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List of Abbreviations

ACCESS	Australian Community Development and Civil Society Strengthening (DFAT program)
ACIAR	Australian Centre for International Agricultural Research
AI	Artificial insemination
AIPD-Rural	Australia Indonesia Partnership for Decentralisation – Rural Economic Development Program
ADG	Average daily gain (kg/d)
APINDO	Associasi Pengusaha Indonesia (Indonesian Businessmen Association)
AU	Animal unit
BPLM	Bantuan Langsung Masyarakat (Direct Community Assistance) Scheme
BPS	Badan Pusat Statistik (Bureau of Statistics)
BPTP	Assessment Institute for Agricultural Technology (Extension/Research Agency)
BRI	Bank Rakyat Indonesia
BSS	Bumi Sejuta Sapi (Land of one million cattle, NTB)
CP	Crude protein
CW	Carcass weight
DFAT	Australian Government's Department of Foreign Affairs and Trade
DGLS	Director General of Livestock Services (superseded by DGLAHS)
DGLAHS	Director General of Livestock and Animal Health Services (Direktorat Jenderal Peternakan dan Kesehatan Hewan)
EI	Eastern Indonesia
EI-ADO	Eastern Indonesia – Agribusiness Development Opportunities
EJ	East Java
FMD	Foot and mouth disease
GoA	Government of Australia
GoI	Government of Indonesia
HPMI	Himpunan Pengusaha Muslim Indonesia (Association of Muslim Beef Traders)
IVMS	Integrated Village Management System
JICA	Japan International Cooperation Agency
LM3	Lembaga Masyarakat Mandiri dan Mengakar (independent public institutions entrenched in the community)
kgs	Kilograms

KKPE	Kredit Ketahanan Pangan dan Energi
KUPS	Kredit Usaha Pembibitan Sapi
KUR	Kredit Usaha Rakyat
LW	Liveweight
MLA	Meat and Livestock Australia
m.o	Months old
NTB	Nusa Tenggara Barat (West Nusa Tenggara)
NTT	Nusa Tenggara Timur (East Nusa Tenggara)
OTGS	On The Ground Staff
PPL	Penyuluh Pertanian Lapangan Indonesia (agricultural extension agents/agencies)
PSDSK	Percepatan Swasembada Daging Sapi dan Kerbau (Acceleration of Self-Sufficiency in Cattle and Buffalo Meat) program
PUAP	Pengembangan Usaha Agribisnis Perdesaan (Village Agribusiness development) program
PUSKUD	Pusat Koperasi Unit Desa
RPH	Rumah Pemotonnegan Hewan, slaughterhouse
SMD	Sarjana Membangun Desa (Graduates Building the Village) Program
SME	Small and medium enterprises
SUSENAS	The Indonesia Social and Economic Survey
TLM	Tanaoba Lais Manekat
TSS	Timor Tengah Selatan
TTU	Timor Tengah Utara
UNRAM	Universitas Mataram
VBC	Village Breeding Centre program
WTO	World Trade Organisation
y.o	Years old

Preface

This project is one of five lead commodity value chain studies undertaken as part of the larger $1 million Australian Government's Department of Foreign Affairs and Trade (DFAT) funded project Eastern Indonesia Agribusiness Development Opportunities (EI-ADO). In this project, Australian Centre for International Agricultural Research (ACIAR) commissioned research to identify lead commodity value chains to be the focus of a new DFAT program Australia Indonesia Partnership for Decentralisation – Rural Economic Program (AIPD-Rural).

This report titled *Eastern Indonesia Agribusiness Development Opportunities - Analysis of Beef Value Chains*[1] was prepared by the Collins Higgins Consulting Group Pty Ltd, as commissioned by ACIAR. The information and recommendations from this study will inform DFAT in the design of the AIPD-Rural program.

The report involved the analysis of secondary data, field trips and key informant interviews with stakeholders in the beef value chain of Eastern Indonesia. The fieldwork for the report was carried out over two months between October and November 2012.

Authors of study are Scott Waldron, Dianne Mayberry, Dahlanuddin, Marthen Mulik, Simon Quigley and Dennis Poppi. Research assistance was provided by Rahman Ahmad (East Java BPTP), Syahrul Zubaidi (UNRAM) and Made and Yelli (Cendana). Stuart Higgins, Chaseley Ross, Sokunthy Haot and Nuraeni Ishak provided extensive logistical and other support for the project.

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

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Executive Summary

Background on AIPD-Rural / EI-ADO

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

The objective is an increase in competitiveness of poor male and female farmers, realised through:

- Increased productivity;
- Improved business performance;
- 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 the systemic growth constraints in rural agricultural sectors that are most relevant to small farmers in the districts in which AIPD-Rural operates.

AIPD-Rural 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.

In consultations with government and industry stakeholders to select commodities for EI-ADO, beef was ranked as the commodity with greatest potential for poverty reduction and market development in NTB and NTT, and second in EJ. Analysis for this report confirms this potential and proposes ways to increase incomes and at scale through closer links between cattle producers and agribusiness actors. However, the report also highlights that a nuanced approach that accounts for the characteristics of the beef industry is required.

Socio-economic and policy settings

- There are at least 1.5 million cattle producers in the three provinces of EJ, NTB and NTT. There are at least another 50,000 people that work in the cattle trading, slaughter and beef retail industries combined (excluding actors in other sectors that are not able to be estimated).
- Women conduct most of the activity in the early stages (cattle production) and late stages (boning and retail) of the chain.
- The industry is governed by a tapestry of socio-economic structures, including: owner-keeper relationships, company-farmer relationships, producer groups,

ceremonies and trading-butcher-retailer networks that form close-knit family communities in rural and peri-urban areas.

- The GoI has applied significant policy commitment and resources to the beef industry under its Beef Self-Sufficiency Program (e.g. IDR 1.5 trillion for 2013 for central government alone), which acts as a flagship for a large range of inter-related policy measures (trade, slaughter, cattle distribution, funding, subsidies).

- Socio-economic and policy settings play a pervasive role in the industry and must be taken into account in conceiving and designing the project. The settings are sometimes thought to pose an obstacle to industry development, but can also provide important integrative roles and opportunities for industry development and GoA programs including EI-ADO.

Macro settings

- Macro indicators show modest changes in domestic production and consumption over the last decade. More recently, however, policies associated with Indonesia's Beef Self-sufficiency Program (trade and cattle distribution programs) have reduced supply, reflected especially in increasing prices.

- High cattle and beef prices in Indonesia in international and regional terms generated large increases in cattle and beef imports over the early 2000s to peak in 2009, after which time trade restrictions reduced import quota to about one-quarter of these levels in 2012.

- Import restrictions were introduced concurrently with very large GoI programs to stimulate domestic cattle breeding (cow-calf production), through cattle 'rescue' and re-distribution programs for at least 1,000 groups between 2010 and 2012.

- Together, import restrictions and government programs have increased competition for both slaughter and breeder cattle in EI. This results in:

  o Upward pressure on cattle prices that, if relayed back to farm level, will mean higher farm-gate prices for cattle producers;

  o Increased difficulties for cattle buyers (butcher, traders, feedlots) to secure cattle to specification at prices that enables viability; and

  o Greater domestic trade flows (also subject to local quota and disease restrictions). Inter-regional and inter-island trade is a significant market in volumes and as a proportion of local slaughter in all three EI-ADO provinces.

- These alignments create favourable conditions in which to conduct a beef project.

- However, when/if these policy measures are wound back, a price correction will occur that may disincentivise small-holders, while some traders, butchers and feedlots in EJ will switch back to sourcing imported cattle. However, this short- to medium-term correction will have a modest effect over the medium- to long-term terms. The fundamentals of (constrained) supply and (growing) demand for beef in Indonesia will remain.

- However, claims that per capita consumption of beef in Indonesia is increasing rapidly have to be assessed critically (see Section 2.7.3 on price elasticities).

- Beef is not a luxury item in Indonesia, consumers have few quality preferences (besides cuts and hygiene) and the vast majority of beef is consumed in a highly cooked or transformed form. This impacts on the potential for development of a 'modern' processing and retailing sector.

Industry settings

The settings above have forged industry structures shown in the beef value chain diagram in the body of the report (Figure 12). Some of the basic characteristics of the industry are:

First, the vast majority of industry activity in EI occurs within rudimentary, low cost structures:

- Low input-low output cattle production systems, where cattle are kept as a part of small integrated farming systems.

- Informal marketing systems in spot markets, and cattle shipped on general cargo boats.

- Low cost, labour-intensive and efficient slaughter by individual butchers and their crews in basic service-kill facilities.

- Basic beef retailing at markets with minimal overheads or infrastructure.

Second, the EI beef industry is best depicted as a supply chain rather than a value chain:

- Product flows from the production sector, downstream through the chain. With some notable project-based exceptions, producers receive few inputs, services, or feedback from off-farm sources, inputs suppliers, the extension system or cattle buyers.

- With weak forward and backward linkages, producers make input, production and marketing decisions as largely autonomous actors. That is, there is very limited deliberate co-ordination between actors to achieve common objectives of the sort that constitutes a value chain.

- Interventions recommended in Section 4 aim to address this lack of coordination and linkages through the development of value chains, but in a way that conforms with the nature of the commodity, the structure of the chain, and policy and institutional settings.

Third, the cattle production sector should be at the centre of any sub-sector program for the several reasons:

- The sector is the least efficient sector in the industry, and has the greatest potential for increased productivity and income gains;

- Extensive, long-standing research and development projects by Indonesian and Australian agencies have established simple, low cost, integrated measures to increase productivity and incomes (Sections 2.4 and 3.3);

- The sector has by far the largest number of low income participants, where the project can have large impacts (Section 2.2);

- High demand for cattle due to underlying supply-demand alignments provides opportunities for cattle producers in EI into the foreseeable future (regardless of policy settings);

- Cattle supply is the most immediate constraint to industry development and for downstream actors.

Recommended intervention areas

Interventions recommended for AIPD-Rural focus on early stages of the beef value chain and the up- and –down-stream linkages between cattle producers and agribusiness firms.

Interventions in the inputs sector are for AI services and feed in EJ where there are established input markets. Success rates of artificial insemination (AI) can be increased if suppliers (breed centres and their agents) work more closely with producers for timely oestrus detection and service delivery. Feed traders can expand their markets if they participate in feed training programs with project fattening groups and households, and disseminate advice and training to other non-project groups and actors. The recommended intervention areas are:

- Improving the success rates of artificial insemination for beef cattle in EJ through closer agent-producer linkages; and

- Improving cattle feeding practices through business development of feed traders and cattle fatteners in EJ.

On the downstream side, it is proposed that AIPD-Rural partner with cattle buyers (feedlots, butchers, traders, cattle marketing companies) in specific cattle supply chains and facilitate their links back to production groups. These links provide buyers with more profitable procurement channels, provide feedback and markets for cattle producers, and can assist in the dissemination of extension information. The recommended intervention areas are:

- Increasing productivity and returns from contract fattening in EJ;

- Increasing small-holder returns from the production of feeder cattle for feedlots in EJ;

- Increasing small-holder returns from the production of slaughter cattle for butchers in major cities in Eastern Indonesia;

- Improving the small-holder production and marketing systems for the inter-regional trade of breeder cattle in Lombok; and

- Increasing small-holder returns from the production and marketing of slaughter cattle for cattle marketing organisations in West Timor.

Four of the recommended interventions are located in EJ due to the higher level of commercial activity in the province. Of the remaining, one recommended intervention is in Lombok, one in West Timor and one potentially across major cities in EJ, NTB and NTT. The efficacy of this approach will be increased by coordination with other beef projects that use complementary 'bottom up' approaches.

1 Introduction

1.1 Project Background

AIPD-Rural has the goal of increasing income of more than one million poor male and female 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 small research activities undertaken in 2012 and 2013 to inform the AIPD-Rural program. These studies will 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 agreed on five lead commodities to be studied in a detailed value chain analysis during a second phase of the project. Beef was one of these identified lead commodities.

A team of beef and value chain experts were contracted to conduct the beef value chain study presented here.

1.2 Study Objectives

The aim of the assessment was to identify value chain constraints and agribusiness development opportunities with the most potential to increase incomes of target groups in the provinces of NTT, NTB and EJ in EI. The outcome of this work will be the focus of a DFAT program: Australia Indonesia Partnership for Decentralisation - Rural Economic Program (AIPD-Rural).

1.3 Analytical Framework

To meet these study objectives, EI-ADO takes an overall value chain approach. Value chain analysis aims to understand and improve the way that rural actors participate in markets. This requires:

- Analysing the structure, actors and dynamics of value chains, including barriers to entry and governance structures;

- Identifying 'upgrading' pathways for rural actors (e.g. that increase incomes or reduce risk);

- Identifying interventions and sites throughout the chain to facilitate upgrading for rural actors, often at points beyond their area of operation; and

- Identifying measures that increase the skills, competencies, services and technologies that allow rural actors to accrue more value from participation in markets.

While there are many ways that value chain research can be conducted, EI-ADO draws heavily on the framework and tools set out in *Making Markets Work Better for the Poor: A Toolbook for Practitioners of Value Chain Analysis*. The handbook is particularly concerned with strengthening linkages between value chain analysis and development interventions that improve opportunities available to the poor. (M4P, 2008, p.1) Tools and methods used in the beef study are aligned with the M4P approach.

1.4 Study Methodology

The study was conducted through the following methodological steps:

- A comprehensive and detailed review of the literature on the Indonesian beef sub-sector (Waldron and Kristedi, 2012).

- A comprehensive and detailed review and analysis of statistics on the sub-sector.

- The development of budgeting and analytical tools.

- The design of fieldwork sites and schedules, finalised in a pre-fieldwork workshop.

- Fieldwork was conducted for 32 days.

- Data from interviews and documents sourced on fieldwork were analysed.

- This report was written up to conform to the template designed for EI-ADO.

Research team

Table 1 below outlines the research team engaged on the project.

Table 1. Research team for AGB-2012-005

Name	Role	Fieldwork areas	Affiliation
Dianne Mayberry	International Commodity Specialist	East Java	University of Queensland, School of Agriculture and Food Sciences
Teddy Kristedi	Commodity, value chain and fieldwork expertise	East Java	ACIAR
Dahlanuddin	Domestic Commodity Specialist	NTB	University of Mataram, Faculty of Animal Sciences.
Marthen Mulik	Domestic Commodity Specialist	NTT	University of Cendana, Faculty of Animal Sciences.
Scott Waldron	International Value Chain Specialist, Team leader	All areas	University of Queensland, School of Agriculture and Food Sciences.
Simon Quigley and Dennis Poppi	International Commodity Specialists	No fieldwork	University of Queensland, School of Agriculture and Food Sciences.

Fieldwork sites

Production sites were chosen on the basis of having:

- Significant cattle herds;

- Several sites (Malang, Central Lombok, Kupang) were chosen on the basis that the research team has access to trial data and sites for other projects;

- A cross-section of production systems (upland, lowland, intensive, semi-intensive and extensive); and

- Varied cattle production regimes (cow-calf, fattening, mixed).

Agribusiness areas visited (slaughter, markets, ports) were generally in provincial and district capitals. Probolinggo was visited because it is the site of a large feedlot.

Within each province, one AIPD-Rural district was chosen as a site. Table 2 below summaries the rationale for the selection of field work areas.

Interviewees

Fieldwork for the study was conducted for 32 days from September 4 to October 4 2012, preceded by a one-day team workshop to prepare for the fieldwork. The schedule of meetings is presented in Annex 1. A full range of industry stakeholders were interviewed (Table 3). Most interviews were conducted with government agencies (12), farmers/farmer groups (12), slaughter units (7), retailers (7), traders (5) and associations (5).

Table 2. Rationale for selection of fieldwork areas

Fieldwork districts	No of cattle 2010 (% in province)	AIPD-Rural district	Farm (F), Agribus (A), Govt (G) surveys	Rationale for fieldwork selection
East Java				
Malang	147,865 (3%)	Y	F, A, G	• Upland production system • Large cattle herd • SapIndo (Agrisatwa) feedlot • Malang slaughterhouse • Data from LPS/2008/038
Probolinggo	177,170 (4%)	N	F, A	• Lowland production system • Large cattle herd • Data from LPS/2008/038 • Santori feedlot, cattle market
Tuban	202,835 (4%)		A	• Cattle market • Wahyu Utama nucleus-plasma
Surabaya		N/A	A, G	• Provincial government and agribusiness actors
NTB				
Central Lombok	94,759 (12%)	N	F, A	• Large cattle herd • Cattle groups • Data from SMAR/2006/096 & other projects
Bima	91,725 (12%)	Y	F, A, G	• Large cattle herd • Extensive production systems • Cattle X and infrastructure
West Lombok	72,861 (9 %)	N	A	• Port, quarantine
Mataram		N/A	A, G	• Provincial government and agribusiness actors
NTT				
Kupang District	151,691 (25%)	N	F, A	• Biggest cattle production area • Semi-intensive and intensive production systems • Largest cattle market • Cattle fattening groups
Sumba Timur	45,472 (8%)	N	F, A, G	• Large cattle herd • Semi-intensive production systems • Port, quarantine • Ranch plans
TTU	64,839 (11%)	Y	F, G	• Large cattle herd • Semi-intensive production systems • Port, quarantine
Kupang City		N/A	F, A, G	• Provincial government and agribusiness actors • Large cattle herd

Table 3. Interview summary

	Input Supplier	Banks	Port / quarantine / holding yards	Government	Farmers / farmers groups	Feedlots	Nucleus-plasma	Traders	Markets	Slaughter	Retail	Assoc / NGO	Total
East Java													
Surabaya		1	1	2				1		1	2	1	**9**
Tuban					1	1	1		1				**4**
Malang	1			1	2	1		1	1	2		1	**10**
Probolinggo	1					1							**2**
NTB													
Mataram	1	1	1	4					1	2	3		**13**
Central Lombok					2		1	1					**4**
Bima					2							1	**3**
NTT													
Kupang			1	2	1		2			1	2	1	**10**
Sumba Timur			1	2	3			2	1	1		1	**11**
TTU				1	1								**2**
Total	**3**	**2**	**4**	**12**	**12**	**3**	**4**	**5**	**4**	**7**	**7**	**5**	**68**

1.5 Report Structure

- Section 2 'The beef sub-sector in Indonesia' provides a descriptive analysis of macro- and meso-level structures in the Indonesian beef industry. Sections 2.3 to 2.7 are organised in line with the supply chain structure (inputs to consumption).

- Policies and programs (Sections 2.9 and 2.10) are critical to understanding industry dynamics and in designing project interventions, so are examined in detail. Data in Section 2 draws on an extensive statistical and literature review, trial and survey data, and fieldwork data which, in most cases, have been reconciled to provide a robust account of industry structures.

- Descriptive analysis in Section 2 lays the basis for more micro-level and prescriptive analysis in Section 3 'Beef commodity chains in Indonesia', where business models and potential collaborative partners are examined.

- Only structures that are identified as potential partners, are associated with, or that have a significant impact on recommended interventions are examined through budget analysis.

- This then leads into recommendations on specific interventions in Section 4. A significant amount of detail from Sections 2 and 3 is carried over into Section 4 to assist in establishing the rationale of the interventions.

- Cross-cutting issues of poverty, gender and the environment are raised throughout the report and are summarised in Section 5.

2 The Beef Sub-Sector in Indonesia

2.1 Indonesia's Position in Global Production and Trade

Statistics in Table 4 provide a long-term (1991-2010) overview of production and productivity indicators of the cattle and beef industry of Indonesia, with World and Southeast Asia used as comparators.

Table 4. Key cattle and beef indicators from the world, Southeast Asia and Indonesia, 1990-2010

Row	Statistical item	World	SE Asia	Indonesia
A	Cattle herd (mil head 2010)	1,429	48	14
	Av annual growth 1991-2010 (%)	0.5	1.6	1.3
B	Turnoff or slaughter (mil head 2010)	2.96	7	2
	Av annual growth 1991-2010 (%)	0.8	2.8	2.6
C	Turnoff/slaughter rates (% 2010) (B/A)	21	14	15.2
	Av annual growth 1991-2010 (%)	0.3	1.2	1.3
D	Cattle meat (mil tonnes 2010)	62.3	1.3	0.4
	Av annual growth 1991-2010 (%)	0.8	3.3	2.5
E	Av carcass weight (kg/head 2010) (D/C)	211	167	208
	Av annual growth 1991-2010 (%)	0	0.8	-0.1
F	Cattle meat supply (kg/person 2007)	9.6	4.2	1.9
	Av annual growth 1988-2007 (%)	-0.4	-0.3	0.9
G	Producer price cattle meat (US$/kg 2009)	4.2	3.0	5.4
	Av annual growth 1991-2009 (%)	1.2	0.9	2.5

Source: Indonesian data derived from DGLAHS (various years). Other data from FAOStat (2012). Average annual growth rates are compounded.

Indonesia is a mid-sized beef producer in international context, ranked 27th in the world, but the largest in Southeast Asia. Between 1991 and 2010, growth in cattle numbers in Indonesia have been modest at 1.3% (Row A) and were found to be under-stated in the 2011 bovine census (see below).

Row B shows that slaughter numbers have increased at an annual average rate of 2.6% (higher than the growth in cattle numbers). These figures are derived from the Directorate General of Livestock and Animal Health (DGLAHS) and are under-stated because they don't record uncertified / illegal slaughtering, which may increase numbers by 25% (Hermansyah and Mastur, 2008). This changes other derived indicators (see below).

Slaughter rates reported in Row C represent the proportion of cattle slaughtered as a proportion of the cattle herd. Slaughter rates are an important indicator of cattle

productivity including conception, calving, survival and growth rates, and the capacity of producers to turn cattle off for market. For Indonesia as a whole, the low reported slaughter rate (15.2%) reflects uncommercialised systems with low productivity indicators, where cattle are kept by farmers as a source of 'savings' with low weight gains for long periods before being slaughtered. If illegal slaughtering is taken into account, then slaughter rates may have been higher at 19% in 2010. This compares to 31% in Australia. Turnoff rates in project districts are lower than the Indonesian average as shown in Table 11.

Beef production (Row D) has increased at a modest rate of 2.5% per year. This increase is due to increased slaughter numbers (Row B) and not from increased carcass weights (Row E) which have actually declined over the period. The statistics indicate that Indonesian cattle are heavy by world standards. However, the average carcass weight for Indonesian slaughter cattle is overstated for two reasons. First, it includes imported cattle which in 2010 accounted for up to a quarter of the total slaughter number and are relatively heavy (notionally 350kgs liveweight imported plus additional fattening in Indonesia). Second, it does not account for illegal slaughtering. If illegal slaughtering is taken into account, then the average carcass weight (which includes imported cattle) decreases to a more realistic 159 kgs (author calculations).

As a result of constrained beef production and population increase, Indonesia has a low per capita supply of beef by world and regional standards (1.9 kgs). This is more pronounced in predominantly Muslim Indonesia, where pork is not a substitute source of meat protein. As a result, prices for cattle and beef are very high in Indonesia. Prices and trade implications are discussed in Section 2.4.4.

2.2 Socio-Economic Importance

2.2.1 Value

Disaggregated data on the role of cattle in economic development and employment are not available. However, data is available for the livestock sector more broadly (DGLAHS, 2011). The livestock sector accounted for 1.9% of Indonesia's GDP and 16.1% of agricultural GDP in 2010 at current prices. These proportions are a slight increase over levels in 2006, and the DGLAHS forecasts that livestock will make increasing contributions to GDP growth of around 4% between 2012 and 2014 (Renstra Pertanian 2010-2014).

Livestock play a more important role in the provincial economies of Eastern Indonesia. In 2010 preliminary figures report that livestock accounts for 22.3%, 16.2% and 30.1% of agricultural GDP in EJ, NTT and NTB respectively. Livestock accounts for 3%, 2.8% and 10.2% of total provincial GDPs. As an indicator of the contribution of cattle more specifically (rather than livestock on a sectoral level), cattle contributed 14% to agricultural GDP in NTB, about half that of livestock, and the largest contributor to agricultural GDP (The Government of NTB, 2009).

The macro-statistics do not take into account the value added in downstream industry sectors. The GDP generated from cattle (number of head sold multiplied by average price) is subject to transformation along the supply chain. Based on adjusted cost structures of various levels of a supply chain in NTB, Deblitz *et al.* (2011) report that the farm-gate value of the animal can increase by about 70% by the time it reaches slaughter level and

another 70% by beef retail level. Value is created in the chain through margins of industry actors, while product transformation generates value for providers of goods and services.

2.2.2 Employment

DGLAHS (2011) also report on the number of producers engaged in livestock production. Nearly 4.2 million farmers raise livestock in Indonesia, 1.98 million in EJ, 34,000 in NTT and 165,000 in NTB. While statistics are not kept on the number of farmers that raise cattle specifically, they are estimated in Table 5 based on cattle numbers in 2011, divided by an average number of cattle per farmer. A value of four is used to align with AIPD-Rural background methods. Household scale of production is slightly lower in intensive production areas (3-4 head in EJ and Lombok), and slightly higher in semi-intensive and extensive production areas (4-5 head in Bima, Sumba Timur and TTU).

Table 5. Estimated* number of cattle farmers in fieldwork production areas

	2007	2008	2009	2010	2011
EJ	676,401	846,226	889,737	936,363	1,181,825
Malang	28,496	28,642	29,330	31,113	56,474
Probolinggo	31,242	32,379	32,859	44,293	71,870
NTB	126,959	136,529	148,219	173,988	196,005
Central Lombok	18,711	18,937	20,144	23,690	
Bima	15,600	15,407	18,668	22,931	
NTT	138,846	143,365	144,388	149,820	194,658
Kupang	35,463	37,936	36,889	37,923	
Sumba Timur	10,653	8,968	11,066	11,368	
TTU	15,154	0	15,735	16,210	

* Estimates based on cattle numbers at average of 4 head per farmer

Source: EJ, NTB and NTT provincial livestock yearbooks

In line with the figures for NTB, the Government of NTB (2009) estimated that cattle production employed 182,000 farmers, and had a (ambitious) provincial medium term development plan (2009-2013) to increase this to 344,000 famers.

These figures do not fully reflect the regional distribution of industry activity within provinces, which can be concentrated in geographical pockets. For example, in particular sub-districts of NTT (TTS, TTU, Soe, Belu) cattle sales can make up over 80% of the family's cash income (Nemmo-Bell and ICASEPS, 2007). In EJ, cattle are concentrated in Madura, Malang, Trenggalek and Situbondo. Priyanti *et al.* (2012) found that gross cash income from cattle exceeded the income from crops in two surveyed sites in EJ: a lowland site (Probolinggo and Pasuruan Districts) where cattle accounted for 61% of cash income; and an upland site (in Malang District, 84%).

2.2.3 Up- and down-stream sectors

Downstream of the production sector, the cattle and beef industry provide livelihoods for very large numbers of chains actors. Statistics on employment throughout the chain are not kept by official sources.

Table 6 provides a broad estimate of the magnitude of the number of people employed in the beef sector, based on assumptions listed.

The table estimates that in the three EI AIPD-Rural provinces, there are approximately:

- 1.5 million cattle producers;

- 15,000 cattle traders;

- 19,000 people employed in the slaughter sector;

- 7,000 people that sell beef in wet markets; and

- A total of 1.6 million people.

It has not been possible to estimate the number of other chain actors including: service providers (vets, AI agents, extension staff dealing with cattle); feed growers and traders; beef processors; cattle brokers at markets; staff of markets; staff of service slaughter plants; beef and by-product traders; retailers outside wet markets etc. However, an estimate of veterinarians, AI agents and extension staff can be made based on administrative levels listed in Table 7.

Like the production sector, the vast majority of the participants are small-scale and operate in fragmented and labour-intensive structures in rural and peri-urban areas, often in close- knit communities.

Table 6. Estimated employment in EI cattle and beef chain, 2011

	3 provinces	East Java	NTB	NTT	Assumptions
Cattle producers					
Cattle	6,191,741	4,727,298	685,810	778,633	
Cattle producers	1,547,935	1,181,825	171,453	194,658	Cattle number by 4 head per household
Cattle trade					
Certified slaughter	624,752	528,050	54,476	42,226	NTT 2010
Uncertified slaughter	154,080	132,013	13,619	8,448	NTT recorded uncertified slaughter 2010. Other, uncertified 25% of certified slaughter
Cattle exports 2011	227,778	148,593	19,515	59,670	
Total	1,006,610	808,656	87,610	110,344	
Cattle traders					Derived from total cattle trade (slaughter and exports) divided by average throughput per actor
Village traders	8,388	6,739	730	920	10 head per month
Sub-district traders	4,194	3,369	365	460	20 head per month
District traders	2,467	1,982.00	214.73	270	34 head/month (Mahendri *et al.*, 2012)
Inter-island traders	19			19	Actual number
Inter-regional traders	17	10	3	4	Actual number
Total	15,086	12,100	1,313	1,673	Sum above
Slaughter					Derived from total slaughter (certified & uncertified) by average throughput per actor
Butchers	3,245	2,750	284	211	Average 20 head/month or 240 per year
Butcher crew/workers	12,981	11,001	1,135	845	Average 4 crew per butcher
By-product traders	3,245	2,750	284	211	Average 1 per butcher
Total	19,471	16,502	1,702	1,267	Sum above
Beef retail					
Beef production	124,500	109,487	10,418	4,595	
Wet market stallholders	6,822	5,999	571	252	Beef production by stall sales volumes (50kgs/ day, 365 days/year). Assumes all beef sold through wet markets
Total estimate chain actors					
	1,589,314	1,216,425	175,038	197,850	
Other					
Cattle markets		110	9	2	Official statistics, but many not active
Slaughterhouses	693	158		54	Recorded certified plants only
Trucks	1,095	316	34	39	7 head/ truck/day, 365 days/year, for all cattle trade
Workers on trucks	3,286	949	103	118	3 people per truck and loading/unloading

Source: Fieldwork data and author calculations

2.3 Inputs

2.3.1 Technical extension

Similar to other AIPD-Rural agricultural commodities, Dinas Livestock has a technical extension system at provincial and district levels that runs in parallel with the government (bupati) agricultural extension system. These systems are effectively combined at sub-district level, where extension staff work from the same office on different agricultural sectors, including livestock. The livestock extension officers work alongside AI and animal health agents at sub-district level and notionally have support from village general agricultural extension agents (PPL). However, there is only one livestock extension staff per sub-district to conduct all duties (livestock, feed, forages, statistical, administration, certificates etc.) which places major constraints on the livestock extension agent, their expertise and ability to do commodity-specific work. However, these agents are a valuable resource with local level knowledge and links into local community and government.

For an idea of the number of extension agents (and AI agents and vets/animal paramedics) in the cattle sector, Table 7 provides basic administrative information for fieldwork areas.

Table 7. Administrative levels in fieldwork areas

	Districts & Kota	Sub-districts	Villages
East Java	38	659	6,094*
Malang		33	273*
Probolinggo		24	255*
NTB	12	116	913
Central Lombok		12	124
Bima		18	177
NTT	21	291	2,884
Kupang		30	240
Sumba Timur		22	156
TTU		24	175

* Rural villages only

Source: ADO Socio-economic Review

There is some discussion within Indonesia about reform of the current decentralised agricultural extension system run by local government to a more centralised national extension system. For detail on the extension system see http://bppsdmp.deptan.go.id/ .

2.3.2 Breeding

The distribution of cattle breeds in Indonesia is shown in Figure 1 and Table 11.

There are three categories of breeding systems for small-holders in EI: natural breeding where households use their own bulls; natural breeding using group bulls; and AI. Issues surrounding breed technologies are discussed here, with mush of the discussion of natural mating in small-holder systems appears in Section 2.4.3.

AI

Table 8 shows the number of cows that were successfully inseminated through AI in 2010. The figures reflect the high demand from households to breed into larger-framed European breeds (Limousin and Simmental) in EJ. AI is done mainly with Bali breeds in NTB reflecting availability (from Mataram breeding centre). The data also reports on services per conception in EJ. Figures at the bottom of the table show the numbers of cattle AI'd as a proportion of total females over 2 years of age.

Table 8. AI conceptions in East Java and NTB, 2010

Breed	East Java	Services per conception EJ	NTB
Bali	202	1.2	4,482
Ongole	7,443	1.3	46
Brahman	2,178	1.3	160
Limousin	601,633	1.2	338
Simmental	265,380	1.2	2,965
Angus	375	1.3	8
Brangus	11	1.4	98
Madura	15,745	1.1	-
Total all breeds	**904,781**		**8,096**
Female population <2yo	2,193,036		309,094
Proportion AI conceptions to >2yo cow population (%)	41%		3%

Source: Dinas Livestock East Java and NTB

AI systems run in parallel with livestock extension systems. Semen and straws for AI in EJ originates from Singosari, one of only three national breeding centres in Indonesia. Bali cattle semen and straws for AI in NTB comes from the Mataram Centre. NTB is considering allowing insemination with other breeds, in which case, the straws will have to come from Singosari as the Mataram Centre has just a few head of other (non-Bali) cattle bulls. Bali also has a Bali Cattle breeding centre.

The breeding centres and AI network are state-run. AI coverage is wide in EJ (90%) where farmers have taken up the technology and established demand for improved (especially European) breeds. Straws are disseminated through the AI network, requiring close coordination in transport and liquid nitrogen infrastructure. The large distances and time involved (which leads to reduced semen survival) place constraints on how far AI can penetrate outside of EJ.

AI coverage is much lower in NTB (10%). Liquid nitrogen containers can only be moved by ship so can take long periods of time to get to NTT, where only about 10,000 cattle (around Kupang) are AI'd per year. AI is impractical when cows and bulls are grazed in mixed herds and where costs of AI increase (and success decreases) in remote areas and fragmented systems.

In areas where AI is conducted, the delivery of AI services is a very important component of the efficiency of production systems. In particular, AI services must be delivered in a timely manner. This is a function of the ability of farmers to detect oestrus in their cows (mucus, riding, etc.) and for farmers to alert AI agents, and also of AI agents to deliver the AI service within the oestrus period. Semen in straws must also be live, which is a function

of collection, storage and distribution (frozen in liquid nitrogen canisters). If quality semen cannot be delivered within a day or two, the oestrus period will be missed and delayed for another 21 days (on average), further lengthening inter-calving intervals. Delays of this kind are common even in EJ. The conception rate in Malang was said to be 1.33 services per conception, and 1.6 in NTB.

There are many dozens of AI technicians in each district of EJ, and about 170 in NTB (about 75% of which are in Lombok). AI agents can be Dinas employees (IDR1.8 million per month in NTB), but there are larger numbers of 'independent' AI agents that are not on the payroll and earn money through AI fees. There are training programs (independent inseminators program) and they report to Dinas and use Dinas resources. Government AI agents were reported in some fieldwork areas to be more highly trained and accurate (15-20 successful pregnancies per month).

While AI is widespread and clearly in demand in much of EJ, a very different story emerges from NTB and NTT where distances, AI infrastructure, cattle and agro-climatic conditions mean that natural mating is usually a more appropriate breeding method. Researchers in ACIAR project AS2/2000/103 in Lombok found that well-run natural mating systems can be more efficient than breeding through AI. Natural breeding can circumvent many of the potential downfalls associated with AI discussed above. Bulls are more reliable and accurate in detecting oestrus and delivering live semen in a timely way than are farmers and the AI network. Under natural mating, farmers do not pay for AI service fees. The costs of keeping a bull for breeding purposes (by the household or the group) can be offset by the revenues from keeping the bull for fattening and sale.

Genotype

The major argument for AI programs is that they expedite the breed improvement process. Cross-breeding programs are often cited as a central measure to rapidly improve cattle productivity. This includes the introduction of Brahman genetics for Sumatra (and Sumba) and from European crosses especially in EJ, while policy-makers in NTB are considering removing the restriction on non-Bali cattle in Lombok.

While cross-breeding programs can increase genetic potential, the realisation of this potential for larger-framed animals requires that prerequisite feed and management systems are in place. In low-productivity systems that are the norm in much of EI, genetic improvement exacerbates inefficiencies (e.g. calving intervals and mortalities). A shift to larger breeds is in this case a retrograde step, primarily because the (limited) feed available is increasingly used for maintenance and less for production (reproduction and liveweight gain). Poppi *et al.* (2011) found that in areas in Lombok and Sumbawa with local regulations requiring artificial breeding be used in preference to natural mating, the crossbred cattle (such as Bali cattle crossed with *Bos indicus* or *Bos taurus* breeds) caused specific problems with fertility and mature size of the crossbred cow (hence an increase in feed requirement). Current genotypes are likely to be as efficient as 'improved' breeds if managed well. There are additional problems in maintaining a crossbreeding program that does not produce a stable cross-bred animal, and in dystocia from crossing with large-frame sires.

Lindsay and Entwistle (2003) found no evidence of genetic regression amongst Bali cattle in EI, which are well adapted to their environment reflected in generally good body condition and high inherent fertility. Random mating in practice is likely to result in stable

genetic merit. Low turn-off weights and fertility rates appeared to be mostly a function of nutrition, an effect of available diets and management (Poppi *et al.* 2011).

Seasonality

Seasonality is another aspect of breeding systems of interest to any project in the cattle sector. There would appear to be benefits to adjusting breeding cycles to align with seasonal feed supply and price movements.

