location and Indonesia in general	▪ Price differences across grades? ▪ Differences between local legume prices and imported legume prices? ▪ Seasonality/availability of legume prices ▪ Legume price trends (over the past three or five years) ▪ Current legume purchasing prices? ▪ Expectations about future legume price and requirement trends

			aflatoxin, size , loan)? ▪ Price differentiation across varieties and qualities ▪ How do you find out prices? ▪ Current legume prices ▪ Price trends over past 3 years (farm-gate) ▪ Expectations about future prices ▪ Price seasonality (farm-gate) ***Credit*** ▪ Sources of credit for households in the village (formal and informal) ▪ Ranking of credit sources in terms of their importance ▪ Advantages and disadvantages of different sources of credit ▪ Changes in access to credit over the past five years ▪ Gender differences in access to credit		
7. Constraints, opportunities and interventions (wrap-up) ***Types of***	▪ Key constraints faced by seed retailer (w/ranking); ▪ what can be done to address existing constraints? Who has to do these things? ▪ Opportunities for development of seed	▪ Key constraints faced by the retailer (w/ranking); ▪ what can be done to address existing constraints? Who has to do these things? ▪ Opportunities for development of agro-input business; barriers	▪ Key production problems/ constraints (w/ ranking) ▪ Key marketing problems and constraints; ranking of problems/ constraints	▪ Key opportunities for development of legume business in province ▪ Key challenges/ constraints: what is preventing your province from becoming legumes exporter?	▪ Key opportunities for development of local legume supplies to quality storage, and processors? ▪ Key challenges and constraints: what is preventing local suppliers from selling

***Constraints*:** ✓ Market Access, Trends, and Governance ✓ Standards and Certifications ✓ Technology / Product Development ✓ Management/ Organization ✓ Input Supply ✓ Finance ✓ Policy/Regulation ✓ Infrastructure ✓ Business Membership Organizations	trading business; barriers and strategies to develop these opportunities ▪ Recommendations for public and project interventions to develop markets for seeds ▪ Does retailer see any opportunities for collaboration with development project intervening in [specific legume] sub-sector? If not, why not? If yes, what are opportunities for collaboration? How would s/he rank them? ***Policies and Regulations*** ▪ what key policies and regulations (regional? national?) are affecting legumes? ▪ is policy and regulatory framework (regional? national?) conducive to or undermining legume development? How?	and strategies to develop these opportunities ▪ Recommendations for public and project interventions aimed at enabling the development of markets for agro-chemicals/seeds Does the retailer see any opportunities for collaboration with a development project intervening in legumes? If not, why not? If yes, what are the opportunities for collaboration? How would s/he rank them? ***Policies and Regulations*** ▪ what key policies and regulations (regional? national?) are affecting legumes? ▪ is policy and regulatory framework (regional? national?) conducive to or undermining legume development? How?	▪ Strategies to overcome problems/constraints in production and marketing ▪ Key opportunities in production/marketing; barriers and strategies to take advantage of opportunities ▪ Recommendations for intervention: what type of interventions enable farmers to improve legume production and marketing? Please prioritise. ***Environment*** ▪ Key environmental impacts (both positive and negative) associated with legume farming. ▪ Storage and handling practices for agro-chemicals ▪ Issues related to agro-chemical residues in legumes ***Policies and Regulations*** ▪ what key policies and regulations (regional? national?) are affecting legumes?	▪ Why isn't your region more competitive in national markets? ▪ Key changes or developments to enable your region to develop legumes? What needs to change? Key innovations required? ▪ Recommendations for public/project interventions to enable these developments ▪ Does collector see opportunities for collaboration with development project intervening in legumes? ***Services*** ▪ What are key services for a successful legume trading business? ▪ Who provides these services? ▪ What are main weaknesses/gaps in services? ***Policies and Regulations*** ▪ what key policies and regulations (provincial and national) are affecting legumes? ▪ is policy and regulatory framework (regional? national?) conducive to or undermining legume development? How?	to processor? ▪ Key innovations required to develop high-quality domestic legume processor chains? ▪ Recommendations for public/project interventions to develop high-value legume chains Does processor see opportunities for collaboration with development project intervening in legume sub-sector? If yes, what should be focus of collaboration? If not, why not? ***Policies and Regulations*** ▪ what key policies and regulations (provincial and national) are affecting legumes? ▪ is policy and regulatory framework (regional? national?) conducive to or undermining legume development? How?

