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Smallholder commercial pig production in East Nusa Tenggara - opportunities for better market integration

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prepared by

Craig Johns
Senior Agribusiness Consultant, Food Chain Innovations, Rural Solutions
SA

Dr Colin Cargill
Senior Research Consultant, SARDI

Dr Ian Patrick
Institute for Rural Futures, University of New England



Australia Indonesia Partnership
Kemitraan Australia Indonesia



*co-authors/
contributors/
collaborators* Dr Maria Geong
Head, Animal Health, Dinas Peternakan Propinsi
Ir. Johanis Ly
Lecturer, Animal Nutrition, Nusa Cendana University

approved by David Shearer

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ACIAR's participation in the Australia–Indonesian Partnership

The Australia–Indonesia Partnership (AIP) supports Indonesia's reconstruction and development efforts, both in and beyond tsunami-affected areas. Assistance will involve long-term sustained cooperation focused on economic and social development.

As part of the AIP, the Smallholder Agribusiness Development Initiative (SADI) aims to improve incomes and productivity for farmers and agribusiness, in response to market opportunities, in four eastern provinces—East Nusa Tenggara, West Nusa Tenggara, South East Sulawesi and South Sulawesi.

ACIAR's commitment to SADI focuses on supporting market-driven adaptive research, improving the transfer of knowledge and developing the capacity of key institutional stakeholders. This commitment will overcome constraints and barriers that prevent smallholders and agribusinesses successfully engaging with the market.

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We are also appreciative of the pig farmers, restaurant owners and other members of the commercial pig chain who generously gave up their time and knowledge when participating in our interviews, surveys and workshops.

2 Executive summary

The commercial pig industry in NTT is growing and there is an opportunity for smallholder pig farmers to become more involved in the market to improve their welfare.

This project uses a value chain approach to identify the market opportunities for farmers and evaluates the role that consumers may play in driving the production and marketing decisions and processes throughout the chain. The project defined the chain in order to identify and prioritise the issues and opportunities so that improvements can be instigated to benefit all stakeholders in the pig industry.

As a result of the workshops, surveys and ensuing analysis it has become clear that the growing local restaurant market can provide sustainable opportunities for smallholder pig farmers in NTT. However, there needs to be significant market chain development undertaken to ensure that the industry develops in an equitable and efficient manner.

The growing demand for pigs from the restaurant market became the focus for the market chain analysis. Through farmer and restaurant interviews in Kota Kupang, Kabupaten Kupang and Manggarai, customer and consumer needs were identified and the key issues and opportunities for market chain stakeholders were defined.

While the market chain is improving, it is still not operating as efficiently as it should in regards to product flow, relationships and information flow. This project goes some way to identifying these issues but the next step needs to be an industry driven strategic plan that sets out a road map for the future. The study has shown that there is the potential to develop:

1. farmer technical and marketing skills
2. communication systems between buyers, sellers and consumers
3. more efficient input provision methods
4. more consistent selection of appropriate breeding stock

This industry development must be undertaken in partnership with the NTT government agencies (in particular the Dinas Peternakan) and the newly formed Monogastric Association. This is an industry body incorporating farmers, support services, input supplies and government officials.

A part of the industry that may require particular attention within a strategic plan is the need to improve the flow of appropriate and timely information throughout the market chain. To encourage information flow and behavioural change at the farmer level it is important that proper systems are set up to reward the farmers providing the best quality pigs and let them share in the benefits. One method for doing this might be to encourage a more differentiated payment system where farmers are paid a premium for pigs and pig meat that have the attributes consumers' value.

The key restaurant and consumer preferences identified are taste and lean meat. This requirement needs to be passed through the market chain to farmers who need to respond with improved breeding and feeding practises.

To address these issues and other opportunities identified from the research it will be necessary to provide farmer based training in the areas of animal husbandry, housing, mating, waste utilization, disease control and general on farm procedures to improve productivity, efficiency and profitability. These skills may also encourage small farmers to take the next step and develop and grow their farm into a commercial business. Part of the training might include a field trip to a more developed pig industry (like Bali) to introduce farmers to what is possible if they are open to change.

On the basis of the information contained in this report it is clear that there is a need for ongoing support and nurturing of the commercial pig industry in NTT. The project has identified the industry's potential and collected information that can now be used to assist the pig industry in NTT to develop and implement a strategic plan that will build the industry and play a significant role in improving the welfare of pig producers and other market chain stakeholders in NTT.

3 Introduction

3.1 Background

Currently pigs are the most important livestock type for smallholders in Nusa Tenggara Timur (NTT). They have traditionally played an important role in religious and social activities of communities and are a critical source of protein for domestic consumption. However, a changing market in NTT has led to smallholder investment in production units orientated at supplying a growing domestic market.

Understanding the changing market dynamics and determining ways that smallholders are able to gain benefit from these changes are critical to the development of a smallholder commercial pig industry within NTT.

3.2 Justification

3.2.1 The role of pigs in NTT

Cattle are regarded as important livestock for the smallholder, particularly by the government and have been the focus of ACIAR's investment in the livestock sector in eastern Indonesia. However, there is greater potential to improve smallholder livelihoods through development of a pig industry than with any other livestock type. In terms of ownership, 85% of families in NTT own pigs while only 10% actually own cattle. There are significant smallholders who manage cattle for large-scale owners but who only receive a management fee or percentage of profit on sale of stock. There is, therefore, less incentive to improve cattle productivity. Pigs also improve cash flow, a critical restraint in the cattle industry, with a shorter timeframe to sale and higher liquidity.

Women play an important role in pig production in NTT. Pigs are generally kept near the house and fed with food scraps and other waste products. As the woman is generally at or near the house during the day, it becomes her responsibility to feed and water the pigs. Improved pig management and marketing has the potential to play an important role in improving family health and education levels as well as improving women's participation in the market.

3.2.2 Pig population and slaughtering

Obtaining a true indication of pig industry structure and production and price trends is very difficult in a farming and social system that has predominantly been subsistence. NTT is the poorest province in Indonesia and can also be defined as 'data poor' with informal market structures dominating most commodity markets. The issue of lack of data is exacerbated in the pig industry by the fact that pigs have not generally been produced as a marketable, profit orientated commodity but managed more as a necessity to be 'cashed in' when required for social and cultural purposes.

The official statistics (Table 1), while showing some anomalies, do provide some indication of the importance of pigs to the people in NTT. NTT with a population of only 4 million (2% of the Indonesian population) has the largest pig population of any province in Indonesia. With a pig population of 1.4 million this is 50% higher than the pig population in Bali; the province with the 2nd highest pig population.

Table 1. Pig statistics, Indonesia 2002-2006

	2002	2003	2004	2005	2006
Population (head)					
East Nusa Tenggara (NTT)	1,170,473	1,225,040	1,276,166	1,319,237	1,363,761
Bali	855,805	795,155	818,300	854,919	861,074
North Sumatra (Sumut)	828,043	849,240	870,980	809,705	830,433
South Sulawesi (Sulsel)	505,815	448,869	393,207	664,669	684,609
Papua	445,878	474,380	806,088	546,455	566,865
Production (tonnes)					
East Nusa Tenggara (NTT)	15,801	16,538	18,793	19,368	20,022
Bali	79,089	81,825	89,788	70,431	72,896
North Sumatra (Sumut)	18,411	18,820	27,785	24,855	27,243
South Sulawesi (Sulsel)	3,751	2,129	4,770	2,703	2,784
Papua	4,077	4,811	6,901	4,329	4,409
Registered Slaughterings (head)					
East Nusa Tenggara (NTT)	468,189	102,572	111,367	115,117	119,002
Bali	192,888	198,527	-	167,178	168,000
North Sumatra (Sumut)	183,274	187,965	133,910	305,297	313,082
South Sulawesi (Sulsel)	43,132	38,998	52,479	54,054	55,675
Papua	98,988	138,051	138,026	123,688	125,983

Source: BPS Statistik Peternakan 2006

While the population is high, the production of pig products and number of pigs going through official slaughterhouses is very low in comparison to other provinces. While the number of pigs slaughtered at official slaughter houses appears to be on the increase (120,000 pigs slaughtered in 2006, compared with 115,000 in 2005, an increase of 4.3%), it became clear during stakeholder consultation, that the majority of pigs were slaughtered in unofficial or 'backyard' slaughter houses. One estimate put this figure as high as 650,000 pigs per year not being registered as official slaughterings.

The pig industry is not evenly distributed and homogeneous within NTT, with different economic and environmental factors leading to a range of different markets and market types. For example, the restaurant trade in Kupang is encouraging the supply of imported breeds, while feed availability in West Flores is allowing export of local breeds to the areas of high cultural demand in Sumba. In reality, 45% of pigs are found in just four Kabupaten (Table 2) with the remainder spread throughout the province.

Table 2. Pig population in the major pig producing kabupaten in NTT (2006)

Kabupaten	Pig Population
Timor Tengah Selatan (TTS)	263,781
Manggarai	143,249
Flores East	123,905
Kupang	102,574
Kupang Kota	22,028
Total all Kabupaten	1,385,961

Source: BPS Statistik Peternakan 2006

The general trend of increasing human and pig populations in this region adds strength to the idea that pig industry development and assessment of market opportunities has the potential to improve incomes and productivity of farmers and agribusiness in NTT.

3.3 Relationship to other ACIAR investments

ACIAR's Indonesia program has for some time emphasized the application of agricultural technical research and development to increase farmer incomes, especially in eastern Indonesia. This emphasis has been strengthened through ACIAR's participation in the AusAID-funded Smallholder Agribusiness Development Initiative (SADI) which, over 10 years from 2006, aims to achieve a sustained increase in rural growth and household incomes through productivity gains, better access to markets, and on and off-farm value-added activities in 4 target provinces of Eastern Indonesia: South Sulawesi (Sulsel), South-East Sulawesi, Nusa Tenggara Timur (NTT) and Nusa Tenggara Barat (NTB).

ACIAR's role in SADI is through implementation of the research subcomponent; Support for Market Driven Adaptive Research (SMAR) which aims to improve access for farmers and agribusiness/SMEs to new knowledge underpinning the production and marketing of agricultural outputs at higher levels of productivity and quality. During research priority setting consultations for ACIAR-SADI in the 4 eastern Indonesian provinces in late 2006, high priority was given to identifying opportunities for better market integration and developing commercial pig production for smallholders in Nusa Tenggara Timur (NTT), which is the focus of this project.

With the majority of ACIAR current and past investment in beef cattle production and the identified ability of the pig sector to make significant contribution to rural growth and household incomes through productivity gains and better access to markets (key aims of SADI) this project is an initial step to improve access for farmers and agribusiness/SMEs to new knowledge underpinning the production and marketing of agricultural outputs (a key aim of ACIAR-SADI).

Importantly, due to the significant engagement of a broad cross-section of Indonesian agencies, including Dinas, provincial universities and AIAT the project will develop capacity within eastern Indonesian R&D providers to support market-driven adaptive research, with the capacity to analysis and understand constraints to technology adoption.