As described above, there is major annual climatic variation, especially in more extensive systems of NTT and NTB, which markedly effects feed supply. The natural cycle of Bali cattle is to conceive at the end of dry season and calve in the middle of dry season when feed supplies are low. This leads to reduced calf birth weight, high calf mortality rates, and low growth rates of suckling calves and other juvenile cattle (i.e. poor reproductive efficiency) (Poppi et al. 2011). Adjusting calving patterns to meet feed supply would mean calving in wet season or in harvest season to fully utilise crop residues.

In addition, there is significant variation in prices throughout the year due to ceremonies (especially at Idul Fitri in August/September in recent years – see Figure 8). Independent of seasons and time, traders offer higher prices for more even lines of aggregated cattle.

These factors notionally provide opportunity to adjust breeding cycles and turnoff periods to capitalise on peak feed and price periods.

Controlled mating is technically possible in intensive production areas of EJ where cattle are AI'd, and in Lombok where cattle are tethered/penned and mated with communal bulls. Controlled mating has been incorporated into ACIAR Project LPS/2008/038 to link with peak feed availability. Improvements to production systems in NTB in ACIAR project AS2/2000/103 concentrated calving in project areas, and moved the average calving date from mid-July to mid-June. However, adjustment of seasonal mating periods varied by areas. Discussions were held in each village to determine the optimum time for mating, and only reduced from the initial period of 12 weeks if conception patterns indicated no risk of reduced fertility.

Controlled mating in semi-intensive and extensive systems is a low priority intervention for several reasons:

- Mating can't be controlled when heifers, cows and bulls are grazed in mixed herds;

- If calving occurs in wet season, problems of mud, hygiene and disease are exacerbated;

- For fattening in wet season, feed has a high water content (e.g. can increase DM from 20 to 80%), which reduces feed retention and conversion, and the increases labour required to collect a unit of DM; and

- High prices in wet season in remote parts of NTB and NNT also arise due to road condition so can't be overcome / capitalised on.

2.3.3 Animal health

Dinas Livestock collates statistics on the incidence and locations of the following diseases:

NTB Anthrax, septicaemia epizootica, malignant catarrhal fever, scabies, ND, Surra, brucellosis, AI, helminthes, bovine ephemeral fever.

EJ   Brucellosis, Campylobacter Sp, Paratuberculosis, Bovine Viral Diarrhoea, Infectious Bovine Rhinotracheitis, Anaplasmosis, Cestodiosis, Fasciolisis, Nematodosis.

NTT   Scours/colibacillosis disease, septicaemia epizootica, coccidiosis disease, streptococcus, bacterial infection, scabies, helminthiasis.

ACIAR (2013) provides a concise overview of major animal health issues in Indonesia. Disease can reduce productivity in beef cattle production systems and impact on the operations of downstream actors (traders, butchers). The prevalence and effect on production and productivity of the most important diseases in Indonesia are not well understood. However, it is known that:

- Respiratory disease and diarrhoea cause reduce growth rate and can cause mortality in calves, but that problems can largely be resolved by better husbandry and management.

- External parasites (tick, screwworm fly and buffalo fly) can cause production losses, but internal parasites seem be more important, especially liver fluke that can have prevalence of 25% to 90% in cattle and buffalo in parts of Indonesia. Annual losses from liver fluke in Indonesia from reduced meat production, draught power, and reproductive performance have been estimated to be between AU$230–274m and $439–525m (Suhardono, 2001), cited by Copeman and Campbell (2008)). As shown in Section 3.5.2, rejection of a liver because of liver fluke can reduce returns for a butcher by IDR 200,000 and make the slaughter of that animal unprofitable.

- Diseases such as brucellosis, vibriosis, leptospirosis and pestivirus reduce reproductive performance and, as outlined below, constrain trade flows from most of NTB and NTT. More research and trials are required to establish their distribution, prevalence and effect on production and productivity in Indonesia.

Disease status restricts the trade of different types of cattle (see Section 2.9.3 'Domestic cattle trade policy') administered by Quarantine as a central agency. Animal health centres (puskeswan) form a separate line agency within Dinas livestock, but have independent centres at sub-district levels. These are staffed by veterinarians or lower level 'animal paramedics'. The official duties are:

- Control and prevent disease through (active and passive) surveillance, consultations, vaccinations, medication and training;

- Conduct public health and sanitation surveillance (slaughterhouses, markets, butchers) and monitor slaughter activity (cows, statistics, certification);

- Recommend animal health certificates for inter-island trade (quarantine/holding ground) (lab analysis for breeding stock, physical check for slaughter stock); and

- Lab analysis at district and some facilities at sub-district levels.

There are no private/independent veterinarians, but government veterinarians can provide private services for a fee. Farmers, traders or butchers pay for the advice and services of veterinarians, which is separate to their official work. For this outside work, veterinarians have to record, account for and pay for veterinary medicines used (not supplied gratis by Dinas). Sometimes traders provide advice on health and can disseminate vaccines and

vitamin supplements to more progressive farmers. Large veterinary product and vaccine manufacturers are state-owned and do not provide embedded services to farmers.

An intervention specifically to address animal health problems is seen as beyond the scope of the AIPD-Rural program. However, measures in other Indonesian and Australian programs to improve animal health in cattle production groups have direct implications for agribusiness actors and a value chain approach to disease prevention will be beneficial. Intervention Area 5 (Section 4.7) recommends closer linkages between cattle groups and butchers, including in treatment of liver fluke. Intervention Area 6 (Section 4.8) recommends closer linkages between cattle groups and inter-regional traders of breeding cattle that could include vaccination against reproductive diseases.

2.3.4 Feed and water

Feed is the most important input into cattle production and lack of feed is the biggest constraint. Much of the ACIAR research in EI is based on growing and feeding roughage and energy (mainly from crop residues like straw and silage) and protein (from a range of sources, but especially legumes) required to increase productivity (reproduction and weight gain).

Feed sources and type

Feed sources vary by area and production system (intensive, semi-intensive and extensive, see Section 2.4.3).

Table 9 indicates the many sources of feed for small-holders in the case of EJ.

Table 9. Sources of rice straw for surveyed farmers in lowland and upland areas of East Java (%)

Sources	Lowland %	Upland %
Collected from own field only	18.4	3.7
Collected from other fields only	21.1	5.6
Collected by group from other fields	0.0	9.3
Collected from own and other fields	30.3	12.0
Collected from own or other fields, and group collection	3.9	48.1
Bought from other farmers	2.6	0.0
Bought from agent	3.9	0.0
Collected from other fields and bought from agent	17.1	0.0
All of the above	1.3	20.4
No rice straw fed	1.3	0.9
TOTAL	100	100

Source: Hanifah et al. 2010

As is the case throughout EI, a large proportion of feed is sourced on-farm (from crop residues and from grasses or forages on bunds and perimeters). However, in EJ, small land sizes (relative to cattle numbers) and a reluctance to store feed (infrastructure, treatment, and storage problems like mould), mean that farmers source a large part of their feed from outside their own farm. This is also common in other parts of EI, where cattle feed is obtained (cut and carry, or grazing) from communal areas (villages land,

roadsides, grazing areas). In EJ, households have developed systems to make up the shortfall of feed (predominantly rice straw) by:

- Assisting with the harvest of other households and in return, keeping some feed. This is possible year-round in areas with 2-3 crops per year, in a staggered harvest period in the local area; and

- By renting trucks with other households to pick up larger quantities of rice straw from areas (further away) where the rice would otherwise be burnt.

In these systems, there is no price assigned to the straw, but the labour and transport costs mean that the straw has an imputed value. It is however significant that a feed market and trading industry is developing in EJ (especially lowland areas, but also highland), where specialised feed trading households assemble, prepare, sell and transport feed for a price (see Section 3.2.2).

While the proportions derived from feed traders in EJ are small – and are much higher than in NTB and NTT – increasing pressure on feed supply may grow the commercial feed market and may form part of an AIPD-Rural intervention strategy. However, it is important to note that the fledgling feed market is populated by individual feed traders. Unlike dairy and poultry, there are no large scale commercial feed mills that produce compound mix for beef cattle. Some small-holders in Sumatra obtain feed from plantations, but no cases were encountered in EI. Only feedlots in EJ source feed through plantations or contracts with feed corn growers.

Improved forages and legumes

Increased quantities and quality of forages clearly play a central role in increasing the productivity of cattle systems. Cattle in EI have traditionally grazed a wide range of forages (native grasses, crop residues and stubble) that are both free grazed and cut-and-carried and fed as fodder. There have been long-standing efforts to increase the availability and nutritional value of forages, including planting of improved grasses (like king grass) and tree forages (especially *Sesbania grandiflora* in NTB and of *Leucaena leucocephala* in NTT) that have been planted in parts of EI since the 1900s.

There are obvious benefits in incorporating forage tree legumes into cattle-crop systems in EI. They are tolerant to a wide range of soils and long dry seasons, can be grown around fields and unused land, they fix nitrogen to improve soil condition, and can yield consistent supply of good nutrition (protein) especially in the dry season.

There has been a more recent increase in the area of tree legumes planted in EI for cattle feed, with some notable successful pockets (e.g. Jati Sari in Western Sumbawa, Amarasi in Kupang District, West Timor). However dissemination has not been as widespread as suggested by the potential benefits. ACIAR Project LPS/2008/054 is investigating the factors that may constrain or facilitate increased uptake of tree forages in NTB and NTT (for cattle fattening). Initial findings are that:

- There are no major agro-climatic barriers to wider dissemination of tree forages which are suitable to many areas of NTB and NTT. Growing and feeding tree forages requires sound agronomic practices, but is not technically demanding for most farmers.

- Planting and feeding tree forages requires some commitment from farmers but are not prohibitively demanding of household resources (labour, land, capital, inputs such as fertiliser and pesticides).

- The availability of seeds of improved varieties for leucaena and of sesbania is a surmountable constraint. Indeed, the demand for a promising variety of leucaena (Tarramba) sells for IDR 50,000/kg and has spawned an entrepreneurial service sector of seed growers and traders.

- The major constraint to increased planting and feeding of tree forages is limited understanding by livestock extension workers and farmers of the value of high quality forages such as tree legumes in increasing cattle productivity and, more fundamentally, in cattle nutrition. The constraints must therefore be addressed through effective training and extension programs (the approach in LPS2088/054 is based around participatory 'Pilot Roll-Out').

- For the benefits of tree forages (and other feeds) to be realised and valued by farmers, other aspects of the cattle production system must also be in place. This includes sufficient water, pen hygiene and disease prevention that can negate the benefits of better nutrition.

For more systematic and detailed analysis of forage systems in EI see data and analysis from ACIAR projects (AS2/2000/125, LPS/2004/005, LPS/2008/054) and publications (ACIAR Monograph No.'s 62, 88 and 99).

Water

Drinking water availability and intake is another significant constraint to more productive cattle production systems. All cattle require water for normal biological functioning like kidney functioning; cows require water for milk production; calves dehydrate at up to 7% of bodyweight per day, which can mean a daily requirement of 30 litres per day. Lack of water stunts liveweight gain, growth potential and increases mortality.

Insufficient water intake can occur at a number of scales. A production area may lack water (underground or surface) for parts of the year. This is particularly the case in dry areas of NTT. Or a given area may have sufficient water, but cattle are tethered or penned away form a water source and insufficient water is carried to the cattle for drinking. One explanation for the lack of drinking water is that carrying water (usually by bucket) can be a labour-intensive task. Any development project can address lack of water by: increased understanding from farmers about the importance of water in cattle production; and utilising infrastructure to increase access to water (location of pens, well and pumping equipment).

2.4 Production

2.4.1 Geographical distribution

Figure 1 provides a snapshot of the distribution of beef cattle by province in 2011. Table 10 presents data aggregated to regional level from 2011. Both draw on statistics from the 2011 national bovine census.

Cattle are distributed throughout Indonesia (though thinly in most of Kalimantan, Maluku and Papua). Three main cattle breeds are identified in the statistics – Bali cattle, Ongole

and Madura. The remainder ('Other') are Limousin, Simmental and Brahmans or their crosses. Bali, Ongole and 'Other' breeds each make up roughly 30% each of Indonesia's cattle. Female breeders make up around 68% of all cattle in Indonesia, with little difference by region (or province). Differences in age profiles of cattle are also subtle, but some exceptions are noted below.

Table 10. Cattle indicators for regions of Indonesia, 2011

	Indonesia	Java	Sumatra	Bali, NTB, NTT	Kalimantan	Sulawesi	Maluku and Papua
Total cattle (mil. head)	14.8	7.5	2.7	2.1	0.4	1.8	0.3
% of national herd	100	51	18	14	3	12	2
Compound average annual Growth 2003-11 (%)	5.3	3.9	9.7	5	4.9	7.8	4.8
Breed composition (% of herd)							
Bali	32	3	25	95	63	79	83
Ongole	29	42	29	4	11	8	14
Madura	9	16	2	1	12	0	2
Other	30	40	44	0	14	12	1
Sex							
% females in herd	68	68	68	67	64	71	67

Source: MoA and BPS (2011)
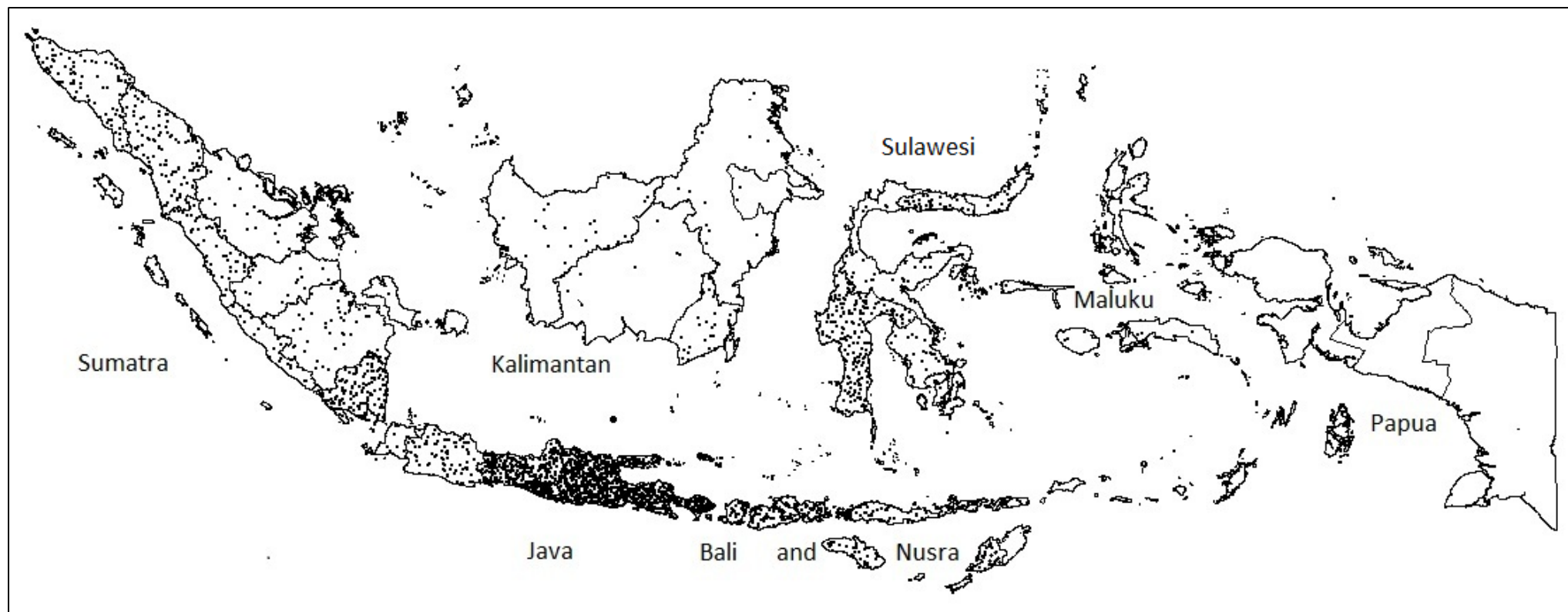
Source: Map generated by authors. Data from MoA and BPS (2011). One dot equals 5,000 cattle

Figure 1. Distribution of beef cattle population in Indonesia by province in 2011

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The highest and densest cattle population is in Java, which holds half of the national beef cattle herd. Cattle numbers in Java have grown at rates below the national average, reflecting resource constraints, which is significant given the number of cattle in Java. Ongole crosses are the most populous breed, but Java is also the major centre for another local breed, Madura. 'Other' breeds that have been introduced for fattening and for distribution schemes make up 30% of the cattle herd.

While Sumatra has a much smaller cattle herd compared to Java, it is the next largest in Indonesia and has grown at the fastest rate. While most cattle are produced in small-holder systems, there are large feedlots throughout Sumatra that utilise feeds from plantation estates (palm, pineapple, cassava). The high proportion of crossbred cattle in this region reflects the greater focus on fattening. While the island has traditionally focused on supplying the Jakarta market, recent economic growth in the island has seen increasing intra-island demand.

The Bali and Nusra (NTB and NTT) region in EI has a drier tropical climate, a longer distinct dry season, a higher incidence of seasonal grazing, poor soils and significant feed gaps. The Bali breed accounts for almost all the cattle in the region. While there are very few cattle of other cattle breeds in the region, there are large numbers of water buffalo in Bali and Nusra (12% of the number of beef cattle) but numbers are declining. Bali-Nusra is known as a cow-calf production region but this is not reflected in herd composition statistics (age, sex) compared with other regions and over time. The region has traditionally been an exporter of live cattle, although numbers have been constrained by quota allocation in recent years.

From this regional picture, Table 11 telescopes down to the three AIPD-Rural provinces and the production areas visited on fieldwork. The table shows that EJ is by far the biggest cattle producing province of Indonesia. NTB and NTT are significant on a national scale. The fieldwork districts all account for significant share of national or provincial herds.

However, the share declines for slaughter numbers and beef production because of lower slaughter rates and because they export significant numbers of cattle to other districts, islands or provinces. Indeed, cattle exports make a very large part of cattle sales in NTB and NTT. The number of cattle exported is in many districts the same as or higher than slaughter numbers. Export numbers are governed not only by demand, but local government quota allocation (see Section 2.4.4), which increased sharply between 2010/11 (reported in figures) and 2012 (when visited). That is, the inter-island and inter-regional export is a major market for cattle in NTB and NTT.

Table 11. Beef industry and productivity indicators in Indonesia and fieldwork districts, 2011

	Indonesia	East Java	Malang	Probolinggo	NTB	Central Lombok	Bima	NTT	Kupang	Sumba Timur	TTU
Cattle											
Number (million head) 2011	14,824,373	4,727,298	225,895	287,480	784,019	119,029	117,812	778,633	151,250	53,051	631
% of national or province herd	100	32	3	4	5	12	12	5	19	6	8
Annual average growth 2003-11	4	8	9	11	8	7	9	5	2	4	7
Slaughter											
Slaughter number (head)	2,239,149	528,050	30,198	11,036	54,476	3,911	1,593	42,279	12,014	5,458	5,213
% of national/ province slaughter	100	24	6	2	2	7	3	2	28	13	12
Cattle exports		148,593	5,634	2,606	19,515			59,670	22,654	4,563	12,116
Beef production											
Beef production (tonne)	465,800	109,487	6,303	2,367	10,418			4,595			
% of national/ province beef production	100	24	6	2	2			1	27	8	10
Breed composition											
Bali	32	2			98			88			
Ongole	29	33			1			11			
Madura	9	24			0			1			
Other	30	42			1			0			
Age and sex											
% females	68	70			68			68			

Source: MoA and BPS (2011) and provincial livestock yearbooks.

2.4.2 Trends

Figure 2 provides production indicators for the Indonesian cattle and beef industry. Data is drawn from the Director General of Livestock and Animal Health Services (DGLAHS) which collects cattle production data on an annual basis from reports submitted by local government offices responsible for livestock services.

From a cattle herd of just 6 million in 1979, numbers increased significantly in the early 1980s. Hadi et al. (2002) attribute this increase to large international projects (IFAD and ADB), which introduced new breeds (Charolais and Brahmans) and increased productivity. Cattle numbers rose steadily over the 1980s and into the early 1990s, and were boosted by imports in the mid-1990s that peaked at 424,000 head in 1997. The Asian Financial Crisis of that year and the heavy depreciation of the IDR saw imports crash, while farmers capitalised on the resultant high prices by selling cattle, including breeders.

With economic recovery in the 2000s, Indonesia's cattle herd and productivity grew. So too did cattle imports from 2004 to reach a peak of 781,000 head in 2009, constituting 6% of the cattle herd and 38% of slaughter numbers. Imports had halved by 2011 due to import restrictions discussed below. However, this decline was more than offset in statistical terms at least by national bovine census of 2011.

In developing industry plans, policy-makers were working with data from the last agricultural census of 2003. In 2011 the Ministry of Agriculture and the Central Statistics Agency conducted the national bovine census (Data Collection of Beef Cattle, Dairy Cattle and Water Buffalo, PSPK). The census found that the national herd had already reached 14.8 million head, well above the figure used in annual reporting (12.6 million head). Based on these numbers, projections for 2013 and 2014 were increased to 16 and 16.8 million head. The bovine census provides much needed updated and disaggregated data on the profile of the Indonesian cattle herd, including regional distribution, age, sex and breed. An opportunity to assess the statistics will arise in the 2013 agricultural census.

As a result of these broad forces, cattle numbers increased by an average of 5.3% per year in the 1980s, 0.4% in the 1990s, 2.3% in the 2000s. These rates are widely thought to be below potential for two over-arching reasons. First, cattle productivity is generally low and can be increased by smallholders adopting relatively simple production and management practices. Second, there is potential to more fully utilise plantation residues (e.g. in Sumatra), crops residues (e.g. in Java) and pastures (in parts of NTT and NTB). Third, there is widespread concern about the slaughter of productive females, especially in periods of rising cattle prices. It is stated in policy documents that 150-200,000 productive cows are slaughtered per year (7-9% of total slaughter) mainly from cow-calf breeding areas of NTT, NTB, Bali and Java. However, this is not reflected in changes in herd composition.
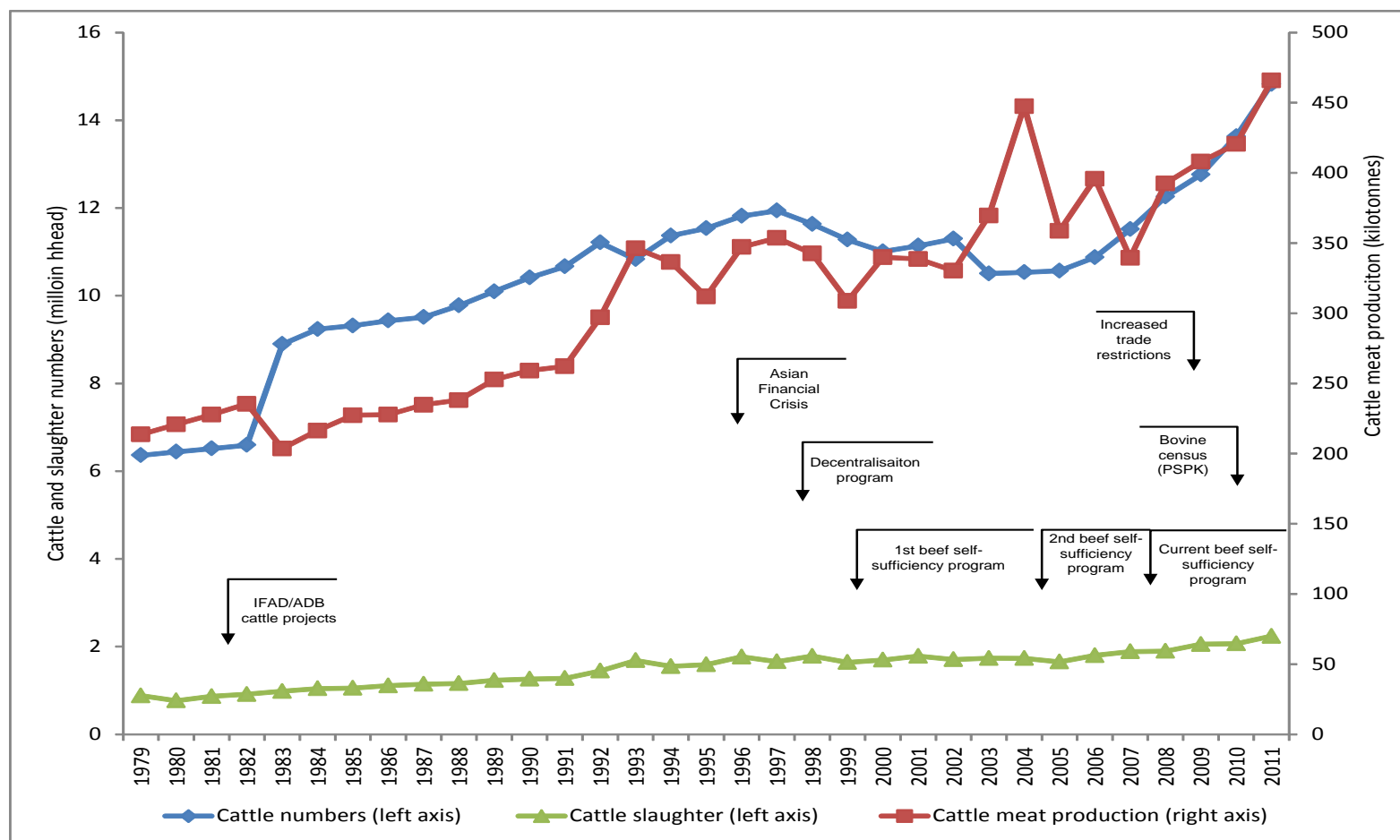
Source: Directorate General of Livestock and Animal Health services (various years)

Figure 2. Production trends and policies in the Indonesian beef industry, 1979-2011

Statistics derived from the DGLAHS under-estimate slaughter numbers because they do not account for illegal slaughtering, which may add another 25% to the numbers. DGLAHS slaughter figures derive from reports from staff of slaughterhouses and from Dinas officials who check slaughter based on interaction with village leaders, consumption patterns and retribution collection. However, they are not able to report on all local-level slaughter activity and uncertified slaughterers. In the case of Mataram City in NTB, illegal slaughtering was estimated as 25% (Hermansyah and Mastur, 2008). In NTT, statistics are kept on cattle slaughtered in and out of slaughterhouses. For the provinces as a whole, 17% are slaughtered out of slaughterhouses, but this can be as high as 41% in places like Sumba (BPS NTT, 2011).

While not discernible in Figure 2, slaughter numbers fluctuate significantly year to year. Over the longer term past, they increased at an average rate of 4.3% per year in the 1980s, 3.3% in the 1990s and 1.7% in the 2000s. Comparing growth rates for cattle and slaughter numbers provides slaughter rates. From 13.3% in 1980, slaughter rates decreased in the 1980s, increased in the 1990s and decreased in the 2000s to reach 15.2%. However, if illegal slaughtering is taken into account, then slaughter rates may be as a high as 19% in 2010.

Long term cattle meat production has increased broadly in line with slaughter numbers (1.4% in the 1980s, 2.9% in the 1990s and 2.4% in the 2000s). Thus, average carcass weights have changed little to remain at 203 kgs in 2011. However, if illegal slaughtering is taken into account, then the average carcass weight (which includes imported cattle) decreases to a more realistic 159 kgs. Average carcass weights are recorded as 140kg in official statistics for NTB province. Production trends for AIPD-Rural provinces and fieldwork sites are the subject of Section 3.

2.4.3 Production systems

A typology of production systems

Cattle production systems in EI share some common characteristics. Small-holder production systems predominate – there are only two major feedlots in AIPD-Rural areas (in EJ) and even in extensive systems, large grazing households account for a small proportion of overall cattle numbers.

Cattle are raised for beef rather than draught purposes. In all areas, corn and rice are grown as relay or substitute crops, and inter-cropped with pulses. Crop residues are used as the major source of cattle feed in intensive areas and as a supplement in extensive grazing areas.

Beyond these common elements, cattle production systems in EI are variable, and this variability has to be taken into account in analysis and the design of interventions. Table 12 provides an overview of production systems in fieldwork areas visited for the project. It includes some of the basic typologies, characteristics and values of production systems that form analysis in Section 3. As an overview, toward the top of the table, rainfall volumes and distribution enable intensive land use and dense human and cattle populations where cattle are fed on crop residues. At the other end of the spectrum, in the dry, extensive land and cattle systems in Eastern NTB and NTT, cattle are grazed on open savannah grasslands.

Table 12. Basic characteristics of production systems in fieldwork sites

Intensity of crop-livestock systems	Fieldwork site	Wet tropics→ Dry tropics					Enterprise mix				Scale	Land				Breeds	Price
		Lowland EJ	Upland EJ	Intensive NTB	Semi-intensive NTB, NTT	Extensive NTT	Feedlots	Cow-calf production	Fattening households	Mixed operations	Cattle(head)	Cropping land (ha)	Crops/year	Trees & forages (ha)	Collective grazing land		Local bull 270kgs (Rp/kg/LW)
	East Java																
Intensive	Probolinggo	1					1	1	1		3	0.4	3			x-breed	25,000
	Malang		1							1	3	0.75	2			x-breed	24,000
	NTB																
	Central Lombok			1				1	1		3	0.2	3			Bali	25,500
	Bima				1					1	5	0.6	2	0.4		Bali	22,000
	NTT																
	TTU				1					1	5	0.5	1	0.5	20	Bali	19,000
Extensive	Sumba Timur					1				1	7	0.5	1	0.5	40	Ongole	22,000

Source: fieldwork data and author analysis

On the left and top of Table 12, lowland areas in EJ (similar to Bali and Central Lombok) have a long wet season and fertile, irrigated land. Farmers in fieldwork areas plant two to three crops per year, but high population densities result in very small cropping areas, on which grasses and forages can be grown on bunds. These crop residues are cut and carried to cattle tethered in pens, with small windows of time for grazing stubble. These on-farm feed resources support just a few head of cattle. To limit feed demands, farmers in lowland areas like Probolinggo are specialising in cow-calf production. Priyanti *et al.* (2012) surveys found that 92% of lowland farmers in EJ produced calves, and 78% specialised in calf production.

In the less intensive rainfed and seasonally dry upland areas like Malang, there are fewer crops, lower yields and larger land areas. Farmers also hold cows that produce calves, but weaned calves are fed to slaughter weight in mixed systems. Cattle are also tethered and households spend large amounts of time collecting feed. Only 18% of upland farmers specialized in calf production, with most (82%) raising adult cattle (Priyanti *et al.* 2012).

There are examples of specialized fattening households and feedlots in EJ that aggregate cattle from the households and crop residues from larger suppliers (including contract corn growers, wastes from rice and soybean processors, and plantations). There is a vibrant trade in feeds, including roughage (rice straw and corn stover) by large numbers of household feed traders.

There are distinct similarities between lowland systems in EJ and intensive systems of Central Lombok.

A semi-intensive production system is a mix of intensive and extensive systems that varies by season, feed supply and cropping cycles. Cattle spend more of their day grazing native grasses (and weeds) on unused land and straw/stalk/stubble on fallow fields, but are confined to pens at night. Cattle are penned for parts of the year where grazing provides inadequate nutrition or when grazing damages crops. These variations are found in Bima, Kupang and TTU.

There are extensive production systems in grasslands like Sumba Timur, where cattle are grazed all year round. They are penned at night, but are allowed to graze and scavenge around savannah grasslands, common or unfenced land, roadsides, the home yard or village surrounds.

In much of the world, cow-calf production systems predominate in extensive grazing areas, where young animals are turned off for growing and finishing in more intensive cropping areas. Cattle holdings generally increase and cattle prices generally decrease from more intensive to more extensive systems. While this pattern is discernible in EI, and can be seen to form the basis of regional comparative advantage, systems on the ground are rarely this clear-cut. The pattern is disrupted by small land sizes in EJ that preclude intensive fattening by households, local topography with pockets of different systems on any given island or district, and by restrictions to the movement of cattle between production systems because of transport, disease and domestic trade barriers.

However, as shown in Table 11, the relative importance of cattle exports to local slaughter increases from western to eastern provinces (28% in EJ, 35% in NTB and 141% in NTT). Growth in cattle numbers has been highest in western areas (EJ) and lowest in eastern areas (NTT).

Productivity

EI cattle systems are unproductive when measured through key indicators (calving rates, growth rates, turnoff rates etc.). However, productivity has to be seen as a function of output per unit of inputs (land, feed, labour, capital). EI cattle production is low-input, so low output indicators can be expected and production may not be as inefficient as suggested by cross-country comparison of the indicators.

Nevertheless, cattle production systems in EI can be seen as unproductive insofar as existing resources are under-utilised or not used in a strategic way to meet key constraints. This has as much to do with the knowledge, skills and animal husbandry / management techniques of farmers as it does with resource constraints. An example of cause and effect relationships is provided in Figure 3, which also shows the array of factors that lead to low calving intervals and growth rates in EJ. The most important factor is feed availability. Good cow nutrition, evidenced by good condition, is essential for high reproduction rates in cattle. Cows need to be fed sufficient quantity and quality of feed to maintain body condition, especially in the few months before and after calving when the energy demands of pregnancy and lactation are highest. Poor cow condition at calving results in a prolonged post-partum anoestrous, which in turn increases calving interval and reduces calving percentages. Inadequate nutrition of growing animals delays development of puberty in heifers and growth rates of fattening cattle.

In addition to improving cow nutrition, calving intervals can be reduced by weaning calves earlier and improving oestrous detection and mating management. Weaning calves reduces the energy demands of the cow and stimulates the cow to start cycling. Nearly all breeding in EJ is done through AI, so timely oestrous detection by farmers and the timely delivery of AI services is a key determinant of productivity.

Long calving intervals and high mortalities are exacerbated in Sumba, where Ongole cattle are grazed in harsh conditions.

While these principles apply to other parts of EI, differences in cattle production systems and breeds have to be accounted for. Virtually all of the cattle in NTB and West Timor are Bali cattle, which are adapted to the harsh conditions and low input systems, and maintain high fertility and conception rates. However, they are small in size and have low growth rates. In addition to this, low feed inputs and milk production, harsh climatic conditions and poor sanitation in pens results in high calf mortality (Mastika, 2003). Low penetration of AI in NTB and NTT means that the availability and selection of bulls for natural mating is important.
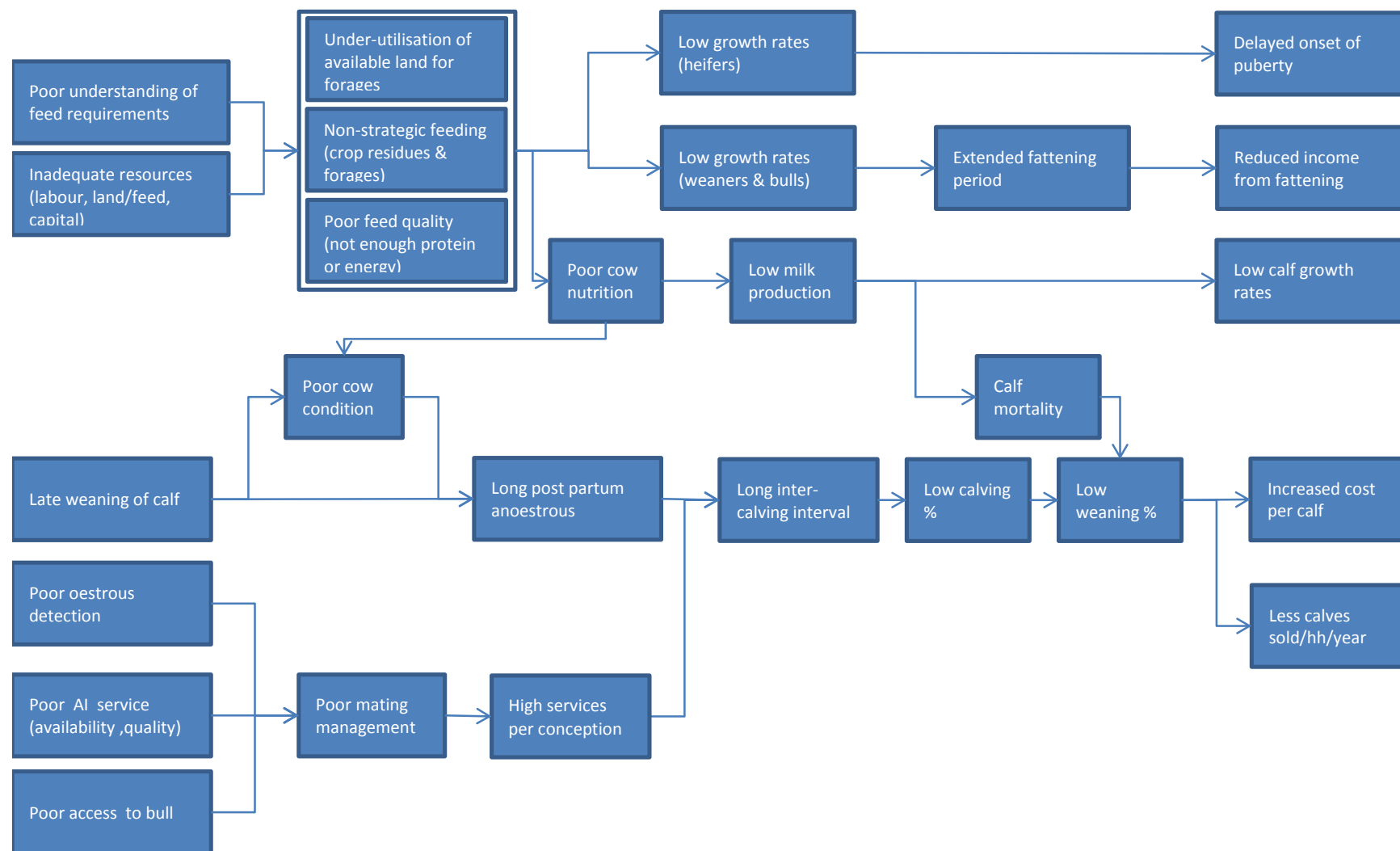
Source: Author's analysis

Figure 3. Problem tree for Ongole, Brahman and cross-bred cattle production in EJ

Poppi et al. (2011) summarise the problems in Bali cattle production – both technical and socio-economic – specifically in Lombok and Sumbawa.