			▪ is policy and regulatory framework (regional? national?) conducive to or undermining legume development? How?		

Annex 2: Legumes Rationale Document

Introduction

The Collins Higgins Consulting Group (CHCG) has been contracted by the Australian Centre for International Agricultural Research (ACIAR), under the Analysing Agribusiness Development Opportunities – Eastern Indonesia (EI-ADO), to conduct a value chain analysis of legumes across the three study provinces of East Java, Nusa Tengarra Barat (NTB) and Nusa Tengarra Timor (NTT).

The aim of this exercise is to identify development constraints and private sector agribusiness development opportunities with the most potential to increase incomes of poor men and women (not just farmers) in the provinces of NTT, NTB and East Java in Eastern Indonesia. The outcomes of this work will be the focus of a new AusAID program: Australia Indonesia Partnership for Decentralisation - Rural Economic Program (AIPD-Rural).

Background

In June 2012 the EI-ADO project Reference Group selected legumes as one of five commodities to be studied in greater detail through a comprehensive value chain assessment. Specifically, the Reference Group identified soybean, mungbean and peanut, as individual crops under the legume commodity grouping. The Reference Group's basis for this was the similar farming systems the three crops are produced under.

A detailed assessment of three crops across the three study areas however creates a logistical issue for the study – all three crops cannot be studied in detail across all three study provinces under the existing project contract. Whilst ACIAR and CHCG have agreed that the legume value chain study needs to cover all three crops within the study provinces, it has been agreed that all three crops do not need to be researched in every province. What crops are researched where will be determined based on their production pattern and selected end-products that present the most important opportunities for smallholder livelihood improvement. This document outlines what crops will be studied in which districts/provinces, and the rationale behind the selection.

Preparatory research conducted and individuals consulted

Immediately after the project reference group confirmed legumes as one of the five commodities to be studied through a detailed value chain analysis, several important informational meetings were held with various commodity experts and specialists in order to develop a strategy on how to conduct the study of three commodity chains under one classification of legumes.

The first discussion focused on what strategic approach should be taken to allocating time and resources to the commodities. The people involved included: Rodd Dyer (ACIAR), Rebecca McBride (ACIAR), Stuart Higgins (CHCG), Rao Rachaputi (UQ), Fred Levitan (CHCG) and Teddy Kristedi (ACIAR). Based on these discussions, a few perspectives were noted:

- NTT is a comparatively hot and dry climate, so soybeans are less suitable and therefore less important to study in NTT. This is supported by the fact that barely one hectare is listed as under cultivation (see BPS, 2011

- Table 32). However mungbeans are cultivated to a significant degree in at least two NTT districts (TTU and Belu).
- Researchers should focus on all three commodities in EJ[10], but focus on the peanut and soybean value chains in NTB and only on mungbeans in NTT.
- The team should allocate efforts/resources strategically as follows: primary attention paid to soybean, followed by peanut, and lastly to mungbean (mostly in NTT, but also in EJ to a more limited degree).

With these observations in mind, local discussions were then held with specialists at the provincial level.