4 Objectives

The long term aim of this project is to support the development of the commercial pig industry in NTT by building a market driven supply chain, where market constraints are able to be identified and addressed by functioning farmer groups, and product is delivered to consistent specifications to satisfy customer and consumer requirements.

The more specific short term SRA project objectives were to:

1. Gather information on the whole pig industry from farmer inputs right through to the final pork consumer
2. Define the different domestic market segments
3. Select a priority market segment to further analyse
4. Interview the specific chain partners capable of supplying that market segment
5. Define strategies to better integrate smallholder pig producers into that market

5 Methodology

The project was executed by using a number of different methods including a series of one on one interviews with members of the chain, group workshops with all chain members and a series of comprehensive farmer and restaurant survey interviews.

5.1 Initial industry interviews and group workshop

The initial interviews were arranged with stakeholders in the pig industry and were conducted by the project team to get a feel for the overall pig industry in NTT. The information gathered allowed identification of the different members of the chain, an appreciation for the broader issues and opportunities and estimates of the flow of pig products from the farmer through to the end consumer.

The concept behind the group workshop was to present initial findings in the form of an industry wide chain map of the current situation. The workshop was then used to test and refine the industry map and ultimately obtain consensus on what the priority target market was and identify some of the current issues and future opportunities along the chain. The map that was developed as a result of the interviews and initial workshop is shown in the Results, section 6.1.

5.2 Farmer and restaurant surveys

Once the target market of 'restaurants' was identified the project focused on the flow of pig products and information and relationships that exist between stakeholders. As well as defining the roles of each member of the chain it was necessary to understand the perspectives of the farmer and restaurant owners. Questions asked of the farmers were designed to complement the questions asked of the restaurant owners so a balanced view of what the current situation is and how it might be improved could be elicited.

The method chosen for collecting this information was face to face interviews with farmers and restaurant owners in Kota Kupang, Kabupaten Kupang and kabupaten Manggarai. Interviews were conducted by Cendana University students under the supervision of our Indonesian project partners Ir Johanis Ly and Dr Maria Geong.

5.2.1 Farmer surveys

29 pig farms were surveyed in Kota Kupang, 23 in Kabupaten Kupang and a further 50 pig farms were surveyed in Manggarai.

The objective of the survey was to:

- Assess current pig production systems in terms of management, feed source, nutrition, housing, health, breeding and sourcing of pigs
- Identify if pigs are the primary source of income
- Identify factors that influence production decisions
- Identify factors that prevent farmers from moving to the next level of production
- Identify how pigs move through the supply chain and the information and relationships that are shared by the chain partners
- Identify what specifications are required further along the chain
- Identify the economics of the whole chain
- Identify issues and opportunities along the whole chain

5.2.2 Restaurant surveys

47 restaurants serving pork were surveyed in Kota and Kabupaten Kupang and a further 3 restaurants were surveyed in Manggarai.

The objective of the restaurant survey was to:

- Assess the restaurant trade in Kupang and Manggarai
- Identify restaurant characteristics
- Identify how pigs and pork meat move through the supply chain and the information and relationships that are shared by the chain partners
- Identify what the consumer preferences are for buying and eating pork meat
- Identify supplier specifications
- Investigate the role of 'family' in these restaurants
- Investigate the role of the restaurant in supporting the family
- Identify the economics of the whole chain
- Identify issues and opportunities along the whole chain

5.3 Final group workshop

Preliminary results of the survey were taken back to the project partners and key industry stakeholders just prior to the drafting of the final report. Stakeholders were given the opportunity to comment on the results and were asked to respond to 2 questions:

- What are important reasons as to why the pig industry is growing in Kupang? (*Apa alasan2 penting mengapa industri babi bertumbuh di Kupang*)
- What are the most important things hindering the development of the industry in Kupang? (*Faktor-faktor apa saja yang dapat membatasi perkembangan industri babi*)

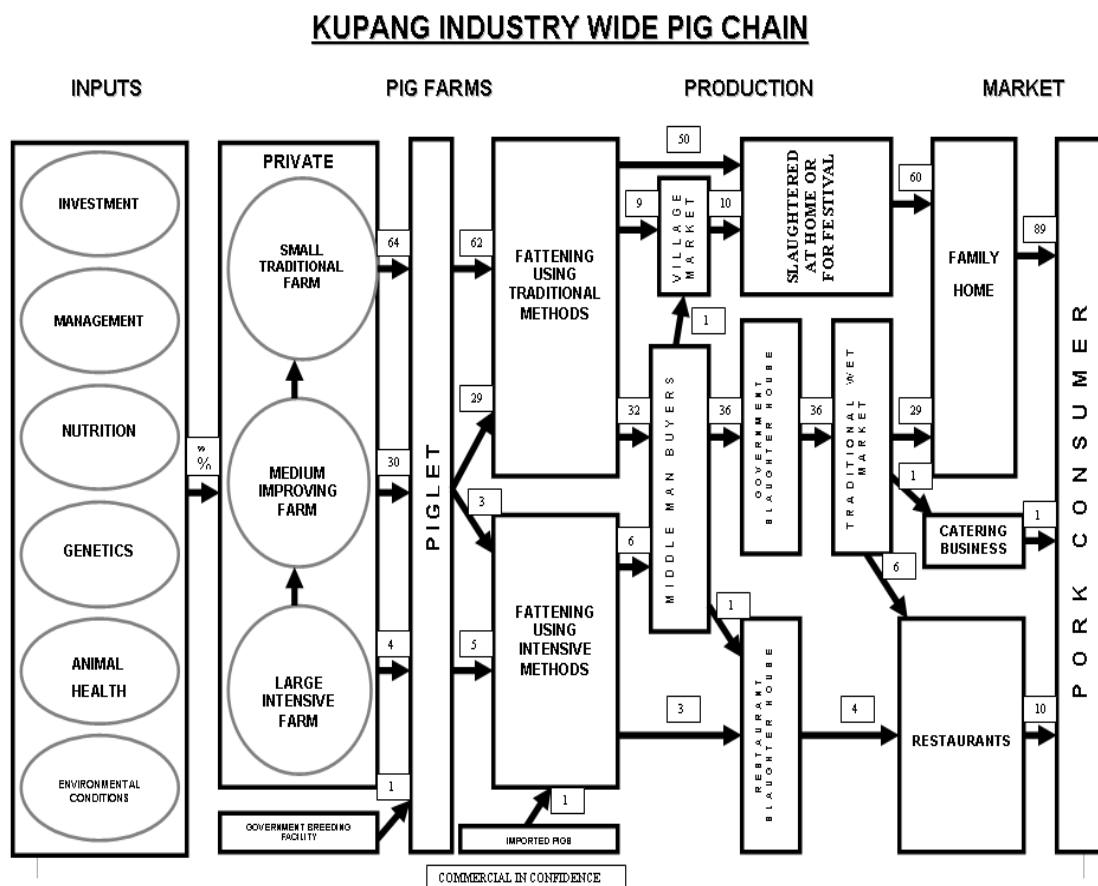
Discussion of these results are provided in Section 6.4

6 Results

6.1 Industry wide pig chain analysis

The below diagram is a simplified map of the pig chain in Kupang. The map provides a snapshot of the key supply chain members and the movement of product from the farm to the consumer. The map was constructed after initial discussions with the pig industry and was used to identify the important stakeholders and relationships that warranted further research. The process of constructing the map facilitated the development of the restaurant and farmers surveys.

Figure 1.



A larger version of this Figure is displayed in Appendix 8.1

Descriptions of some of the main diagram components are listed below.

Large Intensive Farms

There are only a limited number of these farms in Kupang and they are characterised not only by the large number of pigs involved but also by having commercial feed, automatic water systems and cleanable pens. Most of these farms also keep records of each animal and use artificial insemination techniques.

Traditional Farms

These farms are much more prevalent with 85% of families in NTT falling into this category. Pigs are not usually the main source of income for these families and women tend to play an important role in the day to day chores of looking after and feeding the pigs. While some commercial feed can be used, pig diets on these farms tend to vary widely.

Government Breeding Facility

This facility was set up specifically to satisfy the high demand for piglets. It consists of around 60 sows (mainly crossbreeds) and is not involved in any fattening of pigs.

Slaughterhouse

There is only one designated pig slaughterhouse in Kupang. Pigs are killed early in the morning (around 2am) and despatched directly to restaurants or the wet market for the following day's consumption.

Traditional Wet Market

This is a place where families or small restaurants can purchase their supplies of fresh pig meat.

Village Market

The village market is the place where live pigs and piglets can be bought and sold.

Slaughtered at Home or for Cultural Festivals

Approximately 60% (Figure 1) of pigs are still slaughtered at home for domestic consumption bypassing the more structured slaughterhouse system. Cultural events like weddings and funerals also provide a constant demand for pigs which can override economic drivers.

Restaurants

Since this project started there have been another 10 new large restaurants and 30 small restaurants opened in Kupang. While most of the smaller restaurants buy pork meat from the market, some of the larger restaurants slaughter their own pigs.

6.2 Pig farmer surveys

The farmer survey was structured into a number of different components that were designed to elicit basic physical and cultural information about the farm and farmer and to identify the role of the smallholder in the supply chain. The survey also attempted to develop an understanding of the farmer's perceptions with regard to market strengths, weaknesses and future sustainability.

Plate 1. Small-scale pig farmer in Kota Kupang



A survey of 102 farmers in three kabupaten in Nusa Tenggara Timur (NTT) was undertaken from December 2008 until April 2009. Three kabupaten were selected as there was thought to be significant differences between marketing chains and production systems in these areas. Kota (or city of) Kupang (see Plate 2) as it is closest to the burgeoning pig market. The majority of new restaurants are springing up in this urban area and hence farmers located in the city may have greater access to this market. Kabupaten Kupang was selected as a more traditional pig growing area which exports its product to both Kota Kupang and the areas to the east of West Timor. Manggarai, on the island of Flores is also a traditional pig producing area which has been exporting to either areas of Flores or the neighbouring region of Sumba (arrow indicates some movement of pigs from Flores to Sumba).