- Inappropriate matching of feed supply with animal requirements, resulting in inappropriate calving patterns (a high proportion of calves born in the peak of the dry season) leading to reduced calf birth weight, high calf mortality rates, and low growth rates of suckling calves and other juvenile cattle (i.e. poor reproductive efficiency).

- Many females do not calve until 3–4 years of age, and this is followed by a long inter-calving interval.

- Calves are often not weaned, under the perception that cows spontaneously stopped lactating after 6 months.

- Bulls are rarely kept specifically for natural mating and there is no existing commercial bull-producing sector; farmers thought that bulls were unable to impregnate more than 10–20 females/year, and bulls were more likely to be traded as they returned a higher price than females and were considered difficult to manage.

- Cattle are penned or tethered during the wet season, meaning feedstuffs were cut and carried, water access was limited and conditions may have been unhygienic.

- Villagers are generally eager to adopt low-risk, low-investment strategies that had a high probability of increasing return on their capital and labour investment—apparently because most villagers have financial constraints.

Against this background of cattle production problems in EJ and NTT, Table 13 generalises the key elements, problems and solutions related to cattle productivity in smallholder systems in EI. It lists key stages in the cattle production (left column), key problems in the systems that lead to unproductive and downward spiralling cattle production cycles (middle column) and on-farm production practices that address the major production constraints to reverse the spiral and ultimately increase efficiency and returns for cattle producers (right column).

Table 13. Constraints and measures to address small-holder cattle productivity in EI

Cattle production cycle	Causes in low productivity system	Solutions in higher productivity system
Cow		
Cow frame, weight	Poor breed development or selection	Improved breed selection, culling and replacement (below)
Cow condition	Lack of feed throughout cycle but especially periods of peak demand	Maintenance of condition and supplementary feeding of cow immediately before and after calving
Foetal development of calf	As above	As above
Lactation	High demands of calf with late weaning	Separation of cows and calves during day, introduction of solid feed and calf feed mix and early weaning reduces demand of calf
Oestrus	Delayed by physiological stress & suckling of calf (Ongole & Brahman)	Better condition carried into calving. Weaning reduces energy demands of cow & stimulates cycling
Calving intervals	Can be >24 months Poor cow condition, long post-partum anoestrous, poor mating management	Can be <12 months, which increases productivity/output of cow Good cow condition, short post-partum anoestrous (<3 months), good mating management
Offspring		
Calf mortality	Can be >10% for Bali cattle. Inadequate nutrition of cow (during suckling) or calf (after weaning), poor hygiene	Can be 0% Adequate feed provided for lactating cow and weaned calf, clean kandang
Onset of puberty	Delayed Low growth rates due to inadequate nutrition	Bought forward Good nutrition and growth rates of calves
Growth potential	Low skeletal and physiological growth potential Inadequate nutrition	Higher skeletal and physiological growth potential Adequate nutrition
Sales value as calves	Low Poor condition & conformation	High (as heifers or fatteners) – price premiums for dressing percent and conformation possible
Female offspring		
Age of joining	Delayed Late onset of puberty due to poor nutrition & growth rates	Bought forward Earlier onset of puberty due to better nutrition and growth rates
Breeding value	Low, perpetuates low productivity cycle (top of table)	Higher value as replacement breeders (top of table)
Male offspring		
Growth	Stunted growth potential, low growth rates, inefficient feed conversion and higher feed costs per unit output	Higher growth potential & with improved feeding have higher feed conversion
Fattening period	Protracted Low rates of growth/fattening due to poor nutrition	Shortened Better rates of growth & fattening due to better nutrition
Turnoff age	Old Low growth rates due to poor nutrition	Younger Better growth rates due to good nutrition
Finance implications	Increases capital tied up in stock, reduced ability to access capital	Increased turnover of capital, more liquidity to meet cash needs, more attractive loan proposition

Source: Author's analysis

Interventions

Extensive and long-standing collaborative research conducted by ACIAR and Indonesian research and government agencies has focused on ways to increase productivity within the context of low-input cattle production systems. Interventions are based on simple and adoptable measures that can make the most efficient and strategic use of existing resources with little or no added cost.

The suite of management changes have been combined in an Integrated Village Management System (IVMS) system developed for small-holder production systems in EJ and NTB (ACIAR Project AS2/2000/103). The research has been scaled out in Lombok (SMAR/2006/096), and the principles are applied in the 'Straw Cow' project (LPS2008/038). Other projects have focused on calf management (LPS/2006/005) and forages (LPS/2006/003, LPS/2008/054). Combined, some of the key interventions are:

- Planting and managing tree forages, especially leucaena and sesbania. This is done on bunds in cropping land, fences, roadsides or dedicated tree areas.

- Better utilization of crop residues, in particular rice straw and corn stover (all areas);

- Feed strategies to involve the mixing of rations and treatment of straw.

- More efficient distribution of feed where lower grade feed (straw) is fed to cows for maintenance, and higher value feed to cattle with high energy demands (e.g. cows in late pregnancy/early lactation, weaned calves, fattening bulls).

- Increased control of animals through pen (kandang) facilities, necessary to match feed resources with animal requirements and for controlled mating. Improved kandang facilities (drainage) increase sanitation and reduce disease hazards for calves.

- In areas such as Lombok where groups are prevalent in more intensive systems, communal bulls and controlled mating have been introduced to displace free mating.

- A focus on calf management, including separation of calves from cows during much of the day to allow lactation build up in cows, the introduction of solid food for calves at a young age, preferential feeding of calves, and early weaning of calves. Project LPS/2006/005 (Evaluating strategies to improve calf survival in West Timor villages) conducted in West Timor (2007–2010) found that post-natal calf loss rates in NTT were very high (> 30%) but could be greatly reduced (to < 5%) when calves were given a supplementary feed.

- The aim of the improved cow-calf systems is to restore physiological functioning of cows to induce oestrus, to produce a calf every year.

- Increase calf survival rates, physiological functioning and frame size, thus increasing growth potential at fattening stage, and reducing age to slaughter weight and increasing turnoff rates.

- Research is being conducted on increasing the efficiency of fattening systems through low cost inputs (tree forages).

These interventions aim to address the highest priority constraints in small-holder cattle production systems at the lowest cost and in the most feasible ways. Integrated, whole farm and systematic changes to farming and management systems are required. That is, individual components of the production system cannot be addressed in isolation.

Trial results suggest high potential to increase productivity and incomes. For example, under the IVMS, breed choice, superior bulls, earlier weaning, controlled natural mating, strategic supplementation, use of tree and forage legumes and penning facilities can increase calf weaning rates (60% up to 83%), reduce calf mortality (10-15% to 8%), and increase calf growth rates (0.3 kg/d to 0.4kg/d), significantly increasing the number and weight of cattle for sale. Detail on the regimes, indicators and income effects in low and higher productivity systems are provided in Section 3.3.

Project LPS/2006/005 (Evaluating strategies to improve calf survival in West Timor villages) was conducted in three regencies of West Timor, Indonesia during the four years 2007–2010. It found that post-natal calf loss rates in NTT were very high (> 30%) but could be greatly reduced (to < 5%) when calves were given a supplementary feed.

Components of the production system not listed above include disease and veterinary care, breed improvement through introduced breeds, and seasonal adjustment of breeding cycles. These can form important elements of the production systems but the efficacy of the measures is dependent on more fundamental parts of the systems – feed, water, pens and management discussed above.

Finally, it should be noted that any intervention take into account the attitudes to risk of cattle producers. ACIAR projects (e.g. AS2/2000/103 and LPS/2008/054) found that farmers are risk adverse to new technologies and systems even if they are simple, low-cost and promise to generate economic and social benefits. Cattle development programs and schemes conducted by the GoI and other groups (and advocated in this report) alleviate some of this risk. Understanding and addressing attitudes to risk should be a primary consideration in any program undertaken.

Feedlots

For Indonesia as a whole, feedlots contributed up to 570,000 head of cattle or approximately 5% of the total inventory in 2008 (DG Livestock, 2010, cited in Deblitz *et al.* 2011). However, there has been substantial investment in the sector in recent years and is said (by the manager of a large feedlot group) to have a turnoff capacity of one million head per year. Import restrictions (Section 2.7.4) have led to high over-capacity in the sector in Sumatra (although feedlot capacity exceeds even peak cattle import levels).

However, the import restrictions and subsequent high cattle prices have benefitted feedlots in EJ. Feeder / input prices have increased, but the feedlots benefits more from the higher value liveweight gains. Feed prices have not increased much recently.

In East Java, three feedlots were visited:

- Agrisatwa (Sapindo) (2,500 head capacity);

- Santosa (12,000 head capacity); and

- Wahyu Utama (1,400 head capacity).

There are also about 10-12 smaller feedlots (around 500 head) that are more speculative, buy young cattle, and are said to be viable.

The three feedlots visited feed cattle for 120 days (three lines per year). On this basis, feedlots account for just 1% of the cattle herd in EJ. However, they account for 6% of turnoff (certified and uncertified slaughter and inter-regional trade). As such, they provide a significant market for small-holders producing feeders (> 250 kgs cross-bred males). In

principle, large feedlots would seem to have incentives to develop formal links with producer groups in EJ to secure supply.

Santosa and Agrisatwa purchase cattle through selected independent traders or their own purchasers who buy at markets. However, both said that they don't provide any services or have formal backward linkages to farmers, nor do they have any obligations to develop these. The development of more formalised relations, where producer groups produce cattle to feedlot specification (> 250 kgs, cross-bred, healthy animals, good feet) and secure sales channels, would seem to bring mutual advantages. There are benefits for the feedlots in knowing the source of cattle – groups that manage calves/feeders well have carry over effects into higher potential weight gains. Some feedlots (e.g. Santosa) have signed off-take agreements with larger suppliers of feeders (e.g. Wahyu Utama).

There are more direct relationships between a feedlot (1,200 head) and about 100 contracted fattening households, who also provide technical, finance and feed services (see Wahyu Utama in Table 25). While this is a small operation, it provides a useful model for AIPD-Rural activities in the sector.

There is no significant feedlot sector in NTB or NTT (although a feedlot is planned and being trialled in Lombok in association with the Meat Business Centre).

2.5 Cattle Marketing

Structure

The vast majority of cattle in EI are sold through an 'open' / spot marketing system (Figure 12). As shown in Table 14, farmers very rarely sell cattle in the market or to butchers themselves, but rather through brokers/collectors or local village traders.

Table 14. Cattle sales channels for surveyed farmers, East Java (%)

Sales channels	All cattle	Young cattle	Adult cattle
Seller	Farmer	Trader	Trader
Village traders	70		
Sub-district traders	15		
District traders	3		
Traders all types	See above	63-66	43
Other farmers	10	22-28	10
Butchers	2		40
Direct to market	2	9-12	16

Source: Mahendri et al., 2012

Village traders then sell:

- Calves and young cattle directly to other traders (63-66%), farmers (22-28%), or through live cattle markets (9-12%); and

- Adult cattle to other traders (43%), butchers (40%), farmers (10%) and through live cattle markets (16%).

District traders sold more cattle than other traders, averaging around 34 head/month, and roughly equal numbers of young and adult cattle (Mahendri *et al.* 2012).

While cattle are traded through private treaty between traders, a significant proportion of this trade occurs within the arena of periodic cattle market places. Butchers interviewed obtained a large proportion of their cattle from markets. Markets are most common and concentrated in intensive production systems (EJ, Lombok, Kupang), rare in semi-intensive systems, and almost non-existent in extensive production areas. Attempts to develop market places in sparsely populated areas with large distances have been unsuccessful:

- In EJ, Dinas statistics record 190 livestock markets, 110 of which trade cattle.

- In NTB, there are officially nine markets. Seven are on Lombok (one West Lombok, one North Lombok, two Central Lombok, two East Lombok, and one in Mataram but open two days per week) and two on Sumbawa Island (Sumbawa and Dompu). However, some of the markets are not functioning.

- There are only two operational cattle markets in NTT, both of which are Kupang District (Lili and Baun).

The size, trading days and infrastructure of the markets varies enormously. For discussion of the administration and regulation of the markets see Section 2.9.3 'cattle markets'.

Are the dominant EI open cattle marketing system efficient?

Stakeholders widely believe that cattle marketing in EI is inefficient and costly (long marketing chains) and subject to market failures (collusion and information asymmetries) that ultimately lead to farmers receiving prices lower than the real value of their cattle. However, two studies in EJ suggest that the marketing system is relatively efficient.

Mahendri *et al.* (2012) found that the margins of traders (village, sub-district, and district) in the marketing chain are low, including traders (about IDR 100,000 or 1% of the sales value of the animal) and butchers (IDR 150,000 or 1.5% of the value of the animal).

Priyanti *et al.* (2012) also found that farm-gate prices for cattle varied with liveweight, body condition, breed, and sex. For example, a crossbred animal obtained a price IDR 510,000 (13%) higher than a local cattle of the same weight and an improvement in body condition score from 2.5 to 3.5 increased the price obtained by IDR 1,000,000. This suggests that buyers of young animals were anticipating a higher growth rate, and that buyers of mature animals were expecting a higher dressing percentage or carcass weight from crossbred animals or animals in better condition. That is, the preferences and requirements of cattle buyers – growers, fatteners, and butchers – for growth potential and carcass quality are effectively transmitted through primary traders (i.e. village collectors) to small-scale cattle producers and expressed in a differential farm-gate price for animals with different attributes.

On this basis, both Mahendri *et al.* (2012) and Priyanti *et al.* (2012) argue that intervention in the marketing system is probably not warranted but that government has a role in supporting infrastructure (roads, market facilities and slaughterhouses) and regulating meat quality. These issues are discussed below. While these studies provide valuable information on the cattle marketing system, there are limits to the studies that should be acknowledged.

- Costs and margins of individual traders are indeed low (as a result of intense competition and low cost operations). However, cattle can change hands many times before slaughter. If they change hands three times before slaughter this can add IDR 300,000 to the costs of the animal (about 3%). Furthermore, cattle are very often traded several times on the same day in the same market, without adding any arbitrage value over space, time or form. This occurs because of speculative behaviour but also to enable trade to occur between parties that trust each other and, relatedly, have liberal finance terms.

- Cattle with different attributes have different values at farm gate, as is expected in any marketing system, and indicates that the marketing system is not dysfunctional. However, because price-grade values were only taken at one point (farm gate, not at markets or butchers), it is not possible to establish what proportion of the value of the attributes are passed back to farm level. As could also be expected in marketing systems based on subjective measurement and information, actors more experienced in appraising and estimating yields and value of an animal (butchers and downstream traders) are in a better bargaining position than actors with little experience (farmers, early-stage traders).

- However, these information asymmetries should become less relevant in competitive markets. There appears to be a strong case to argue that markets for local trade (traders, live cattle markets and butchers) are competitive.

- However, for inter-regional and inter-island trade, the presence of a large number of actors inside and outside markets does not necessarily signal high levels of competition. These actors work (in one way or another) for a very limited number of inter-regional traders that have export permits and quota, and that coordinate to divide trading territories and set prices (NTB, Bima, Sumba Timur) through formal and informal mechanisms.

- Returning to local markets, even with price-grade differentials at farm level, it should not be assumed that farmers receive clear signals through prices alone about what type of cattle to produce. Little (if any) other forms of feedback (communication, forums, linkages with downstream actors) exists. In this regard, cattle producers are not well integrated into the value chain, and receive little information on the preferences of buyers that can be used to target production or marketing systems.

- As also noted by Priyanti *et al.* (2012), the urgency of the sale can affect the farm-gate price. Households that sell cattle to meet immediate cash needs sell in unknown price/market conditions and when buyers know of a forced sale. A more pro-active and profit-maximising marketing strategy can address this.

- The Mahendri and Priyanti studies do not take into account the costs of downstream actors (butchers and inter-regional traders) to assemble cattle. As discussed above, inter-island/regional traders and butchers incur significant search, transaction and storage costs associated with assembling cattle to specification. If these costs can be reduced, then they would be prepared to pay higher prices for the cattle.

Hadi (2002, Table 8.1) simulated the impacts of 'Reducing the costs of marketing native cattle'. Analysis suggests that measures to reduce native cattle marketing would increase the farm price of native fattened cattle (10%), some of which is passed back as higher

prices to native cattle breeders (4.6%). This leads to increases in incomes of smallholder fatteners (39.1%) and to native cattle breeders (7.3%).

2.6 Processing

As a central component of the industry, it is important at this stage to sketch out the structure and features of the Indonesian and EI slaughter sector.

Perhaps the most important characteristics of the sector relates to ownership of product. A limited number of abattoirs in Indonesia purchase cattle outright for slaughter and then market their own beef.[2] The bulk of the sector consists of service kill slaughterhouses, where local government (or state-owned companies) provide slaughter facilities and jagal (butchers) retain ownership of product (cattle, beef, by-products). Jagal have high levels of integration in up- and down-stream sectors of the cattle and beef industry. They are major cattle buyers both inside and outside of cattle market places, and are closely integrated into the beef retailing sector through networks (their own, extended family and community) with stallholders in wet markets. Seventy-six percent of butchers in EJ are integrated into the beef retail sector (Mahendri *et al.* 2012).

Hadi *et al.* (2002) distinguishes between three different ownership structures in the sector:

- Regional Technical Service Unit (UPTD) – non-profit, government owned;
- Regional (local) State Business Enterprise (BUMD) – profit oriented, government owned; and
- Private Business Enterprise - small, registered.

Abattoirs visited were largely seen as providing a public service. Ownership of plants visited had been transferred from Dinas to local government, and run as state-owned companies or consortiums, with contracted professional managers.

Hadi (2002) based on DGLS (2001) identifies three types of slaughter units based on scale:

- Five Type A slaughterhouses (> 100 head per day);
- 35 Type B slaughterhouses (50–100 head per day); and
- 724 Type C/D slaughterhouses (5–10 head per day).

The overall structure of the slaughterhouses does not seem to have changed much. In 2009, there were 693 licensed slaughter houses and abattoirs in Indonesia which slaughtered 935,700 head of cattle. Fifty percent of the plants are located within Java.

Data from AIPD-Rural province includes:

- NTB has one provincial level slaughterhouse, and 41 district and sub-district slaughterhouses (two in Mataram, four in west Lombok, one in north Lombok, five in central Lombok, nine in east Lombok, two in west Sumbawa, nine in Sumbawa, five

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[2] There are a limited number of large, modern, mechanised abattoirs in Indonesia (Santori, Elders etc.) listed for Java in Deblitz (2011, Figure 7.17). Most beef processors produce various meat products which usually include beef and poultry. Companies like JapfaSantori are fully integrated from farm to processed product both in poultry and beef. Other companies combine their business with slaughter activities, imports and/or food distribution.

in Dompu, three in Bima and one in Kota Bima). There were two abattoirs with a slaughter capacity of 50-100 head per day located in West Lombok and West Sumbawa (The Government of NTB, 2009).

- The NTT slaughter sector is the most underdeveloped. There are 15 certified slaughterhouses in 21 districts in NTT, one in each of the fieldwork districts and two small registered plants in Kupang. Official statistics record 56 abattoirs in total (both certified and uncertified), nine in Kupang (one active), four in Sumba Timur (0 active), four in TTU (0 active). NTT no longer has a functioning abattoir that can slaughter bulls and ship frozen or chilled beef to Jakarta (Nimmo-Bell and ICASEPS, 2007).

- East Java has by far the largest slaughter sector (in Indonesia).

  o EJ has 158 registered slaughterhouses that kill an average of 1,024 head per day;

  o Three large slaughterhouses in and around Surabaya (Krian, Pegerian, Kedurus) account for 400 head per day;

  o Other cities also had substantial plants (50 head per day in Malang and five others with 10-20 head);

  o The mean number of cattle slaughtered per plant per day is two head;

  o All plants notionally have a Dinas inspector, and up to seven inspectors in the largest plants; and

  o All plants had Modin to supervise Halal slaughter, and up to 10 registered in even some smaller plants.

Because almost all slaughter is done in service kill plants, butchers are the dominant actors in the industry. Table 15 provides an overview of the scale of operations of butchers.

Table 15. Number of cattle purchased and slaughtered per month by jagal in East Java

Breed	Cattle bought per month (head)	Price of cattle (IDR/head)	Cattle slaughtered per month (head)
Local			
Male	18	7,682,692	16
Female	2	6,312,500	2
Crossbred			
Male	22	10,127,778	21
Female	6	7,000,000	6

Source: Mahendri et al (2012). Based on surveys with 34 butchers in 6 slaughterhouses in Malang, Probolinggo, Pasuruan, Sidoardjo and Tandes

In large slaughter houses there can be 100 butchers registered to use the plant, but there may only be one or two in small regional slaughter points. Each butcher has one (or more) teams of workers (four-five people). The butchers have very little equipment or overhead costs of their own ('a knife'). Butchers are often well coordinated and integrated through networks into retailing in markets. It is also important to note that cattle purchase is a major aspect of the operations of butchers, to the point that they are often known as (beef and cattle) traders. The butcher (manager) spends large amounts of time searching and

negotiating for good value cattle as a key determinant of profitability. Because of the skill and experience required to do this, the manager does this himself.

2.7 End Markets / Demand

It is important to recognize that there are two distinct markets for cattle and beef in EI. The first is where cattle are slaughtered for local beef consumption. The second is sale of cattle (slaughter or breeding) for the inter-island or provincial trade (no local beef consumption). In parts of NTB and much of NTT, the latter can account for more cattle than the former (Table 18).

2.7.1 Product uses

A large number of products are produced from cattle. The outputs at slaughter level are summarized in Table 16. The table shows that the vast majority of revenues from cattle slaughter are from beef (84%). This is reflected in the demand and preferences of butchers for cattle with high dressing percentages (that are a function of body condition, weight and breed). The high dressing percentage of the trial animal (64%) is a result of the large animal (582 kgs).

Even so, by-products (head, offal, bones) comprise a small proportion of the value of an animal. Hides makes up a slightly higher proportion (8%). The value of the hide may increase with the production of heavier animals (size), and breeding (e.g. thicker white hide from Ongoles are worth slightly more than red hides) but hide value is not a factor for producers in breed choice. Other practices that might increase the condition of hides (e.g. not branding) are impractical in semi-intensive or extensive grazing areas. For these reasons, by-products are not considered further in the study.

Table 16 also shows the large number of different beef cuts that are produced in the boning process (28 in this example), each of which have different yields, values and uses. Although this is higher than normal butchering (for the trial and the heavy animal), beef is butchered, traded and retailed with a relatively high degree of cut differentiation in EI. As discussed below, however, the degree of differentiation varies by slaughter and retail channels, with high levels of differentiation in butcher shops and supermarkets and fewer (but still many) in wet markets. This has important implications, which are also discussed below.

Table 16. Slaughter products, yields and prices in Surabaya 2011

Product	Yield (kgs)	Price (IDR/kg)	Revenue (IDR)
Beef			
Tenderloin	4.5	60,000	
Striploin	11.9	57,000	
Cuberoll	6.95	54,000	
Knuckle	11.5	50,000	
Gandik	5.65	50,000	
Topside	17.5	50,000	
Outside flat	10.95	50,000	
Chuck	46.35	49,000	
Chuck tender	3.15	50,000	
Blade	21.75	49,000	
Rump	11.5	50,000	
Shank	18.2	49,000	
FQ 85CL	42.95	38,000	
FQ 65CL	9.75	27,000	
90CL	0	44,000	
Fat	25.05	9,000	
Tendon	2.65	23,000	
Shortrib	8.15	35,000	
Backrib	4.65	28,000	
Spare rib	3.35	11,000	
Konro	2.4	23,000	
Brisket bone	7.3	9,500	
Neck bone	5.2	9,000	
Oxtail	1.45	35,000	
Toptail	0.0	7,000	
Total Beef	**282.8**		**6,269,748**
Bone	**38.3**	**2,500**	**95,750**
% of total revenue			1 %
Hide	**50.0**	**12,500**	**625,000**
% of total revenue			8 %
Total Head and Hooves			**225,000**
% of total revenue			3 %
Total Other Offal *			**250,000**
% of total revenue			3 %

* Includes: heart, lung, liver, gall, stomach, intestine, spleen, pancreas, offal fat, blood

Source: Slaughter results from Surabaya slaughterhouse on cross-bred bull, 582kg empty.

Raw beef is of course transformed for consumption. Figure 4 provides a snapshot of the form in which households buy meat in Indonesia drawing on household consumption

survey data (SUSENAS). [3] The data disaggregates between four major meat types: 'preserved meat'; 'offal and bone'; 'meals'; and 'fresh meat'.
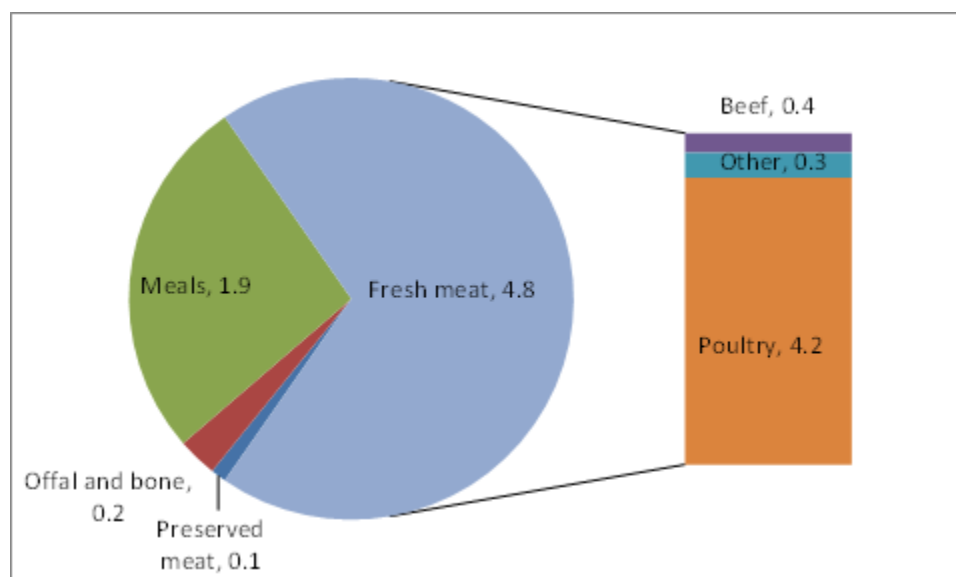
Source: SUSENAS, BPS reported in DGLAHS (various years)

Figure 4. Annual per capita consumption of meat products in Indonesia, 2010 (kgs)

Preserved meat and offal are small consumption items. The greatest proportion (69%) of meat purchased by households is 'fresh' (actually meaning meat cuts that may be fresh, chilled or frozen) and cooked at home. Consumers also buy a significant proportion (27%) of meat already prepared by restaurants and stalls as 'meals' (soups, soto, gule, rawon, sate, toneseng, goreng, bakso). A large proportion (often reported as the majority) of beef in Indonesia is consumed as meat balls (bakso), mixed with various ingredients (fat, flour, offal and even chicken, given price relativities).

In this regard, Indonesian purchasers (mainly women) have a high awareness of the type of beef cuts that are best suited to different Indonesian dishes. These preferences have evolved over time (e.g. rendang requires firm and dry beef; bakso meat should be firm). The preferences are also promoted by consumer awareness campaigns, especially supermarkets that hang posters and label beef trays to link cuts and dishes. These are formalised in national beef standards (Jenis potonnegan daging dan peruntukannya, SNI3932:2008, DGLAHS).

Consumer preferences and standards for cuts impact on upstream industry activity. Butchers need to train their slaughter teams to butcher the cuts (without offcuts that reduce weight/volume, or downgrading the product). Butchers aim to buy cattle with developed muscle areas of higher value primal cuts (e.g. loins, fillets and hindquarter). Indeed, their skill and 'eye' to select cattle with high carcass yields of primal cuts – relative to price – is the key source of profitability for butchers. These preferences should notionally be passed back to producers. However producers are far less knowledgeable

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[3] Household Food Expenditure and Consumption Surveys reported in national socio-economic household survey (SUSENAS) conducted by the Bureau of Statistics (BPS). BPS conduct surveys of large numbers of households nationwide (75,000 in 2011) and reports on household expenditures and quantities both in and out of home on weekly basis.

about the live weights, carcass weights and conformation of their cattle, so price/grade differentials are not fully relayed back to production level. Implications for cattle marketing are discussed in Section 3.4.

2.7.2 Demand structure

There are three major types of retail channels: wet markets, supermarkets and butcher shops. While the outlets retail and purchase beef differently, there are not always implications for upstream demand and actors, especially back to cattle production level.

Wet markets

Wet markets account for the vast bulk of beef sales. Stallholders in wet markets are specialised in selling beef, and often different types of beef products. Stallholders get supply from butchers, through close working relationships and very often family and community relationships. Of the beef buyers at wet markets, perhaps 60% are household consumers, 30% are meatball and soup stallholders/peddlers (in Java where meatballs are popular) and 10% are restaurants and supermarkets (Hadi *et al.*, 2002). For a recent account of retail and slaughter structures in EJ see Mahendri *et al.* (2012).

Supermarkets

Beef sold through modern channels accounts for small proportion of overall beef sales (3% for Indonesia as a whole in the early 2000s, Hadi, 2002). Supermarkets are thought to be increasing their market share (Sullivan and Diwyanto, 2007; Morey, 2011). However, there is little data to quantify increasing volumes. The Modern Retailer Association (APRINDO, cited in Morey, 2010) estimates that 'modern' retailers sell just 12,700 tonnes of beef per year, of which hypermarkets and supermarkets account for about 50% each. Volumes are much lower in EI, as supermarkets are only prevalent in big developed cities. There are no supermarkets in Kupang, where meat shops act as substitute channels.

The impact of growth in the supermarket sector on upstream activity or actors is often and easily exaggerated. Most supermarkets, even those organised in chains, buy beef from wet markets, or slaughter channels that are exactly the same as beef that is supplied (by wholesalers) into wet markets. The supermarkets visited had no distinct demands or standards (beyond cut differentiation). Supermarkets further butcher, trim, package, label and present beef in cabinets, and can refrigerate beef, and mark up prices for the services they provide. However, as they don't purchase through distinct channels with different price-grade structures, there are few implications for chain structure or upstream, especially back to primary production level.

Furthermore, the volumes per supermarket are small (see Table 17, which conforms to supermarket interviews in Surabaya and Mataram).

However, supermarkets derive beef from legal, certified slaughter houses, and sell hygienic beef. There may also be opportunities for high-end abattoirs to establish more formal supply channels with supermarkets (see Section 3.7).

Table 17. Beef sales in surveyed supermarkets in East Java, 2011

Supermarket	Type of Beef	Supplier	Capacity
Matos Hypermart, Malang	Local	PT. Sukanda Djaya and PT. Fedoratama from Surabaya	3 times a week @ 225 kg/week
Carrefour, Malang	Local	PT. Sukanda Djaya and PT. Fedoratama from Surabaya	4 times a month (250 kg/week
Giant, Pasuruan	Import Local offal	Imported from Jakarta (Cibitung) and Surabaya PT. Fedoratama from Surabaya	50 kg/ 2 weeks 5-10 kg per item / 2 weeks
Carrefour, Pasuruan	Local	PT. Fedoratama from Surabaya	100 kg / 2 days Fasting period and Idul Fitri reached 300 kg/day
Lotte mart, Sidoarjo	Local Import	RPH Pegirikan, Surabaya Imported from Surabaya	50 kg/days (5-6 days) Fasting period and Idul Fitri reached 100 kg per day Import: 75 kg/days (5 days)
Giant, Sidoardjo	Local Import	PT. Fedoratama PT. Wonokoyo (import)	
Hypermart, Royal Plaza Surabaya	Local	PT. Sukanda Djaya and PT. Fedoratama, Surabaya	22 kg /3 days Offal : 5 kg/week

Source: Source: Mahendri et al. (2012) surveys conducted September 2011

Butcher shops

There are dedicated meat shops in most provincial capital cities and some district capital cities. In cities where there are no supermarkets, butcher shops are the outlet for more hygienic and better presented beef (Kupang). In this regard, they can be seen as a substitute beef retail outlet. The share of beef sold through meat shops in a given city is small, perhaps similar to supermarkets. The full range of beef and beef products are sold at prices similar to those at supermarkets to household customers. However, butcher shops offer scope for upstream integration upstream in slaughter. Other forms of integration to retail level are Wahyu Utama (restaurants and wet market stalls back to cattle production) and the Mataram Meat Business Centre (outlets, slaughter facilities and plans in the production and input sectors).

As mentioned in Section 2.2, ceremonies also generate high demand for cattle and beef in particular times of the year and events. These can also be delivered through structures other than those mentioned above. For Idul Adha, cattle are slaughtered at and beef distributed by mosques. For events (weddings, funerals, graduations) cattle are also killed locally and distributed to guests.

2.7.3 Demand trends

Figure 5 below show that poultry is by far the most consumed meat in Indonesia, followed by beef as a distant second. As could be expected, total protein intake increased with national economic recovery from 1999 to 2002. Intake from fish and eggs/milk increased

over the 2000s while intake from cereals decreased. Protein intake from beef also grew from 1999 to 2002, but stagnated thereafter. Fresh beef accounts for just 0.37 kgs per capita per year and levels declined from 0.57 kgs in 2002 and 0.42 kgs in 2007. However, if beef accounts for, say, one half of the meat used in meat 'meals', then beef consumption is about 1.3 kgs/person/year.[4]

Source: SUSENAS, BPS reported in DGLAHS (various years)

Figure 5. Household protein intake by selected food groups in Indonesia, 1999 and 2002-2011

Consumption studies provide insights into the determinants of beef demand into the future. Hutasuhut *et al*. (2001) draw on SUSENAS data and find that drivers of beef demand include:

- Population growth of 1% per year (though based on figures above this would increase beef consumption by just 3,500 tonnes per year).

- An urbanisation rate of 1.7% per year, which is significant given that Hutasuhut *et al*. (2001) find that expenditure elasticities for beef are higher in urban areas than in rural areas.

- Growth in per capita incomes, which is important given the findings of Hutasuhut *et al*. (2001) that expenditure elasticities for beef are positive (but lower than chicken at the time).

- As a normal consumption good, the high price of beef in Indonesia constrains consumption quantities.

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[4] This figure resembles the "per capita availability" of beef of 1.4kgs in 2010 that is calculated by DGLAHS annually (based on FAO Food Balance methods).

- Cross-price elasticities suggest that chicken is a substitute for beef (i.e. if the price of chicken increases the quantity of beef demanded will increase).

In developing its self-sufficiency program, the DGLAHS projected that beef consumption would increase by 17.6% over the four years from 338,700 tonnes in 2010 to 398,300 tonnes in 2014.

2.7.4 Trade

International trade

The Indonesian cattle industry has a large international trade sector in cattle, beef and offals. The trade sector is dominated by imports, which is impacted strongly by trade policy, necessarily discussed here.

Following broader liberalisation measures and accession to trade groups (including WTO in 1995), Indonesia adopted a liberal trade policy to cattle and beef. This is particularly the case for tariffs. A 0% tariff is applied to breeders on the rationale that they grow Indonesia's herd (although these make up a very small proportion of cattle imports). Feeder cattle were also imported duty free, subject to the requirement of the maximum weight of 350kgs on the basis that the value of weight gain is captured by Indonesian feedlots and used in breeding schemes. A 5% tariff is imposed on imported beef and offal. Under the ASEAN, Australia, and New Zealand Free Trade Agreements, tariffs on bovines, beef and beef offal are to be eliminated or phased out.

Despite this, trade policy has become increasingly protectionist in recent years, particularly toward Australian imports. This coincides with the most recent self-sufficiency program (PSDSK) and was accentuated when animal welfare concerns led the Australian government to ban the export of live cattle to Indonesia for a month in 2011 leading into the peak consumption period of Ramadan. Trade restrictions include stricter enforcement of the 350 kilogram limit, while in 2012 a 5% tariff was introduced for cattle imports except 'oxen and breeders' (which is open to interpretation and contestation) (Nason, 2012b).

However, the import quota is by far the major policy instrument used to restrict imports. This is effectively done through reduced allocations of import permits. From a peak of 781,000 head of live cattle imported in 2009, the GoI imposed a limit of 520,000 head of cattle to be imported from Australia during 2011, 283,000 head for 2012 and 238,000 for 2013. For beef, from a peak of 91,000 tonne in 2010, imports of boxed beef have also declined due to quota restrictions. After additional quota was issued in 2012 (8,300 tonne and 7,000 tonne), the total allocation was 41,000 tonne, or about 10% of Indonesia's beef production.