In NTT, participants included Fred Benu (Project Reference Group), Teddy Kristedi, Wayan Mundita (UNDANA), Damianus Adar (UNDANA), and Rao Rachaputi (UQ). Key issues raised during the NTT discussion included:

- The research focus in NTT should be on mungbean. In East Java and NTB, the research should focus on soybeans and peanuts. This will enable the team to explore the value chain dynamics in these provinces in further depth, with an emphasis of quality of analytical research over quantities of commodities produced.
- The identification of the NTT bank model of mungbean partnerships was seen as an important element for research; there exists a publicly-funded scheme in NTT whereby farmers grouped into cooperatives are accessing guaranteed loans from NTT bank to procure seed and inputs from BPTP, a government research service. The study team could try to determine the possibility of implementing this scheme among non-cooperative farmers and using private/commercial input suppliers in place of BPTP.
- Based on the 2 points above the team then decided key districts and value chain actors that relevant for the project. Belu, TTU and Kupang are proposed based on various reasons that will be discussed further in section0.

In Malang, East Java, discussion participants included Rao Rachaputi (UQ), Anna Rahmianna (IELETRI) and Krisnadi (BPTP). Key issues raised during the East Java discussion included:

- Focus on soybean and peanut in East Java and NTB
- Options of districts to visit include field work in Blitar, Pasuruan, Trenggalek, Sampang, Malang, Tuban, and Surabaya for East Java and for NTB field work would focus on North Lombok and Bima districts. Subsequently after this discussion, the team conducted several phone and email discussions to gain more understanding of the soybean and peanut farm, trade and processing practices in each districts.

[10] *this was amended in subsequent discussions to focus mostly on soy and peanut in EJ*

Rationale for and Selection of Legume Crop Research Priorities within the Study Provinces

Mungbean

There is no clear statistical data available on mungbean consumption in Indonesia. However, it is generally understood that most mungbeans are consumed as fresh sprouts (for dishes), mungbean tea, and ingredients for various dishes. Mungbean starch is also processed into vermicelli/transparent noodles by food processing companies.

Therefore, the research on the mungbean value chain in NTT will focus on unprocessed mungbeans for daily household meals. Commercially processed mungbean tea and starch will also be investigated as a potential outlet. As mungbean trade for household consumption primarily takes place in the wet market, the focus for the mungbean value chain will be on the commercial supply from producers to the wet market wholesale, but will also try to identify the input supply channels (seed, fertilizer, and implements) and support networks (bank credits) upon which farmers depend.

While research on the mungbean value chain will primarily occur in NTT, there will be some data collected for the mungbean value chain in the other two provinces as well. Although NTT has smaller sized plots of mungbean production than NTB and East Java, the commercial sector in NTT is very active; there is reason to believe more mungbean is grown for marketing in NTT than for home consumption.

Since 2011 Bank NTT has been successfully providing sizeable loans to mungbean farmers grouped into cooperatives, and non-performing loans are reported to be zero (pers comm., 2012). The research in NTT will review this financial model, as well as the sector in the province in general. Interviews will be conducted with local banks, farmers, wholesalers, larger-scale retailers, and commercial input suppliers, in addition to visiting local markets where mungbeans are traded. For NTT, the team would like to explore any potential alternatives to the Bank NTT loan scheme rooted more in the private sector and inclusive of individual farmers who are not members of beneficiary cooperatives.

The team will also access available data and information from ACIAR's existing mungbean project in NTT.

Soybean

The domestic demand for soybean in Indonesia is mainly for foods such as tempeh and tofu at 83.7% of national demand. Industry, seeds, and animal feed represent only 14.7%, 1.2%, and 0.4% respectively (http://bisniskeuangan.kompas.com/read/2012/07/26/21322949/Kedelai.Hitam.Terbaik.Dunia.Ada.di.Indonesia). Since processed soy food products are the largest driver of demand, the research will focus on value chain actors involved in the marketing of soybeans to the food industry and local consumption (see below), with the special emphasis on tofu and tempeh, the two most important processed soy food products.

The research on soybean will be conducted in East Java and NTB, as both are significant producing areas of soybeans in Indonesia. East Java is the hub of national production, accounting for over 41% of all soybeans produced in Indonesia. Sampang district alone accounts for 9% of soybeans produced in Eastern Java. (In comparison, soybeans account for only 0.16% of production in NTT in 2011). (BPS, 2011)

NTB produces 9.5% of the soy grown nationwide. The research on soybean in NTB will benefit from the long established ACIAR data and network of researchers that work on the commodity in the province.