Plate 2. Map showing key project locations in Nusa Tenggara Timur, Indonesia

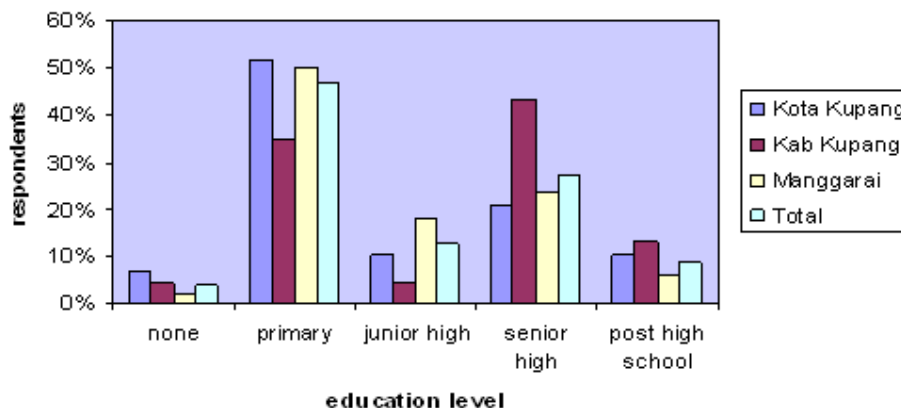


There were 29 respondents surveyed in Kota Kupang, 23 in Kabupaten Kupang and 50 in Manggarai. All those surveyed were farmer owners. This report provides some introductory information concerning the characteristics of the owners and their households in the respective kabupaten but the majority of the later analysis considers the respondents as a single group. Preliminary consideration of the data has shown that there are 6 farmers with over 50 pigs in their herd. It is thought that including them in an analysis of small commercial producers would skew the results. Therefore, for the following analysis only 96 respondents have been included.

6.2.1 Household characteristics

The average age of the household head in Kota Kupang is 45 years, this compares to 41 years in Kabupaten Kupang and 52 years in Manggarai. The age of the household head may be influencing the size of the household as the younger household heads have more family members implying that children have not yet left home. Manggarai has the smallest number of family members (2.2 per household). While nearly 50% of respondents only have a primary education this is not the case for Kabupaten Kupang. Over 50% of household heads in this area have at least a senior high school education (Figure 2). The reason for these differences is not clear, but may be related to the fact that the household head tends to be younger in this kabupaten. Access to education is certainly improving in NTT.

Figure 2. Education levels of household heads in the 3 sample areas



In terms of household income, only 6% were totally reliant on their pigs for their income. 64% were involved in other agricultural activities and 15% were government officials. In Manggarai respondents earned on average Rp.12.1m per annum compared to Rp.7.6m in Kota Kupang and Rp.6.7m in Kabupaten Kupang. Farmers were also asked to identify other sources of income or support from such things as scholarships, payment in kind, remittances and government and NGO welfare or poverty alleviation programs. It was found that on average a total of Rp.1.5m per household was obtained from these sources with the majority coming from government and NGO programs.

Labour Use

Table 3. Provides some indication of the average labour requirements for pigs in the survey area. There is not much difference between seasons as stalls must still be cleaned and pigs are mostly hand fed with purchased feed or scrap products. From this data, it may be perceived that labour availability may not be a restriction on the development of the commercial industry. Efficient labour use and economies of scale may well be an area that needs to be considered when assisting the development of the industry.

Table 3. Labour use in pig management activities

	Dry season (hrs/day)	Wet season (hrs/day)
Clean stall	0.64	0.63
Shepherd	0.01	0.01
Provide feed/water	0.57	0.57
Other activities	0.27	0.25
TOTAL	1.48	1.46

Assets

Most households (97%) earn income from activities other than pigs. These activities include other agriculture, home industry, construction, retailing, government employment, transport asset leasing. The average non-pig income is Rp.16.2million per annum. 75% of this income is spent directly on consumption items, there were only 3% of smallholders who invested all this income while 16% both consumed and invested some of these funds. Farmers are relatively poor; Table 4 highlights the assets owned by farmers in the 3 survey areas.

Table 4. Farmer wealth in Kota Kupang, Kabupaten Kupang and Manggarai

	Kota Kupang	Kab. Kupang	Manggarai
Average area of land owned (ha)	0.16	0.82	0.36
Farmers who own cattle (%)	7	30	22
Farmers who own chickens (%)	52	74	68
Farmers who own goats (%)	7	13	2
Farmers who own a car (%)	10	22	2
Farmers who own a motorbike (%)	55	43	34
Farmers who own a computer (%)	3	26	6
Farmers who own a fridge (%)	28	30	18
Farmers who own a TV (%)	79	48	76
Farmers who own a mobile phone (%)	72	52	64

Most farmers (96%) owned their own house with only 2 living in houses they had no equity in. However, in all areas access to electricity was a problem. In Kota Kupang and Manggarai, the electricity was available for an average of 73% of the time, this decreased to 58% in Kabupaten Kupang.

Credit and Savings

In terms of use and access to credit, 18% of the respondents had borrowed money in the previous 2 years. Most of these were in Kota Kupang, where of the 29 respondents 13 had borrowed money. They borrowed from the following sources:

1. family (5)
2. commercial bank (4)
3. farmer/village cooperative (2)
4. neighbour (1)
5. other (1)

There were only 4 households out of 73 in Kabupaten Kupang and Manggarai that borrowed money.

The survey also tried to elicit information with regard to household savings. While 10% of respondents were not prepared to say if they had savings or not, of the remaining 86 respondents, 33% said that they did have some savings. The survey was not able to derive sufficient information concerning the access to credit and level of savings, but at the final workshop, the stakeholders did identify access to capital as a major hindrance to the development of the industry in Kupang. The interest in the work, however, by Bank NTT shows that there is potential to work further in this area of credit availability.

6.2.2 Farm characteristics

The objective of this part of the survey was to assess current pig production systems in terms of management, feed source, nutrition, housing, health, breeding and sourcing of pigs.

The majority of farmers interviewed had less than 10 years experience with pigs (60%) and 30% had 2 or fewer year's experience. This indicates that there has been an increasing interest and involvement in pig production over the last decade.

Herd Details

The majority of farmers interviewed had small herds. Of the 102 farmers interviewed, 67% had less than 9 pigs and 91% less than 20.

Table 5¹ provides some insight into the breeds of pig owned and the herd structure for these particular breeds. There were 6 distinct 'breeds'² defined by the farmers, some farmers owned more than 1 breed. While there are some commercial producers using local pigs, they tend to place more importance on owning boars. The reason for this is not clear from the survey but it may be that they hire their boar out to local smallholders who do not have the scale of operation to own their own boar. It may also be that they don't regard their sows as being '*loka*' and place them in another category. It is not clear if farmers have a good understanding or knowledge of pig breeds. The only other potential differences between breeds are that those who own crossbreds tend to have a higher proportion of growers, those who have VDL have more weaners and those who have Landrace more fatteners.

Table 5. Pig breeds and herd sizes

Pig breed	No. of owners	Pig type					
		sow	boar	sucker	weaner	grower	fattener
Local	15	1.0	1.5	1.4	0.3	0.3	0.1
Crossbreed	36	1.7	0.5	2.1	0.9	2.4	0.6
Duroc	10	1.5	0.6	1.5	1.2	0.8	0.6
VDL	7	1.3	0.3	1.6	3.4	0.4	0.4
Landrace	4	0.5	0.3	2.0	0.0	0.8	1.3
Banpres	36	1.6	0.6	2.1	2.6	1.4	0.0

During interviews the following definitions were used with the farmers: Weaner; piglet that is just weaned/separated or stopped suckling, age range 1-1.5 months / Grower; boars or gilts in the age range 3-5 months / Fattener; pigs older than 6 months old

¹ Most of the following analysis does not include the 6 farmers who have populations over 50. These farmers tend to have different management practices which may distort the accuracy of small farming information.

² Banpres (Presidential assistance) is a name given to pigs provided by government assistance programs. While not a distinct breed they are crossbred pigs imported from Bintan and are treated as a breed in this discussion.

The majority of farmers surveyed (40) owned only one sow and another 30 owned 2 sows (Table 6), just over 82% owned fewer than 10 sows, and 14% owned only growing pigs and boars, with no sows. Five farms owned between 20 and 50 sows each and five farms had no pigs at all on the day of the survey. Many of the smaller farms did not own a boar suggesting that they used boars owned by other farmers.

Table 6. Sows, boars and progeny/farm size

Herd Size	Number Farmers	Mean Sows/farm	Mean Boars/farm	Mean Total Progeny
0 sows	14 (13.7%)	0	0.93	5.50
< 3 sows	70 (68.6%)	1.44	0.61	6.14
< 6 sows	80 (78.4%)	1.73	0.71	6.06
< 10 sows	84 (82.4%)	1.98	0.73	7.25
3 – 5 sows	10 (9.8%)	3.78	1.44	6.00
6 – 9 sows	4 (3.9%)	7.00	1.25	31.00
20 - 50 sows	4 (3.9%)	42.50	4.75	149.25

The number of suckers per sow on the day of the survey (Table 7) was recorded for all farms. Although the figures cannot be used to assess productivity on small farms with fewer than 10 sows, on larger farms (over 20 sows) the number of suckers per sow was less than 0.20 against an expected value of 1.6 to 1.8 for a 4 week lactation period. Two of the 3 herds with 50 sows had no suckers on the day of interview and the other had only 11 suckers. A herd with 50 sows with a 4 week weaning should have a between 6 and 9 litters on the farm so the figures indicate either a significant infertility problem or an uneven flow of sows into the farrowing house. The latter is the more likely as the same farms averaged 3.3 weaners per sow, which is higher than the expected value of 1.6 to 1.8. Only the 20 sow herd, with 22 suckers (possibly 3 to 4 litters), seemed to have acceptable productivity. The reasons were not documented and the result needs to be validated and the causes identified.

The total number of progeny per sow was also lower than expected (Tables 7 and 8) but as 44% of all pigs were sold as weaners, this is an expected outcome.

Table 7. Progeny/sow on all farms

Herd Size	Number Farmers	Suckers/sow	Weaned Progeny/sow	Total Progeny/Sow
< 3 sows	70	1.39	2.87	4.26
< 6 sows	80	1.27	2.25	3.51
< 10 sows	84	1.28	2.29	3.55
3 – 5 sows	10	1.00	0.59	1.59
6 – 9 sows	4	1.43	3.00	4.43
20 - 50 sows	4	0.19	3.32	3.51

The number of progeny per farm was also lower than expected but again this maybe associated with selling weaner pigs to other farmers for fattening.

The 50 sow herd with only 11 suckers, recorded only 6 weaned progeny and if the data is accurate it adds further evidence of a significant infertility problem. The other two 50 sow farms recorded no suckers but 170 weaners per farm (3.4 weaners/sow) and 272 total progeny per farm (5.5 pigs/sow). By way of a comparison, a realistic target for commercial

herds in Bali and Western Indonesia is 8 – 9 total progeny per sow, and hence a 50 sow herd would be expected to have 400 to 450 pigs on the farm.

Table 8: Mean progeny/farm for all farms

Herd Size	Number Farmers	Mean Weaners/farm	Mean Growers/farm	Mean Fatteners/farm	Mean Weaned Progeny	Mean Total Progeny
0 sows	14	0.36	0.50	4.64	5.50	5.50
< 3 sows	70	1.94	2.04	0.16	4.14	6.14
< 6 sows	80	1.90	1.80	0.18	3.88	6.06
< 10 sows	84	2.21	1.90	0.78	4.88	7.54
3 – 5 sows	10	1.78	0.11	0.33	2.22	6.00
6 – 9 sows	4	6.50	2.00	12.50	21.00	31.00
20 - 50 sows	4	85.00	17.25	38.75	141.00	149.25

This discussion about herd sizes and reproduction rates highlights the underdeveloped nature of the production systems. Most producers probably could not be defined as 'commercial' as their productivity and herd size does not indicate a production for profit motivation. Although this survey data provides only a snapshot of the farms and accurate data is sometimes difficult to obtain, it does indicate that for the industry to develop there needs to be a focus on more efficient scale of production, better understanding of appropriate species and more emphasis on efficient pig management.