Indonesia imposes total country bans (not based on area of freedom) for Foot and Mouth Disease (FMD). Australia, New Zealand and Uruguay are FMD free, while Brazil and India are not 'allowable country of imports' for beef. Measures to relax the laws were rejected by parliament in 2010 although press reports suggest that the issue is being revisited (Nason, 2012b).

A combination of policy, production, consumption and price factors culminate to forge a dynamic trade sector for cattle, beef and offal reported in Figure 6. Indonesia has a large import sector relative to domestic production, and imports increased rapidly over the 2000s for both cattle and beef.
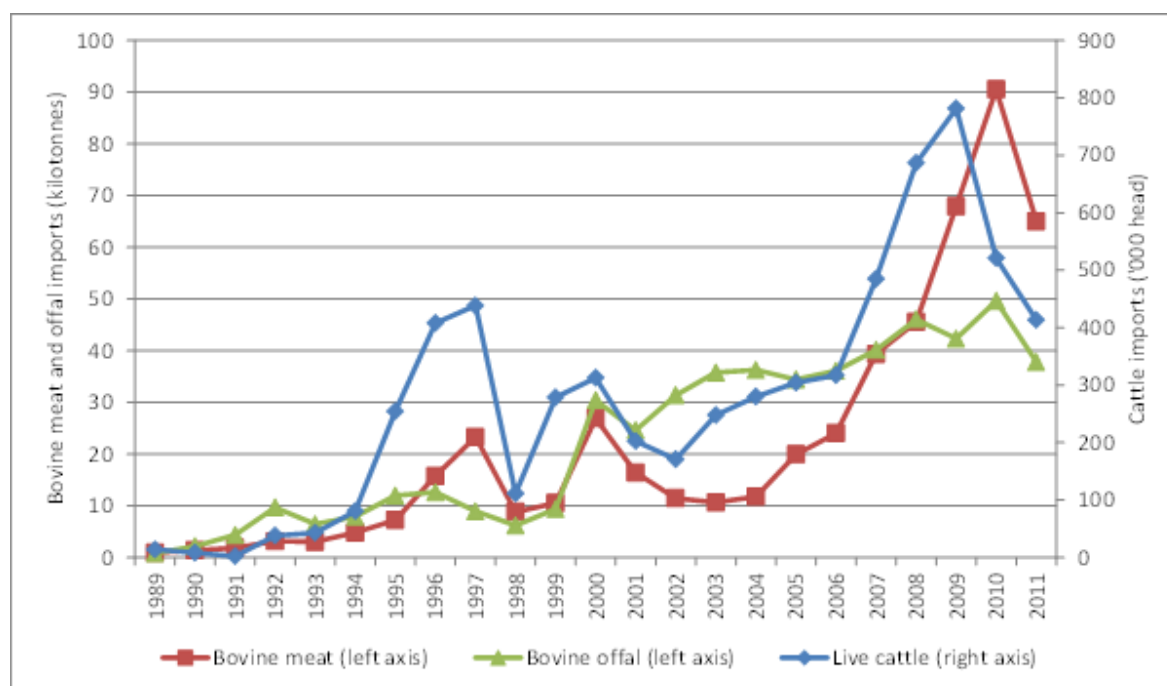
Source: UNComtrade, FAOStat and MLA.

Figure 6. Indonesian imports of bovine meat, offal and cattle from world / all sources, 1989-2011

Virtually all cattle imported into Indonesia are from Australia, and virtually all of these are feeder cattle rather than breeders. The average unit value of imported feeders in 2009 was US$560 (if 350 kgs would be $1.60/kg). Virtually all legal beef imports are from Australia and New Zealand, in frozen form. The average value of imported frozen beef in 2011 was $US 3.5/kg, and US$5 for fresh beef. It is widely known that a significant amount of buffalo meat is smuggled in from India.

Offal imports increased less abruptly than beef and cattle in the 2000s. However, there has been a large increase in value from US$ 0.6/kg in 2003 to US$ 2.3 in 2011. The vast majority of offal has come from Australia and New Zealand, but the US became a significant supplier in 2010-11 (FAOStat).

These general price levels of this imported product can be compared with beef prices in Indonesia (Figure 7) and producer beef prices worldwide and in selected countries (Table 4). Cattle and beef in Indonesia are very expensive, which suggests that the industry is not competitive without protection. However, even in this case, the scale of beef demand means that imports will not displace domestic industry, especially in EI which is less integrated into international markets. Demand for cattle can be expected to remain strong under a range of international trade policy scenarios.

Domestic live cattle trade

With restrictions on the import of cattle and beef from overseas, with beef a small but regular part of the Indonesia diet, and with policy measures to increase breeding stock populations, there is high demand for both slaughter and breeding cattle across Indonesia. EI is an important supplier of cattle for nearly the entire Indonesian archipelago and has a significant domestic trade sector in live cattle. Aggregate provincial trade flows are shown in Table 18.

Table 18. Domestic trade of cattle in EJ, NTB and NTT, 2001-2012

	EJ slaughter cattle export	EJ slaughter cattle import	NTB slaughter cattle export	NTB breeder export	NTT slaughter cattle export
2001	154,594		15,675	616	
2002	122,555		11,412	3,105	
2003	129,149				35,061
2004	134,973		14,260	3,991	44,901
2005	135,520		21,909	4,249	48,519
2006	138,691	6,000	14,791	9,489	61,275
2007	142,551	6,500	16,283	10,687	63,036
2008	146,583	5,500	15,823	13,445	
2009	146,832		8,248	8,193	58,392
2010	126,830		5,601	3,978	49,876
2011	148,593		12,384	7,131	60,000
2012	147,000		13,476	13,400	66,000

Source: Provincial Livestock yearbooks, various years

These trade flows must be understood within the regulatory and disease framework (see Section 2.6.3). The regulations (see 2.6.3) mean that the market for live cattle is confined to slaughter cattle (bulls) from EJ and NTT and breeding cattle for NTB.

As the largest cattle province in Indonesia, and with high demand especially to the other parts of Java, especially Jakarta, EJ has a large live cattle export trade (148,000 in 2011). Of the 126,830 slaughter cattle exported from EJ in 2010 (based permits issued by Dinas Livestock):

- 2,600 breeders and 25,500 fatteners were shipped, with most going to Kalimantan, and small numbers to Sulawesi and Sumatra (as recorded by Quarantine, Balai besar karantina pertanian Surabaya); and

- The remainder (approx. 100,000) were trucked to Jakarta, West Java and Central Java. These figures are under-stated by about 30% because it is not possible to monitor all road trade (Dinas Livestock EJ).

The high demand for slaughter cattle also extends to NTT. Cattle from NTT are exported by ship mainly to Jakarta, through Surabaya and Kalimantan. Of the 66,000 slaughter cattle exported from NTT in 2010:

- Kupang accounted for 26,453;

- TTU for 8,212 (although this is likely to be significantly under-stated); and

- Sumba Timur 4,431 (although this increased to 6,300 in 2012).

The disease status of NTB makes it by far the largest exporter of Bali breeding cattle in Indonesia (13,600 head). The trade is regulated by standards for Bali cattle breeders, 'base prices' set by provincial government, exporter permits and quota (see section 2.6, Table 21). NTB also exports significant numbers of slaughter cattle.

- In 2012 Bima District exported 9,600 cattle, 9,000 of which were slaughter cattle. The majority of these are for inter-provincial exports, rather than inter-island to Lombok.

- As shown in Table 18 cattle exports make a very large part of cattle sales in NTB and NTT. The proportion of cattle exported to local slaughter is 28% in EJ, 35% in NTB and 141% in NTT. This has important implications for the way that production and marketing is and should be conducted.

2.8 Prices

2.8.1 Price trends

Figure 7 represents weekly beef prices in four cities (Jakarta, Surabaya, Denpasar and Mataram) and, for comparative purposes, chicken meat prices in Jakarta and an inflation index. Beef prices in Indonesia are high by world and regional standards. Over the 2001-12 period, beef was also an average of three times more expensive than the most highly-consumed meat, chicken. High beef prices in Indonesia reflect high costs at various stages. Reflecting transport and arbitrage costs, the price of beef in Jakarta is considerably higher than it is in cattle production areas to the east; an average of 11% higher over the period than East Java (Surabaya), and 35% higher than Bali (Denpasar). However, Mataram prices (only available in this series for 2012) are similar to Jakarta. The prices tended to move together in the short term suggesting an integrated beef market.
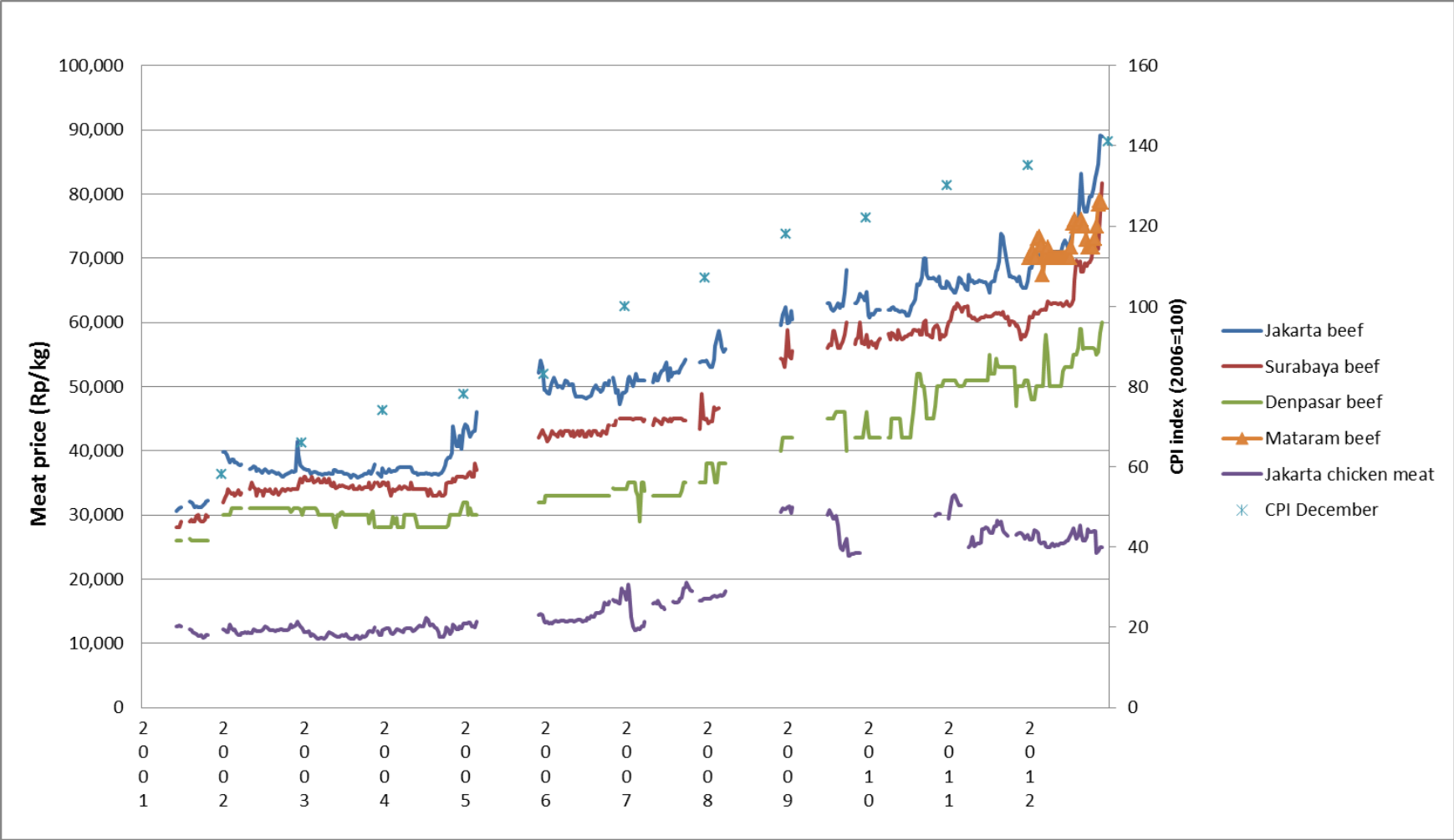
Source: MoA (various years)

Figure 7. Inflation, beef and chicken meat prices in selected cities, 2001-2012

Beef prices increased rapidly between 2001 and 2012 at an average of 10.6% per year in Jakarta. This was in line with increases in chicken prices, lower than average inflation rates and lower than expected GDP and income increases, making beef no more expensive for the average consumer. However, due to import restrictions, prices increased in the latter half of 2012 well above inflation, previous years and other commodities.

2.8.2 Quality premiums

In developed beef industries and consumer markets there are a large number of quality attributes of beef (color, tenderness, juiciness, flavor, and leanness/fat). As established, there are preferences for different cuts for different Indonesian dishes, which reflect the attributes of those cuts (Table 16). There are also national beef standards (SNI 3932:2008) that specify language and measurements used to define quality of cattle (age, breed, sex), beef (cuts, muscle and fat colour, marbling), processes (freezing), certification and labeling (Halal) and microbiological standards. However, industry informants and fieldwork said that these standards are used as a reference only and don't form the basis of trade (not widely recognized, accepted and used).

Beyond differentiation of cuts, there may be other more minor preferences of consumers.

- Higher value beef in supermarkets and butcher shops tended to be lighter in colour than in low value wet markets (related to age of animal).

- Consumers use sensory methods to establish 'quality' (fat, colour, smell/hygiene, warmth/ freshness).

- Perhaps most importantly, more affluent consumers have a willingness to pay for safety assured product, or that is from a certified or known source.

- There didn't seem to be many other attributes that were valued or that have implications for the cattle from which the beef is derived.

The following provides an indication of the premiums that affluent consumers are prepared to pay for the services and hygiene (all else being equal):

- A butcher slaughters two Bali bulls per day at the Mataram slaughterhouse (the slaughterhouse and the butcher are certified).The butcher or his customers have no specifications for the bulls slaughtered;

- The butcher sells primal cuts for IDR 75,000/kg to both market stallholders and a beef trader;

- The loins are retailed at the Mataram wet market for IDR 80,000/kg;

- The same product / cuts are sold to a beef trader (IDR 75,000/kg) who then distributes to the supermarket and sells for IDR 85,000/kg; and

- The supermarkets sell portions of the beef for IDR 9,900 per 100 g pack.

2.8.3 Price seasonality

To establish price seasonality, Figure 8 shows weekly prices for the major beef market of Jakarta. It confirms that beef prices increase substantially in the months around Ramadan (Muslim fasting period) and during the festive period (Idul Fitri; 21/9/09, 10/9/10, 31/8/11, 8/8/12). Between July and September, prices increased by 10% in 2010 and 8% in 2011.
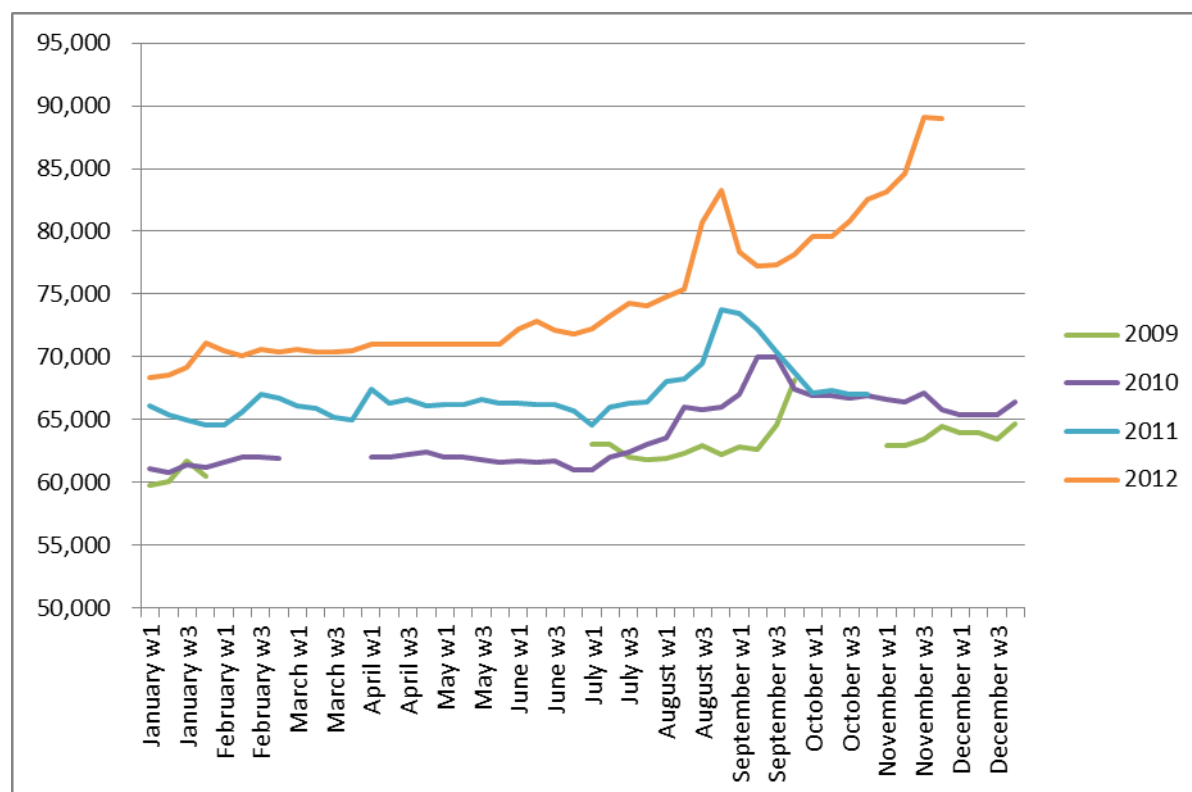
Source: MoA (various years)

Figure 8. Weekly beef prices in Jakarta, 2009 to November 2012

This seasonal pattern is long-standing and well-known. Hadi (2002) notes that sales increase by 50% up to 400% (depending on the province/area) on big holidays/festivals in wet markets, supermarkets and meat shops, and cattle and beef supplies can be hard to access.

The other major feature of Figure 8 is the rapid increase in beef prices in the latter half of 2012 due to cattle and beef import restrictions.

Research conducted by Mahendri *et al.* (2012) also finds considerable seasonal price variation for cattle prices purchased by butchers (see Table 19).

Taking advantage of these demand and price increases through targeted cattle production systems requires practices including controlled mating, feeding to time and cattle specifications and aggregation. This can be demanding and impractical in some cases (controlled mating in extensive systems) but may provide opportunities in other areas (Section 3.3).

Table 19. Seasonal cattle price differences for butchers in East Java, 2010

	Normal season	Low season	Peak season
Price of local cattle			
Male	7,913,462	6,854,388	9,230,769
Female	7,000,000	5,000,000	6,750,00
Price of cross-bred			
Male	10,175,000	9,664,583	11,455,357
Female	8,000,000	7,000,000	7,750,000

Source: Mahendri et al. (2012). Based on surveys with 34 butchers in six slaughterhouses in Malang, Probolinggo, Pasuruan, Sidoardjo and Tandes

2.9 Policies and Regulations

The EI beef industry is impacted heavily by a large array of sectoral policies and regulations. This section focuses on the most relevant policies to the project. For ease of interpretation, they can be ordered to form a 'policy hierarchy' shown in Figure 9. The hierarchy is ordered from:

- Guiding principles and plans formulated at the highest level of policy-making;

- To the 'flagship' beef cattle self-sufficiency program that sets the agenda for lower level policies and schemes;

- To specific industry policies and schemes in production and agribusiness sectors; and

- That are implemented and taken up by agencies and actors at the bottom of the hierarchy.

These directives and signals have a large and direct effect on industry activity at all levels. They must therefore be taken into account for AIPD-Rural purposes, both for their role in distorting market/industry development, but also in providing opportunities for the project.

Before examining the policy settings, various international studies have modelled the efficacy of Indonesian beef policy measures. Hadi *et al.* (2002) and Vanzetti *et al.* (2010) both find negative net welfare effects from trade restrictions, and that the most effective policy area to benefit smallholder producers and consumers is through research and development to increase the productivity of native cattle (although this can have lagged time to impact). Vanzetti *et al.* (2010) find that credit provision has a neutral impact. Rather than a sole production-side approach, Deblitz *et al.* (2011) argue for a more whole-of-industry and market-led approach.

2.9.1 National plans

Examples of cross-sectoral plans that relate to multiple industries include:

- Indonesia's Economic Masterplan (Masterplan for Acceleration and Expansion of Indonesia Economic Development) 2011-2025. Coordinating Ministry of Economic Affairs (2011). Under the plan:

- o The corridor of Bali and Nusa Tenggara (NTB/T) are to develop through tourism and contribute to national production; and

- o Drive the national development of industry and services.

- The Ministry of Agriculture five year plan 2010-14 (National Medium-Term Development Plan (NMTDP) for 2010-2014).

- Indonesia's National Medium-Term Development Plan (2010-14) targeted five commodities to achieve 90% self-sufficiency by 2014 – rice, soybean, sugar, maize and beef.
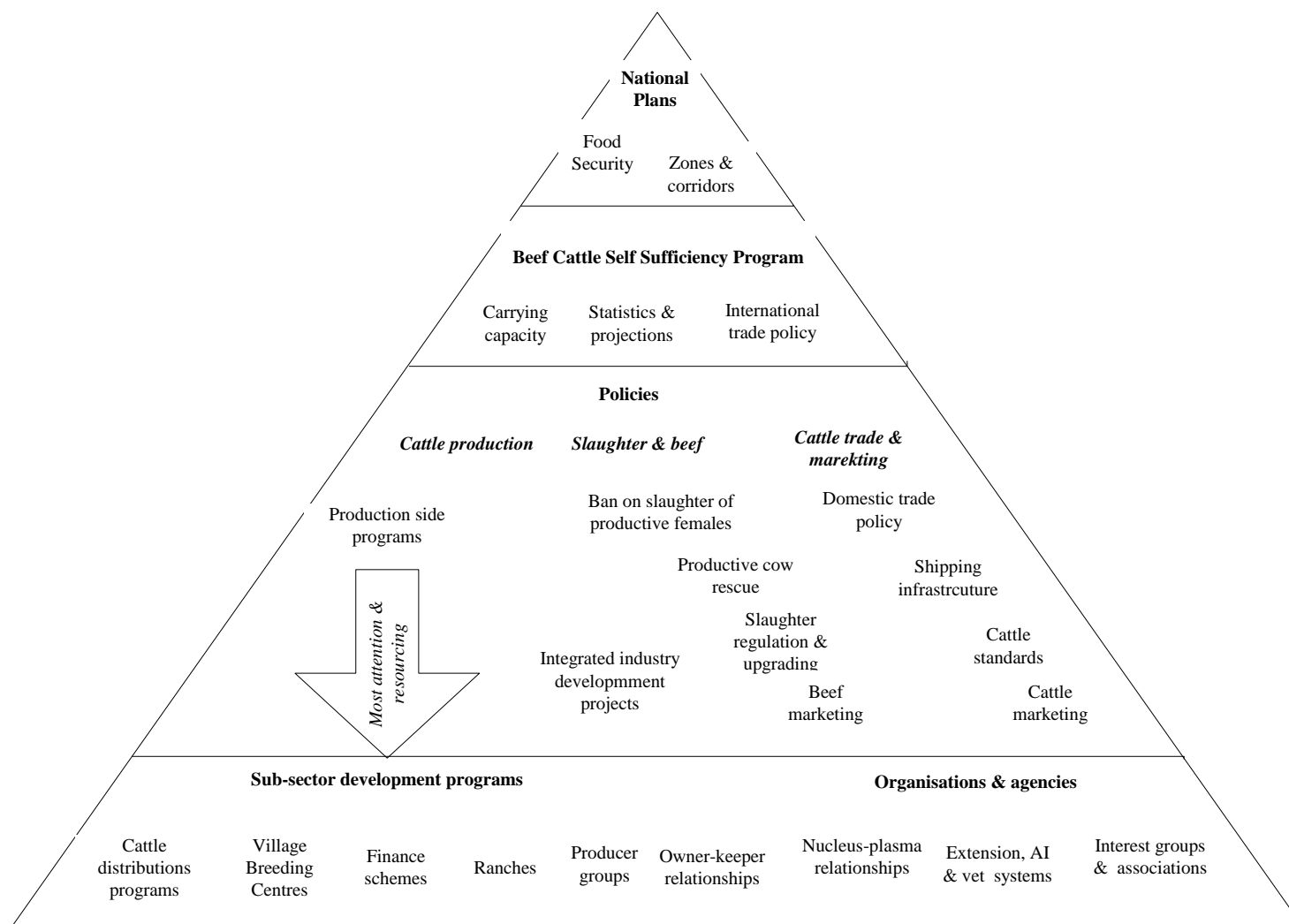
Source: Author's analysis

Figure 9. Policy hierarchy for the EI cattle and beef industry

2.9.2 The beef cattle and buffalo self-sufficiency program (PSDSK)

Beef was introduced into Indonesia's self-sufficiency programs in 1999. The first program aimed to achieve self-sufficiency in beef by 2005 (Ilham, 2006) and another cabinet launched a second program to achieve self-sufficiency by 2010. The Beef Cattle and Buffalo Self-sufficiency program (PSDSK) began in 2008 and is Indonesia's third beef self-sufficiency program, with a time frame to 2014.[5] Indonesian commentators emphasise that previous self-sufficiency programs have been under-resourced, and that funding has increased dramatically in the current PSDSK (Prabawo, 2011). Government has allocated IDR1.5 trillion for 2013 (which equates to US$156 million per year or US$10 per head of the Indonesian cattle herd). Investment for the program originates from government (10%), private (20-30%) and farmers (60-70%). There is also a much higher level of political commitment to the current program.

The targets of PSPDK include:

- To increase Indonesia's beef cattle herd to 14.23 million head by 2014 (annual average growth 12.4%);

- To increase beef production to 420,200 tonne (10.4%);

- To restrict imports to 32,000 tonne (10% total consumption);

- To increase employment in the industry by 76,000 people per year;

- To increase revenue for producers to minimum provincial wages; and

- To ensure a beef supply that is 'ASUH'. Safe (free from contaminants and residues), healthy (free from potential disease), intact (not mixed with other meats); and Halal (conforms to the rules of Islam).

Results from the bovine census were used to pronounce that the 2012 target had been achieved, that the PSDSK program was on track (see Section 2.3.2) and indeed that the budget planned for the program (IDR 10.65 trillion over 5 years) could be pared back (Prabawo, 2011).

Provincial policy-makers participate in PSDSK by increasing cattle production to fill both national and provincial objectives. AIPD-Rural provinces have ambitious cattle expansion goals.

- East Java has implemented the Madura Sapi Berlian (Diamond Cattle) program with the aim of producing 5 million calves within five years. This program is an acceleration of a previous program that aimed for artificial insemination (AI) of one million cows. The projected growth rate for beef is 2.7%.

- The government of NTB has launched the Bumi Sejuta Sapi (BSS, land of one million cattle) program, which aims to make the province a key source of local breeds and to increase the beef cattle herd from 685,000 to 1 million head by 2014.

- The government of NTT has launched the 'anggur merah' (red wine) program to speed up economic growth and reduce poverty in which the beef cattle sector development is a strategic focus. Since 2010, provincial government has declared

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[5] Regulation of the Minister of Agriculture of the Republic of Indonesia No.19/Permentan/OT.140/2/2010

NTT a 'livestock province' with a 'one citizen, one cattle' program, aiming to return NTT to a position as one of the country's main suppliers of livestock, with 4 million cattle within the next 5-10 years.

Trade policy

Trade policy is a central component of the beef self-sufficiency program. Import quotas are set to fill the 'shortfall' between projected domestic beef supply and projected demand. The same rationale is used by provincial policy to set domestic trade policy (imports and exports of different types of cattle). For details on international and domestic trade policy, see Section 2.4.4.

Carrying capacity

Measures to increase cattle numbers and productivity raise the question about the availability of feed resources to support the increased production pressure. Policy-makers tend to assume that Indonesia has large amounts of untapped feed resources (grasslands, crop residues, plantation residues and land on which forages can be planted). This may be a valid assumption (especially for residues and forages). However, there is considerable conjecture amongst researchers and policy-makers about the carrying capacity for Indonesia's growing cattle herd. Major problems arise from the over-estimation of carrying capacity that leads to over-stocking. Over-stocking means that available feed has to be apportioned over more cattle and that available feed is used for maintenance rather than production (calving and weight gain) and degrades the resource base (especially grasslands, leading to lower grass growth and higher weed growth). Much of the research conducted to increase and better utilise feed resources in ACIAR projects is based on the premise that farmers should increase the quantity and quality of feed for existing herds to increase productivity and incomes, rather than expanding herd sizes.

The pressures on land are most intense for EJ, where 74% of land is already used for agriculture and where the poor have small land areas (The World Bank, 2011). Policy-makers seek to address this by promoting agricultural commodities that are not land intensive, especially cattle. EJ has by far the largest and most densely populated cattle herd in Indonesia (see Figure 1) with 102 head per sq. km (70 in Malang and 170 in Probolinggo). Cattle production in EJ is intensified, commercialised, and mechanised (Priyanti *et al.* 2012).

EJ produces about 19 million tonnes of rice straw, much of which was previously burnt. However, in recent years there has been a rapid increase in the utilisation of even low grade and low value feed (rice straw) from low to high demand areas to support a growing cattle population by very large numbers of feed traders. A study by Gaja Mada University in Yogyakarta said that EJ has a carrying capacity of 7 million head based on feed availability. However, other studies (Syamsu *et al.* 2003) found that based on local resources, EJ may already be over-stocked. In EJ, the feasibility of more productive cattle production will be determined by the availability of and access to crop residues, agricultural by-products, cut and carry forages and tree legumes on existing land. A considerable amount of agricultural by-products are imported into EJ (palm oil fruit /kernel cake, cocoa etc.) for feed. However, the utilisation of these residues ultimately depends on the prices, labour and nutritional value of the feeds relative to outputs (see Section 3). Similar factors apply in intensive production systems in Lombok.

Capacity to absorb increases in larger numbers of more demanding breeds is thought to be highest in semi-intensive and extensive areas of NTT and NTB due to large areas of under-utilised grasslands. This claim also has to be interpreted critically.

In NTB, government estimates claim that unused feed resources and land can support an increase of 51.5% in cattle numbers (The Government of NTB, 2009). Such figures are generated from estimates of carrying capacity (1.34 AU/ha, 300 kg bull) by UNRAM in the 1980s based on grass, forage, and straw and by-products availability. However, the area of unutilised land has been revised down (from 2 million hectares in 2002 to 1.05 million hectares in 2010), and livestock numbers have increased (see Table 11). (See EI-ADO maize report on transforming grazing land to cropping land.)

In NTT, policy-makers also cite large areas of unused grasslands that can support a 38% increase in cattle numbers. The amount of useable grassland has been revised down slightly from 888,000 to 832,000 hectares, and weed invasion is pervasive. If a carrying capacity of 0.31AU/ha is used for grassland areas[6] then NTT is already over-stocked (Mulik, 2012).

2.9.3   Policies

Policies associated with PSDSK are multi-faceted, broad in scope and cover all aspects of the industry. Many of the policies have a long history in EI, but have been ramped up under PSPDK. This section outlines a series of inter-connected policy measures. By far the greatest emphasis is on increasing cattle numbers, followed by cattle productivity and then agribusiness. Agribusiness (slaughter and marketing) policies are discussed first in this section, while production related policies are discussed at the end and lead into a discussion in Section 2.10 on sub-sector development programs.

Slaughter policies

This section outlines a series of policies toward the slaughter sector.

Ban on the slaughter of productive females

PSDS-2104 states that 150-200,000 productive cows are slaughtered per year, mainly in NTT, NTB, Bali and Java.[7] To increase herd numbers and production, the slaughter of productive females is banned under a series of central, provincial and sometimes district and kota (city) regulations.[8] Transgressors can be imprisoned for 9 months or fined IDR 25 million. A productive cow is defined as less than 8 years old, with less than five calves (although the definition can vary by area). Cattle slaughtered within this range must be certified as diseased, injured or sterile. Implementation of the policy is highly variable.

- In one very large abattoir, the manager said that 60% of all slaughter is female, and about 40% of all slaughter are productive females. The person responsible said that he can't enforce regulations because the jagal own the cattle and set the rules (not government or the RPH).

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[6] Based on Based on 1,450 kg DM/ha, feed utility 70 percent, 3% DM consumption by 300kg LW AU (Genetics Quality of Bali cattle in NTT)

[7] These figures are broadly consistent with earlier figures from the DGLS of 150,000 to 170,000 productive females killed per year (10% of slaughtered animals) (cited in Sullivan and, 2007). ACIAR data indicates that around 34% of all female cattle slaughtered are productive females (cited in Nimmo Bell and ICASEPS, 2007).

[8] At central level - PP No. 22 1983; superseded by Undang Undang RI No. 18, 2009, Article 18, DGLAHS

- Other interviewees said that the ban was not enforced:

  o Across whole districts;

  o In district and illegal slaughter houses, where inspection is minimal ;and

  o Particularly during periods of cattle scarcity and high prices, high proportions of females are slaughtered (up to 75%).

- However, many cities did indeed enforce the ban, partly because provinces, cities and districts can have their own slaughter regulations (e.g. Malang 1% female slaughter, Mataram 4 out of 735 killed in one monthly report seen). In Malang, the slaughter fee for females is actually (IDR 15,000) higher to cover the costs of testing (certification, visual, teeth, pregnancy test). The abattoir claimed that bakso makers have a preference for beef from male cattle (possibly relating to higher final pH and water-holding capacity).

- It is also relevant to note that the slaughter of female cattle can increase in Idul Fitri when beef is in high demand. However, only bulls are slaughtered for Idul Adha, and for traditional ceremonies in NTT (funeral, weddings etc.).

Slaughter sector regulation and development

The Indonesian slaughter sector has evolved in line with the demands of consumers and localised retail channels. It provides a low cost and efficient form of processing. However, there are concerns about food safety and hygiene standards for the local mass market and few abattoirs are fitted to meet the demands of inter-regional trade (cold chain) or high-value markets. This section focuses on policy to improve hygiene levels and infrastructure in the slaughter sector.

Hadi (2002) simulated the effects on the beef industry of a 10% improvement in the efficiency of processing beef. They found that there are gains for: consumers (retail prices for beef decrease by 0.2%); consumption increases (by 0.3%); producers (through higher farm prices for fattened cattle with an increase of 1.2% for native fattened cattle, 0.3% for lot-fed cattle and 0.7% for native feeder cattle); and beef producer incomes increase by 1.9%, with the largest gain (4.2%) accruing to smallholder fatteners.

Illegal slaughtering

There are large numbers of uncertified slaughter points that account for a significant proportion of the Indonesian cattle slaughter. In the case of Mataram City in NTB, illegal slaughtering was estimated at 25% (Hermansyah and Mastur, 2008). In NTT, statistics are kept on cattle slaughtered in and out of slaughterhouses. For the provinces as a whole, 17% are slaughtered out of slaughterhouses, but this can be as high as 41% in places like Sumba (BPS, 2011).

Illegal slaughtering involves obvious problems with hygiene and disease as well as other policy enforcement issues including regulations on the slaughter of productive cows and stolen cattle or trading outside of quota. Illegal slaughter also alters the finance and viability of certified plants (which would increase throughput if illegal slaughtering was stopped) and industry development (increasing consumer confidence and demand for beef). In all areas, there is a stated intent to shut down illegal slaughtering. Local government have the legislative base to do so, and know the locations and actors involved.

However, enforcing the regulations is difficult. Measures to close, merge or centralise slaughter facilities effect the spatial organisation of the sector (proximity to small decentralised markets that are hard to reach without cold chain facilities) and also effect the relationships between groups of jagal that work in close-knit and established structures. Partly because of established structures and interests at slaughter level, several interviewees sought to address issues of illegal slaughter and beef hygiene at wet markets. As discussed below (see 'beef market policies') this involves stamping carcasses from certified plants and certification of stallholders who are only permitted to buy from certified plants.

Inspection and licensing

Dinas officials (veterinarians and 'animal paramedics') are posted to certified slaughterhouses to inspect cattle and beef. In the larger slaughterhouses officials conducted anti- and post-mortem inspection. Anti-mortem inspection is conducted at night to check for external symptoms of disease (mouth, hide, nose) and prior to slaughter (teeth/age, sex for productive cow slaughter policy). Infected animals are cremated (in one abattoir about 10 head out of about 8,000 per month). Post-mortem inspection is conducted on the carcass (especially for *Fasciola hepatica* / liver fluke). If the fluke count is too high, the liver is disposed of and the intestines washed out.

Jagal operating at the slaughterhouse are also certified, and then subject to a series of regulations, including that they will sell only beef slaughtered from the RPH (in accordance with national regulation the BP22 1983).

Slaughter is also notionally supervised by Modin to ensure cattle are killed according to Halal practice. Modin can be paid by the slaughterhouse and/or the Association of Muslim Beef Traders (HPMI).

All interviewees (with one exception in Malang) acknowledge the low standards of hygiene and sanitation (especially compared to international standards). Hygiene concerns include butchering on the floor, transport, workers hiding beef to sell later etc. In addition to slaughter practices of jagal, hygiene is largely a function of facilities and infrastructure.