Efforts will be made to meet with local businesses most responsible for bringing the product up through the value chain to market, starting with commercial wholesalers, local processors of tempeh and tofu, and then down to farmers and farmer groups. Commercial input suppliers (fertilizers, seed companies, implements, etc.), both local and regional distributors as well as national company representatives, where possible, will also be interviewed. An important objective for the field research is to be able to design an up-to-date value chain map for soybean that clarifies the actors and their roles/interrelations, as well as a list of the most important Lead Firms working therein. In turn, this will help interested donor agencies (specifically AIPD-Rural) identify areas in which to intervene in the value chain to achieve sustainable, market-friendly improvements that benefit actors at all levels.

Peanut

The research on peanut will be conducted in NTB and East Java. East Java has been selected because the province is the single largest peanut producing province in Indonesia, accounting for 69% of national production on 27% of the total area cultivated commercially nationwide.

NTB will also be a focus area for peanut research within this project. Garuda Food, a large peanut industry player, had previously operated a processing facility in NTB. Although that facility is no longer active, there are many lessons that can be learned from the process: how might the Garuda Food project have succeeded and what are the lessons for future investors in this value chain?

The peanut value chain research will focus on peanuts for snacks and daily household meals. It will look at the chain of peanut from producers to the wholesalers and snack food processors (small–scale home industry level and/or large corporations). While there are no clear statistics on peanut consumption in Indonesia, the literature suggests that peanut sauces (kacang sambal) and snacks (roasted peanut, fried/steamed peanut, etc.) are important products. Sugar-coated peanuts (kacang gula) are a specialty in NTT, while peanut sauce is important for sate bulayak, a specialty food in NTB. Peanut oil is produced on an industrial level, but there is no clear literature to indicate the importance of this industry. Therefore, the team will endeavour to identify and interview key players in peanut oil production and marketing to understand the importance this added-value product represents as a sales outlet to local farmers and commercial wholesalers.

Some insights should be gained on efforts by value chain actors (and their support networks among input suppliers and government, if applicable) to mitigate issues concerning post-harvest storage and aflatoxins, which is a national crop security concern affecting the peanut value chain.

Similar to soybean, the research on the peanut industry in NTB will benefit from the long established ACIAR data and network of researchers that work on the commodity in the province.

Summary of Rationale and Location

Table 29 outlines the study provinces and districts and the rationale for including them as part of the legumes value chain assessment in Eastern Indonesia.

Table 29 Rationale for crops and districts to be analysed

Legume Crop to be Researched	Province	District(s)	Key Informants/value chain Actors	Rationale
All		Jakarta	Processor inter Island wholesalers, inter district wholesalers, retailers, input suppliers	– Jakarta is the largest national market, and it is important to interview processors, wholesalers, research centers, and business associations based there. – Insights gained vis-à-vis macro issues regarding mungbean, soybean and peanut. – Insights gained vis-à-vis industry/ buyers/demand on national/macro level.
Mungbean	NTT	Kupang	Visit district govt, collectors, retailers, wholesalers, farmers, input suppliers, financial institutions	– as commercial hub for NTT, Kupang is home to important support networks (banks) and commercial entities working with munbean farmers in other districts.
Mungbean	NTT	TTU and Belu	Visit district govt, collectors, retailers, wholesalers, farmers, input suppliers, financial institutions	– TTU is an AIPD district. – Belu is located next to TTU and important area of mungbean production in NTT. – insights gained into mungbean supply chain.
Peanut	EJ	Surabaya	Visit processor inter Island wholesalers, inter district wholesalers, retailers, input suppliers, and exporters	– As a trading hub, it is the center of legumes trading, with commercial wholesalers, and traders. – Insights gained into buyers/demand and beginning of production chain.
Peanut	EJ	Sampang	Visit district govt, farmers, collectors, retailers, wholesalers, processors, input suppliers	– Center of legume production: Sampang has 15% of mungbean production, 9% of soybean production, and 11% of peanut production of EJ. – Largest among 4 AIPD districts. – Potential to understand production system of three legume