Reproduction management

81% farmers had mated sows during the previous 12 months, spread unevenly over the year. Only 11% farmers mated sows every month.

The common signs used to detect heat included; a swollen and reddened vulva (key sign used), vulval discharge, appetite loss, back pressure (only one farmer). Other signs included aggression and mating other sows, convulsion was also used by some farmers but the significance of using a nervous sign unclear. Virtually all farmers used natural mating and only 2 practiced artificial insemination.

The majority of farmers (51%) mated sows within the optimal timeframe (morning after heat was first detected) or that afternoon (7.7%). But 16.5% mated the sow immediately this was too early after heat detection and does not ensure optimal conception rates. In terms of mating frequency 41% sows were mated only once at each heat, 37% twice (recommended) and 5.4% three times. The conception rate for mating on the first heat was 66% compared with a target for commercial Balinese piggeries of around 85% to 90%. Once again the mating practices indicate a lack understanding of effective management practises required for a profit/production orientated industry.

Table 9 provides an overview of average production figures for different herd sizes. Production was relatively good in terms of litter size born and pre-weaning mortality. Average litter size was 8.8 piglets born (range 1 to 17 but majority between 5 to 9 piglets/litter). Preweaning mortality was 11.4% with an average of 7.9 pigs weaned per litter (majority between 4 and 8 piglets/litter). However, in herds with 3 to 10 sows it was 30%.

Table 9. Litter size born and weaned by herd size for 12 month period prior to interview

Herd size	Number Farms	Number litters born	Pigs born/litter	Pigs weaned/litter	Pre-wean mortality %
0	14	5	8.2	8.2	0
1 sow	40	43	7.7	6.9	10.0
2 sows	30	31	7.4	6.7	9.6
1 – 2 sows	70	74	7.5	6.8	9.8
3 – 5 sows	10	14	9.5	7.0	26.3
1 – 5 sows	80	88	7.8	6.8	12.8
6 – 9 sows	4	12	8.8	5.7	35.2
3 – 10 sows	14	26	9.2	6.4	30.0
1 – 9 sows	84	100	7.9	6.7	15.2
20 – 50 sows	4	70	10.1	9.4	7.0
All herds		175	8.8 (1 – 13)	7.9	11.4

While litter size and pre-weaning mortality was relatively good, in terms of sows farrowing per year, overall productivity was very low (Table 10). Only 48% sows owned by farmers in the survey group had farrowed during the previous 12 months (< 0.5 litter/sow/year) compared with an expected target of 1.5 to 1.8 litters/sow/year. The only groups to exceed 1 litter/sow/year were the one sow herds and the 20 sow herd. In the 4 large herds (50 sows) the figure was only 0.32 litters/sow/year which if correct, indicates a severe production deficiency and is consistent with the small number of progeny on these farms. The figure for commercial herds of similar size in Bali ranges from 1.2 to 1.5 litters/sow/year.

Table 10 Percentage of sows farrowing/year

Herd size	Number Farms	Total number sows	Number litters born	% sows farrowing in 12 month period
0	14	5*	5*	-
1 sow	40	40	43	107.5
2 sows	30	60	31	51.7
1 – 2 sows	70	100	74	74.0
3 – 5 sows	10	40	14	35.0
1 – 5 sows	80	140	88	62.9
6 – 9 sows	4	53	12	22.6
1 – 9 sows	84	193	100	51.8
20 – 50 sows	4	170	70	41.2
50 sows	3	150	48	32.0
All herds		363	175	48.2

* It is assumed that these sows had been sold before the day of survey visit

Housing

Most farmers (96%) had 100% equity in the pig sheds. Four farmers partly owned their sheds and one of these also used sheds owned by someone else. Most of the sheds had tin roofs (65%) and timber walls (68%). In terms of floors both concrete (42%) and bamboo (35%) were common.

The average number of stalls per farm was 4, but almost 90% had 5 or fewer. 32% had less than 3. Only 5% had 10 or more stalls. 35% had a special farrowing pen but 44% of

farrowing pens also used creep boxes and 24% of these used a lamp as a heat source. 27% farmers had special pens for weaner pigs and of these 60% had weaner boxes. 50% of farms had pens for growing pigs.

The relatively low number of farms using farrowing pens with creep boxes and a heat lamp and weaner boxes could be a major factor contributing to pre-weaning and post-weaning mortality.

Food and Water

Commercial diets

Only 26% farmers purchased commercial feed during the interview month. Feed was mostly purchased from poultry shops (17 farmers bought from this source) and other 'special agencies' (17). All feed was paid for at collection or delivery. The commercial feed made up from 16 to 100% of the daily rations for pigs.

Non - commercial diets

Most farmers had fed non-commercial feed to their pigs during the last 12 months. This ranged from 2% to 100% of the total feed given. The most important sources of this feed were; rice hulls or bran (74 farmers used feed from this source), vegetables (53) and domestic restaurant waste (38),

Farmers used non-commercial feeds because of; the feed is always available, its feed they have always used and it will be wasted if not used. Price was not a major deciding factor.

Pigs were fed once daily on one farm, twice daily on 21 farms, 3 times on 9 farms, 4 times on 2 farms, and 5 times a day on one farm.

Farmers appeared to be quite satisfied with the feeding arrangements with 75% of farmers not wanting to change. Only 13% were unsatisfied and wanted to change

Water supply

Using a bucket to provide water to the pigs was by far the most common method of watering stock with 87% using this method. The source of water was not clear with 38% choosing 'other' for their most common source of water. 28% got water from their family owned well. Only pigs on 32% of farms had access to water 24 hours per day.

This raises a major welfare issue, especially in a climate as hot as Kupang. Lack of constant water will be reducing production as well. Of further concern was that most farmers were satisfied with the situation and most did not want to change anything.

Little cost was associated with providing water, but given that 60 farmers were providing water for less than 5 hours per day, the production costs could be quite significant.

Pig Health

Approximately 50% of farmers reported sick pigs during the last year but only 41% were able or willing to say which months this occurred. The month when the most deaths occurred was October which accounted for 43% of the stated deaths. November and August both recorded 21% of deaths with 16% in April.

Most illness occurred in weaners (31%) followed by sows (10%), growers (7%) and fatteners (5%). This is predictable as the housing data indicates that most weaner accommodation appears to be sub-optimal and it is the younger weaned pigs that are the most susceptible to poor environment and housing.

Inadequate weaner accommodation is also consistent with diarrhoea being the most common clinical sign recorded (21%) followed by appetite loss (11.5%), coughing (6%) and swollen neck (7%). Approximately 49% farms did not record clinical signs, which is consistent with 50% not reporting sick pigs.

No diagnosis was made in the majority of cases, although 54% farmers with sick pigs called a Vet, 36% did nothing. On average farmers with sick pigs spent Rp.125,000 (range Rp.6,000 to Rp.200,000) on medicine. Of the 150 pigs recorded as sick, approximately 43% recovered and 57% died.

Only about 37% of farmers commented on the disposal of dead pigs with burial (25.5%) and consumption (9%) the most common methods recorded. Only 3% burnt them and 2% sold them.

6.2.3 Pig supply chain

Number and price of pigs sold

There were only 107 sale transactions during the previous 12 months, with 50% of these being weaners. 35% of the total transactions were direct to other farmers, 21% went straight to butchers. Only 6% were sold to a middleman.

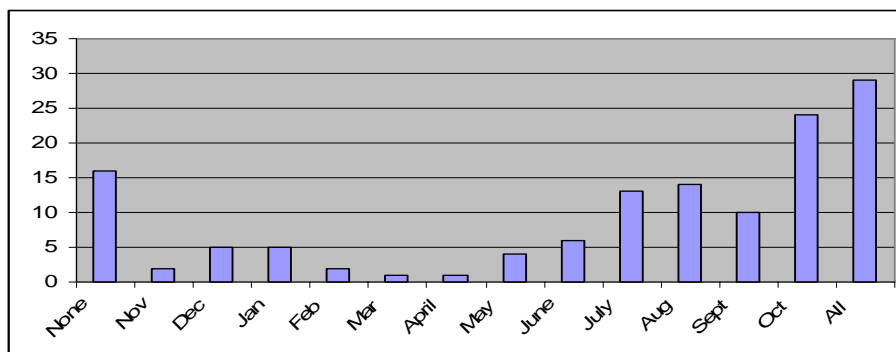
The number of pigs sold and the average prices received from the sale of pigs in the last 12 months are provided in Table 11. This does not break down the results in terms of breed and kabupaten. There may be some significant differences due to these factors. It does, however, provide an indication of the market value of pigs, and hence the potential benefits in improving productivity and efficiency. One observation is the similarity in price between piglets and weaners; further research is required to determine the reasons for this.

Table 11. Number of pigs sold in previous 12 months and average prices.

	Total sold in last 12 months	Average price (Rp.)
Piglets	126	370,000
Weaners	279	376,481
Growers	32	1,266,667
Fatteners	37	1,779,545
Sows	5	900,000
Boars	4	1,937,500

The survey was undertaken in January and February when the prices were low. At the time of the final stakeholder workshop in June, the price for weaners had increased to Rp.600,000/head, reflecting either an increase in demand for pigs at this time of year due to cultural and social priorities or, a decline in mid-year supply. Figure 3 does indicate that the pigs tend to be sold more often from July to October.

Figure 3. Number of pigs sold during 12 month period



Weaners were the most common class of pigs sold (44% of all sales) followed by fatteners (20%) and piglets (8%). This result is no doubt influenced by the fact that farmers who owned breeding stock were targeted in the survey. Those who bought the weaners and fattened were not included.

There were 30 farms which sold only one pig for the year and 80 that sold 5 or fewer. Only 4 farms sold between 11 and 20 pigs and 4 sold more than 20 pigs. One farm sold 72 pigs and one 45 pigs. These figures confirm the small scale and low productivity of the pig industry in this area and highlight the need for an industry to encourage more productive systems.

Selling Pigs

In terms of pig selling systems, most pigs were sold direct to other farmers (35%) and to butchers (21%). Relatives, who may also be farmers purchased 8% of the stock with only 6% sold to middlemen. This is consistent with the finding that most pigs sold were weaners, presumably for fattening. The data also suggests that middlemen play only a minor role in marketing pigs.

The main reason why a farmer sold to a particular buyer was that the buyer asked to buy the pigs (53%). That is the buyer approached the farmer and made an offer. Only 16% of farmers actually stated that they sold based on price. A further 11% sold because their product best suited the buyer's needs. Payment was generally by cash at sale (84%). This selling system may also have important implications for the development of the industry. Farmers need to develop skills in production and marketing so that they can be better informed about timing of sale and the value of their product. Sale time should be based on quality of the product and price rather than simply responding to the offer of another farmer.