Infrastructure

Cattle facilities at slaughterhouses (unloading facilities and pens) seemed appropriate. Cattle are usually kept in pens near (in sight of) the facility for significant periods (overnight at a minimum). Cattle didn't seem stressed in pens, leading into slaughter or at slaughter. Some restraining boxes were seen in one plant in EJ but rarely used because of the bans on imported cattle. Slaughter boxes are not required for local cattle (quiet, smaller, easier to handle).

Even the largest slaughterhouses in EI have only rudimentary facilities. Slaughterhouses that do have rails for moving carcasses are largely unused, because a jagal crew will use a particular small section of the slaughter room to do major carcass and by-product divisions, and then move products to the boning area for their crew. Amongst the critical infrastructure is:

- Water supply, pumps and towers for washing plants down;
- Water and effluent treatment;
- Rails and hooks to hang carcasses for first stages cuts (not on the floor);

- Benches that are easily washed down (not butchered on the floor); and

- Biogas, compost, collection of rumen fill.

There are measures to upgrade facilities in some slaughterhouses that were visited, backed by a national program. However, measures to achieve this occur in a complex socio-economic environment. Infrastructure improvement in slaughterhouses is costly. With limited scope for private investment, upgrading is funded by central but mainly local government. Cost recovery for upgraded facilities and inspection services in slaughter structures is through increases in slaughter fees. However, higher levels of inspection and increases in slaughter fees can deter jagal from using the certified slaughter facilities and drive slaughter further into uncertified points.

Existing slaughter practices of jagal are fast, low cost and efficient. Several examples were encountered on fieldwork where measures to upgrade or re-design plants did not take into account the systems that jagal use to organise and conduct their slaughter. Because of the central role of jagal, not just in the slaughter sector but the industry as a whole, government and slaughterhouse managers recognise that they must be involved in all aspects of reform of the slaughter sector (infrastructure, inspection, broader industry policy, and training).

The vast majority of slaughtering in current systems (in service slaughter plants or backyard operations) is done in un-mechanised facilities, with a high division of labour (for each slaughter activity), and linkages with a vast number of downstream actors (hide, offal, beef traders and processors). The sector is therefore highly labour-intensive and generates a lot of employment. As discussed below, jagal are a powerful and well-organised group at local levels (see discussion on 'local level associations' in Section 2.10).

The refurbishment and building of new abattoirs

While policy-makers seek to regulate and manage the existing slaughter structures, there are also moves to refurbish and build new slaughter facilities. Larger RPH's in EJ were built by the Dutch pre-1945. In the late 1990s the GoI with support from JICA built slaughterhouses in many provinces of Indonesia including EJ and NTB. While these plants provide a platform for development, they are under various states of disrepair. All RPHs are scheduled for refurbishment and new abattoirs will be greenfield sites.

EJ plans:

- To refurbish abattoirs in major cattle producing areas;

- To build three government-owned, mechanised service slaughter operations -

  o Two (Ponorogo and Pacitan) from national budget; and

  o One larger abattoir (200 head per day, Puspa Agro) to be funded from province budget, and to target higher value markets.

- EJ is buoyed by a policy change in Jakarta that allows beef to enter the city, rather than live cattle for slaughter in the city.

NTT

- NTT has a budget allocation from the central government (IDR 3 trillion) to build a modern hygienic abattoir.

- Plans to build an integrated new wet market in Kupang to sell the beef and other food products.

NTB

- The government of NTB has placed the Meat Business Centre at the centre of its cattle and beef industry development plans. The former JICA-built abattoir on the outskirts of Mataram (West Lombok) has been partially renovated. The abattoir is to be integrated with a feed mill, composting plant and fattening operations.

- Other plants are planned for Sumbawa District and Bima District (to service the mining industry).

Plans to modernize the slaughter sector are often conceptual in nature, appear ambitious, and may not come to fruition. There are also serious issues of financial feasibility and sustainability to address. However, the slaughter sector is underdeveloped in Indonesia and well-conceived projects that are able to secure sales channels through innovative and progressive measures may provide a much-needed boost to the sector and parts of the industry that supply into them. This is discussed in Sections 3.5 and 3.6.

Beef market policies

The vast majority of beef is sold by stallholders at wet markets, so the regulation and management of wet markets is a significant component of the industry. Much like the slaughter sector, wet markets are a low cost and efficient way to retail beef, but food safety and hygiene issues arise and the potential to sell higher value beef is not fully utilised.

Some measures to control food safety at wet market level include:

- Intermittent inspection of wet markets by Dinas (city level) and HPMI (Association of Muslim Beef Traders).

- Some slaughterhouses stamp beef cuts with fat cover with an edible dye that identifies the slaughterhouse. Some markets (Malang, Waingapu, and Surabaya) specify that only beef from certified slaughterhouses can be sold at particular markets.

- In others, however, there was wide recognition that beef from 'the districts' and uncertified slaughter points was sold alongside beef from certified plants, with little or no difference in consumer awareness or price.

A national program is being established to address illegal slaughtering and beef sales, focused at stallholders / wet markets. Under the program, stallholders register (with Dinas animal health assigned to slaughterhouses), sign a form saying that they will only buy from legal slaughterhouses, and receive a card that they wear around their necks at their stalls. The registration is renewed every week, and a certificate is issued in a different colour every week. At the same time, the plan is to post signs in the market 'please buy meat with stamps'. This measure is still in its infancy.

Interviewees suggested it is easier to manage illegal slaughtering and feed safety at retail level rather than to shut down the slaughter points themselves. Again, the relationships and dynamics between butchers and retail networks would be an important component of these measures.

Given the rudimentary and immediate concerns associated with beef retailing at wet markets, the issue of quality upgrading and value adding may appear 'far sighted'. However, there would appear to be scope to involve wet markets in any upgrading of the industry. As discussed above in section 2.7.1, there is already a significant differentiation of cuts from butchers, retailers and consumers. National beef standards provide a formal basis to increase awareness for other quality characteristics (SNI 3932:2008). However, developing widespread awareness, acceptance, and uptake of formal standards is unrealistic.

The Chinese beef retail sector may provide some guidance. City government in more developed cities have sought to regulate unhygienic wet markets through various measures:

- Closing down smaller markets, centralisation, inspection and infrastructure (benches, refrigeration either at individual stallholder or common levels);

- By linking management of wet markets to particular slaughterhouses and abattoirs (although this has created local monopolies);

- Of most relevance, larger abattoirs promote their own brands and stalls within markets. This is done through the establishment of stalls usually with covered cabinets, and often a spate sealed/glassed area, with a small fridge. The stalls are operated as franchises of the abattoir. The stalls and beef are branded to act as a private form of quality and safety assurance; and

- A similar system on a larger scale was used in supermarkets.

Slaughterhouses that retain ownership of their beef (Surya Jaya and Meat Business Centre in Lombok) and service slaughter plants (Pegerian and Malang) have plans to extend and integrate their slaughter operations into retail.

Domestic cattle trade policy

Indonesia also has a significant domestic trade sector in live cattle, which must be understood within the regulatory and disease framework. As a throwback from the colonial era, Indonesia has long had restrictive policies on the domestic trade of cattle including: designation of breeds for particular regions; export quotas and permits; weight and sex restrictions; government purchases and cattle redistribution; and restrictions due to disease status. Table 20 summarises policy for domestic trade in project areas.

Table 20. Summary of domestic trade policy in project areas, 2012

	Export from area		Import to area		Disease status
	Restrictions	**Comments**	**Restrictions**	**Comments**	
East Java	No X of female cattle		No imports of Australian cattle, offal or beef, breeders	Governor decree June 2010	
	Males >250kg		5-10% of total beef production permitted entry	Importers need import permit	
	X quota 147,000 head	Already 80,000 this year. Not supposed to export Ongoles	No cattle imports from Central Java, NTT or NTB	'Not required' and anthrax	
			Transhipment permitted from Bali, NTB & NTT to central and west Java	From Bali by truck/ferry From NTB/T by ship. Quarantine recorded 44,000 feeders by ship.	But Bali doesn't permit from NTB/T (anthrax)
NTB	X quota 13,600 heifers - 65% for Lombok, 35% from Sumbawa.	Will increase to 15,000 next year	No imports of any cattle, except slaughter cattle from Sumbawa to Lombok	MoA edict	NTB free of Jembrana and rabies, prevalent in Bali
	Exported on government standards	Age, height, prices, Not permitted to export Grade 1 breeders			
	No quota slaughter cattle	No demand for Bali slaughter cattle			
Lombok			Slaughter cattle from Sumbawa to Lombok	Only butchers with import permits, allocated quota based on slaughter number, stocks for one week.	Anthrax - free of cases, but virulent, Brucellosis - free 2002, Hemorrhagic septicaemia - free
Bima	500 female breeders, 50 breeding bulls, 8,000 slaughter cattle	Successfully applied for an additional 1,000 quota			Anthrax-cases, Brucellosis - free 2006, Hemorrhagic septicaemia - cases, also Septicaemia Epizootica, scabies, bird flu

NTT	No X of breeders from NTT	Brucellosis and to retain for breeding	No (international) protocol to import cattle from East Timor	Thousands of cattle smuggled from East Timor through TTU and Belu	Brucellosis prevalent throughout NTT
	Quota 50,000 head slaughter cattle	Extra quota allocated (66,000 to date this year).			
	>250kgs Bali cattle, >300kgs Ongoles				
West Timor	Slaughter cattle allowed to move between islands within NTT				
TTU	No breeders	But there are high numbers (3,000).			
	Slaughter cattle - 8,000 quota from province	Actual numbers about 12,000, district has higher target (18,000). District has applied for another 6,000 head allocation.			
	Not supposed to send cattle from Belu to Kupang	Supposed to come from TTU			
Sumba Timur	Slaughter cattle only, >300kgs				
	Quota 3,800 slaughter cattle	Additional quota released to reach 6,300 head. 3,500 last year.			

Source: fieldwork interviews

The regulations are based on several factors:

- An assessment of disease status and risks from trade. This is largely determined at a national level, where diseases are classified and assessed. The quarantine system is operated and funded by the central government (Quarantine Centre under the Ministry of Agriculture, on the same line and level as DGLAHS).

- An assessment of cattle/beef supply and demand balances in each province and district, which are in turn influenced by available statistics and assumptions. These are also influenced by signals from higher levels (e.g. the beef self-sufficiency program), but enacted at local level, usually through governor decree.

Regulations listed above are the formal regulations. In many cases, additional quota is applied for and is released by government. In almost all cases, there were significant numbers of cattle that were traded outside formal channels. This is especially the case in the districts outside provincial capitals where there are numerous roads and ports, local-level inspectors, intermittent checking of slaughter etc. The grey channels are well-known by government all levels.

Quarantine requirements and costs.

Regulations are most likely to be implemented and enforced in large, centralised port areas overseen by quarantine. The quarantine procedures and fees are discussed here.

Cattle are held in holding yards as a stand-alone facility near port (owned by Dinas), or at quarantine yards (Quarantine). Days in quarantine are as follows;

- East Java (Surabaya but applies to other ports):
  - 0 days for exports;
  - 7-14 days if bought in from other areas and will stay in EJ (but no M now);
  - 0 days for trans-shipment.
- Lombok exports 10-14 days.
- Sumbawa to Lombok - 3 days in Sumbawa.
- Kupang:
  - 7 days slaughter cattle;
  - 40 days breeders (but no X now);
  - Sumba Timur – 14 days.

The number of days specified for quarantine is significant but outnumbered by periods required for aggregation and delays in shipping. This incurs costs (fees for holding yards and labour), but especially feed and the risks of weight loss.

Quarantine costs are based on national standards (PP/48/2010), but there can be regional variation. The following provides an example of costs for a shipment (460 head):

- Health certificate – IDR 5,000/head.
- Breeding cattle – IDR 5,000/head.
- Health treatment – IDR 50/head.
- Vaccine – IDR 50/head.

- Lab – IDR 1,000/head.

- Diagnosis of blood sample – IDR 1,000/head.

- Pen disinfection in isolation – IDR 1,000/sq. m (only 5 sq. m).

- Spray – IDR 500/head.

- Isolation if required – IDR 100/head.

- Disinfection of ship – IDR 10,000 / ship.

- Penning cost – IDR 500/head/day.

- IDR 8,950,000 total for this 460 shipment (about IDR 19,500 per head).

With specific regard for the costs of clinical tests, national standards[9] are listed below. Again, there can be variation by region in the disease being tested for:

- Breeding cattle:

  o International import – IDR 10,000.

  o International export – IDR 10,000.

  o Domestic import – IDR 5,000.

- Fattening cattle:

  o International import – IDR 10,000.

  o International export – IDR 5,000.

  o Domestic import – IDR 2,500.

- Brucellosis:

  o M and X – IDR 1,000.

  o Intra-provincial – IDR 500.

There are also significant certification demands for exports including:

- Health certificate (Dinas);

- Certificate of ownership (village);

- Export permit (issued by Dinas on behalf of governor); and

- Quarantine assessment and approval for export.

Trade in breeders is also constrained by policy on allowable breeds. These are:

- Bali cattle in Lombok and most of Sumbawa (although crosses permitted in some intensive production areas of Bima).

- Bali cattle in West Timor.

- Ongole and Brahman breeds in Sumba Timur.

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[9] Peraturan Pemerintah RoI, 2012. Jenis dan tariff atas jenis penerimaan Negara bukan pajak yang berlaku pada kementerian pertanian. Dengan ramat tuhan yang maha esa. Presiden Republik Indonesia.

Cattle standards

There are standards on cattle for specific market channels:

- Breed standards;

- Feedlots have basic specifications for purchased cattle (e.g. in EJ, not dairy, not Madura, 250-350 kgs, no major diseases, normal feet condition); and

- Inter-regional trade in NTB.

The trade is regulated by NTB Governor Decree No 17 on standards of Bali cattle breeders (2010), where cattle are measured on weight, girth, height at shoulder and body length, to derive classes of breeders in male and female cattle at 6 months and 12 months of age. 'Base prices' are set for these standards of cattle under Governor Decree No 52 of Bali cattle (2010). The combination of the standards is presented in Table 21.

Table 21. Bali cattle breeder standards and base prices, 2010

	Parameter	Class 1	Class 2	Class 3		Class 1	Class 2	Class 3
Females								
6 mths	Weight (kgs)	>125	>110	≥95	**12 mths**	>150	>140	≥130
	Girth (cm)	>120	>115	≥110		>132	>128	≥124
	Height at shoulder (cm)	>100	>95	≥90		>110	>104	≥98
	Body length (cm)	>98	>92	≥86		>100	>96	≥92
Standard price (IDR million)						**6.5**	**5.5**	**5.0**
Males								
6 mths	Weight (kgs)	>125	>112	≥100	**12 mths**	>165	>150	≥135
	Girth (cm)	>130	>122	≥114		>145	>137	≥130
	Height at shoulder (cm)	>106	>100	≥94		>110	>105	≥100
	Body length (cm)	>100	>94	≥88		>106	>102	≥98
Standard price (IDR million)						**7.0**	**6.0**	**5.5**

Source: Adapted from NTB policy documents

Traders aggregate cattle based on standards and then enter into contracts to sell the breeders to other provinces based on government base prices. Export contracts are executed by one of only three large traders in NTB (Lombok) with export permits, who deal with importing traders that have won tenders from the government (Dinas Livestock) of the importing region. Local government then distribute breeders through their cattle and breed development programs (East, South and West Kalimantan, West Sumatra and the eastern islands). That is, the trade is governed by the broader central and local government cattle and beef programs (see Sections 2.6 and 2.7). Because of the programs, there is high demand for breeding cattle and government adjusts the base price annually to reflect demand.

It is also important to note that the base prices are sales prices at point of export. Several traders interviewed bought 102cm heifers (from producers and groups) at IDR 3.6 to 4 million per head and then exported at governor decree prices (IDR 6 million). With large amounts of public money, shipping costs and other 'business costs' the cattle can cost IDR 13 million by the time they reach Papua (15 days). There are high margins for

traders. However, traders incur large costs in aggregating large orders (300 up to 1,200 head per lot): cattle to uniform specification can be hard to find; the traders have a large network of traders and collectors working for them; and cattle must be held and fed to specification, sometimes over many months.

If households are able to produce calves to specification in more uniform lots, and capture more of the standard export price, there may be significant income effects. Linkages between traders and producers groups already fill some of this function (see profile of H Saad in 'nucleus-plasma relationships' in Section 2.10) but more widespread linkages could be developed.

Shipping infrastructure

Given the importance of inter-regional trade in the EI cattle and beef industry, shipping facilities are of interest to any industry development program. There is agreement that facilities are rudimentary but measures and incentives to address this are not immediately obvious.

Infrastructure relevant to domestic live cattle shipping includes:

- Quarantine area (owned by Quarantine);

- Holding yards (can be separate from Quarantine yards) (owned by Dinas);

- Loading/unload facilities (ports, labour union of the port); and

- Ships.

The physical holding facilities (holding yards and quarantine) viewed were generally well-constructed, large and stocked well below capacity. Authorities and traders did not regard these facilities as a major constraint, with some exceptions. The holding yards in Bima were said to be in disrepair and yards in Sumba Timur lacked water. DGLAHS is reviewing infrastructure at quarantine stations across Indonesia.

The main losses (weight, feed) that occur at quarantine and holding facilities are a result of long periods in holding yards waiting for shipment. This occurs due to:

- The time for traders to aggregate a line for export (can sometimes be held in holding yards);

- Delays and uncertainty in shipping (weather, ship schedule etc.); and

- Bureaucratic processes.

Loading and unloading facilities are not themselves seen as a high priority:

- In Surabaya and West Lombok, the port deck is close to sea level. Cattle can therefore be unloaded from a truck, sent through a makeshift race and ramp on to the top deck of a single-decked ship; and

- In Kupang, the port deck is well above sea level, so at low tides cattle have to be lifted on the ship by crane (by horns or in net). There are negative animal welfare, stress and productivity effects.

The major constraint in inter-regional trade is in shipping. The vast majority of cattle are shipped on general cargo ships (of various types) and not on purpose-built cattle ships. Cattle make up only a small cargo component for the shipping companies, which may

lead to lower per unit costs than for a purpose-built cattle ship (costs of fitting out, costs shared between a range of commodities, back loading etc.).

However, there may be substantial impacts on the value of cattle.

- Makeshift bamboo pens are constructed (should be on top deck to allow for ventilation), feed is piled up in whatever other room is available, and there is no effluent management or watering facilities.

- One observer claimed that this restricts the size of cattle that can be transported.

- There can be deaths and stress in rough seas – several examples were cited on fieldwork.

- Most importantly, there are substantial weight losses at sea. This is an issue of environment/facilities and also management, feeding and watering on the ship.

Losses in cattle, weight and time would be reduced through the introduction of purpose-built cattle ships. There are such ships – a twin deck ship based on Madura. There have also been other ventures in this area in South Sulawesi but were said to have stopped operating.

Despite these issues, shipping infrastructure was not seen as a major constraint by traders (exporters and importers). This may be because:

- Exporters (traders that sell cattle) are usually paid on liveweight when loaded on to ship; and

- Importers may be able to recover weight lost at sea through further feeding, compensatory weight gains (although these may be offset by long adaption periods of Bali cattle in particular).

Nevertheless, losses experienced at sea will have an aggregate effect on the industry, and will be factored into prices received by farmers. This issue was not examined in any detail during fieldwork, but may be an issue for further analysis by the private sector, finance, development and research agencies.

Cattle markets

As discussed in Section 2.5, several measures have been implemented or discussed to develop the cattle marketing system. This section concentrates on infrastructure and the management of live cattle market places

There are national standards for three categories of livestock markets: A – district; B – sub-district; C – village. The standards set the requirements for infrastructure and services that should be provided for each category of market. For example, for Type B markets, there should be 18 sets of infrastructure. The GoI is now improving markets, as was seen through modest resourcing in several sites (e.g. IDR432 million in the largest market in West Timor). However, resources for these projects are limited for development beyond rudimentary facilities and services. A large amount of funding and, importantly, training and capacity-building is required to develop live cattle markets to national standards.

There are few livestock markets in semi-intensive and extensive production areas (Bima, Sumba) because of the distances and terrain. A livestock market was constructed in Bima but was not well located, so is unused now.

The DGLAHS and Dinas Livestock are interested in the infrastructure and physical condition of livestock markets (mud, pens, tie rails, trucking, loading/unloading, water and feed facilities etc.). A recent survey in 10 provinces found variable conditions (Livestock Research and Development Team, PSE-KP, and Balitnak Bbalitvet). Although a formal appraisal of these measures was beyond the scope of the study, infrastructure improvement could in principle, reduce the time involved in trading (trucking, parking, loading/unloading), reduce weight loss and stress of animals (better penning, feeding, water facilities and loading/unloading ramps) and therefore reduce the costs of trading. Type A and B markets are supposed have auction centres for sellers and buyers. While these were undeveloped, several interviewees in Dinas were interested in developing this aspect of market operations (see Section 2.5 'interventions').

In addition to infrastructure, market management is another aspect for the development of markets. There are several agencies involved:

- Markets (land, assets) are usually owned by local government (bupati, kecamatan etc.);

- Bupati appoint an agency to administer the markets (Dinas Economy and Tourism, or Dinas Industry and Trade), to regulate the market and collect retribus (a tax for services or permits administered by local government);

- Dinas Livestock posts officials to the markets to check for diseases, and in some markets record the details of buyers and sellers (as proof of purchase that the animal wasn't stolen).

It is also relevant to note that receipts (on cattle numbers, buyers and sellers) could aid in the collection and reporting of statistics.

Cattle production policies

Cattle production policies receive by far the most policy attention and resourcing. Several production related policy issues are outlined in the remainder of this section (carrying capacity and payments to farmers for pregnant cows).

Long-standing production related programs that have been scaled up in PSDPK are:

- Rescue of productive females;

- Incentives for pregnant females;

- Cattle distribution schemes;

- Village Breeding Centres;

- Finance Scheme;

- Groups; and

- Nucleus-plasma programs.

While this set of inter-related programs arise from policy settings, they are discussed in full in section 2.10 'Sub-sector development programs'.

2.10 Sub-Sector Development Programs

Policy for the beef industry is supported by a large number of inter-related industry development programs. These have important implications for industry development (both enabling and constraining). A careful analysis of the schemes provides some structures, models and specific examples that provide potential for partnership and collaboration. For these reasons, a significant amount of detail is provided in this section of the report.

2.10.1 The rescue of productive females

In addition to slaughter bans, Dinas Livestock in all AIPD-Rural areas have a large program to 'rescue' (buy back) productive cows and heifers. Dinas officials that see productive cows at slaughterhouses or cattle markets can rescue them by buying the females, and then redistributing them. This is a long-standing program, which has stalled at various stages because of the very large amount of capital required to sustain the program. However, the program has been revitalised since 2010 with policy and resources from PSPDK.

Rescued female breeders are distributed predominantly through cattle distribution schemes that have also escalated in recent years (Section 2.10). To meet buying targets and utilize financial resources within budgeting periods, Dinas will purchase cows from a range of sources including slaughterhouse butchers, market traders, and also directly from farmers, groups and contracted traders.

2.10.2 Incentives for pregnant females

Another program to stimulate production is the Incentive Betina Bunting (Incentives for Pregnant Females) program, where farmers are paid for successful pregnancies. In some regions visited Bima government pay farmers IDR 500,000 when cows are five months pregnant and IDR 750,000 at seven months. Payments are made in all districts, but not all farmers. IDR 100 million is allocated per group. Of the funding available, about 25% is paid to groups that have participated in distribution schemes (where the government owns the cows) and about 75% to the 'community' where households own the cows.

In most cases in NTB and NTT, the programs 'productive cow rescue' and 'incentives for pregnant females' are run together. In NTB between 2010 and 2012, these two schemes have been funded to distribute IDR 156 billion over many hundreds of kelompoks (Table 22). If cows distributed under the productive cow rescue program were IDR 5 million each, the program would have distributed 21,340 head between 2010 and 2012.

Table 22. Scale of cow rescue and incentive for pregnant female programs in NTB, 2010-2012

	Number of groups (kelompok)	Funding per group (IDR million)	Total funding (IDR billion)
Productive cow rescue			
2010	10	740	7.4
2011	157	250	39.2
2012	54	250	60.1
Total program	221		106.7
Incentives for pregnant females program			
2010	0		
2011	294	100	29.4
2012	200	100	20
Total program	494		49.4
Total both programs			**156.1**

Source: Adapted from NTB policy documents

2.10.3 Cattle distribution schemes

Cattle distribution schemes have been running since the 1980s. Because of the very large numbers of disparate cattle distribution schemes and the associated agencies that run them (see Table 23), firm figures on scale are not available. However, in regions visited in NTB and NTT, Dinas Livestock distributed cows/heifers that account for about 2% of the total herd per year (67% of which are females). Over breeding cycles, this has a very large impact on herd formation and composition. Virtually the whole cattle herd of NTB and NTT can be traced back to distribution schemes conducted over the last three decades.

Given the large number of programs (Table 23) and that just one NTB 'productive cow rescue' scheme had 221 groups between 2010 and 2011 (Table 22), there is likely to be more than 500 groups participating in cattle distribution schemes in EI, concentrated in NTB and NTT.

Table 23. Cattle distribution schemes in EI

Scheme	Partners	Terms
Government schemes		
SMD (Sarjana Membangun Desa, Graduates Building the Village) Program	• University graduate assigned to village or kelompok to help with technical, management and financial tasks. Are usually locals. • Graduate paid a salary (IDR1.5 million/month) for the first year, then expected to generate own salary • Salary from group or from activities (graduate can be part of cattle distribution (2-3 head) or in cattle business)	• IDR300 million allocated to group • 2-3 cows per household in group • Households can't sell females, or any offspring before 3yo (about 200kgs) • After 2 calves, households keep cow
Kopel scheme (sub-district extension system)	• Central government allocation through bupati • Sub-district extension agent • Dinas Livestock support • Help group with vet examination, technical assistance, buy & sell cattle. • Monitoring and evaluation	• In Sumba Timur, farmer receives 5 cows and 1 bull, returns 9 calves over 5 years • NTT – farmer receives 2 cows and 1 bull, returns a calf • New arrangement – farmer receives 3 cattle, returns 3 calves in 5 years
Pengembangan Pembibitan dalam Kawasan peternakan, Breeding livestock development in regions	• Centrally funded • Supervision of Dinas	• 40 cows and 3 bulls per group • 2 cows per farmer • Grant – cows can't be sold or, if sold, must be replaced • All offspring belong to farmer
BPLM (Bantuan Langsung Masyarakat), Direct Community Assistance) Scheme	• Direct fund transfer to farmers (not through 3rd parties) • Aims to assist capital formation, production, agribusiness and village microfinance • Dinas technical extension in first year only • Between 2001 and 2005, 33 groups in Lombok participated in BLM schemes	• In Lombok, farmer receive a cow, return 2 calves in 5 years • Mainly IDR 300 million per group (in 2000s)
LM3 (lembaga masyarakat mandiri dan mengakar, independent public institutions entrenched in the community) (NTT)	• No facilitator attached • LM3 aims to empower people in religious organisations through agribusiness development (training in entrepreneurship, administration, business managements and agricultural production)	• IDR 300 million per group • Based on diversified commodities – big (cattle, buffalo) and small (cattle, goats, chickens) livestock, as complementary activities

BSS (Bumi Sejuta Sapi, land of one million cattle (NTB))	• Provincial funding • No facilitator	• Similar terms to SMD • In Lombok, 30 cows and 2 bulls distributed to a group
Other government programs are run by: Ministry of Social Affairs, Min. of Religious Affairs, Min. of Education & Culture, State Min. for Cooperatives & Small & Medium Enterprises, State Min. for the Development of Disadvantaged Regions, Min. of Manpower & Transmigration, National Narcotics Board, Indonesian National Board for Disaster Management		
Corporate responsibility schemes		
Pertamina, State Oil and Natural Gas Mining Company	• Pertamina, Gadja Mada University, Ministry for Less Developed Regions and Sub-district UPTD, Unit Pelayanan Technis Dinas, Technical Services Department) • Latter provides on ground support	• Visited in Bima • Set up for cattle production and biogas.
Other corporate responsibility programs encountered are by cement companies (Hocim) and airport companies. There are many others.		

Source: fieldwork interviews

The vast majority of cattle distributed are cows (pregnant or empty) or heifers, but bulls are also distributed to new groups for breeding purposes. In some areas (Sumba Timur) feeders are distributed on a profit-sharing basis with Dinas. AI is used in a few of the schemes. Cattle distribution schemes are effectively a subsidy for cattle production, especially breeding. With the promise of a free cow, households are willing participants in the schemes and indeed government is overwhelmed with applications from groups (that can number in the hundreds). However, the ownership of the cows remains with the donor agencies until calf return obligations are met, which can take up to six years. Thus, short term economic gains for households are low or negative with low income effects and incentives to keep or increase productivity of the cattle in the medium term (see economic analysis in Section 3). The sale of cows before obligations are met is endemic.

This imposes high supervision and transaction costs on agencies (that need to account for the assets of the state and credibility of the scheme). Agencies have developed measures to do this by, for example, distributing cattle to higher-income or younger households under less pressure to sell. There have also been new schemes to provide breeders as a grant, with no calf-return obligations. However, parliament, from central to local levels, are concerned about the egalitarianism of the scheme, that cattle distribution be used as a poverty and income tool, and where cattle can be revolved back 'into the community'.

Another dynamic in the cattle distribution schemes is that they are undertaken by a very large number of agencies. Dinas administer perhaps one-half of all distributions, but there are at least 11 other government agencies, numerous community, religious and NGO groups, and companies operating under corporate responsibility schemes. In addition, a range of community groups, companies and industry actors operate as nucleus (traders, feedlots) plasma (farmers and groups) structures with some similarities to cattle distribution schemes. The various schemes are associated with different agencies and partners and have different technical support, on the ground staff and terms. Dinas Livestock are the largest agency, and are sometimes participants in other schemes, but the other schemes are usually run independently. Obvious issues of co-ordination arise.

Despite the problems associated with cattle distribution schemes, some were reported to function well. Interviewees, Dinas staff and researchers said that the successful program had a strong on the ground presence, provide ongoing technical support and assistance, and participate in the organisation and management of the group and cattle. There are also several schemes (LM3, BPLM) that emphasize business development which is maintained as a major aspect of any cattle development initiatives.

A full evaluation of the scheme is beyond the scope of this study, but considerations and input from interviewees on which schemes and designs work best in different areas are provided in Section 4.

2.10.4 Village breeding centres (VBCs)

One of the measures that the GoI has used to strengthen breeding is to strengthen the Village Breeding Centre program. VBCs are an important component of Indonesia's overall breed improvement program, with a stated aim of distributing 37,500 head by 2014 (Beef Self-sufficiency Blueprint, PSDS-2014). Several VBCs were encountered during the fieldwork in AIPD-rural areas (so provide only a very partial overview of the program).

VBCs are similar to previously discussed schemes insofar as cattle are distributed or granted to producer groups, or combined with the SMD program. Staff from Dinas based in the sub-district where the VBC is located, run and monitor the VBCs.

Cattle distributed can be held in the pens of farmers or on state or village land. Selected bulls are distributed but remain the property of the state. The program aims to increase productivity through genetic improvement. Records are taken on the herd profile and productivity indicators. Calves (male or female) are graded (A, B, C). Grade A and B cattle can be redistributed, and grade C animals culled with the aim of improving the genetic base of the region. This provides an opportunity for research, improved understanding and learnings and stock for scale out.

VBCs have operated in Indonesia for many years. It is widely acknowledged in Indonesia that many VBCs have been unsuccessful for two main reasons. First, there was a strong emphasis on increasing cattle numbers, without sufficient consideration of the broader cattle production systems (training of on the ground staff, monitors and farmers, feed, water, cattle management etc.). Second, there is unclear delineation of roles and commitment from stakeholders. For an account of a VBC/SMD project using Brahman crosses in Central Java see Yuwono and Sodiq (2010).

Interviewees believed that the program design itself was not flawed and that the program can be revitalized by drawing on past lessons, using a more integrated approach and with appropriate stakeholder roles and incentives. These systems would have to be in place before any cattle from an Australian project entered into VBCs.

2.10.5 Finance

A very large percentage of farmers in EI aspire to owning or raising cattle as an asset or source of 'savings'. Cattle constitute large divisible units of investment for farmers compared to smaller animals (chickens, pigs, goats). Cattle are also kept in household farming systems for long periods – the shortest being for contract feeding (4 months), but usually for years. There are also low levels of capital formation in most parts of EI, and limited access to formal finance. Thus, means of acquiring both ownership and use rights of the asset is a critical aspect of the EI cattle industry. Many of the structures discussed in this section (cattle distribution schemes, owner-keeper relationships, nucleus-plasma relationships, groups) have been developed by industry actors as a means of dealing with these financing issues.

To expand cattle production in Indonesia, government has devised two cattle-specific finance schemes: KUPS (Kredit Usaha Pembibitan Sapi) and KKPE (Kredit Ketahanan Pangan dan Energi).[10] Large amounts of government funding have been allocated to the schemes to subsidise loans for cattle production. The loans are distributed through state banks (BRI and provincial banks, Bank Jatim, Bank NTB, Bank NTT).[11] Banks want to utilise the subsidies to generate bank business and revenue. However, disbursement and uptake of the loans have been limited.

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[10] Minister of Agriculture No. 40/Permentan/PD.400/9/2000 Credit Guidelines for Implementation of Cattle Breeding.
[11] For an idea of how the funding is delivered through a development bank, see BNI Bank website http://www.bni.co.id/BankingService/Commercial/Kredit/KreditProgramBNI/KreditUsahaPembibitanSapi.aspx.

KUPS

- Is targeted at the breeding (cow-calf) sector;

- Is targeted at larger scale breeding operations with a floor on loans of IDR1 billion. Regulations allow financing for up to 5,000 head of cattle with maximum loan capped at IDR66 billion per application (Hadibrata, 2011) although banks interviewed did not specify an upper limit;

- Lenders are therefore larger producers: feedlots with significant numbers of breeding cattle (Wahyu Utama and Santori in Lampung), or large farmer groups (Central Lombok, but where a group leader provided collateral);

- Individual households are not eligible (although there has been some discussion about adjusting the scheme to be more available to individual cow-calf households). Breeders must be formed in groups; and

- The stated terms are an interest rate of 5% for period 6 years with 24 month grace period (when market interest rates were around 14% in 2010). However, there was variation from the fieldwork, with KUPS interest rates ranging between 4% and 6% for 5 years. E.g. the commercial rate is 11.5% total at present, government subsidises 6.5%, farmers pay 5%.

Budget allocation for KUPS is IDR 200,000 per head per year (in a split of 80:20 between beef and dairy cattle enterprises). By October 2010, expenditure on KUPS had reached IDR128 billion or about 3.3% of the target of program credit in 2010 (Hadibrata, 2011). The low uptake of KUPS is a result of underlying financial viability and assessment of breeding operations. Although the schemes are subsidised, the liquidity is held by the banks, which bear the risk, and apply standard criteria to assess loan applications. Banks interviewed (in EJ and NTB) regard cattle breeding as low return, with long periods between returns (low turnover) and possibly a high risk field of business, especially in low productivity systems. Demand for loans from farmers and groups are also limited because they compete with government cattle distribution schemes, where cattle are given away.

KKPE

- KKPE is targeted at small-holder fattening operations, with loans made to groups;

- One group interviewed took out a loan of IDR 16.4 mil / per person, for 12-14 months, 5% and another at 4%;

- Fattening households use money from cattle sales to repay loans periodically or at the end of the term. The faster turnover of fattening operations when operating in a productive system increase the viability of fattening compared to breeding;

- Disbursements and uptake is therefore higher for the KKPE than KUPS scheme. For example IDR15.6 billion has been disbursed across five districts in EJ and;

- By far the largest cattle loan scheme in NTB. Bank NTB have loaned to two groups in Central Lombok and eight in Sumbawa District.

General procedures for loans:

- In the first instance, the group puts together a simple proposal, assisted by extension agents (PPL). Dinas must endorse the applicant on technical grounds.

- Loans are assessed by bank sub-branches using a standard (not scheme-specific) application form. Some principles against which the application is assessed are 'the five C's': character, capacity, capital, collateral, condition of economy.

- While collateral is just one of the criterion, lenders without large cash deposits require collateral (or will be a high interest uncollateralised loan). So the loan will be in the name of the group, but collateral will be held/provided by a company or head of group (traders in Lombok, H Saad, Santori, act as guarantor for Wahyu Utama). This means that loans are often associated with groups, structures and nucleus-plasma structures.

Other loan facilities for agriculture are:

- Kredit Usaha Rakyat (KUR); and

- PUAP (Pengembangan Usaha Agribisnis Perdesaan – Village Agribusiness development) program.

2.10.6 Groups

Farmer groups (kelompok) are a feature of the cattle industry. The formation of a group is required for eligibility for government cattle distribution and finance programs. Dinas officials in NTB estimated that about 50% of cattle groups have formed to be eligible for programs; the other 50% already existed.

Patrick et al. (2010) found that this eligibility for government programs, together with security of cattle (i.e. to stop theft) were the major reasons for the formation of groups. Production and marketing functions were of lower significance. However the groups that do engage in markets have higher levels of group capital formation including trust within the group and leaders who are confident and have the support of group members.