				commodities.
Soybean **Peanut**	EJ	Malang	Visit soybean and peanut processors	– Peanut oil processorpeanut snack producer Tofu/tempe manufacturers, tempeh snack (keripik) processor, soy sauce processor, are located in Malang.
Soybean **Peanut**	EJ	Trenggalek	Visit district govt, farmers, collectors, retailers, wholesalers, processors, input suppliers	– Legumes, especially soybean and peanut are considered by the local government to be crops of interest. – Insights gained in the production system of soybean and peanut.
Soybean **Peanut**	NTB	Mataram	Visit district govt, collectors, retailers, wholesalers, small processors, input suppliers	– Center of peanut and soybean trading. Mataram is hub for trading commodities from NTT. – Tofu/tempe manufacturers present in Mataram. – Peanut for snacks produced in Mataram at household level. – Insights into entire value chain gained.
Soybean **Peanut**	NTB	North Lombok	Visit district govt, collectors, farmers, small processors, retailers, input suppliers	– North Lombok is center of peanut production on Lombok island, with nearly 20% of NTB's total production. – Insights gained into peanut production and local value chain.
Soybean **Peanut**	NTB	Bima	Visit district govt, collectors, farmers, small processors, retailers, input suppliers	– Bima is the center of peanut and soybean production in NTB: 31% of soybean and 38% of peanut production in NTB. Of all the districts surveyed, it has the highest quantity of soybean produced at 29,000 tonne. – Insights gained into peanut and soybean production and local value chain.

Legume Data Summary for East Java, NTB and NTT

Table 30 Legume data summary for East Java

AIPD target districts	Sampang	Situbondo	Malang	Trengalek	TOTAL
Area Harvested (ha)					
Mungbean	10,757	496	9	9	67,868
Soybean	21,198	1,748	744	1,752	246,894
Peanut	24,111	770	3,142	2,366	172,550
Production (tonne)					
Mungbean	12,001	497	9	9	79,878
Soybean	32,119	2,346	868	2,169	339,491
Peanut	23,612	848	4,357	2,545	207,796
Productivity (tonne/ha)					
Mungbean	0.90	1.00	1.00	1.00	0.85
Soybean	0.66	0.75	0.86	0.81	0.73
Peanut	1.02	0.91	0.72	0.93	0.83

BPS, 2011

Table 31 Legume data summary for NTB

AIPD target districts	North Lombok	West Lombok	Dompu	Bima	TOTAL
Area Harvested (ha)					
Mungbean	76	189	5,342	1,205	45,511
Soybean	7	3,037	14,307	29,745	86,649
Peanut	6,342	1,223	472	9,005	34,860
Production (tonne)					
Mungbean	76	214	5,839	1,413	50,012
Soybean	7	2,794	17,712	29,278	93,122
Peanut	8,870	1,764	551	12,728	33,666
Productivity (tonne/ha)					
Mungbean	1.00	0.88	0.91	0.85	0.91
Soybean	1.00	1.09	0.81	1.02	0.93
Peanut	0.71	0.69	0.86	0.71	1.04

BPS, 2011

Table 32 Legume data summary for NTT

AIPD target districts	TTU	East Flores	Ngada	Sumba Barat	TOTAL
Area Harvested (ha)					
Mungbean	825	418	280	282	15,767
Soybean	1	1	288	294	1,758
Peanut	2,704	1,539	256	365	16,574
Production (tonne)					
Mungbean	848	466	316	271	13,462
Soybean	1	1	278	286	1,780
Peanut	3,410	1,776	287	433	20,069
Productivity (tonne/ha)					
Mungbean	0.97	0.90	0.89	1.04	1.17
Soybean	1.00	1.00	1.04	1.03	0.99
Peanut	0.79	0.87	0.89	0.84	0.83