Buying pigs

Weaners (58%) and piglets (24%) were the main pigs purchased by farmers at an average price of Rp.600,000 (range Rp.100,000 to Rp.2 million) and again this seems high given the sale price quoted. However, this confirms the importance of trade in pigs for fattening. Although 40% farmers did not purchase pigs, of those that did, around 50% bought from other farmers or a neighbour (24%). Few bought from large breeding farms or middle men. It seems that most trade in pigs is between farmers and neighbours.

The reasons for buying from a particular source were best price or best suited to needs and again cash at the time of sale was how payment was delivered.

Changes in marketing practice

Although 48% farmers did not know if they had sold more pigs than the previous year, 40% said yes to more pigs and only 9% said fewer. The main reasons for selling more pigs were increased demand and higher prices, while the reasons for fewer sales were unsuitability of breeding stock and unavailability of feed.

Most farmers believed they got the best price for their pigs and most believed prices had increased during the last 12 months. Other farmers were the main source of price information. Farmers believed that prices had increased because there were now more consumers and more restaurants. In terms of improving the marketing system they believed prices could continue to improve for their pigs if they had access to improved quality of feed and price information.

Changes in herd size and composition

The majority of farmers did not wish to change the composition of their herd (43%). Of those that did, 23% wanted to change to imported breeders and 11% to imported fatteners. Fewer than 20% did not know.

Just under half the farmers (48%) wanted to increase herd size, 24% wanted to stay the same and 17% did not know. (12% did not answer). The main reasons for wanting to increase herd size were; more profit (32%), and more efficiency in pig production (16%)

The reasons why farmers wished to stay the same were: housing capacity limited (12%), and capital limited (10%).

Buyer preference

The most important requirements for a buyer were breed, sex, weight, body shape, and fat to lean ratio, in that order. It is interesting that breed and sex were placed ahead of body shape and weight. Priorities of the buyers had not changed during the last years.

Most farmers stated they did not get paid a higher price based on these important characteristics, and this identifies a problem for motivating farmers to improve the product.

Most either did not answer or did not know about buyer preferences 5 years ago. Only body shape was considered important for sows and no clear opinions were expressed for fatteners or ceremonial pigs.

Most farmers did not receive feedback from buyers for any class of pigs.

Most farmers who answered had been dealing with the same buyer for 2 to 4 years (27% for sows and 11% for fatteners) and the next highest was less than 2 years (19% and 8%).

6.2.4 Farmer perceptions

Farmers were asked a range of questions to gauge their perceptions of different issues within the market chain. This information provides an important local perspective and can be used to better target future activities. Respondents were asked to say whether they strongly disagree, disagree, neither agree nor disagree, agree or strongly agree to the statements provided. The results discussed below have reduced these responses to disagree, neither and agree.

1. Local pig meat tastes better than imported breeds

Local perception of flavour for different pig breeds is evenly divided between local and imported breeds. While in Timor the respondents lean toward the imported breeds in Manggarai there is still a stated preference for local pigs. This may be because the Se'i style of cooking pig meat, and the associated restaurants, have not yet been introduced into this area yet. The pig industry is still less developed in Manggarai.

Table 12. Local pig meat tastes better than imported breeds

	Total	Kota Kupang	Kabupaten Kupang	Manggarai
Disagree (% of farmers)	41	31	35	50
Neither (% of farmers)	9	0	0	18
Agree (% of farmers)	50	69	65	32

2. The market for pigs would only get bigger

There was general consensus that the market for pigs would get bigger - 90% of all respondents agreed with this, with no perceived differences between areas.

3. The pig market will decrease next year

Specifically in the next 12 months, 75% of respondents disagreed with this statement, they believe that it will continue to grow. Respondents in the other 2 areas were not so sure. Only 70% of respondents in Kabupaten Kupang and Manggarai disagreed with this.

4. I have a good relationship with buyers

94% agreed, no differences between areas

5. I know what buyers want

73% of respondents actually stated that they knew what the buyers wanted, with this down to 69% in Kota Kupang. While this may seem acceptable, for a market to function properly especially with regard to a specialist product such as pig meat, it is imperative that growers know what the market needs and are able to target their production decisions around this.

6. I don't care what the buyer wants

It was also interesting to find out if the farmer thought it was important to understand what the buyer wanted. Respondents in Kota Kupang certainly thought it was important, however, those in Kabupaten Kupang and to an even greater extent those in Manggarai, were not so sure it was all that important (Table 13). The differences in perception may reflect, once again the presence of the particular Se'i market which is more accessible to producers in Kota Kupang, while producers in Manggarai are still producing and selling to the more traditional cultural and social markets.

Table 13. I don't care what the buyer wants

	Total	Kota Kupang	Kabupaten Kupang	Manggarai
Disagree (% of farmers)	63	83	74	48
Neither (% of farmers)	25	0	22	42
Agree (% of farmers)	11	17	4	10

7. I don't need a good relationship with buyers

This was a similar result to the previous question. The majority of respondents (80%) believed the relationship was important, but this was felt a bit more strongly in Kota Kupang where 90% disagreed with this statement. In the other 2 areas there was a significant percentage (20 and 22%) that neither agreed nor disagreed with this. Once again this may be due to the strong linkage with the developing Se'i market in Kupang City where producers are more reliant on good marketing.

8. Friends and family help me with production

In Manggarai, pig production is predominantly a family responsibility with 98% receiving assistance from family and friends. This was generally the result across the survey area but in kabupaten Kupang 70% agreed their assistance provided while 30% could not say yes or no.

9. I keep pigs mainly to sell for money

This is an important perception question and may provide some insight into the motivation for keeping pigs and timing of sale. In total only 66% of respondents are keeping pigs predominantly to sell for cash (Table 14). The remainder are receiving cash but also may be keeping them to barter or for their own use. For a commercial industry to develop, this priority for cash remuneration needs to be further increased. Once again Manggarai respondents seem to be less dependent, or less able to access, a developed pig marketing system.

Table 14. I keep pigs mainly to sell for money

	Total	Kota Kupang	Kabupaten Kupang	Manggarai
Disagree (% of farmers)	9	7	4	12
Neither (% of farmers)	24	17	13	34
Agree (% of farmers)	66	76	83	54

10. I sell my pigs when the price is highest

This is very much a mixed response as once again indicates a lack of functioning market drivers (Table 15). Only half the respondents sell when the price is highest. In Manggarai 66% sell when the price is good. This may reflect a number of things which need further research. It may reflect the fact that producers in or near Kupang have constant demand for product hence are selling whenever the buyers require product. This constant demand may arise from the development of new restaurants. In Manggarai, this constant demand is not yet there and hence production and sale are still targeted more towards the cultural demands of the people in Flores (and Sumba, where there is a significant export market) at particular times of the year. Once again, however, this perceived lack of importance of price in the sale decision has important implications for the development of a commercial industry.

Table 15. I sell my pigs when the price is highest

	Total	Kota Kupang	Kabupaten Kupang	Manggarai
Disagree (% of farmers)	25	38	13	24
Neither (% of farmers)	24	38	39	10
Agree (% of farmers)	50	24	48	66

11. I keep pigs mainly for family celebrations

It is clear that pigs play an important role in cultural activities, but Table 16 also begins to provide an indication that in Kota Kupang things may be changing; pigs are being grown predominantly for economic reasons. This is not yet the case in Kabupaten Kupang and certainly not in Manggarai. In Kota Kupang 79% of respondents did not keep pigs mainly for cultural reasons while this was only 28% in Manggarai. Once again, this maybe an indication that the new market demand in the city is leading to a natural progression to a more developed and focussed commercial production system.

Table 16. I keep pigs mainly for family celebrations

	Total	Kota Kupang	Kabupaten Kupang	Manggarai
Disagree (% of farmers)	46	79	43	28
Neither (% of farmers)	47	17	52	62
Agree (% of farmers)	7	3	4	10

12. I want good access to improved feed

92% of respondents agreed with this statement and there was general consensus across the survey areas.

13. I am scared about pig disease

There was general concern about pig disease, 88% agreed they were concerned. The percentage was actually higher in Manggarai where all but one producer (49 out of 50) was concerned.

6.3 Pig restaurant surveys

It is estimated that the restaurant market is responsible for around 10% of pork consumption (Figure 1). The restaurant survey was structured into a number of different components that were designed to not only seek information about the restaurant itself but also to look at their consumers, suppliers and their role in the whole supply chain. The sub headings used to categorise this information are; Restaurant characteristics; Restaurant requirements; Consumer preferences and Restaurant owner perceptions.

Plate 3. Cooking the *Se'i babi* at a restaurant in Kota Kupang



6.3.1 Restaurant characteristics

Most restaurants are only 2-3 years old, are open 6-7 days per week and can seat between 30-80 people in a sitting. The average age of the business owner is 41 years old and most restaurants are fully owned by the operator.

Restaurants themselves are made from fairly sturdy construction material, commonly having cement walls and floors and roofs of tin. On average, a restaurant building takes up 43 square meters in area and has an annual maintenance costs of around Rp.3.5 million per annum.

All but one of the restaurants is on mains electricity and supply is 3 days on, 1 day off. Water supply to the restaurants can take the form of wells, tanks, creeks and various other sources.

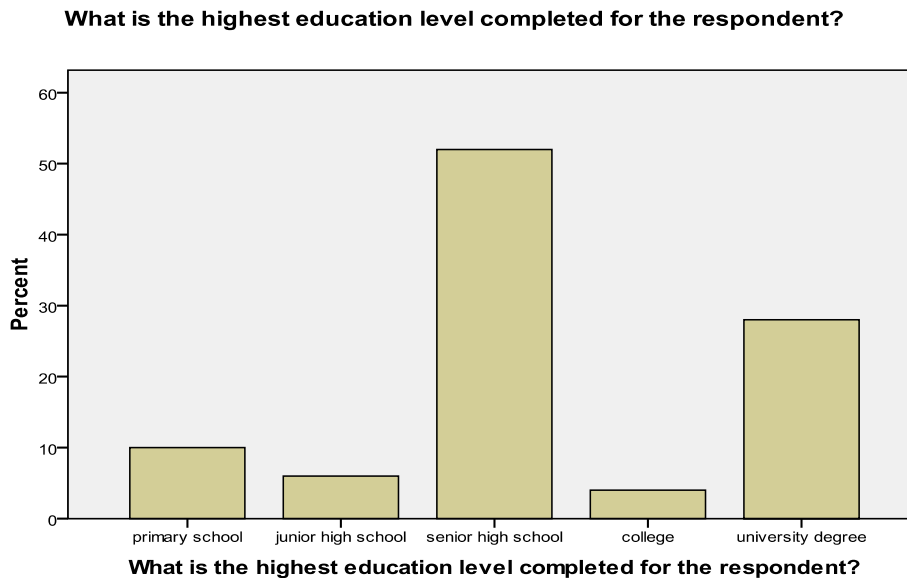
Most restaurants require more than 2 people to run them and employees are generally made up of a mixture of family members, non family members, males and females, but no children. Owners are currently making do with the staff they already have but they didn't think finding more staff would be a problem if they needed to.