A total of 1.6 million farmers in East Java are engaged in livestock farming, and these form into a total of 1,422 farmer groups (Dinas Peternakan Provinsi Jawa Timur, 2011, cited in Cahyadi et al. 2012).

Dahlanuddin et al. (2004) surveyed 303 cattle groups in Lombok, 80 of which participated in government schemes, 70 of which were run by Dinas Pertanakan and 71 of which were for livestock distribution (others being for pens, group development and cash assistance). In addition to the 303 collective housing systems surveyed in 2004, Dahlanuddin *et al.* (2008) identified an additional 475 units making the total number of 778 units distributed in most sub-districts on Lombok. The vast majority of groups had less than 30 members; most were engaged in cow-calf production, followed by mixed operations, followed by fattening. The geographic distribution of the groups is shown by the blue triangles in Figure 10. Similarly high concentrations of groups are also found in Bima, reportedly from fieldwork to be many hundreds of cattle groups.

While there are strong social dimensions to the formation and success of groups in different areas, projects seek to utilize groups for their technical, financial or risk management functions, and on the basis that outsiders can play a catalyst role in group development.
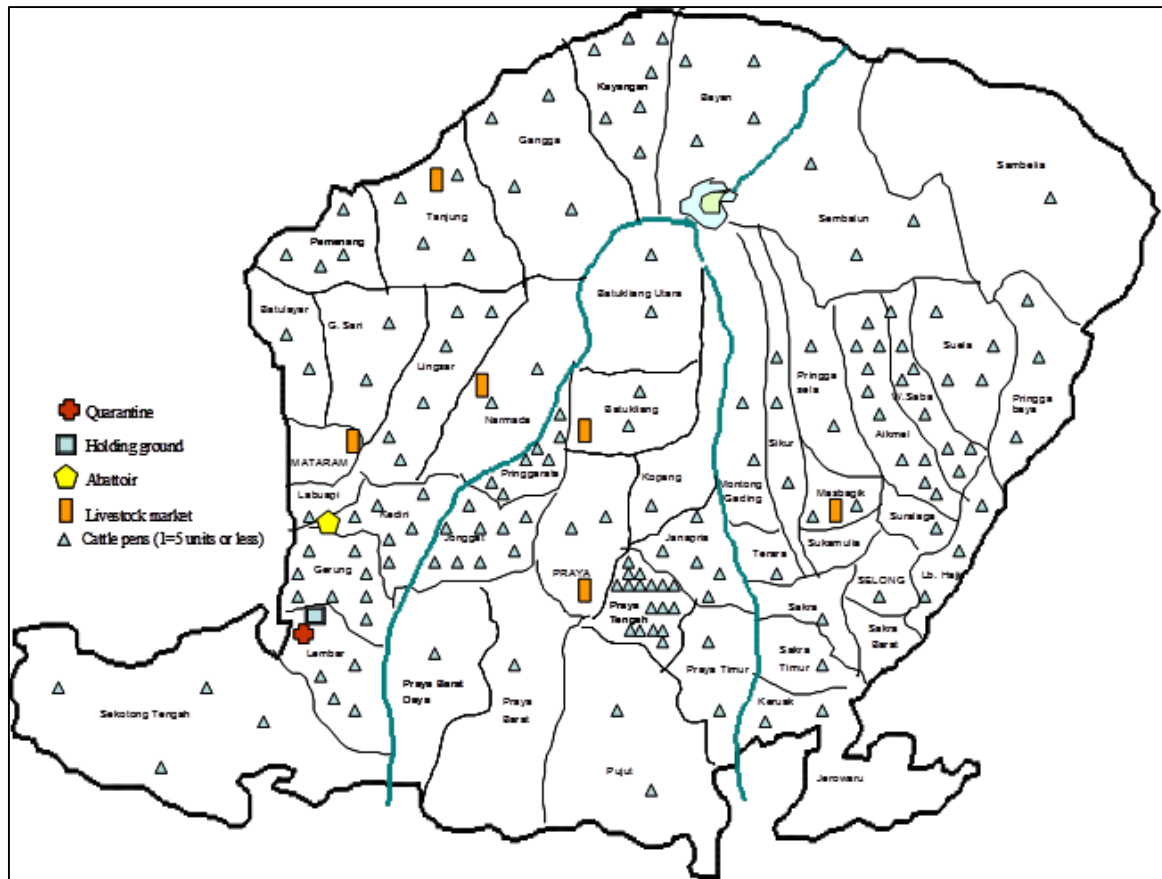
Source Dahlanuddin et al. (2008)

Figure 10. Distribution of cattle collective housing units (kandangs) by sub-districts in Lombok

Groups were encountered in all fieldwork areas. Some of their characteristics are shown in Table 24.

In addition to group functions noted in the surveys (eligibility of programs, theft), groups also provide some forms of efficiency.

- There are many cattle fattening and breeding groups that have common pens (kandangs) and regimes (H Saad) (lower overheads, utilization of groups land).

- There are many groups in Lombok that use communal bulls, which are separated with cows in the kandang as they come into oestrus. The bull is generally owned by the group.

- This lowers breeding costs for individual households. Apart from breeding services, the bull can also be fed to put on weight over a period (say, 6 months) and sold to generate profits from the weight gain. Profits can be distributed to group members or used as group savings to build a small finance facility that members can draw against.

- It is important, however, to establish clear rules on which household holds and feeds the bull and the compensation they receive. In one group, for the weight added (difference between purchase and sales weight), the distribution was: 60% for keeper, the rest (40%) for group savings. Proceeds from the sale were then used to

buy another animal. With accumulated savings, the group can then loan money to households at 15-16% for 6 months.

Table 24. Characteristics of cattle groups visited on fieldwork

Kelompok name/area	Structure and function	Scale
Groups in Malang	• Located around tofu and tempeh processing areas • to use residues for fattening.	• About 10 cattle groups. • 15-20 members • Each member has 10-15 cattle.
Malang, Srigonco Village	• Established by ACIAR Straw Cow project. • Used to aggregate straw and help owners find links with keepers	• 1 group
Meat Business Centre, Mataram	• Integrated beef business • Centered around a small mechanized abattoir • Plans to link with groups for more direct supply of cattle	• Have established MoUs with several groups • Plan to link with 100 groups
Kelompok Tani Ternak Menemeng, Central Lombok	Unique because is the home village of a large inter-regional trader of breeders (see discussion on H Saad in nucleus-plasma section).	• 67 cows • Average 2 per household
Pade Girang group, Central Lombok	• Specialised fattening group • KKPE finance but wants to build up own capital base • participates in UNRAM project	• 24 households • Average 2 feeders each
Rejeki Nomplok, Central Lombok	• Focus groups issues	• 35 people, 89 cattle
Ingin Sukses, Central Lombok	• Mainly cow-calf production • But have group bulls for breeding and fattening. Bull kept and sold in profit-sharing arrangement, and contributes to group finance	• 50 people, • 50 cows • 25 calves
Putri Bekekem, Central Lombok	• Group can loan to households (5-15%) • Have access to programs (BLM, SMD) • Mentor program (1 person mentoring 2-3 others)	
Ketua, Bima	• SMD program • Involves setting up a 'passive' account • Group bulls	• 15 members • Stated in 2010 with 33 cows and one bull • Now 65 cattle

Sabai, Bima	• Breeding • 1 ha. common area for forages • BSS program	• 15 members • started in 2010 with 30 cows, and 2 bulls in 2011 • Now with 65 cattle
Lewintana Jaya, Bima	Pertamina program (see 'cattle distribution' section)	• 80 members (of 130 in dudun) • 109 cattle (104 females, 5 males)
Gejati Cooperative, TLM and PUSKU	Linked with groups, see 'nucleus-plasma' section below	• Perhaps incorporate 100 groups between them
Papindung Indah	• Cow-calf and mixed operations in semi-intensive systems • Manages owner-keeper relationships & cattle distribution programs • And cattle grazing in cropping and communal land • Group head also active in farmers association (poktan)	• 14 members in groups • Linked through Poktan local farmers association to 17 other groups
Letmafo, TTU	• Mixed prod system • Target of the Dinas Pembubibitan sapi bali program • Group activities – land clearing, forage planting, pens	• 20 members • Dinas distributed 60 head in Oct 2011 • Now have 81 head

Source: Fieldwork interviews

2.11 Structures within the Indonesian Beef Sector

2.11.1 Nucleus-plasma relationships

A much-vaunted structure to develop the Indonesian cattle and beef industry is nucleus-plasma (NES) structures, where the nucleus (lead firm or organisation) is inter-dependent on the plasma (small-holders). These structures have existed since 1990 through feedlots and farmers, but virtually ceased with declines in economic growth and cattle imports at the end of the 1990s, and were further threatened by the involuntary nature of some relationships (Hadi, 2002). The latest self-sufficiency policy and large numbers of imported cattle in recent years have revived some of the relationships, especially in Sumatra. Examples include:

- Relationships between large feedlots and households, where large feedlots are obliged to distribute breeders to households as part of their social license to operate; and

- Relationships between plantations (pineapple, palm oil, cassava) or cattle import companies that distribute cattle to households for fattening. In some cases, the households buy the cattle in 'packages' (loans of set amounts – e.g. IDR 50 million used to buy about 8 feeders) through subsidized loans ('Finance' section above) and feed from the company and then sell the finished cattle back to the company.

There is only one example that fits this model in EI (Wahyu Utama discussed below). The largest feedlots in EJ (Santori, Agrisatwa) had no formal linkages or relationships with farmers or farmer groups. However, there are a range of other organisations that can be seen to form a 'nucleus' structure. These include: an integrated feedlot-butcher-retailer in EJ; a butcher-retailer in NTT; NGOs with contract fattening links; cattle trading companies; and traders. Others in the planning phase include the Meat Business Centre in Lombok. Some of the issues that emerge from the analysis are:

- The nucleus-plasma model works best for fattening rather than breeding operations, which have low turnover periods. See Table 25 below for a summary of the nucleus-plasma relationships present in the EI cattle industry.

- Nucleus operations above all provide finance and collateral to the relationship, though in different ways.

- The benefits of the relationship for farmers depend on terms and efficiencies.

- Most of the relationships are small, but act as examples of linkages, that may be able to be expanded.

Table 25. Nucleus-plasma relationships in the EI cattle industry

Name	Structure	Scale	Terms
Wahyu Utama, Tuban, East Java	Integrated cattle-beef business • Breeders (600) • Feedlot (1,400) • Slaughter point • Retailing (integrated stalls in wet market and restaurants) • Sales of slaughter cattle to local markets, feedlots or export	• 100 farmers total (revolving*4 months) • Majority are repeat contracts • Average 4 cattle each farmer • 17 villages in Tuban	• Farmers buy cattle from Wahyu Utama with KKPE loan (package of IDR 10-14 million, 4%) • Households feed cattle from 350 kgs, for 4 months • Sell back to Wahyu Utama 470-500kgs • At contract price
Saad Husni, Central Lombok	Large cattle trader, mainly breeders for inter-regional trade	• 2,800 head export market • 600 head local • Formal and financial links between trade and his (home) group • 67 cows	• Trader provide collateral for KUPS loan • Used by farmers to buy weaners/heifers • Fed to export specifications and prices • Sold by trader as part of larger consignments
Gejati, Amarusi, NTT	• Large cattle trader and co-op head • Operates within co-operative structure • Links with non-member groups & farmers • Co-op business in: breeding; feeding; finance and trading	Co-op consists of: • 22 breeding groups • 5 fattening groups, • each with about 20 farmers • 2,432 cattle Also links with non-member groups and households Trade <3,000 cattle/year	Breeding • 3 cows distributed per farmer. • 1st calf belongs to farmer, 2nd and 3rd calf returned to co-op • On 4th calf, one cow returned to co-op, the other two cows then owned by farmer. Feeding • 70:30 profit-sharing Member loans • 2%/month, max 10 months, IDR 2.5 mil. Trading • Trader purchases cattle on price schedule

			• Differences in member and non-member prices • Trader sells cattle (local and inter-regional) • Purchase-sale differentials profit trader
Tanaoba Lais Manekat (TLM), NTT	• NGO with many development activities including cattle • Established sales channels • No OTGS, limited tech	• Fattening of young Bali bulls • 500 cattle • About 250 farmers	• Ownership of cattle remains with TLM • Difference between outputs (sales price) and inputs (valuation of feeders from TLM to farmers) used to derive 'profit'. • 70:30 profit split • Up to 12 month feeding period at low ADWG
PUSKUD, NTT	• Private company • Long history in cattle trading and contract feeding • Established auction system • Technical support and buyers	• Sales of 3-4,000 head per year • 1,500-2,000 farmers per year	• Similar to TLM (above) • Sales through auction
Large owner-keeper structure, Sumba Timur	• Owner-keeper structures, with numerous co-ordinators • 'Ranch' as holding area	• Owns 5,000 cattle • 2,000 cows • 5-10 head per household	• 70 (owner); 30 (keeper) split on calves born

Source: fieldwork interviews

Integrated cattle and beef operation in EJ

A simplified structure of the Wahyu Utama model is outlined in Figure 11. The company is integrated across beef retailing with its own wet market stalls and restaurants, a small slaughter point and a sizeable breeding operation (600 cows) backed by a KUPS loan (6%, 5 years) to produce female replacements, herd build-up and males for feeding. The feedlot is at the core of the operation and is used to feed and manage the flow of cattle feeds from various sources. Wahyu Utama feeds its own male calves to about 300 kgs and then sells to contracted households, who fatten for about 4 months and then sell back to the nucleus feedlot. The cattle can then be traded or slaughtered and then retailed. A copy of the contract between Wahyu Utama and farmers is available on request.

Farmers take out loans to buy the cattle from a commercial bank (BRI, Bank Jatim). The loans are short term (flexible but for a fattening period of around 4 months) and subsidised under KKPE (4% pa). Households provide their own collateral on the loan and have to convince the bank of their credit-worthiness. Wahyu Utama assists and supports farmers with their loan application.

There are 100 farmers with an average of four cattle each distributed over 17 villages, so there are only 5-10 farmers per village. Because of the small scale this leads to high transaction costs (training, buying, and administration). To be eligible, households must have:

- Pens;

- Be progressive farmers; training from Wahyu Utama and Dinas;

- Be eligible for loans (creditworthy and have collateral, land-ownership certificate); and

- Should be endorsed by the manager and Dinas.

Wahyu Utama has five staff that provide training to contracted households for one week on feed, management and veterinary care. Dinas extension agents are also invited and Wahyu Utama facilitates links between the agents and households, especially in areas distant from the nucleus feedlot. Wahyu Utama has a feed mill and sells the feed mix to contracted and non-contracted households (sell IDR 1,600/kg, production cost IDR 1,300/kg). The mix is from agricultural residues including rice straw (4%), coffee skin, peanut husk, copra meal, wheat by-product, cassava skin, palm oil skin, kangkung, corn cobs, rice bran, cassava tubers and molasses with an estimated 12% crude protein.

There are cases where households renege on the contract (sell on the open market) especially in periods of dropping prices. Because Wahyu Utama does not own the cattle, this does not lead to high losses to the company; only the setup costs. They then don't enter into arrangements with that household again. To provide certainty, the company specifies a set purchase price in the contract (per kg LW). This purchase price from farmers is the same as the selling price to farmers, (no premium for heavier cattle) and is set above the prevailing market price (i.e. IDR 28,000/kg LW in Tuban market, IDR 30,000 in contract).

Wahyu Utama has entered into the nucleus-plasma scheme for commercial reasons (continuity of supply of cattle to specification, reduced search costs for cattle compared to the open market) and possibly philanthropic reasons (in the policy environment of the beef

self-sufficiency program). The manager claimed that households benefitted from the scheme (IDR 1 million per head gross at 1kg ADG) and this is modelled in Section 3.

Wahyu Utama would like to have more concentrated households, but only a given number of households are eligible to join the scheme (progressive and credit-worthy). One of the biggest limitations for farmers was the possession of a land-ownership certificate. The manager didn't know of any other equivalent schemes in EJ. Dinas are interested in extending the model into other areas
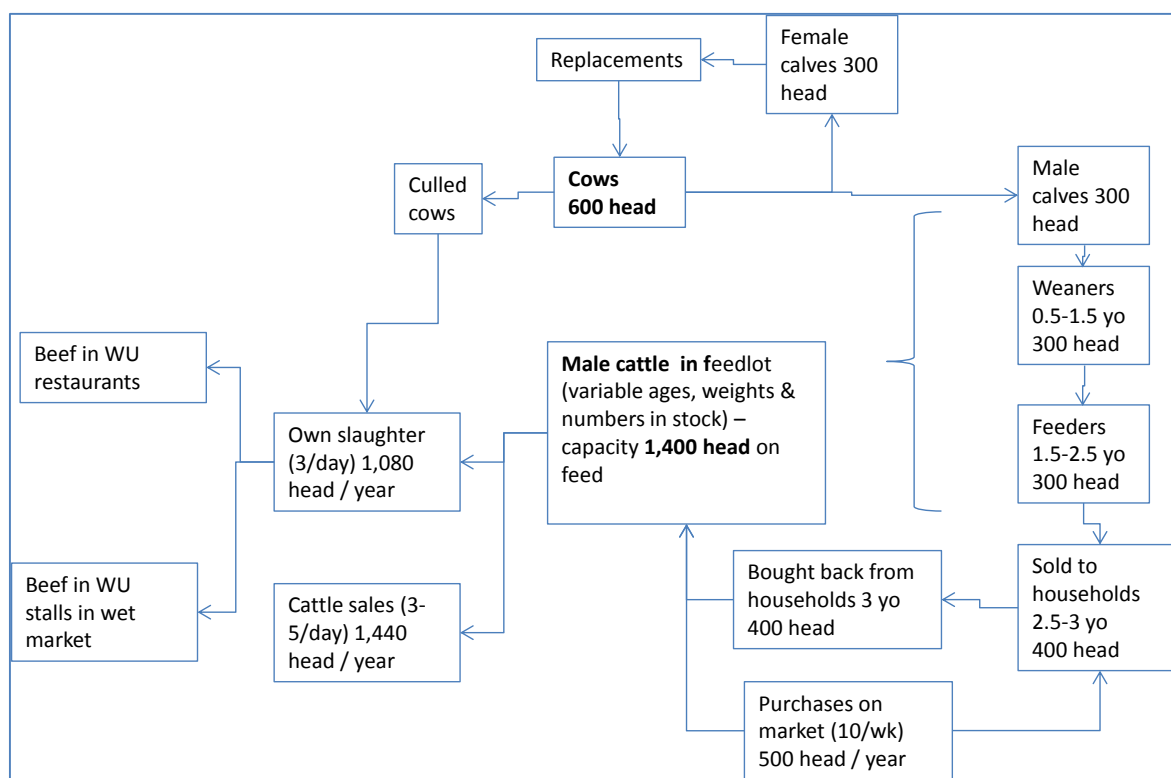
Source: Fieldwork interviews

Figure 11. Structure of Wahyu Utama cattle and beef operations

Trader in Lombok

H Saad Husni is the largest (2,800 head for export, 600 for local market) of only three traders in Lombok licensed to export cattle (breeders). For very large orders (many hundreds) he cooperates with the other large traders. The other big breeder cattle traders in Lombok are H. Sabri and H. Fathullah.

While H Saad Husni has a large herd of his own (300 head) and buys the majority of exported cattle from households he has no formal linkages with, he is also leader (67 cows) and connects directly with the group in his village. In this regard, the structure can be regarded as a small-scale nucleus-plasma structure. It also provides a rare case of a nucleus-plasma scheme in the breeding sector. The trader and the group concentrates on female breeders to export specifications (102 cm, 8-12 m.o., about 100 kgs), but can also retain male calves.

As a significant cow-calf operation, the trader is able to access KUPS loan (IDR 1.1 billion at 6% per annum for 5 years from Bank NTB). Saad Husni provided the collateral (the kandang covers 0.5 ha and IDR 1 billion value) and took out the loan in the name of the group, but then members of the group (and H Saad himself) use the loan facility to buy

cattle. Farmers buy breeders (heifers) for 4-4.5 million per head, which are fed for about a month to specifications for inter-regional trade (102 cms) and then sold at the standard export price (Table 21). This was reported to be profitable for the farmers. The group makes repayments in one lump sum on a 6 monthly basis. The brother of the trader is the accountant.

The trader had considered establishing formal linkages with other groups outside 'his' kelompok to secure supplies and reduce search costs for the export market. However, the main constraint cited was that outside groups did not have enough cattle (so could be seen as a philanthropic project in his home hamlet).

Cattle Cooperative in Kupang

A large co-operative structure called Gejati was visited in Kupang (Amarasi sub-district). This can also be regarded as a nucleus-plasma scheme, with the nucleus comprised of a trader/financier (Pak Ardi) within a cooperative structure that connects with large numbers of cooperative members (22 breeding groups, five fattening groups, each with about 20 farmers) and also with non-member groups and households.

Like all nucleus-plasma programs, the cooperative has an established financial base. The cooperative was formed in 1999 and then in 2004 granted 500 cattle from a distribution program. The area also has a lot of leucaena from a planting program in the 60's. The co-operative herd has grown to 2,432 head (of all types). The cooperative runs several activities:

- Breeding. Cow distribution from the co-operative to households (and a proportion of calves returned to the co-operative).

- Fattening. Feeders from co-operative sent to farmers, 70:30 profit sharing.

- Finance. Farmers can loan from the co-operative at 2% per month (max. IDR 2.5 mil., 10 months). Members are not required to raise collateral.

- Trading:

    o 180 slaughter cattle from the co-operative herd; and

    o 3,000 head from outside the co-operative herd.

Co-operative members sell at specified prices:

- 250 kg LW – IDR 19,500/kg;

- 250-300 kg range. Additional IDR 200 per additional 25 kgs;

- 300-349 kg range, IDR 20,000/kg; and

- 350+ kgs, IDR 21,000/kg.

If the co-operative sells cattle of non-members, purchase prices are lower (about IDR 1,000/kg). The co-operative pays the salary of 32 ground staff, administration and technicians (average IDR 1.05 million / month). The co-operative head Ardi has a salary of IDR 2.8 million but more importantly keeps the difference between the purchase price (from members or non-members) and sales prices.

As one of its major sales channels, the co-operative sells to a large importer from Jakarta. Sale price with the buyer are based on prevailing Jakarta prices minus trading costs. The head of the co-operative used to export directly to Jakarta so knows the costs (about IDR

5,000/kg). Transactions are made through a deposit (IDR 5 mil per head), with the balance at weighing at the co-operative when the collector for the Jakarta importer transports the cattle (10 head per truck). Unlike groups, cooperatives have a legal person status for contracts and loans

Direct trading relationships avoid costs associated with open market transactions (live cattle markets) which can include: hold up; collusion; spot payment; risks of miscalculating weights; search costs and time; market retribus.

While this co-operative has established well-organised finance and trading systems, cattle productivity is low and there is the potential for large increases. Accurate records were not available but estimates include:

- 13-14 kg birth weights;

- Mortality < 10%;

- No weaning strategy;

- About 0.6 kg ADG for feeders;

- Leucaena varieties are getting old; and

- The holding and weighing yards were dirt, sloped and would get very muddy in wet season. No composting.

TLM in NTT

Tanaoba Lais Manekat (TLM) is an NGO with a very large infrastructure (said to be 500 staff) involved in micro-finance and other projects with 31,000 clients. TLM have been incorporating cattle into their activities for 10 years, but it is a minor activity with 500 cattle distributed to farmers at an average of two head each.

TLM buy feeders (at market) using their own capital. The feeders are then transferred to the TLM holding ground for 2 weeks adaption, where groups/farmers select cattle. The cattle are weighed and valued at market rates (e.g. 90 kg feeder, 1-1.5 y.o., IDR 3 million, or IDR 33,000 /kg). Farmers feed cattle for a maximum of 12 months. Cattle are then sold by TLM.

TLM sell cattle direct to Kalimantan:

- Through contract with importer; or

- Auction of a line of cattle.

- Price paid by buyer to TLM is currently approximately IDR 19,000, plus IDR 100 per additional 25 kgs.

- TLM used to sell directly to Kalimantan for a higher price (IDR 25,000) but it is risky and generally they would suffer a 13-15% weight loss and shipping delays.

After sale

- Profits are calculated based on the weight and price of the slaughter animal sold to the Kalimantan buyer, and subtracting the weight and price of the feeder purchased from TLM by the farmer.

- 70:30 share between farmer and company of the difference. This is to pay capital costs of the cattle incurred by TLM.

- Farmers also pay 3% to TLM on the value of the feeder bought from TLM, to pay for TLM administrative costs.

TLM provide other services:

- Training, veterinary services, livestock consultant from Uni Cendana; but

- Farmers pay all other costs (feed, labour).

Interviewees did not know the productivity indicators, but feeders bought at 90 kg and sold out at 250 kg might have a weight gain of 0.44 kg ADG (long fattening period). They are considering shortening the period to two months by starting with 2 y.o cattle and charging households a flat rate (IDR 4,000) per kilogram liveweight increase to cover costs. A breeding system has been trialed with with households (AI) but was not feasible. TLM were involved in the ANTAR project from 2008-2009 which assessed productivity and economics but which only ran for two years so had minimal impact. TLM were involved in the ANTARA project in 2008-09 (only two years so didn't see impact) and was assessed (productivity and economics). Details may be available from Isnawa, DFAT Jakarta.

PUSKUD in NTT

PUSKUD are a commercial company that works with a number of agricultural commodities in NTT, including livestock. The company has traded cattle since 1985, but entered into contract fattening in 2002. The company operates in every district in West Timor and one in Flores, and sells 3,000 to 5,000 cattle per year.

PUSKUD operates under a similar but larger scale model to that previously outlined for TLM. PUSKUD has eight buyers that buy Bali bulls at 110-130 kg, 1-1.5 years of age. from markets or households. The feeders are then distributed to households and valued at the real purchase price by PUSKUD. Cattle are not weighed but are measured to check minimum height (102 cm). Farmers feed cattle for 8-12 months at about 0.4 kg ADG to reach sales weight of 250 kg.

Farmers are also supplied with training, veterinary products, vitamins and veterinary support. Farmers pay for the veterinary products (e.g. IDR 100,000/head) and their own production costs (feed, labour, pens). Profit is calculated as the difference between the sales price and the value of the feeder, which is split 70:30. The costs of "normal" deaths are borne by PUSKUD (2% mortality rate) but farmers pay if cattle "disappear' (no cases).

PUSKUD and technical staff hold regular meetings on the number of cattle that have reached slaughter weight, and relay current price information to farmers to ascertain interest in selling and numbers. Most of the cattle are sold for export (Jakarta, East Kalimantan) through auctions, usually monthly, averaging 300 head. Seven traders buy through PUSKUD auctions, but some can miss auctions if they run up against quota ceilings. Bidding starts at a current market price (e.g. IDR 19,800/kg) with established weight-price differentials:

- 250-274 kgs – IDR 19,800/kg;

- 275-299 – IDR 19,900/kg;

- > 300 kgs – IDR 20,000/kg; and

- No other specifications.

Auctions are conducted in Kupang and sighting of cattle not necessary because it is an established system. Cattle are weighed (PUSKUD have two digital scales) on dispatch from the farmer to the trader, which may mean an adjustment of payments. Traders don't place a deposit on purchases at auction. If a trader buys a large lot (e.g. 300 head), but can only ship out in smaller lots (e.g. 100 head) they just pay farmers per shipment. In the event of delays, residual cattle can be put up at the next monthly auction.

Traders and their trader association proposed to PUSKUD a 'division of territory' between production and trading, and formed a cartel to collude on auction prices. In response, PUSKUD used its export permit to export directly, circumventing traders as a warning'' to the association. Direct export is however a high return, high risk trade with capital costs from delays in payments (e.g. after slaughter in Jakarta).

PUSKUD believes that it has the network, veterinarians, technical assistance and links with households to expand to 7,500 farmers with 15,000 cattle. The major constraint faced by PUSKUD is finance. PUSKUD draws on a range of finance options including subsidies credit (6%) under the 'capital strengthening program'.

A range of organisations have partnered with PUSKUD (USAid, provincial government, a private investor in Jakarta and a revolving fund management board from the Ministry of Cooperatives). Marthen Mulik and Dick Copland developed an MoU with PUSKUD but it didn't eventuate. A breeding program with 230 cows was trialed but was found not to be viable.

Large cattle owner-keeper scheme

Alvin is a member of a large ethnic Chinese family that has a diversified business (hotel, agricultural equipment retail and a love of horse racing which is a major social activity/sport in the Sumba). Cattle are also a major business. Since 2008 he has increased his herd from 3,000 head to 5,000 head of which about 2,000 are cows.

He employs four permanent staff to liaise with 50 coordinators that link with the cattle keepers that raise the cattle for him. The usual arrangement is that if the keeper has 10 calves, the trader keeps seven, household keeps three. Alternatively, keepers can be paid a flat salary for looking after animals.

Females are kept as replacements (in the same household/area). Of the 2,000 cows, he records a calf drop of only about 1,100. This is low partly because of mortalities (first calf) but mainly due to long calving intervals (up to 2 years). Keepers also don't always report cattle numbers accurately. About 80 head died last year due to fires, deliberate killing of animals (social conflict) and a lack of feed at the end of the dry season. Thefts are common, (approximately 100 head in 2008).

Alvin is trying to build relationships in the community particularly through gifting cattle for ceremonies. He sometimes provides veterinary services and products, but no other services. When asked if there was scope to do so (increase productivity, build social relations, increase profits), Alvin replied that households have established production systems, which are hard to change.

Any productivity measures are applied on his own ranch of 10 hectares outside Waingapu. The ranch has some improved pasture and fences. A 60 head feedlot was built there but feed supply and costs mean it was not viable so it remains unused. The ranch is used as a holding facility for cattle to be distributed, tamed or for sale.

Very few bulls are sold (200/year), reportedly to build the herd up. Alvin used to export himself but he has since stopped because of the risks associated with exporting and now sells through traders. Sales are based on weight on farm, with advanced payment followed by quarantine.

While Alvin might be one of the largest cattle owners in Sumba Timur, there are many others that own a few thousand head each in owner-keeper relationships, sometime connected to debt and land mortgages.

2.11.2 Owner-keeper relationships

Cattle ownership structures have a major impact on the incentives of households to invest in more efficient production and marketing strategies. With limited alternative investment opportunities, cattle are a major business activity in Eastern Indonesia at district down to hamlet levels. Entrepreneurs (capital-rich but labour poor 'owners') buy cattle and then outsource the raising to 'keepers' that are capital poor but labour rich. Owner-keeper relationships may provide a much needed economic opportunity for low-income keepers. However, the real returns to keepers depend on the terms of the relationship and the valuation of inputs from keepers.

- In some parts of Eastern Indonesia (Sumba Timur), 90% of cattle are raised by households that don't own them. The equivalent numbers can be as low as 10% in East Java, although in monitored sites cattle were increasingly being raised by keepers (Cahyadi et al. 2012).

- Government also effectively operates as an owner in an owner-keeper relationship through cattle distribution and roll-over programs (cattle distributed remain assets of the state until program obligations are fulfilled).

Various profit sharing arrangements are entered in to. In upland EJ there were 2 models:

- Model 1. Owner distributes cows to the keeper, who feeds them on their own farms, and bears all feeding costs. The keeper pays the AI cost for the first pregnancy and keeps the first calf. The owner pays the AI cost for the second pregnancy and keeps the second calf; and

- Model 2. The owner distributes cows to keeper, the keeper pays all costs, sells the weaner and the owner and keeper split the profits. There can be various profit-sharing arrangements (50:50, to 70:30).

These models or variants on it are widely used in other parts of EI, both for cow-calf production and fattening.

2.11.3 Local level associations

A number of associations are active in the beef industry and can have an impact on the structure of the industry, and also may act as future potential partners.

Cattle transport associations

- There are two cattle transport associations in EJ that cover different geographic territories. One in Malang (Paguyuban) has 40 members (truck drivers). The main purpose of the association is to help solve transport problems (legal, police, checkpoints). Membership was required to bring a truck to market., Membership is IDR 1.3 million/year and meetings are held every two weeks.

- One butcher in Surabaya said that he can organise transport through a transport association (including inter-lotted trucks).

Butchers

- There is an association of Cattle and Beef Traders in EJ (Pedagang Sapid dan Daging Segar). With 50 members, the association is effectively a lobby group for the sector, and is active in organising representations to government on issues like quota and prices. Butchers in EJ and elsewhere have staged public demonstrations against (provincial) trade policy that has led to increased cattle and beef prices and adversely affected their businesses. There is also a jagal association in Mataram comprised of 14 jagal that facilitates communication between jagal and government (quota, prices and facilities).

Beef and retail

- The Indonesian Ulema Council (Majelis Ulama Indonesia, MUI) set the Halal standard for Indonesia and is the only recognized authority to release halal label/certificate for a product sold.

- There is an Association of Muslim Beef Traders (HPMI) throughout Indonesia, with branches at local levels. The association enforces laws relating to quality, hygiene and Halal standards and sets the minimum price for beef (to 'maintain relationships' between traders).

Traders

- There is a national organisation called the Indonesia Animal Traders Association (Persatuan Pedgre Hewan Indonesia, Pepehani) that has branches down to district levels. These are active especially for inter-regional trade. They can lobby government on issues like quota, the release of additional quota, 'coordinating' buying areas and prices. In some districts, there can be 25 members.

- Because of the importance of the cattle sector in NTB and NTT, there can be links into business associations (district chamber of commerce) and APINDO (Associasi Pengusaha Indonesia, Indonesian Businessmen Association).

Farmers

Several formal farmer associations/groups were active in the cattle industry. These were comprised of local level households (about 15) formed into farmer groups (poktan), several of which formed a larger ''group (gapoktan) at the sub-district level and above. The structures are legally recognized, enable members (farmers) to develop rules, meetings, financial structures, training and enter into business activities (on a group basis) and link with companies. Cattle groups have also participated in the Business Agriculture Development Program (PUAR).

Industry associations

No genuine whole-of-industry cattle associations with representation from all sectors were encountered during fieldwork. When asked, interviewees cited the associations listed above. There are examples of successful associations for pork and pigs in NTT (Kupang). These are led by the expansion of pork restaurants and chains and the need to maintain

consistent supply of healthy pigs. The association consists of restaurants, transporters, traders,farmers and their brokers.

At a higher level, a group has been formed called BisNak (Forum Business Pertanakan Sapi Local) that includes the Deputy Minister of Agriculture, the DG of DGLAHS, National Bakso Association, the new graduate program of the Ministry of Agriculture, slaughterhouse managers, provincial Dinas etc.

2.11.4 Ranches

Cattle ranches have been a major point of discussion in the NTB and NTT beef industry in 2012. Large tracts of semi-intensive and extensive land are to be developed with feed, improved grasses, water and fences to run cattle as large-scale, commercial cattle farms.

The concept received a high profile boost when the President visited Sumba Timur in July 2012 to promote ranches, immediately after attending the Annual Leaders meeting and discussions with Australian government and industry interests in Darwin. Australian (and Brazilian) industry has visited prospective sites. Very large tracts of land, villages, cattle and funding were cited. Plans have been scaled down but are proceeding with reports of the GoI committing trillions of Rupiah to the development of ranches, co-funded by provincial and private sector interests.

Dinas Livestock across semi-intensive and extensive areas of NTB/T are now developing up plans and applying for central funding (DGLAHS) for the ranches. For example, Bima developed a plan for a 200-500 hectare ranch and funding of IDR 10 billion. This is to incorporate other structures (VBCs) and to promote commercialisation and technology adoption on either private or state land.

NTT are designing four ranches – in Sumba Timur, TSS, Kupang District and Ngagakayo (Flores). The proposed site in Sumba Timur (Waingapu District, Pandawi Sub-district, Maubokul village) was visited. It is potentially good cattle country if improvements such as new dam, grasslands, water points and fencing go ahead. Business groups interviewed said that there was a lot of interest from local businesses in farming and land.

There does however appear to be complex issues associated with property rights in the areas. Land in Maubokul, for example, is collectively owned by 70-80 households in a vestige of the traditional clan/landlord system. The households reportedly said that they will not give up land claims but will accept cattle if given to them, but no doubt it will depend on terms and enforcement. There are precedents: Dinas developed a 500 hectare farm using land from three clans, which transferred use rights in exchange for cattle and the chance to 'learn' from the government farm. Cattle thefts, fires, exploitative relationships (land and cattle) are common problems in Sumba Timur and any investment in the area would have to be subject to a rigorous risk assessment and due diligence.

2.12 Cross Cutting Issues: Poverty, Gender and the Environment

This section raises some of the structures and issues related to poverty, gender and the environment. The way that these may be impacted on by industry development or project interventions is discussed in Section 5.

2.12.1 Social aspects of cattle production

Socio-economic structures and forces have a pervasive effect on the cattle production sector. Numerous considerations are mentioned throughout the report, but some further major issues are explicitly outlined in this section.