BPS, 2011

Annex 3: Lead Firm Extension Outreach Estimates

Table 33 Lead Firm 'best practice' extension outreach estimates for soybean, EJ and NTB

Detail	Total AIPD-Rural Districts East Java	Total AIPD-Rural Districts NTB
Area Harvested (ha)[1]	28,984	45,132
Area per household (ha)[2]	0.30	0.50
Total number of hh producing Soybean[3]	96,613	90,264
Production (tonne)	39,089	46,665
Yield (t/ha)[4]	1.35	1.03
Observed yield (t/ha)with quality seed + targeted nutrition and plant protection[5]	2.0	1.5
% of hh households receiving Lead Firm extension in AIPD-District[6]	15%	15%
Impacted farmers total	14,492	13,540
Additional tonnage	2,832	3,155
Additional tonnage per hh	0.20	0.23
Additional gross income IDR/hh (6,700IDR/kg)	1,309,232	1,561,210
[1,4] BPS, 2012		
[2,3,5,6] Estimates based on research findings from ACIAR SMAR 2007/68 Project - Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia, 2012		

Table 34 Lead Firm 'best practice' extension outreach estimates for peanut, EJ and NTB

Detail	Total AIPD-Rural Districts East Java	Total AIPD-Rural Districts NTB
Area Harvested (ha)[1]	31,719	19,732
Area per household (ha)[2]	0.3	0.50
Total number of hh producing peanut[3]	105,730	39,464
Production (tonne)	33,887	27,059
Yield (t/ha)[4]	1.07	1.37
Observed yield (t/ha) with quality seed (B.W tolerant) + row planting + plant protection (seed treatment+ foliar disease control)	1.8	2.2
Impacted hh %	15%	15%
Impacted farmers total	15,860	5,920
Additional tonnage	3,481	2,453
Additional tonnage per hh	0.22	0.41
Additional gross income IDR/hh (4,000 IDR/kg)	877,980	1,657,348
[1,4] BPS, 2012		
[2,3,5,6] Estimates based on research findings from ACIAR SMAR 2007/68 Project - Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia, 2012		

Table 35 Potential outreach and impacts of improved certified seed, soybean, NTB and EJ

Detail	Total AIPD-Rural Districts East Java	Total AIPD-Rural Districts NTB
Area Harvested (ha)[1]	28,984	45,132
Area per household (ha)[2]	0.30	0.50
Total number of hh producing Soybean[3]	96,613	90,264
Production (tonne)	39,089	46,665
Yield (t/ha)[4]	1.35	1.03
Observed yield (t/ha) with improved certified seed only	1.75	1.5
% of hh households receiving Lead Firm extension in AIPD-District[6]	50%	50%
Impacted farmers total	48,307	45,132
Additional tonnage	5,817	10,517
Additional tonnage per hh	0.12	0.23
Additional gross income IDR/hh (6,700IDR/kg)	806,732	1,561,210
[1,4] BPS, 2012		
[2,3,5,6] Estimates based on research findings from ACIAR SMAR 2007/68 Project - Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia, 2012		

Table 36 Potential outreach and impacts of improved certified seed, peanut, NTB and EJ

Detail	Total AIPD-Rural Districts East Java	Total AIPD-Rural Districts NTB
Area Harvested (ha)[1]	31,719	19,732
Area per household (ha)[2]	0.3	0.50
Total number of hh producing peanut[3]	105,730	39,464
Production (tonne)	33,887	27,059
Yield (t/ha)[4]	1.07	1.37
Observed yield (t/ha) with improved certified seed only	1.4	1.7
Impacted hh %	50%	50%
Impacted farmers total	52,865	19,732
Additional tonnage	5,260	3,243
Additional tonnage per hh	0.10	0.16
Additional gross income IDR/hh (4,000 IDR/kg)	397,980	657,348
[1,4] BPS, 2012		
[2,3,5,6] Estimates based on research findings from ACIAR SMAR 2007/68 Project - Productivity and Profitability Enhancement of Tropical Pulses in Indonesia and Australia, 2012		