More than half of the restaurants surveyed only sold pork (64%) and most restaurants cater for lunch as the predominant meal serving time (85%).

Sick pigs don't seem to be a problem for the restaurants because they don't care for them for long enough or buy meat directly from the market.

85% of restaurant owners have completed senior high school level or above (Figure 4)

Figure 4. Restaurant owner education levels



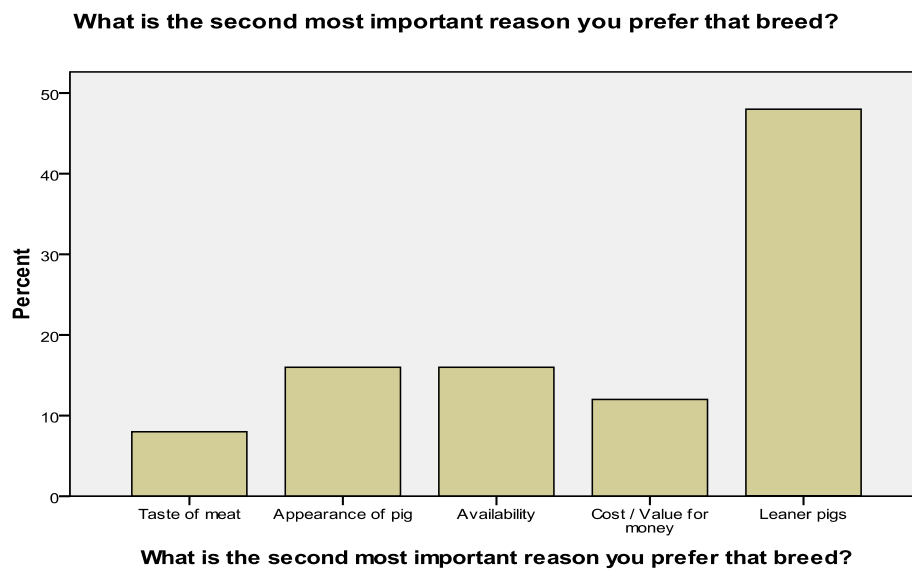
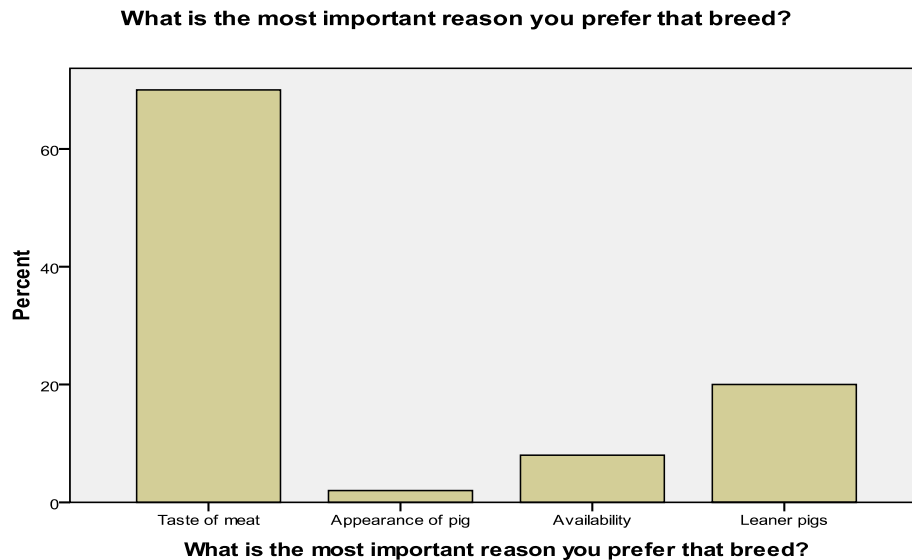
Just over half the owners said the restaurant was their main source of income (55%) with most families picking up extra work in day labouring, as a government employee or with a home industry. Extra income tended to go to household consumption or investment

Most respondents had money saved (90%) while only 16% had borrowed money in the last 2 years (either from a bank or farming coop). The money borrowed was mostly used to improve the land.

6.3.2 Restaurant requirements

Restaurants are buying either pig meat (60%) or fattener pigs (40%) and require supply all year round with seasonal increases around Christmas and Easter and the through the wedding season. Those buying pig meat didn't know what species it was but most restaurant owners thought the pigs were crossbreeds. Their reason for preferring crossbreeds is predominantly due to the taste (Figure 5) and leaner meat (Figure 6)

Figure 5 and 6. Pig breed preferences

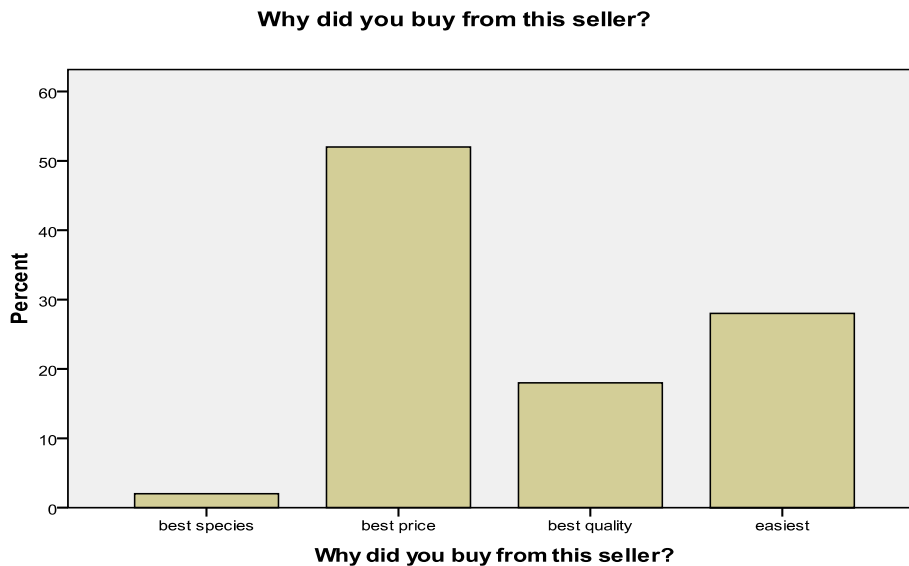


The average number of pigs bought per month was 37 with an average weight of 63kg and a price per pig average of Rp.2 million. The average quantity of pig meat bought per month was 16kg with an average price per kilogram of Rp.39, 000.

When the owners were questioned about their reasons for buying from a particular supplier the predominant reason was best price, followed by easiest and then best quality (Figure 7). The corresponding response from farmers said they sold it to their customer predominantly because they asked to buy it. A further indication of the infancy of the commercial nature of this chain is that only 8% of restaurants have contracts in place to buy pigs, all pigs (100%) are paid for in cash and 60 - 70% of restaurants owners order and pick up their pigs in person.

Nearly all restaurant owners use a mobile phone to do business although 2 of the 3 respondents in Manggarai didn't use a phone at all.

Figure 7. Preferences for dealing with pig suppliers



The majority of restaurant owners believe pig prices have increased in the last 12 months due to changes in demand.

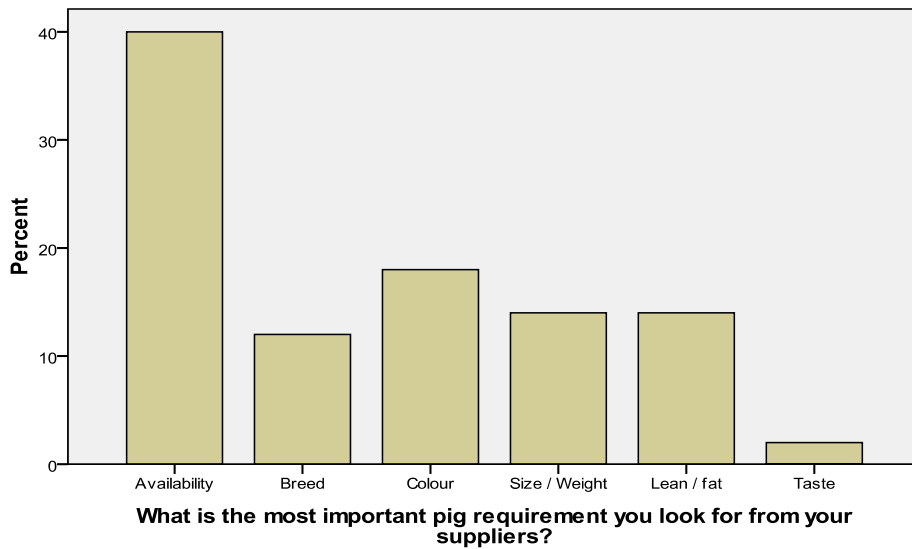
Only 28% of owners said they had bought more pigs in the last 12 months than the previous 12 months but this may not be accurate when you consider a lot of restaurants haven't been open for that long yet. The main reasons given for selling more pigs / pig meat was more customers and existing customers buying more followed by better tasting pig meat, improved cooking techniques and leaner pigs.

72% of Kota Kupang respondents said they would like to expand their business to sell more pig meat compared to only 3 out of the 11 respondents from Kabupaten Kupang and Manggarai which may be an indication of how much more developed the restaurant trade is in Kupang compared to the other two regions. The main obstacles to business expansion were considered to be access to money, access to land and pig supply.

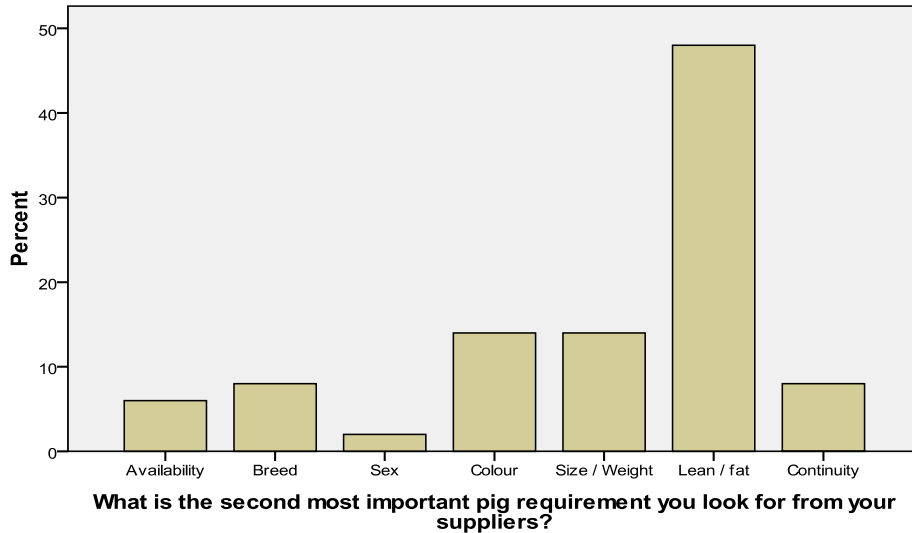
The most important pig requirement wanted from suppliers was considered to be availability and lean meat (Figures 8 and 9) and it was interesting to note that only 18% of restaurants gave any feedback to their suppliers indicating there is definitely an opportunity to improve information flow back down the chain.