Functions of cattle in smallholder systems

Cattle play multiple roles in farming systems and livelihoods throughout the world. They provide cash income from sales of animals and animal products, food from animal products, farm inputs (manure and draught) and are a source of savings, security, insurance and social status (Moll, 2005). In Indonesia, surveys find that cattle are raised by households primarily for 'economic' purposes and only secondarily for reasons relating to 'tradition'. Throughout Eastern Indonesia, farmers aspire to own cattle as the major pathway to increased financial security. In the absence of other means to accumulate and save capital (investments or bank accounts), cattle are used as a source of 'savings'. Animals are sold to meet immediate cash needs (60% of respondents), secondary needs like a motorcycle and TV (24%) and large expenses like weddings and houses (10%) (Mahendri *et al.* 2010, see also Deblitz *et al.* 2011; Patrick *et al.* 2010). However, this means that many small-holder cattle producers rarely aim to maximise biological and market efficiencies from cattle production.

Cultural values

There are also strong cultural values attached to cattle (and buffaloes) in Eastern Indonesia. Beef consumption and therefore cattle slaughter increases sharply during the major Muslim festival of Idul Fitri (August/September in recent years) and large numbers of cattle are slaughtered at mosques for Idul Adha (Day of Sacrifice, approximately two months after Idul Fitri) where meat is distributed amongst the community and the poor. Especially in Christian areas of NTT, cattle and buffaloes are slaughtered for traditional ceremonies (*adat*) including burials, weddings, and graduations. Hundreds and sometimes thousands of guests attend these events, and hosts are socially obliged to provide them with meat. This can lead to a very large slaughter of (male) cattle and buffaloes, a lifetime of debt to pay for it and perpetuation of owner-keeper relationships. The socio-economic impacts in areas like Timor and Sumba cannot be understated.

The landless poor

Cattle are also an important source of livelihoods for landless rural households. Cattle can be raised in rural areas where households have an area to tie or house cattle (their own or communal), but no land. Landlessness rates vary with 10% in parts of EJ like Trenggalek, 37% in Central Lombok, and perhaps higher in Sumba Timur.

Owner-keeper relationships

Owner- keeper relationships are extremely common and important in the EI cattle production sector. Details on the structures are provided in Section 1.1 'Owner-keeper relationships' and economic incentives of different ownership structures and terms are analysed in Section 3.3.2.

Valuation of returns to cattle production

Budgeting in Section 3.3 shows that households can generate positive cash returns from cattle. Economic returns can be increased significantly through improved production and

marketing strategies. However, economic returns generally become negative when non-cash items are valued; especially costs of feed produced on farm, opportunity costs of labour and capital of the cattle inventory. For this reason, analysis of the real returns to cattle production is not straightforward. Measures to increase efficiencies, real returns and capital accumulation from cattle production are outlined in Section 3.3.

2.12.2 Gender roles

Based on data in Table 6 and the proportion of women in each sector, an attempt has been made to estimate the role and number of role of women in different sectors of the beef industry (see Table 26). Estimates are that in the three AIPD-Rural provinces:

- Women could assume to take charge of perhaps half of the cattle in EI, or conduct at least half of the cattle production tasks. This translates into 774,000 women producers;

- Women rarely participate in cattle trading;

- There may be about 10,000 women that work in the slaughter sector; and

- More than 5,000 in stalls at wet markets.

Women therefore play a significant role in the industry but the role is concentrated in the early stages of the chain (input and production) and the latter stages (boning and retail). The mid stages of the chain are dominated by men. This is borne out in the more detailed discussion below.

Table 26. Estimate of employment of women in cattle and beef chain in EI, 2011

	% women in sector	Total for AIPD-Rural Provinces	East Java	NTB	NTT
Cattle producers	50	773,968	590,912	85,726	97,329
Traders	0		-	-	-
Slaughter sector					
Butchers	10	325	275	28	21
Butcher crew/workers	60	7,788	6,601	681	507
By-product traders	60	1,947	1,650	170	127
Total		10,060	8,526	880	655
Stallholders in wet markets	75	5,116	4,499	428	189
Total all sectors		789,144	603,938	87,034	98,172

Source: Author estimates and Table 6

Inputs and production

Everyone in the household (men, women, children, elder members) can collect feed (grass, straw, forages) in the immediate proximity of the farm. However, women do the majority of this work. This is partly because men are allocated work off-farm (where they are paid a higher rate than women) or heavier manual labour, leaving women to collect feed in conjunction with other on-farm cropping work.

Around the farm, feed is collected on the way to and from other jobs (weeding, crops etc.) In the wet season plenty of feed is available close to the house so it may only take one

hour per day to collect enough feed for two head of cattle. However, in the dry season, feed has to be collected from further away, venturing well beyond farm boundaries and onto neighbours' or collective land. This can take three hours per day. Banana trunks are a common source of roughage in EIbut can be heavy and hard to cut, so this is done by men. In EJ, households help each other to harvest or thresh rice in exchange for rice straw – both between and within the hamlet – in which women participate.

Cattle can also be tied in the field to graze on stubble after harvest. If household members (often women) work on crops, they will take cattle to graze while they work. Cattle herding in semi-intensive and extensive systems is done by all members of the family, including children, but if they have to go to school then men or women do the work.

Measures to reduce the amount of time required to collect feed (tree forages, feed storage etc.) will have a significant effect on the labour burdens of farming women, freeing them up to do other activities on and off-farm.

Importantly, women do much of the pen feeding (mixing rations and putting feed into troughs) and carry water to kandangs if required. As women spend most time with the animals, they are more likely to be involved in animal husbandry and management (animal health and disease, oestrus detection, calf management etc.). Thus women would seem to be an important target in any production related training and extension activities.

Cattle marketing and business

Despite the prevalence of women involved in cattle production activities, men tend to regard the cattle as theirs, at least in external relations. Cattle in NTT are a major (if not the major) source of wealth and reputation in the community. Surveys in EJ by Cahyadi *et al.* (2012) found that the decision to sell cattle was mainly taken by the husband (85% of farmers in the lowland site and 94% in the upland site). Culturally in East Java the husband is regarded as the head of the household and the owner of household assets, including livestock.

Cattle selling and negotiation is done exclusively by men. This is true for farmers selling their cattle, traders, brokers and buyers, transporters and workers regardless of whether sales are through livestock markets or more direct purchases from farmers.

In the absence of other formal savings (investments, assets, bank accounts), cattle are kept as the major source of 'savings' for households. They are used to pay for immediate household needs (education, health, food) or used for unproductive consumption. Women are therefore very interested in the management and sale of cattle and no doubt play a role in the formation of price and terms. Women may also be important in programs to use cattle to build household and group finance and business development programs.

As mentioned previously, cattle play a very important role in traditional ceremonies. Especially in Christian areas of NTT, very large numbers of cattle are killed for burials, weddings and graduations, when the hosts are expected to provide meat as food for large numbers of guests and as a present to take home. This is a major expenditure for households and can put a family into lifelong debt. For weddings, men pay dowry to the family of the wife, and this can include cattle.

Slaughter and retailing

There are large close-knit communities and families of butchers down into sub-district level, with all members of the family involved, often across generations. While the butcher

is most likely to be a man with a primary role of buying cattle and overseeing the slaughter crew, there were some cases of managers being women (Mataram).

Men kill animals, supervise slaughter to halal specification (Modin) and work on the slaughter line moving heavy carcasses. In some abattoirs, there were 100% men on the boning line. However, in others (Surabaya) with 100 people working on boning, at least 30% were women. The proportion of women was higher (60%) in collecting and cleaning of beef products and by-products, which is usually integrated with the beef distribution and retail sectors. Measures to centralise or mechanise slaughtering will affect women.

Women play a major role in beef and by-product marketing. In most wet markets, women were the stallholders for beef and beef products. These stalls can be integrated with jagal family operations (Surabaya) or separate (Mataram). In Kupang however, all of the stallholders were men.

Importantly, women do much of the meat buying for the family meals and are more discerning on product, cuts and price. Women would seem to be important participants in measures to improve beef marketing, consumer awareness and measures to improve food safety and hygiene.

2.12.3 The environment

Impact and scale of operations

While this study has not examined environmental aspects of the beef industry in any detail, important issues have been identified for different industry sectors.

Cattle production

Cattle have both positive and negative environmental impacts.

Negative aspects can be summarised as:

- Section 2.9.2 'Carrying capacity' raises the prospect that the feed-livestock balance (resources to meet livestock demands) may already have been exceeded in EJ and NTT. That is, increases in livestock numbers will further deplete the resource base.

- However in EJ (and Lombok), feed supply can be increased through resource mobility, especially of crop residues and 'imports' from other regions (e.g. plantation residues).

- However, in semi-intensive and extensive cattle production areas, livestock population pressure results in over-grazing, especially of grasslands. Agronomists and grasslands scientists with long exposure to EI agree that grassland degradation is widespread in the islands of Sumbawa, Sumba and Timor with impacts on species composition, soil erosion and weed invasion. Over-grazing weakens root structures that lead to lower plant growth.

- Deforestation and over-grazing exposes bare soil to weed seeds that, once established, have more opportunity to spread. Weed invasion is a serious environmental problem in many native pasture areas in EI and include *Chromolaena odorata* and *Lantana camara* (and *Jatropha* sp in lowland areas of Timor). Weed invasion has been reported (e.g. McFayden, 2003) and biological control measures trialled, though uptake at a community level has been slow.

- Intensification of cattle production in areas where cattle are highly concentrated, or organized into kandangs (pens) on a group basis (e.g. 100 cattle), or in small feedlots can also be associated with effluent runoff including urine leeching into water tables, and manure and urine runoff into waterways.

- Very large herd buildup may have a discernible effect on methane emissions, especially on a roughage based diet.

While increasing cattle numbers have environmental externalities, there are also positive impacts.

- In intensive production areas in particular, cattle are fed predominantly on straw. This would otherwise be burnt, causing air pollution (solid particles) that can impact on air quality and in some cases air traffic.

- The majority of manure from cattle is collected by farmers and spread on fields as organic fertilizer, which can increase organic matter in soils and reduce the application of fertilisers.

- An increasing number of projects incorporate compost heaps from kandangs, and biogas converters that can generate gas for household cooking.

- Manure from large feedlots has a commercial market.

- Many cattle development strategies in both intensive and extensive systems involve the planting of forages for cattle feed. Many of these are perennial legumes (trees like sesbania and leucaena) that fix nitrogen in the soil as a sustainable and ongoing form of soil improvement.

Other sectors

- While not investigated, there are issues of effluent management in live cattle markets, and quarantine and holding yards. Again, this could create effluent runoff to pollute water courses, but could also be collected for sale with positive environmental impacts.

- There are clearly major issues of effluent runoff from slaughter houses (blood, offal, trimmings, manure and urine). Larger plants did have some drainage and treatment facilities, which were in some cases the result of government investment. These facilities were very crude or non-existent in small slaughter areas.

3 Beef Commodity Chains in Indonesia

Section 2 has already provided a detailed description of the chains, structures and interventions trialled or implemented in the beef industry. From this base, Section 3 concentrates on analysis of sectors and actors associated with the interventions recommended in Section 4 (producers, butchers and traders). That is, budgets are not constructed for actors that are of less relevance (inputs providers, feedlots, mechanised abattoirs, retailers, shipping companies).

3.1 Overview

Figure 12 provides an overview of the EI beef supply chain. Because of the heterogeneous nature of the industry and inter-regional differences, it is not meaningful to include numbers on chain actors, product flows volumes and relative importance in the figure. Instead, these are signified through stars, where three indicates the dominant structures, and one the least important. The data on which this is based is available in Section 2 (see cross-references below).

Rather than replicate the description of supply chain structures detailed in Section 2, analysis in this Section 3 focuses on potential interventions *by industry sector*. This lays the foundation for the recommendation of *intervention areas* in Section 4, which focuses on how interventions should be designed and organised.

General observations about the EI beef industry include:

- The EI beef industry is best described as a supply chain, where product flows (from left to right) through the chain, with very few backward linkages (services, inputs, feedback, formal relations). There is very limited deliberate, formal co-ordination between actors to achieve common objectives of the sort that constitutes a value chain.

- Interventions recommended in Section 4 aim to address this lack of coordination and linkages, through the development of value chains considering the nature of the commodity, the structure of the chain and policy and institutional settings.

- In this regard, it is important to note that large (national and multi-national) lead firms, both input suppliers and processors, are either missing in the chain or lack incentives to provide services to farmers on a scale that will lead to large productivity and income effects.

- However, there are some more local level private sector actors (butchers and traders) that have incentives to develop backward linkages with producer groups on a more localised scale, and could form local beef business groups.

- Another feature of the beef industry is the prevalence of large scale government and community schemes focused on cattle production at the farmer group level, shown in the middle section of Figure 12.

These structures and resources provide reach to large numbers of farmers in a cost-effective and sustainable way.

- However, even in these structures, there can be a lack of services, backward linkages and market-oriented support for farmers and groups. Investment and

support for producers to improve productivity and target particular production regimes and markets is limited.

- The recommendations in Section 4 aim to build on these structures and include proposed measures for their development and commercialisation.

3.2 Input Distribution

Figure 12 (top left) lists the inputs relevant to cattle production (breeding, feed and animal health). Because of the characteristics of small-holder cattle production in EI, inputs (breeding, feed, animal health) are sourced predominantly from within household and farming systems. Inputs from external suppliers are limited and make up a small cost for farmers. Even where there is uptake of external inputs (AI in EJ), external input suppliers have limited incentives to provide services to farmers on a scale that will lead to significant productivity effects. This means that a strategy based on facilitating linkages between large scale, corporate input suppliers (lead firms) and farmers is less relevant to beef than it may be in horticulture and cropping.

There are however opportunities to increase linkages between farmers and small scale input suppliers at a local level through innovative market-based interventions and inclusion of these actors in the business support program proposed in Section 4.

Inputs & services	Cattle production	Cattle marketing	Slaughterr	Beef marketing & retail

Breeding
- hh bulls
  ***NTB/T
- group bulls
  *Lombok
- AI
  ***EJ

Feed
- hh feed
  *** all areas
- local feed traders
  *EJ
- contract feed hhs & inter-regional traders (feedlots only)

Animal health
- hh detection
  *
- local vets
  *
- vet supplies from nucleus
  * in schemes

Specialised cow-calf households
* lowland EJ

Mixed cow-calf & fattening households
***

Specialised fattening households
*

Feedlots
* EJ only

Village collector
***

Markets & brokers
**

Sub-district & district traders
***

Inter-regional traders
**

Inter-island traders
** Sumb & Sumba

Cattle importers (M area)

Uncertified butchers & slaughter points
**

Certified butchers
***

Certified service slaughter houses
***

Slaughter house (company has ownership of facilities & product)
*

Stalls in wet marckets
***

Meat shops
*

Supermarkets
*

Beef trader

Bakso makers, street vendors, HRI

Cosumption

Inter-regional beef trade

Supporting actors, structures, schemes

Owner-keeper-trader relations

Production — Cattle distribution / Individual owners / Contract fattening & trading agencies — Market

Inputs and cattle production	Cattle marketing	Slaughter	Beef marketing & retail

Actors
- Extension agents
- AI providers
- Vets, labs
- Banks
- Universities & research
- OTGS

Structures
- Cattle distribution
- Owner-keeper
- Nucleus-plasma
- Village Breeding Centres
- Groups

Cattle marketing
- Trucking
- Livestock markets
- Shipping
- Quarantine, port, holding facilities

Slaughter
- Slaughter facilities
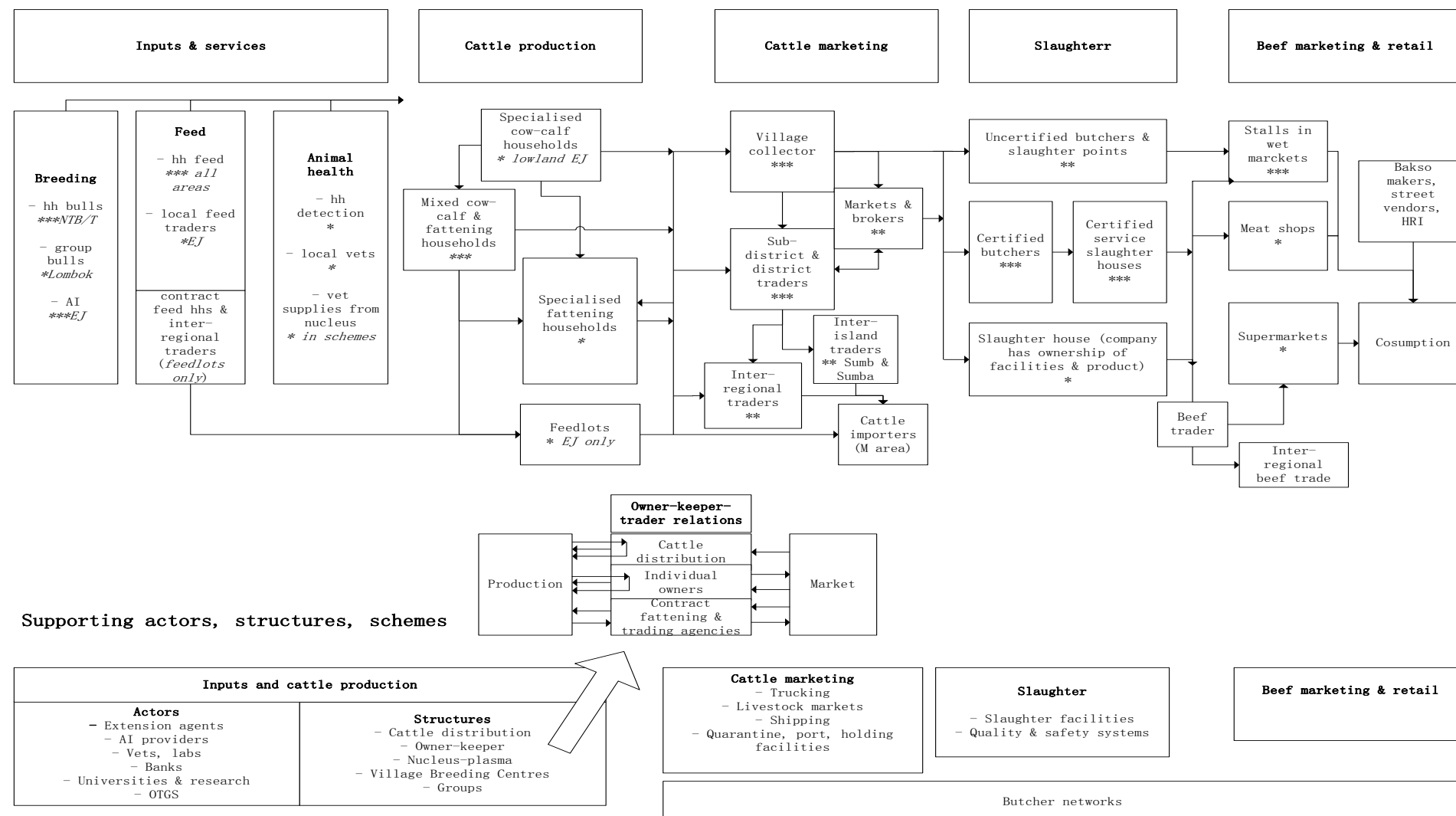- Quality & safety systems

Butcher networks

Figure 12. A stylised cattle and beef value chain of EI

3.2.1 Breeding

AI

As discussed in Section 2.10 'The AI system', the ability of AI agents to coordinate with farmers and to deliver AI services in a timely way is a very important component of productivity. AI coverage can reach 90% in EJ where the semen/straw originate from, but coverage diminishes over more distant (eastern) provinces.

There are large numbers of AI agents (government staff and independent) in EJ and Lombok. AI agents buy straws at set rates, but service costs charged to farmers vary according to distance or basis of payment. Technicians in Lombok can charge IDR 50,000 for the first attempt and, if unsuccessful, can charge lower amounts (e.g. half) for subsequent services. Some AI technicians charge a (higher) flat rate for a successful pregnancy, which in principle would give technicians incentives to work more closely with farmers to achieve a successful pregnancy. Crossing larger sires with smaller framed cows commonly causes calving problems (dystocia), and AI agents can offer services (pull calves) for fees of up to IDR 200,000.

In Section 4, recommendations are based on developing cattle programs and groups in EJ that foster closer relationships with local AI agents. A change in AI fee structure from one based on attempts, to one based on successful conceptions, would increase incentives for agents to achieve higher success rates. This would involve   closer communication with farmers, the provision of training on oestrus detection, and timely delivery of AI services and quality semen.

Group bulls

While most farmers use their own bulls for natural mating, there can be inefficiencies in poor bull selection and feeding costs. In some intensive (pen-feeding) systems in Lombok, a (good) communal bull owned by the group is used for natural breeding, and after service can be sold to generate income. A clearly defined structure on the household(s) that manage and feed the bull is required and these household(s) must have incentives (through compensation or profit-sharing) to do this job well. Profits from the sale of the bull can then build the group fund that can be utilised by members (see Section 2.10 'Groups'). This system works in more intensive pen-feeding systems, where households prefer to use local bulls over AI and in NTB where crossing with non-Bali cattle breeds is not allowed. This strategy would also seem to be applicable to Village Breeding Centres (see Section 2.10).

3.2.2 Feed

As discussed in Section 2.4.3, feed supply is a major constraint to cattle productivity in all areas. While the vast majority of feed comes from on-farm or community sources, small farm sizes place high pressure on on-farm resources. There is a growing private market for feed in EJ that should be considered in project activities for intensive production areas.

Unlike dairy or poultry industries, there are no commercial compound feed manufacturers for beef cattle. A mill is planned in Lombok as part of the Meat Business Centre, but the viability is questionable (transport costs for low grade feed).

Feed traders

Of more relevance is the growing number of small scale, private feed traders, especially in EJ. Priyanti *et al.* (2012) surveyed feed traders that sold (in order of importance) corn stover, rice straw, grasses, sugar cane tops and leaves and legume hay. Three types of actors were identified (collectors, small and medium sized feed traders and feed preparation site providers). Feed traders (second category) were interviewed during fieldwork. Any cattle group development program should involve and seek to develop linkages between farmer groups and feed traders.

Grain processors

All farmers in all areas take their rice and corn to small scale, local processors for grinding into flour. There can be several fixed small-scale processors in a village, or some drive around the village in a mobile processor. When the grain is processed into flour, the processor retains the bran, which they sell primarily to poultry farmers. Some parameters in Malang are:

- Corn bran processing yields are about 4:1, sell for IDR 2,500/kg; and

- Rice bran processing yields about 3:1, sell for IDR 1,000/kg.

Bran is a good quality feed source, one of the few sources of concentrate in small-holder systems and produced in significant quantities. If farmers maintained and fed their bran strategically, it would provide a significant boost to cattle productivity (see 'high productivity' scenarios in EJ in Section 3.3). However, retaining the bran would come at a cost. Processors said that if farmers wanted to keep the bran they would have to buy at their normal selling price. Ways for farmers to maintain their bran include: negotiating a processing only fee structure with processors, or developing a group processing facility. The feasibility and logistics of this could be explored in any cattle group development program.

3.2.3 Veterinary products

There are limited opportunities to link large veterinary product manufacturers and suppliers with farmers. Veterinary products are a small input in cattle production systems, while veterinary product manufacture and services (vaccinations etc.) are provided as a public service. See Section 2.3.3 'Animal health'.

There are, however, examples of traders and contract fattening agencies distributing veterinary products (drenches, sprays and vitamins) to households in order to improve supply. There may be opportunities for these traders to do this more regularly and systematically as part of a proposed cattle group development program

3.3 Production

The cattle production sector involves: the major constraints to industry development; the greatest potential for productivity and income gains (Section 2.4.3); the greatest numbers of poor rural households (Section 2.2); and is the focus of policy attention (Section 2.9 and 2.10). This section outlines budgets for different types of cattle producers in different production systems and regions, under different ownership and governance structures.

3.3.1 Household modeling

Modelling approach

The economic analysis of cattle production systems presented here is based on a model reported previously (Longworth et al. 2001; MacLeod et al. (2007); Waldron 2009). Features of the model are:

- The budgeting is conducted on a whole-farm basis (i.e. not partial budget), which is necessary in cattle production because cattle inputs (feed, labour) and some outputs (e.g. manure) are sourced or used within integrated farming systems.

- Activities include various crops and forages, livestock types and off-farm work. Costs and revenues are attributed to each of these activities. The model values and reconciles physical flows of intermediate products such as feed that form outputs of cropping and inputs of livestock activities. Manure is an output of livestock and input for cropping activities.

- The opportunity cost of labour (for adult, children and elderly members of the family) and capital (mainly in livestock inventories) is valued, as these are critical factors in understanding incentives in the sector. If after opportunity costs of capital are deducted, net returns are positive, it is assumed that cattle production is more profitable than other investment alternatives.

- Far more detail on model parameters and results were generated than are able to be reported here but are available on request.

Scope

Three different production systems are reported on:

- Mixed cattle production systems, where the households raise cows that produce calves that are fed through to slaughter weight.

- Cow-calf systems, where the households raise cows, which produce calves that are sold at a young age (from weaning).

- Fattening systems, where the household does not raise cows, but buy in feeders (bulls) that are fattened for a specified (short) period and then sold.

- For each of these systems, two scenarios are run – low and higher productivity. These scenarios are based on a series of integrated measures that have been trialled under various programs (breeding, early weaning and calf management, supplementary feeding of cows, nutrition, forages, pens/sanitation and water). Parameters are detailed below.

- Fieldwork was conducted in seven different production areas (Probolinggo, Malang, Central Lombok, Bima, Kupang, Sumba Timor, TTU) with different agro-climatic conditions (lowland, upland, intensive, semi-intensive, extensive etc.) and cattle production systems (cow-calf, fattening, mixed) (see Table 12), with different productivity levels (low, higher) and different breeds (Ongole and Bali).

- There are also important scenarios to run on cattle governance structures (participation in government programs, owner-keeper relationships, contract fattening, and finance schemes) and relationships that impact on input and output prices.

- Due to the enormous degree of variation and number of variables, it is not possible in the confines of this study to analyse and report on all systems.

- Individual cases have therefore been selected to explore particular systems and issues in some depth, based on how well they illustrate issues important to the project and the robustness of the modelling for that case.

Limits

- Data for the model is drawn from farmer and focus group interviews, trial results from ACIAR projects (LPS 2008/038) and expert input (government officials and researchers). This data is of course not statistically valid and may not be representative of broader production systems.

- Given time and other resource constraints the model has not been fully calibrated for Indonesia and various assumptions have been made (especially on labour, manure and transport).

- Many items require interpretation on the most appropriate way to value inputs.

- The models are based on a steady-state (year-in, year-out) production system and so cannot capture the development or contraction phases of households moving into, or out of, cattle production.

- For these reasons, results of the modelling should be treated as indicative. That is, the trends, magnitudes and sensitivities are more important than the specific values.

- Some confidence in the results can be gained because there is broad consensus / alignment with results from two larger long term economic analyses of cattle production in EI (Rutherford *et al.* 2004; MacLeod *et al.* 2007).

3.3.2 Mixed (cow-calf, fattening) production

Base (low productivity) scenario

Srigonco Village is in an upland area of East Java in Malang and the site for trials in ACIAR project LPS 2008/038 (Straw Cow project). There are 1,559 cattle in the village, 563 cattle owners and 100 cattle keepers (average of 2.3 head per household).

A representative mixed (cow-calf and fattening) household was selected based on Straw Cow village data.

Characteristics of the household include:

- 0.75 ha of cropping land:

  o 0.2 ha rice, 1.5 t/ha yield, price IDR 6,000/kg;

  o 0.2 ha corn, 2.4 t/ha yield, price IDR 3,000/kg;

  o 0.25 2nd corn crop following rice, 1t/ha yield, price IDR 3,000/kg;

  o And other crops (cassava etc.);

  o Tree legumes (sesbania) (5% of land on bunds, 300 trees per ha on bunds @ 2 kgs / tree per cut fresh * six cuts per year *50% DM;

  o King grass (5% of land on dykes, 2 kgs per sq. m fresh per cut * six cuts per year * 0.25 DM;

- o   Native grasses (25% king grass).

- The household raises two Ongole cows, which are AI'd to produce calves that are kept to slaughter weight (30 months of age). Productivity parameters are presented in Table 28. Cattle are not used for draught purposes.

- Cattle are fed on rice straw, corn stover and forages (sesbania and king grass) at rates specified in Table 28 and a price of IDR 350/kg (dry). Cattle are fed small supplements of rice bran in high productivity scenarios (112.5kgs/year for all cattle, at cost of IDR 1,200/kg.

- The household consists of a mother (full time on farm), a father (0.625 time on farm) and a child (0.5 time on farm).

- The father works off-farm in construction and transport at a wage of IDR 45,000/day (IDR 25,000 for women), which constitutes an opportunity cost of labour.

- Women do almost all animal husbandry, women and men collect feed and children can graze animals (on stubble, roadside).

- Importantly, straw is collected from multiple sources (see Table 9). The household collects some straw from its own rice and corn crops, but the majority from two off-farm sources: by assisting other households harvest crops every second day (so costs of labour and motorbike for transport); and by hiring a truck with (seven other neighbours) to collect straw from farms 20 kilometres away, once per month.

The whole-farm budget for the representative household is shown in Table 27.

Table 27. Budget report for low productivity upland East Java (Malang) mixed cattle production household (IDR)

	Cropping / forages	Cattle	Total farm	Off-farm	Total household
A. Revenues					
Cattle sales	5,127,000	5,469,720	11,016,720		
surplus manure sales		392,080	395,437		
opportunity value of farm produced feed	598,125		598,125		
opportunity value of farm produced manure		28,480	28,724		
Total Revenues	**5,725,125**	**5,890,280**	**12,039,005**	**3,600,000**	**15,639,005**
B. Costs					
own-produced feedstuffs		506,625	556,125		
purchased feedstuffs (including transport)		1,363,891	1,386,391		
Fertiliser	136,949		136,949		
other variable costs	-	274,675	274,675		
Depreciation	650,000	300,000	1,000,000		
hired labour	-	-	-		
transport costs (including manure)	11,690	511,895	523,585		
Total Costs	**798,639**	**2,957,086**	**3,877,724**		
C. Gross profit (returns to capital, labour and management)	**4,926,487**	**2,933,194**	**8,161,281**	**3,600,000**	**11,761,281**
less opportunity cost of inventory/capital	1,690,000	2,902,076	4,776,676		
D. Net profit (returns to labour & management)	**3,236,487**	**31,118**	**3,384,605**		
less opportunity value of family labour	3,870,186	608,760	4,532,946		
E. Net profit (returns to management)	**(633,699)**	**(577,642)**	**(1,148,34)**	**3,600,000**	**2,451,659**
Share of total household income (%)	-25.8	-23.6	-46.8	146.8	

Source: Author's calculations

Revenues:

- Almost all returns are from the sale of cattle at 30 months of age. Manure is significant but the price is overstated (the only manure value that could be established was ex-feedlot that may not be applicable at household level).

Costs:

The largest cost item for gross returns is 'purchased feed' which is actually 'feed brought in from off-farm sources'. The costs are not for the straw per se, but its transport (see above).

- Other variable costs include the transport of cattle and own feed (motorbike etc.) and may be over-stated.

- Depreciation is mainly cattle pens (5%).

- Transport costs (including manure) may be overstated.

Profits:

- Gross profits are positive at nearly IDR 3 million;

- However, the opportunity costs of inventory is about the same as gross profits (calculated as weight of cows plus calves at weaning plus half total weight gain at current cattle prices and interest rate (13%).

- Net returns become negative (-IDR 577,642) when the value of family labour is costed. The applicability of applying a value on farm labour is open to debate, but there are considerable opportunities for farmers in Srigonco to work off-farm.

Productivity and income effects

Longstanding research has tested the productivity effects of introducing a suite of inter-related measures (supplementary feeding of cows, nutrition, detection of oestrus and timely delivery of AI, early weaning and calf management, improved feed management (forages and crops residues), pens/sanitation and water) (see Section 2.4.3). The key feed and cattle productivity parameters that are able to be entered into the model are shown in Table 28 below.

- The measures increase the turnoff of cattle (20%) and the weights of cattle sold (by 35%), which increases revenues by 100%.

- Costs increase also by 100% (from collected feedstuffs, depreciation (better pens), increased labour for animal husbandry, and manure transport (although the latter is over-stated).

- The measure doubles gross returns to >IDR 6 million.

- However, opportunity costs of inventory and labour also increase; and

- Net returns are still positive at IDR 897,527, an increase of 150% over the low productivity base scenario.

These results are higher, but broadly comparable to those of other long-term studies on the economics of small-holder cattle production in Eastern Indonesia (Rutherford et al. 2004; MacLeod et al. 2007).

Table 28. Productivity scenarios and income effects for upland mixed cattle system in Malang

Productivity level	Low	High
Straw (% body weight)	1.7	1.5
Forage (% body weight) + bran supplement	0.3	1
Mortality (%)	5	0
Average weight cow (kgs LW)	280	305
Calving (calves per cow per year) (%)	40	60
Weaning age (month)	7	6
Weaning weight (kgs)	90	109
Live weight gain (kg/hd/day)	0.3	0.4
Weight at 30 months of age (kg LW)	297	403
Total Revenues (IDR)	5,890,280	12,203,310
Cattle sales	5,469,720	11,724,000
Total Costs	2,957,086	5,854,875
own-produced feedstuffs	506,625	527,024
collected and purchased feed	1,363,891	3,135,049
other variable costs	274,675	326,750
depreciation	300,000	500,000
transport costs (including manure)	511,895	1,366,052
Gross profit (returns to capital, labour and management)	2,933,194	6,348,435
less opportunity cost of inventory/capital	2,902,076	4,169,308
Net profit (returns to labour & management)	151,366	2,179,127
less opportunity value of family labour	608,760	1,281,600
Net profit (returns to management) (IDR)	(577,642)	897,527
Share of total household income (%)	-23.6	19.4

Source: Author's calculations

Owner-keeper relationships

As discussed in Section 2.10, owner-keeper relationships are an important governance structure in household cattle production. Rutherford et al. (2004) distinguishes between different types of ownership structures, costs and risks and finds that gross returns for 'managers' (keepers) are approximately half those of owner-managers (that raise their own cattle).

We take a straightforward approach based on the following assumptions:

- Most owner-keeper relationships for calves operate on the basis that the owner and the keeper keep every second calf each. For the purposes of modelling, this effectively means that calving percentages are halved.

- Because the ownership of the cow remains with the owner, the keeper does not incur the opportunity cost of the value of the animal (only every second calf grown out to 30 m.o.)

All else being equal, Table 29 shows the income effects of different ownership structures.

Table 29. Income effects of changes in ownership structures in mixed cattle production systems (IDR)

Productivity level	Low		Higher	
Ownership structure	**Owner/keeper**	**Keeper**	**Owner/keeper**	**Keeper**
Total Revenues	5,890,280	3,121,840	12,203,310	6,287,655
Total Costs	2,957,086	2,564,285	5,854,875	4,640,447
Gross profit (returns to capital, labour and management)	2,933,194	557,554	6,348,435	1,647,208
less opportunity cost of inventory/capital	2,902,076	1,011,118	4,169,308	1,783,054
Net profit (returns to labour & management)	151,366	-453,563	2,179,127	-135,846
less opportunity value of family labour	608,760	456,570	1,281,600	961,200
Net profit (returns to management)	-577,642	-910,133	897,527	-417,446

Source: Author's calculations

The table shows:

• As could be expected, revenues are roughly halved under a keeper-only structure because they forgo half of their revenue stream (every second calf).

• However, costs reduce only slightly (reduced feed) because the cow, feed, facilities and labour have to be maintained (effectively overhead costs).

• This results in gross profits many times lower for a keeper compared to an owner-keeper.

• However, the keeper has much lower capital costs than the owner-keeper (only on their own claves/feeders).

• Labour costs are also slightly lower in the two systems.

• Net profits confirm that there are far higher returns to owner-keepers than keepers in either low or higher productivity systems.

The implications are that:

• Keepers are less likely to adopt higher productivity production practices if they are cattle keepers; and

• Any program should be done with or encourage households to own their cattle (through cattle distribution or finance programs).

Cow distribution – calf return programs

Government distribution programs effectively also act under an owner-keeper structure, where households are supplied with breeders under obligation to return calves in specified periods/numbers. If the contract was to return two calves in 5 years and the calving rate was 80% (as it is for Bali cattle in NTB/T), then this would also mean forgoing every second calf, with incomes effects similar to those of the keepers in different ownership structures. However, in the case of government programs, the household takes over ownership of the cow after 5 years at which time returns change to those of owner-keepers. Furthermore, the household may after 5 years regard the breeder as a (capital)

cost free item, in which case gross returns may be a better reflection of household incentives (an additional IDR 3-4 million in returns).

The implications are that:

- Unlike owner-keeper relationships, cattle distribution programs offer incentives for households to increase productivity (especially calving and weaning rates) in order to meet calf return obligations and become owner-keepers earlier.

- However, in the intervening period, returns to households can be low or negative (depending on valuations used).

- Structures that facilitate favourable terms for households in cattle distribution programs, and ownership of cattle should be sought out.

- Some (central) government schemes have begun providing cattle on very favourable terms (i.e. grants, but if households sell cows, have to replace them).

Finance

- Access to finance is important, not only to buy cattle but also to increase options for marketing.

- Capital costs (i.e. interest rates) of 13% have been factored in to budgets above, so the obstacle is largely one of access (through backing, business plans, groups etc.).

- If households take out an uncollateralised loan at a rate of 26%, then capital costs double and net returns to production in mixed systems – even under higher productivity scenarios – becomes very unprofitable (IDR-3.2 million).