Figure 8 and 9. Supplier pig requirements

What is the most important pig requirement you look for from your suppliers?



What is the second most important pig requirement you look for from your suppliers?

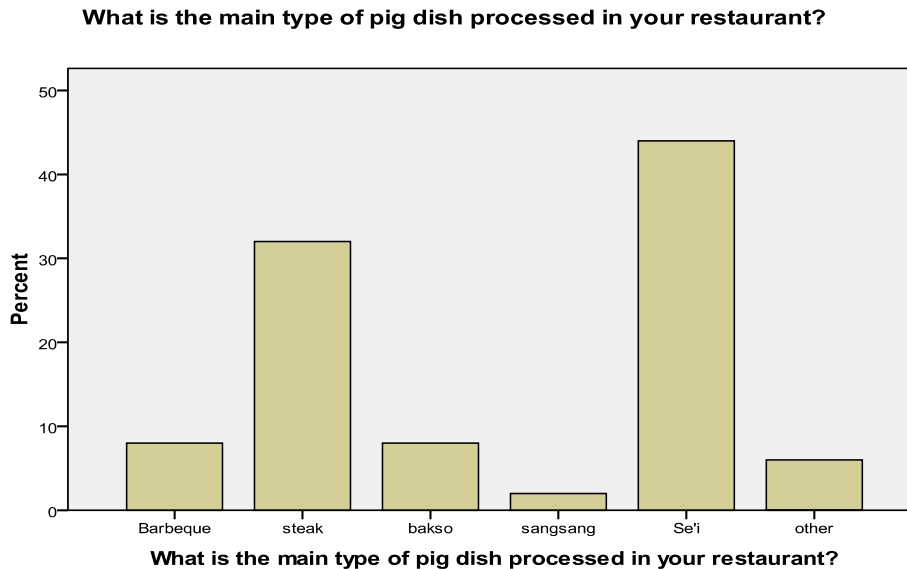


6.3.3 Consumer preferences

All restaurants do allow takeaways but most of the pig meat is consumed at the restaurant location and all pig meat is sold as cooked meat.

The preferred cooking methods are Se'i and steak (Figure 10). Most restaurants have a range of cooking methods on their menu although Manggarai restaurants only do a basic menu in comparison to their Kota Kupang counterparts.

Figure 10. Most popular cooking methods



All restaurants use flavours and marinates during cooking and preparation with the favourite additives being pepper, garlic, salt and ketchup.

When they were asked why they think consumers buy their pig products, 44% of owners said it was due to taste, 24% the way it is cooked and 22% said price.

The consumers that patronise the restaurants were considered to be mostly local and an even mix of both male and female, singles, families and groups.

6.3.4 Restaurant owner perceptions

1. Imported breeds taste better than local breeds (Farmers survey showed they weren't as aware of this trend yet which probably has something to do with the lack of feedback given to them).
2. Most think demand will increase for pig meat (Farmers agree).
3. Some restaurants use family members, some don't (Farmers are much more dependant on family members).
4. Relationships with suppliers are good (Farmers agree)
5. Suppliers know what I want (Farmers also believe they know what buyers want).
6. Price is not the biggest priority (Farmers are split on this).
7. Quality is a higher priority
8. Owners buy pigs from wherever they can which is probably a symptom of demand exceeding supply.
9. Owners believe they know what consumers want
10. All respondents are confident of income increasing in the future (Farmers agree)

6.4 Final group workshop

The team took the preliminary results back to 15 members of the pig industry in Kupang on June 8th, 2009. There were 5 farmers, 3 company staff members, 2 restaurant owners, 4 government staff (2 from quarantine and 2 from agriculture) and 1 Bank (Bank NTT) staff member. The following points were made from the survey results.

- Limiting the interviews to breeders meant that an understanding of the production and marketing of fatteners was not possible. Fatteners tend to access small numbers of stock (1 to 4 head) from breeders and sell as required. The lack of fatterer numbers on the surveyed farms is due to this fact.
- An average price for piglets and weaners was approximately Rp.375,000. However, the price in June (4 months later) was on average Rp.600,000. Workshop participants indicated that this was due to the increased demand at this time every year. June is the beginning of the school year, hence school fees needed to be paid. It is also the beginning of the preferred time for weddings which also increased demand.
- The Bank NTT is lending money to farmer groups for the development of their piggeries and purchasing pigs. This is another positive sign that the pig industry in NTT is gaining momentum and the issue of lack of capital might be diminished over time but this development and the relationship between the industry and the banking sector does require more research.

Participants as a group were asked to list the reasons that they thought were behind the rapid industry growth over the last 5 years. The group came up with 11 factors. Each participant was then given the opportunity to personally select the 5 most important factors. They were given 5 votes and if they wished they were able to give multiple votes to more important factors. The following reasons were identified by the group. They are presented in order of most important to least important, the number in brackets is the number of votes allocated by the participants to that particular factor.

Reasons as to why the pig industry is growing in Kupang:

1. Increasing household income (12)
2. More marketing options (10)
3. Breeding stock and pig feed is more accessible (10)
4. Increasing number of restaurants (8)
5. Government encouraging consumption (6)
6. Decrease in pig diseases (5)
7. Imported pigs are better than the local pigs (4)
8. Encouragement from local banks (2)
9. The taste of pig Se'i is better than beef Se'i (2)
10. Eating pig is healthy (2)
11. The price of cattle is increasing (1)

Stakeholders found it difficult to differentiate between 'cause' and 'effect' in this discussion. Certainly reasons 2, 3 and 4 may well be effects, while the discussion hinted that reasons 1, 6, 7 and 9 are more likely to be causes. It was clear that the respondents found it difficult to enunciate why the growth had occurred.

A possible kick-start for the industry was the entry of Classical Swine Fever (CSF) approximately 10 years ago into NTT which caused a significant decline in the local pig population. This provided government and industry with the opportunity to increase the importing of new, larger, faster growing and leaner breeds into the area. It appears that

these new breeds allowed the development of a Se'i industry using pig meat rather than the traditional beef. A cultural and social demand for pig products combined with improving incomes and a better quality pig all influenced the sharp rise in the number of new (predominantly) Se'i restaurants. Entrepreneurs seeing the success of these new restaurants decided to copy them and build new ones. This industry growth is continuing.

Stakeholders were also asked a second question. This revolved around their perceptions of what was hindering future development of the pig industry. Responses were elicited using the same method as in the previous question.

Factors identified as limiting the development of the pig industry are:

1. Lack of access to capital (14)
2. Technical limitations of farmers (12)
3. Access to breeding stock (8)
4. Access to local processed pig feed (7)
5. Weak local institutional support (e.g. rules and regulations) (5)
6. Lack of communication/linkage between farmer and restaurant (4)
7. Lack of experience of meat examiners and processors (4)
8. Lack of slaughterhouse (2)
9. Lack of export potential (maybe exception of Timor Leste)
10. Poor laboratory facilities and certification support (1)

From observing the discussion it was perceived that stakeholders also found it hard to define the factors limiting growth of the industry. Apart from capital and production expertise, the stakeholders generally did not perceive that there were any other relevant issues. When prompted they were satisfied with present marketing arrangements and access to feed etc. This satisfaction, however, may be due to lack of understanding or knowledge of a marketing system that encourages timely selling with low transaction costs and rewards for quality. Selling of pigs is discussed elsewhere but selling pigs to neighbours or other farmers when money is needed for school fees or a wedding celebration is not what is required in an efficient marketing system. An important part of future work may be assisting the industry to understand and develop an efficient and equitable marketing chain.

This future work would be driven by further research into what it is that consumers actually want when they purchase pork. Further clarity in this area would provide the impetus to research the following areas at the pig production end of the chain, ie:

1. Most sustainable and productive diets based on current crops available as well as potential crops that could be grown
2. Most suitable and cost effective housing to optimise production
3. Most suitable, cost effective and efficient production system
4. Most suitable technology for pig production and how appropriate it would be across the different regions of NTT

7 Conclusions and Recommendations

7.1 Pig Industry

As a result of the initial interviews and key stakeholder workshops we were able to get a snapshot of the pig industry in this region and subsequently identify local restaurants as the target market with the most potential for smallholder farmers. Without doubt, this relatively small pig industry in NTT is growing on the basis of the increased consumer demand for pork.

Household income is increasing and consumers are seeking new outlets like restaurants that are providing greater quality and variety through better tasting leaner meat cooked with new and improving techniques like Se'i. These changes are most pronounced in Kota Kupang but indications are that industry growth and development is occurring right along the chain throughout NTT. The further investigation into the restaurant market has highlighted a number of areas that could benefit from further research and intervention.

Through the restaurant survey it became clear that consumers prefer the taste of leaner pork obtained from non-local breeds. Restaurant owners were also of the opinion that new cooking techniques coupled with the newer tasting pork was actually more important to consumers than the price of the product. The implications of this for farmers are that they need to focus on pig diets and breeding to maximise their potential returns into this growing market.

A major issue for the industry stakeholders is that they are largely unaware of what an efficient pig production and marketing system could look like. They have no terms of reference as to the present strengths and weaknesses of these systems. The study has shown that there is the potential to do more research to develop:

1. farmer technical and marketing skills
2. communication systems between buyers, sellers and consumers
3. more efficient input provision methods
4. more consistent selection of appropriate breeding stock

It was also noted that the industry in West Timor has formed an association (the Monogastric Association) which is beginning to meet and take responsibility for the development of the industry. The industry is in fact at the crossroads, it has developed organically to the point where consumers can access the improved quality of pork product through the increasing number of Se'i restaurants. If it now wants to develop into a sustainable industry where farmers are rewarded for producing a timely, quality product, and restaurants can be assured of accessing a consistent, cost-effective product then there needs to be support provided to assist the industry facilitate this.

An industry-driven strategic plan needs to be developed and implemented. This will only be able to be achieved with the assistance of an existing developed pig industry. The pig industry in NTT needs to be aware of what an efficient industry looks like and begin to follow a road map to assist it on this path.

The study has identified a number of specific issues within the industry that may require particular assistance.

- *Feed quality*; To help improve the nutritional content of feed for smallholder pig farms in NTT the government is planning to expand its new milling operation to produce feed from a mixture of local ingredients and supplementary concentrates. This product has the potential to be cheaper than imported commercial feeds while maintaining equivalent nutritional value. Further research is required to determine the most sustainable and productive pig diets based on local crops and the best process to get those ingredients to the farmers.
- *Information Flow*; For farmers to want to change their behaviour (like pig diets) it is important that systems are set up to provide feedback from the restaurants back to the farmers. One way to do this would be to encourage a differentiated payment system to the farmer, where key consumer preferences are rewarded by the restaurant. That way, when the consumer pays more, there is an opportunity for everyone along the chain to benefit from it, including the farmer. Research into the optimal production system that extends from the farmer to the restaurant and uses key consumer preferences as a driver would need to be a major focus of any future project.
- *Capacity building*; In addition to consumer led changes at the farmer level, the surveys also identified some on farm practises that could be improved to significantly increase farm productivity, efficiency and ultimately profitability. These could be addressed through farmer based training in the areas of animal husbandry, housing, mating, waste utilization, disease control and general on farm procedures. Confidence in these areas may prompt those smaller farms who want to increase their herd size to take the next step and become more commercial in nature. As long as the focus on the end consumer is maintained and follow up research is conducted to ensure we understand the effects this change is having on the rest of the chain then these adjustments have the potential to improve not only the farmers but the industry as a whole.
- *Economies of scale*; The role of large farms in the industry also needs more consideration. They can play a role as both complementary to the smallholder production systems by supplying high quality piglets (e.g. Sylvester's breeding farm) or they can be competitors if they can supply a more consistent cheaper product into the restaurant market. Further research is required to determine optimal herd size and the resources and institutional support required to reach this size. The present perception from the surveys is that present herd sizes are too small to ensure efficient production systems.

7.2 On Farm

7.2.1 Farm and herd

The majority of farmers (60%) interviewed had less than 10 years experience with pig production and 30% had less than 3 year's experience. While this indicates that there has been an increasing interest and involvement in pig production over the last decade, it also confirms a need for farmer training programs to help raise the level of husbandry skills for farmers moving into pig production.

Based on the survey data, the pig industry in NTT consists mainly of small holder farms with fewer than 3 sows (69%). There is a wide gap between the majority and the four 50-sow commercial herds. What is lacking is an interim stage of production with 5 to 10 and up to 20 sows. Future developments need to target this middle ground by providing protocols for small holders to move from owning 1 to 3 sows to owning 10 to 15 sows, as a stepping stone to larger commercial pig production.

The most popular breeds are cross breeds including commercial crossbreds imported from Bali and Bintan Island in Sumatra. However, any further improvement in genetics

should be accompanied with farmer training programs to ensure a standard of nutrition and husbandry commensurate with the requirements of more productive genotypes.

7.2.2 Production efficiency

Based on the data collected the large commercial farms appeared to be relatively inefficient in terms of litters/sow/year (<0.32) and progeny per sow. On the other hand small herds with fewer than 5 sows were achieving almost 1 litter/sow/year. Herds with fewer than 10 sows achieved only 0.5 litters per year. These data indicate a need to investigate the causes of low productivity and the role of nutrition, housing environment and boar/sow management.

Despite the data indicating low productivity, the majority of farmers used commonly accepted signs for recognising when sows were on heat, but only half mated sows at the optimal time. The remaining farmers mated sows either too early or too late, which could explain the low conception rates recorded (mean 66%) and low productivity in terms of litters/sow/year and litter size (7.9 piglets/litter in herds with fewer than 10 sows). Again this indicates a need for farmer training programs based at community level.

Pre-weaning mortality rates were also higher than expected (15%) in herds with fewer than 10 sows. Issues identified as possible contributing factors included lack of farrowing crates (only 35% had a special farrowing pen), lack of creep boxes (only 44% of farrowing pens had creep boxes) and a heat source (only 24% of farrowing pens used a lamp). In other parts of Indonesia improving farrowing accommodation and providing optimal environments for suckers has resulted in significant improvements in productivity.

7.2.3 Housing

Most farmers owned their facilities outright with 100% equity in the buildings. The most common material used was tin or grass for rooves, concrete or bamboo for floors and timber or concrete for walls. About 1/3 farms had special pens for weaners, but only 2/3 of these used weaner boxes. Increasing these figures would be expected to improve growth rates and reduce mortalities.

Only 33% farmers used manure as fertiliser indicating that most wasted this valuable commodity.

7.2.4 Nutrition

Just over 25% farmers purchased commercial diets for their pigs, with sow, starter and finisher diets being the most common. The cost ranged from \$AUD 375 to \$875/tonne, which is very expensive and unlikely to be commercially viable.

The cost factor was a major reason for the majority of farmers using commodities from their own gardens to feed their pigs. These included rice hulls or bran (74), vegetables (53), root crops (20), grains (13) and forage (5) or cut and carry (4). Other feed sources included domestic restaurant waste (38), tofu waster (17), coconut extracts (12) and other commodities (29). Other reasons for using home grown commodities were that they were always available, and would be wasted if not fed to pigs. By far the majority of farmers were satisfied with the current situation (75%), but the remainder wanted change.

Introduction of small scale milling systems similar to those developed by ACIAR projects in PNG and the Pacific would benefit these communities as farmers could mill feed from commodities grown on their own or neighbouring farms.

Water was supplied to most pigs by bucket from a range of sources including family owned or community wells, creeks and government pipelines. However, only 32% farmers provided water for 24 hours/day and almost half (47%) provided water for 1 hour/day. This raises a major welfare issue, especially in a climate as hot as Kupang, as lack of water can significantly reduce productivity as well. Of further concern was that most farmers were satisfied with the situation and most did not want to change anything.

Little cost was associated with providing water, but given that 60 farmers were providing water for less than 5 hours per day, the production costs could be quite significant. This situation requires further investigation so that economic losses are quantified and validated, and the value of providing a constant water supply demonstrated.

7.2.5 Health

Approximately 50% of farmers reported sick pigs during the last year with a cluster of deaths occurring between August and November.

Most illness occurred in weaners (31%) followed by sows (10%), growers (7%) and fatteners (5%) and the high weaner morbidity may be associated with the sub-optimal weaner accommodation. Inadequate weaner accommodation is also consistent with diarrhoea being the most common clinical sign recorded (21%) followed by appetite loss (11.5%), coughing (6%) and swollen neck (7%). Although most farmers (54%) sought veterinary advice, the mortality rate for sick pigs was above 50%.

Programs to improve husbandry techniques and housing facilities, and help farmers to understand the environmental requirements for younger pigs, are required if farmers are to increase herd size and develop a more sustainable production system.

7.2.6 Selling and buying pigs

Half the pigs sold during the previous 12 months were weaners, and the highest number of sales were from one farmer to another, suggesting that farmers buying pigs to fatten is an important part of the market chain. Only 21% went straight to butchers and only 6% to a middleman. While the latter indicates that middlemen play only a small role in the market chain, the popular perception is the reverse.

Prices ranged from Rp.370,000 (AUD\$46) for weaners and suckers up to Rp.1,266,000 (AUD \$160) for growers and Rp.1,800,000 (AUD \$225) for fatteners. These prices are comparable with prices in Australia and it is interesting to note that cull sows are cheaper than fatteners. No price was recorded for gilts being purchased as future breeders.

Most pigs were sold between August and October and the reason for this was not identified. However, prices in June 2009 had risen to Rp.600,000 for weaners compared with an average of Rp.370,000 during the 12 months to February. If selling patterns were the same as 2008, then the increased price could have been due to a shortage of pigs available for sale. The selling pattern does indicate that availability of pigs fluctuates during the year and this may be due in part to peaks and trough in the production on larger farms (50 sow herds), as well as an unpredictable unplanned production pattern in herds with fewer than 3 sows.

The factors influencing the availability of pigs over 12 months need to be identified and understood so that peaks and troughs can be eliminated or designed to meet market demand.

As with pig sales, weaners (58%) and piglets (24%) were the main class of pig purchased, and mostly from other farmers rather than middlemen or markets.

7.2.7 Changes in marketing, herds and preferences

Around 40% farmers sold more pigs in the previous 12 months and the main reasons given were increased demand and higher prices because of more restaurants and an increase in consumer numbers. The reasons for fewer sales were unsuitability of breeding stock and unavailability of feed.

Most farmers believed they got the best price for their pigs and most believed prices had increased during the last 12 months. Improving feed quality was identified as the main way to increase prices.

A significant number of farmers felt that the Government should set a market price that is realistic and profitable for farmers.

Less than 25% farmers wanted to change to imported breeders and almost half were content with the current genotype they were using. However, almost 50% wanted to increase herd size and the main reasons given were to increase profit (32%), become more efficient (16%), to have more pigs available for sale (13%), and to meet the higher market demand (12%). Reasons for staying the same were limited housing capacity (12%), limited capital (10%), and satisfied (6%).

Most felt that the buyer's priorities had not changed during the last 5 years and interestingly breed and sex were placed ahead of body shape and weight.

7.3 Recommendations

There is an opportunity to assist in the development of the commercial pig industry in NTT. The report has identified that:

1. There is a market opportunity for increasing the quantity of quality pig products
2. Consumers are demanding new pork products e.g. Se'i
3. The restaurant market offers potential benefits to smallholder farmers
4. There are priority issues and opportunities along the chain
5. Subsequent targeted research would allow intervention to address these issues and capitalise on the opportunities in this market

The best way to assist this industry is to engage with the industry stakeholders (through the Monogastric Association) and work with them to research the best strategic direction for the industry. The research would need to look at where the industry is going and how it can get there, what support is required and how it will address the priority issues of information flow and farmer training.

One of the key areas of improvement centres on focusing on the consumer preferences for taste. The taste of pork is directly related to what the animal is fed so a key recommendation is to focus on pig diets. The first step to encouraging change in this area is to improve information flow and instigate a sustainable feedback loop where farmers are financially rewarded for supplying better tasting pigs. If they have been reluctant to go down this path before because of the high cost of commercial feed then the government owned milling process might prove to be a cheap alternative way to improve the nutrition of their pig feed.

Taste and lean meat is also linked to pig breeds so if smallholder farmers are struggling with the quality of their breeding programs or literally can't get enough piglets to satisfy market demand it is recommended that we should encourage models where smallholders can source from larger enterprises that are capable of improved breeding and disease control procedures.

To drive improvements at the farmer level will require on farm training. As well as working with farmers and farmer groups on specific on farm issues this program should also involve other chain members like restaurants and piglet suppliers to try and improve relationships, information flow and provide an opportunity for chain members to gain a better understanding of how they can work together for the benefit of everyone in the chain and the industry.

As those changes are made it will be important to follow the effects down the chain to ensure they have a positive impact right through to the end consumer. This will require some direct consumer surveys to confirm what their preferences and purchasing drivers are and how they can best be met (ie. what do the terms 'taste' and 'lean meat' actually mean to consumers).

Since there was some feedback in the farmer survey that suggested farmers might not appreciate the full potential of the industry and where it might be heading, the farmer training might also include some sort of field trip for key people in the industry to go and visit a more developed market such as Bali. This type of experience might open up their eyes to the possibilities and make them more receptive to changing their own behaviour.

8 Appendix

8.1 Kupang Industry Wide Chain Map