- However, in the absence of finance and a cattle production plan, households are most likely to hold cattle in inefficient production regimes as a form of 'savings' to meet emergencies or long-term cash outlays. In this case, the household is likely to be operating under a 'low productivity scenario' with income effects reported above.

Price

Price alignments have a significant impact on household returns. In mixed cattle production systems where AI is available (no bulls bought in), the relevant price is for cattle outputs (i.e. not feeder inputs). The price set in the budgets is IDR 24,000/kg LW. Price increases of 5-10% are realistic.

- As discussed, cattle and beef prices are under upward pressure due to macro and policy settings. Some of these prices could be expected to be passed back to farm-gate.

- Cattle marketing initiatives and linkages proposed in this report have the potential to increase. Butchers, and inter-regional traders can spend amounts of this magnitude on search, aggregation, holding costs and broking fees (in addition to purchase and contract risks).

- Beef prices increase by about 10% leading up to Idul Fitri (Figure 8) and in the second half of 2012.

- If cattle producers use more discretion in the timing of cattle sales (i.e. not in a forced sale to immediate cash needs) then market movements can be capitalised on and the household is in a better bargaining position.

- For the breeding cattle market in NTB, there is a much larger difference in price between the export price and the price producers receive.

Gross returns increase by roughly the same as the price increases (5% per increment) because of increased revenues. No additional costs are associated with the price increases (although some transaction costs may need to be accounted for).

The implications for project design is that measures to increase farm gate prices can have a significant effect on incomes and incentives, but the feasibility and costs of these measures should be examined.

3.3.3 Fattening

This section focuses on household fattening operations. Because of the faster turnover of cattle, fattening can be more commercialised and suited to development projects than cow-calf / mixed operations, so is of particular interest for AIPD-Rural.

Base model

The base model for a fattening household is set in a lowland area of East Java, in Probolinggo, Klampok Village. Data is from Straw Cow project. See Table 30.

The parameters are:

- 0.4 ha of land;
    - three crops per year, similar yield and prices to Malang;
    - Same forages as Malang.
- The household raises three Ongole bulls only, purchased at 250 kgs LW and fed for 365 days. The input and output prices are set at IDR 24,000/kg LW.
- Feed is specified in Table 31 below.
- Other labour and transport issues are assumed to be the same as Malang.

Table 30. Budget report for low productivity lowland East Java (Probolinggo) fattening household

Item	Cropping / forages	Cattle	Total farm	Off-farm income	Total household
A. Revenues					
Sales revenue	8,364,000	9,431,892	18,215,892		
Surplus manure sales		358,164	361,536		
Opportunity value of farm produced feed	1,061,925		1,061,925		
Opportunity value of farm produced manure		24,210	24,438		
Total Revenue	**9,425,925**	**9,814,266**	**19,663,791**	**3,600,000**	**23,263,791**
B. Costs					
Own-produced feedstuffs		945,000	1,002,600		
Purchased feedstuffs (including transport)		2,776,726	2,791,126		
Fertiliser	131,178		131,178		
Other variable costs	-	130,950	130,950		
Depreciation	650,000	300,000	1,000,000		
Hired labour	-	-	-		
Transport costs (including manure)	10,940	770,966	781,906		
Total Costs	792,118	4,923,642	5,837,760		
C. Gross profit (returns to capital, labour and management)	**8,633,807**	**4,890,624**	**13,826,031**	**3,600,000**	**17,426,031**
less opportunity cost of inventory/capital	1,690,000	3,752,034	5,626,634		
D. Net profit (returns to labour & management)	**6,943,807**	**1,138,590**	**8,199,397**		
less opportunity value of family labour	3,715,497	932,364	4,701,861		
E. Net profit (returns to management)	**3,228,310**	**206,226**	**3,497,536**	**3,600,000**	**7,097,536**
Share of total household income (%)	45.5	2.9	49.3	50.7	

Source: author calculations

Budget results suggest:

- Gross profits from fattening are high even with low productivity; but

- Net profits are marginal (IDR 206,226) when opportunity costs of capital and labour are valued.

Productivity and income effects

Table 31. Productivity scenarios and income effects for lowland fattening household in Probolinggo

Productivity level	Low	High
Straw (% body weight)	1.8	1.5
Forage (% body weight) + bran supplement	0.3	1
Forage (% body weight)	0.8	1.2
Bran and husk (% body weight)	0	0.5
Liveweight gain (kg/hd/day)	0.37	0.6
Weight at 30 months of age (kg LW)	385.5	469
Total Revenues	**9,814,266**	**16,162,200**
Cattle sales	9,431,892	15,768,000
Total Costs	**4,923,642**	**7,856,233**
own-produced feedstuffs	945,000	966,107
collected and purchased feed	2,776,726	5,427,653
other variable costs	130,950	135,000
depreciation	300,000	500,000
transport costs (including manure)	770,966	827,473
Gross profit (returns to capital, labour and management)	**4,890,624**	**8,305,967**
less opportunity cost of inventory/capital	3,752,034	4,664,920
Net profit (returns to labour & management)	**1,138,590**	**3,641,047**
less opportunity value of family labour	932,364	1,922,400
Net profit (returns to management)	**206,226**	**1,718,647**
Share of total household income (%)	2.91	18.44

Source: author calculations

- Significant increases in the quantity and quality of feed increase growth rates, sales weight and sales revenues.

- However, there are proportionately lower effects on costs because the feed is low cost, with only modest increases in labour and depreciation costs; and

- This results in an increase in gross profits of 70%.

Fattening households linked to Wahyu Utama

An integrated breeding/feedlot/slaughter/retail/restaurant company called Wahyu Utama in Tuban in EJ was visited (see Section 1.1 'Nucleus-plasma relationships'). The company has developed contractual relationships with about 100 fattening households, to which it provides feeder cattle, feed and backing for subsidised loans under the KKPE scheme (see Section 2.10 'Finance').

Parameters:

- Wahyu Utama sells four cross-bred or Ongole bulls from its feedlot to farmers at 350kgs, about 2.5 y.o, IDR 27,000/kg;

- Farmers utilise subsidised loan scheme (KKPE) at 4% to buy cattle;

- Fatten for 120 days, 1 kg ADG;

- Feed 12kg/head/day Wahyu Utama concentrate feed mix, 12% CP, IDR 1,600/kg (rice straw 4%, coffee skin, peanut husk, copra meal, wheat pollard, onggok (from cassava skin), kulit sawit (palm oil skins), kankung, corn cobs, rice bran, cassava tubers, molasses); and

- Wahyu Utama buys back at 470 kgs LW.

Table 32 below outlines the returns to households contracted to Wahyu Utama.

Table 32. Returns to cattle fattening households contracted to Wahyu Utama

Item	Cattle
Total Revenue	13,132,800
Sales revenue	12,960,000
Total Costs	6,319,178
purchased feedstuffs (including transport)	5,760,000
other variable costs	59,178
Depreciation	500,000
Gross profit (returns to capital, labour and management)	6,813,622
less opportunity cost of inventory/capital	2,171,200
Net profit (returns to labour & management)	4,642,422
less opportunity value of family labour	842,696
Net profit (returns to management)	3,799,726
Share of total household income (%)	25.6

Source: Author's calculations

Results:

- Appears highly profitable. Note: it could potentially be done three times per year (3*120 days);

- Dependent on subsidised credit. If at market rates (13%) then capital costs are IDR 7 million, sending net profits negative;

- Also technically demanding. If ADG is 0.7 then net profits are negative.

Contract fattening

Note DFAT have undertaken projects with trading companies previously, most notably TLM in NTT under ANTARA in 2008/9. Assessment, budgeting and a pilot project were conducted as part of the program so DFAT staff involved (Esnawan Budisantoso) should be consulted. The pilot operated under low/no interest loans, with other inputs (feed and seeds).

The other much larger contract fattening program done by a trading agency in NTT (PUSKUD) has also been the target of USAID program and there have been discussions regarding cooperation on an ACIAR calf program. .

3.4 Cattle Marketing

Section 2.5 highlighted that there are inefficiencies and market failures in the dominant (spot) cattle marketing systems in EI that put downward pressure on cattle prices received

by farmers. However, developing alternative systems to address these problems is not straightforward. Alternatives include:

- The development of shorter and more direct marketing systems, under contract fattening, co-operative and owner-keeper relationships (see Section 2.10 'nucleus-plasma relationships').

- In one large contract fattening scheme (PUSKUD in NTT), an auction system has been introduced for cattle exporters from West Timor.

- The development of cattle and cattle price standards for inter-regional trade (Section 2.9.3 'cattle standards').

- The development of infrastructure in live cattle markets (see Section 2.9.3 'Cattle markets').

Other interventions not yet overviewed include the introduction of weighing scales and price reporting systems.

3.4.1 Weighing scales

As discussed in Section 2.5, downstream buyers (traders, butchers) are in a much better position to estimate liveweight, dressing percentages, body conformation and carcass weights 'by eye' than early-stage traders (l*et al*one farmers). Weighing scales to allow objective measurement of liveweight potentially increases the accuracy of pricing, reduces information asymmetries and improves the bargaining position of sellers. Feedlots buy based on scales (at the feedlot, empty). Even many buyers (butchers) interviewed said that they would prefer to buy over scales to reduce transactions risks. There are scales at slaughterhouses but these are used to weigh carcasses and by-product, not cattle. All market managers interviewed agreed that scales would help make trade and conduct more transparent.

Scales have been introduced into markets in many areas (NTB, EJ). They were sighted in some markets visited, were substantial (fixed, bar scales) and in good working condition, but were simply not used. Traders were said to refuse to use them because it detracts from their competitive advantage in trade based on subjective measurement. It is not possible to make the use of scales at markets mandatory.

However, scales can and should be used at the village level in cattle projects for multiple purposes: a) to monitor cattle for research purposes; b) assist households to track and identify problems and sources of growth in cattle production systems; and c) so that cattle can be sold on the basis of objectively measured liveweight (converted by an agreed dressing percentage to derive dressed weight).

Given these benefits, weighing scales may be a cost-effective investment for the cattle development projects. Placed in a central area of a cattle group, they are accessible to households in intensive or communal kandang systems. The distances between households and central group areas in semi-intensive system will preclude high frequency use, but are still accessible for intermittent use (e.g. annual recording, weaning and especially sales). Approximate costs are:

- Digital scales (load bar and digital screen might cost up to AU$2,000 in EJ and a platform and crush could be cheap (timber) or more expensive (steel). However, digital scales can break;

- Cheaper balance scales are readily available in EJ and more suitable for project purposes.

3.4.2 Market information

Accurate, accessible and flexible market information is an important but under-emphasised component of increasing returns from cattle production. Farmers have limited access to formal market information. They are precluded from entering cattle market places, and there are few formal price reporting systems, so they gather partial information through local contacts (traders and other farmers). Farmers sell cattle through local traders on the basis of best price offered or relationship, but receive little or only indirect feedback (through price signals) from downstream actors (traders, butchers) about their preferences (type of cattle, slaughter results etc.). That is, market information received by farmers is indirect, unclear and may be difficult to translate into production and selling strategies.

An obvious way to increase market information in the chain is through a formal price reporting system, which is undeveloped in Indonesia. There is little collection or reporting of cattle prices at markets. Beef (not cattle) prices in local markets were reported in one market (Mataram) for the benefit of butchers. Government in some areas (NTB, TTU) also have 'standards prices' (administratively set, for inter-regional trade). Some prices are posted on the internet (e.g. http://sapiternak.com/harga-sapi/)

Developing and maintaining a formal price reporting service is an expensive and time-consuming process and faces challenges in delivering accurate information for heterogeneous product in a timely and flexible way (Stuth et al. 2006). Sustainability also depends on a buy-in from a telecommunications provider. This was not able to be investigated in this project, but may be a topic for further investigation.

3.4.3 Role of OTGS in marketing

Other more flexible and informal alternatives to deliver price and other market information to farmers are available. For example, some cattle groups in development projects have 'on the ground staff' (OTGS) responsible for increasing uptake of improved production and business practices for farmers and groups. An additional important task of the OTGS could be to seek market intelligence through markets, media (internet, radio, and publications), networking and direct contact with downstream chain actors (butchers, traders). This market information can then be relayed back to farmers through structured forums (e.g. monthly group meeting) or, more importantly, one-to-one regular contact with farmers.

There may also be a role for OTGS that act as business advisers to relay information through public channels. Type A and Type B cattle markets are, under national standards, supposed to have auction areas and scales. Another channel is through district government radio (RPD, radio pemeriutah radio).

An obvious extension to the role of the OTGS in marketing is to facilitate sales. That is, as business advisers, they can act as a broker between farmers and farmer groups and butchers and larger (inter-island/regional) traders. As discussed below, downstream actors (traders and butchers) have incentives to deal with local business advisers to aggregate cattle to specification. There may also be scope for confident and experienced advisers to enter into cattle trading (buy and sell cattle outright). Indeed, business advisers to the group may be existing local collectors or traders.

3.5 Processing

Characteristics of the slaughter sector detailed in Section 2.6 have important implications for the potential sector interventions. A feature of the Indonesian slaughter sector is that there are few slaughter houses that buy cattle and then sell beef. Virtually all cattle are slaughtered by individual, small-scale butchers that slaughter in service kill plants. These means that there are few large-scale abattoirs that have incentives to enter into supply contracts with farmers (these are common in countries like China).

Slaughter dominated by individual butchers in service kills plants are rudimentary, low cost and adapted to servicing the mass market and, indeed, the supermarket sector. However, there are concerns about food safety and hygiene standards for the local mass market and few abattoirs are fitted to meet the demands of inter-regional trade (cold chain) or high-value markets.

3.5.1 Upgrading slaughterhouses

As detailed in Section 2.9.3 ('the refurbishment and building of new abattoirs') government and companies licenced to manage their slaughter houses have ambitious plans to refurbish and/or build new slaughterhouses. At first glance, these projects are a potential investment target for AIPD-Rural. The plants aim to:

- Build integrated operations (from slaughter to retail);

- Target higher value or niche markets;

- Some abattoirs will slaughter their own cattle and sell their own beef;

- The Meat Business Centre in Mataram has begun to establish and plans to expand contract fattening systems;

- Jakarta no longer regulates that cattle must be slaughtered within the province/city, and accepts beef imports from other provinces (including EJ).

When asked, planning agencies and company managers were not able to provide feasibility studies on the projects and, indeed, they may not have been conducted. A feasibility study of these projects is beyond the scope of this study, but the following case illustrates the fundamentals considerations.

A supermarket visited in Surabaya referred the research team to their beef source, which is the only mechanised abattoir in Surabaya (a shareholder state company that used to buy its' own cattle). The mechanised slaughter line has not been used for 3 months. A variety of reasons were cited (cattle too expensive, compete against boxed beef for markets outside EJ). However, another fundamental reason is the high costs of the mechanised slaughter line compared to the un-mechanised slaughter area, which the company also ran next to each other. All else being equal, this provides a good opportunity to compare costs (see Table 33).

Table 33. Comparison of costs of mechanised and unmechanised slaughter units in Surabaya

Cost item	Mechanised slaughter	Hand slaughter
Infrastructure	Race, restraining box, mechanised slaughter line, hanging room, offal and boning rooms, drain	5 * 5m concrete area, rail and hooks, drain
Slaughter costs	IDR350,000 slaughter fee and costs to half carcass form	IDR40,000 slaughter fee (use of facility) IDR75,000 for the butcher team fully butchered
Capacity	50 head per day to half carcass form, 3 hour shift (16 head per hour)	15 head per shift (3 hours) fully butchered
No. of workers	18 workers	8 workers

Source: Fieldwork interviews

The company also had freezing and cold storage facilities leased out to other food companies and trades beef under its' own brand (both beef bought in and from the un-mechanised plant). Power costs for the facility are IDR 55 million per month.

Table 34 shows some of the price alignments for beef.

Table 34. Beef prices at supermarket, abattoir and wet market levels, Surabaya

Price supermarket (IDR/kg)		Price abattoir (chilled or frozen) (IDR/kg)	Price wet market (IDR/kg)
Blade	99,990	Chuck, blade, shank, and brisket 64,000	'Low value cuts' (flaps etc.) 60,000
Shank	89,990		
Silverside	79,990	Rump, knuckle, silverside, topside 65,000-66,000	'Mid' (strips etc.) 65,000
Rump	88,990		
Topside	69,990		
Knuckle	89,990		
Sirloin	91,990	Striploin 67,000	'Good' (fillets) 70,000
Fillet steak	108,990	Tenderloin 72,000	
Ribeye steak	134,990	Ribeye 65,000	

Source: fieldwork observations

Even though the abattoir has a supply contract into a supermarket, which sells beef at high prices (left column), this is not reflected in high prices at abattoir level (middle column), which are not much higher than prices at a nearby wet market (right column). That is, the abattoir does not appear to receive premiums for hygienic, hung, chilled beef that would offset higher costs vis-à-vis lower costs channels.

This case reveals several fundamental points (that also applies to other small mechanised plants visited (in Mataram):

- Mechanised abattoirs are not cost-competitive with low-cost butchers on local fresh beef markets;

- Retail channels that sell beef for higher prices (supermarkets) do not have demands and specifications that preclude supply by individual butchers operating in certified slaughterhouses with satisfactory hygiene conditions (see discussion in Section

2.8.2 'Quality premiums'). That is, mechanised abattoirs are unlikely to be competitive even in more 'modern' retail channels;

- While niche markets for frozen beef such as mining camps are developing in Sumbawa and Kalimantan, plants in EI are unlikely to be competitive with imported product (but subject to trade policy).

The viability of mechanised abattoirs depends therefore on their ability to secure sustainable and higher-value sales channels.

- As discussed in Section 3.6, there may be opportunities to do this through innovative marketing initiatives (stalls, franchises in markets and supermarkets).

- Cattle supplies in EJ (especially given import restrictions to Sumatra) and low labour costs in EJ, may add to the competitiveness of abattoirs in EJ.

Establishing these sales channels and cold chains is however a major, long-term undertaking for the abattoirs. Until these are in place, any investment in the mechanised abattoir sector would be high-risk, beyond the time horizon of AIPD-Rural and also potentially controversial in Australia (on animal welfare grounds).

From a policy perspective, policy-makers seek to develop mechanised abattoirs on the assumption that downstream activities increase value adding opportunities. However, value adding is, by definition, the difference in value between inputs and outputs (profits). If these downstream activities are not profitable or are less profitable than the alternative (i.e. exporting live cattle) then there is little rationale to pursue downstream processing. NTB and NTT appear to hold a comparative advantage in the export of live cattle.

3.5.2 Butcher operations

Table 35 reports on a budget for one of 95 butchers (jagal) that slaughters at Pegirian service kill slaughterhouse (RPH) in Surabaya. The budget is based on slaughter yields and prices presented in Table 35.

As shown in the budget, the butcher runs a low cost and profitable business. Revenues are generated predominantly from beef sales, through integrated stalls at the nearby wet markets. He employs a slaughter crew of four people in a low cost slaughter and butchering system (IDR 120,000 per head for slaughter fees and labour). Returns are highly sensitive to beef prices, and relativities with cattle prices.

Cattle procurement is a major component of his business. The jagal buys and slaughters 12-18 head (14 assumed) per week, slightly more than the average reported in surveys in Table 15. The jagal buys cattle at markets around Surabaya twice a week (seven in each line assumed). Because of the importance of this task (selection, negotiation), he does it himself (2 days of his time per week). Cattle purchases, transport and holding constitute a significant cost for the jagal (>IDR 313,000), far higher than slaughter costs. These costs do not include cattle purchase risks (low carcass yields, liver fluke (liver worth up to IDR 200,000 discarded) and the costs of not finding cattle to price-grade requirements).

While butchers have no or only weak links with farmers, they would appear to have a stake in developing these links.

Table 35. Budget report for butcher in Surabaya

Budget Item	Value	Notes
Revenues	**8,459,979**	See slaughter results Table 16, converted for 300 kg animal
Beef sales	6,152,007	
Hide	346,154	
Offals	1,961,818	
Costs	**8,183,268**	
Cattle	7,750,000	IDR 25,000/kg LW for 300 kg animal
Cattle purchase costs	137,834	Time and costs of jagal to buy 2 days/week, broker and market fees
Cattle transport	100,000	Truck and labour
Cattle holding and feeding	75,435	Fees at abattoir yards, labour, feed
Slaughter fee	40,000	Service kill
Labour – slaughter, boning and cleaning	80,000	IDR 20,000 per person for crew of 4
Overheads	0	Service kill plant - 'only a knife'
Gross profit per head	**276,710**	
Capital costs	9,688	Opportunity cost of working capital (cattle in stock)
Net profit per head	**267,023**	
Head per year	728	

Source: Author's calculations

3.6 Retailing

Structures in the retail sector were overviewed (Section 2.7.2) and information on prices and premiums appear in Section 2.8.2 and Table 34. The main points of relevance to possible interventions are:

Beef can be sold for high prices in supermarkets but with few product quality requirements that effect cattle production or premiums that are relayed back to even the slaughter level. Beef is also purchased by individual supermarkets in small volumes, through butchers, so again there is no incentives to link with producers.

However, butcher shops offer a more promising structure for the proposed project to link with.

- While the amount of beef sold per day in a given shop is small (may even be only the products from one carcass), sales volumes are consistent (every day) and can be organised as chains (a few shops per city) (Aldia in Kupang, and Syb RPH).

- This can amount to a significant throughput for a small certified slaughter operation selling into its own outlets and invariably spill-over sales into other outlets (wet markets, restaurants e.g. Wahyu Utama).

- Butcher shops can also be important components of small, integrated beef chains (e.g. Aldia in NTT).

- In some cases, Aldia in Kupang, and Syb RPH, Wahyu Utama, they are integrated with the slaughter sector.

- Butcher shops allow for the establishment and development of brands and brand awareness, and have incentives to promote beef and consumer awareness.

- Development of this sector is a potential area for growth and intervention, but is likely to have a small impact on the sector overall.

- Nevertheless, where butcher shops do exist, they should be invited to participate in project structures, at a local level.

Several parts of the report have also highlighted the need for higher cost (abattoirs) that buy their own cattle to secure higher value beef markets to be viable (e.g. Meat Business Centre, Surya Jaya, and many others under planning in EJ, NTB and NTT). Faced with the same pressures, abattoirs in China have established an innovative and successful marketing strategy that may also be applicable in Indonesia. Many Chinese abattoirs have established franchise chains of beef retail stalls in wet markets. The stalls sell hygienic, attractively presented beef, sometimes in sealed stalls with bench, cabinet and refrigeration facilities. With quality and food safety standards not widely recognised by Chinese consumers, company branding acts as a defacto form of assurance that can attract price premiums and help reinforce brand awareness. Many abattoirs have extended these stalls into supermarkets (and into integrated or franchise hot pot restaurants). However, outreach in Indonesia may be limited by the small scale of the abattoirs. The best way to assess applicability to Indonesia would be to take a delegation of abattoir and beef marketing managers to China.

3.7 Costs and Margins

Costs and margins were presented in sections 3.3-3.5.

3.8 Constraints

Constraints to the operations and returns of chain actors are outlined throughout the report, but are summarised here.

The cattle production sector poses the greatest constraint to industry development. It is the least efficient sector, with the largest scope to increase productivity and incomes. The underlying causes of low productivity are set out in Figure 3 and the measures to address them in Table 13. Long-standing research and development projects by Indonesian and Australian agencies have established simple, low cost, integrated technical and management practices to increase productivity and incomes (Sections 2.4 and 3.3). While there has been uptake in specific trial sites, there has been little uptake in the broader EI cattle production sector.

As is well recognised, adoption and implementation of the measures is not just a technical upgrading exercise, but is framed (constrained or enabled) within ingrained socio-economic, institutional and policy settings. Adoption therefore requires:

- Communication of technical and managerial interventions in an ongoing (repetitive) communication strategy.

- Those interventions need to be tailored to fit with the characteristics (land, labour, capital, and demographics) and objectives (income, risk, utility) of individual

hamlets, groups or households, which vary case by case. Planning is therefore required at individual household and group levels.

- Those systems are integrated to cover inputs, production, management, outputs and other business aspects of cattle systems.

- An enabling institutional environment (programs, ownership relations, finance, and sales) that allows farmers to increase independence, control planning and responsibility for their cattle businesses.

- With links and integration into the broader industry, both on the inputs and outputs side, from local to district geographical basis.

In short, adoption of technical measures requires close and ongoing support. This is largely absent in the Indonesian cattle sector.

- Producers receive few inputs, services, or feedback from off-farm sources, input suppliers, the extension system or cattle buyers. That is, there is very limited deliberate, formal co-ordination between actors to achieve common objectives of the sort that constitutes a value chain; and

- With weak forward and backward linkages, producers make input, production and marketing decisions as largely autonomous actors, which perpetuates low productivity and income systems.

Low productivity systems – and trade barriers – also limits cattle supply (reflected in high and increasing prices) which (if output prices don't keep pace) acts as a major constraint to the operations of downstream actors (cattle traders, butchers and feedlots, retail outlets) and consumer welfare.

Similarly, the ability of traders and butchers in particular to assemble good value cattle is a major determinant of profitability. These cattle are sourced on the open market, but entail significant search, holding and other transaction costs. These could be expected to increase with tightening supply.

3.9 Chain Development Prospects

This section presents a strengths, weaknesses, opportunities and threats (SWOT) analysis of the Indonesian beef industry, broken down into sectors.[12] This provides context for the specific intervention areas recommended for AIPD-Rural in Section 4. The SWOT analyses are based on the stated approach and the objectives of AIPD-Rural and therefore takes into account the potential for practice change, impact, outreach and the ability to leverage on existing business (partner-intermediary-target) models. There are four levels of SWOT analysis:

- For development prospects of the industry in general;

- Sectors in the industry that are not recommended for AIPD-Rural;

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[12] A comprehensive SWOT analysis across all sectors was conducted in response to recommendations from an external reviewer.

- Sectors in the broader Indo-Australian beef program particularly relevant to recommended AIPD-Rural interventions; and

- Sectors recommended for AIPD-Rural.

3.9.1 Broad prospects for industry development

This section outlines the broad prospects for industry development through a SWOT analysis. Table 36 depicts the SWOT for the beef sector broadly.

Table 36. SWOT analysis of beef sector

Broad sectoral developments		
Sector	**SWOT**	**Assessment**
	S	Underlying demand for beef remains sound (established place in Indonesian cuisine/diet, population and income growth, urbanisation).
		The processing and retail sectors are generally efficient in transforming and delivering beef to meet consumer preferences.
		The development of cattle production systems, cattle and breeds that are well adapted to low input – low output farming systems
	W	Inefficient cattle production systems that do not fully utilise resources and potential
		Weak chain linkages
		Limited feed resources and carrying capacity in EI
		Few sources of premiums for quality attributes of beef
		Not internationally competitive (but not fully exposed to international trade due to quota and disease protocols).
	O	Policy settings can be seen as positive/opportunity or detrimental/threat (see below).
		One opportunity is that international trade restrictions have increased demand for (slaughter and breeding) cattle from EI which have increased cattle prices which, if passed back, can benefit producers.
		Indonesian and Australian agencies and projects have established simple, low cost, integrated measures with large potential productivity that can be combined with business development activities to bring large income effects.
		Other stakeholders (on inputs and outputs side) have incentives to integrate more closely with viable and progressive producer groups
		These alignments create favourable conditions in which to bring together resources, expertise and participation from Indonesian, Australian, government and private sector actors to conduct a significant beef program in EI.
		The opportunities are not dependent on distortionary policy, or the functioning of Indonesian cattle distribution programs. Demand for cattle is likely to remain high over the mid- and long- term, even if import quotas are relaxed.
		The sector has a large number of low income participants, where the project can have large impacts (Section 2.2).
	T	The policy-driven nature of the industry also entails some threats. Relaxation of import quota will lead to a price correction and put downward pressure on cattle prices as a short-term response

3.9.2 Sectors not recommended for targeting in AIPD-Rural

This section outlines sectors that, as a whole, offer limited opportunities as interventions for AIPD-Rural. However, some specific aspects of the sectors are of interest to AIPD-Rural and these are carried over into 'recommended interventions'.

Infrastructure and shipping was considered because it is widely thought to be a major constraint to industry development. Ranches were considered because they are the topic of government and private sector investment attention. These are not recommended for AIPD-Rural in EI for reasons highlighted in Table 37 (but may be suitable for other beef development programs).

On the outputs side, it is widely assumed that rudimentary beef retail, cattle slaughter and marketing practices in Indonesia constrain industry development and depress farm-gate prices for cattle. However, interventions relating to mechanised abattoirs or formal cattle marketing are regarded as unfeasible within the confines of AIPD-Rural. However, the strengthening of linkages between buyers (traders, butchers and feedlots) and producer groups informally – through off-take agreements and price discovery – are important components of the recommendations for AIPD-Rural activities.

The design of interventions in the inputs sector (breeding, feed, veterinary products) also requires a nuanced approach. The approach adopted in AIPD-Rural is well suited to the cropping and horticulture sectors where well defined interventions can be identified: in a specific technical area or input (e.g. Paclo for mangoes); and with established large agribusiness firms and their agents that can act as project partners and intermediaries.

The approach has limitations in the beef industry because:

- Technical interventions applied in isolation are ineffective and indeed can be counter-productive. Technical change must be applied as a package of integrated measures that require changes in practices across the whole farm system.

- The majority of inputs into cattle production are sourced on-farm. Purchased inputs make up small cost items for farmers and small per unit / farmer revenue items for companies.

- Agribusiness firms do not necessarily have clear incentives to provide embedded services to farmers to increase uptake and sales of their products, especially as these will only be only be effective if whole-farm changes are implemented. This limits the number of partners and intermediaries that AIPD-Rural can work with in the inputs sector.

Within this context however, there are opportunities for AIPD-Rural to invest in the inputs sector (e.g. AI services and feed).

Table 37. SWOT analysis sectors not recommended for AIPD-Rural

Sector	SWOT	Assessment
INFRASTRCUTURE		
Infrastructure (ports, quarantine/holding yards, cattle markets)	S	Poor infrastructure can increase transport and holding costs, can impact on animal welfare and weight loss, which can be relayed back to producers (farmers) in the form of lower prices
	W	However, any investments in infrastructure would have only an indirect and modest impact on cattle prices and farmer incomes
		No clear pathways or partnerships for private sector co-investment were identified. The GoI is investing in cattle and beef infrastructure as a public / state investment
	O	Value chain development and PPP activities in the program provide forums for cross-agency resolution of specific infrastructure needs (e.g. water and yard repairs in quarantine holding yards in Bima)
	T	
Purpose built cattle ships	S	Current shipping of cattle on general cargo ships limits shipping volumes, increases holding periods and costs, causes deaths and weight loss at sea, and animal welfare concerns. May have an aggregate negative effect on prices received by farmers
	W	However, current (general cargo) shipping arrangements are lower cost than purpose-built ships (fitting out, costs shared across commodities, back loading)
		Ship users – traders – did not identify shipping as a major constraint, partly because exporters are paid on basis of loaded weight, and importers can achieve compensatory weight gain
		Purpose-built cattle ships have been built but are not widely used, suggesting uncompetitiveness against general cargo ships
	O	Value chain development and PPP activities in the program provide forums to increase shipping efficiency. E.g. timely aggregation of lots allow for larger bookings / consignments on ships
	T	
PRODUCTION		
'Ranches' (Sumba, Sumbawa, West Timor)	S	Discussed at inter-governmental level as an investment target, with some interest from Indonesian and overseas corporate sector.
		May be able to utilise under-utilised land and labour resources through centralised corporate entities
	W	However, the participation of small-holders in the ranches is variable
		Involves a plethora of land tenure, political, social risks that would need close investigation and due diligence
	O	If/when established, could be invited into PPP activities
	T	

DOWNSTREAM SECTORS		
Retail	S	The vast majority of beef is sold in wet markets in rudimentary preparation and presentation which inhibits the development of a (segmented) beef market, and food safety concerns, which feeds back to long term demand and price formation for cattle producers
	W	Few opportunities for formal partner-intermediary-target linkages from the retail sector. Supermarkets purchase from individual butchers with no links back to producers.
	O	There are opportunities for innovative beef retailing strategies (required for mechanised abattoirs).
		There is an example of small vertically integrated retailer-slaughter-production companies (in EJ and NTT) that may be suitable (small) partners.
		Value chain development and PPP activities in the program provide opportunity to extend early chain activities downstream
	T	Generating premiums in generic markets
Mechanised slaughter facilities	S	Dominant slaughter systems are rudimentary, not conducive to the development of higher value markets, hygiene and animal welfare concerns
		Pre-slaughter stress (most relevant to imported Australian cattle) can reduce meat quality, shelf life
		Reduces derived demand for beef, especially higher value (heavier) cattle with specific attributes
	W	However, less relevant in EI where animals are not stressed prior to slaughter
		Mechanised and higher cost abattoirs are uncompetitive in the absence of higher-value beef markets
		Abattoirs are service kill plants for individual butchers so do not establish contracts with producers at scale, thus abattoirs do not act as 'lead firms' in the beef industry
	O	Value chain development and PPP activities in the program provide opportunity to extend early chain activities downstream. For the inter-regional trade, the abattoirs would be in Jakarta, West and Central Java
	T	Animal welfare issues
Formalised cattle market reporting interventions	S	Inefficiencies and market failures in the dominant (spot) cattle marketing systems put downward pressure on cattle prices received by farmers
	W	However, measures to address market failures are difficult to address – weighing scales in markets are not used, auctions that have been trialled were not successful, large formal price reporting systems are expensive to operate and telecommunications companies would have to deliver services on a commercial basis
	O	However, *informal* 'bottom up' price discovery mechanisms and market linkages are recommended below
INPUTS	S	In low input - low output systems, there are notionally opportunities to improve input use and services to increase productivity

	W	However, the vast majority of inputs for cattle production are sourced on-farm, with an uncommercialised inputs sector and companies compared to other commodities
	O	There are however a specific opportunities to partner with inputs suppliers – partners and intermediaries (AI and feed traders)
	T	Requires capacity building and development of linkages of those partners and intermediaries
Commercial feed companies	S	In other livestock industries (dairy, poultry) feed companies are major suppliers of product and services. Feed supply and management is the major constraint to cattle productivity.
	W	There are no commercial feed companies for small-holder beef cattle in EI. A mill is planned in Lombok but appears unviable
	O	However there are traders of bulk feed (that supply feedlots, and groups), very large numbers of feed traders in EJ, and some nurseries for niche forages. Discussed below
	T	Linkages, knowledge, finance and storage for small-holders to access feed off-farm
Animal health	S	Several diseases constrain on-farm productivity and inter-island trade for some classes of cattle.
	W	Large-scale vaccination programs are beyond the scope of AIPD-Rural. Disease not generally seen in isolation as a major constraint to production (and a function of controllable feed, water and penning conditions). Vet products are a small input item for small-holder producers. Large companies and agents lack incentives to systematically link with cattle producers to address production constraints
	O	Traders sometimes sell or give veterinary products and advice to more progressive groups. These distribution / dissemination strategies will be explored in value chain and PPP activities
		Vaccination programs for specific value chains will be explored in PPP activities
	T	Developing and formalising the linkages, effectiveness of group specific vaccination programs
Genetics / breed companies	S	Breed improvement has the potential to increase genetic potential of cattle (beef production)
		Very high penetration of AI in EJ, with an established (state-run) breed station and network that links with producers, with several areas for productivity improvement (AI success rate, oestrus detection)
		In some areas (Lombok) and groups, bulls are kept for communal breeding. The services and weight gains from the bulls provide local level commercial opportunities for the group or household
	W	Reaching genetic potential is dependent on supporting (feed, management) systems, otherwise can be counter-productive. Genetic improvement is not a major driver of increased productivity as an isolated measure.
		The vast majority of breeding in NTB and NTT is done through natural mating with own bulls – not as a large scale commercial activity
	O	Improve AI delivery through closer breed centre-agent-farmer links. Discussed below.
		Consideration of breed development to meet demands of specific markets (in project value chains)

3.9.3 Sectors in the broader Indo-Australian beef program particularly relevant to recommended AIPD-Rural interventions

The on-farm cattle production sector is where the greatest productivity and income gains are able to be achieved at scale. The constraints are familiar to other commodities – inefficient production systems and the under-utilisation or inefficient use of resources. It is not technically demanding to address these constraints and research shows that households have economic incentives to adopt practice changes. However, changing underlying resource use, social attitudes and deeply embedded practices, requires repetitive, ongoing contact, training and close up- and down-stream linkages.

Measures to do so through the development of on-farm cattle and farm management systems, via technical and business development, are outlined in this section. It is, however, difficult to directly address these constraints solely through a market-led, 'lead firm' approach adopted by AIPD-Rural. These aspects are the focus of Indo-Australian research and/or development projects. This program provides opportunity and synergies that should be capitalised on in AIPD-Rural. SWOT factors are analysed here (Table 38) because they indirectly impact on AIPD-Rural.

Table 38. SWOT analysis components in Indo-Australian beef program relevant to AIPD-Rural

Sector	SWOT	Assessment
On-farm cattle management		Improving farm productivity through improved cow management, improved feeding of calves, utilisation of feed resources and improved penning and control in an integrated management system
	S	Production necessarily the centre of any sub-sector program
		Cattle supply is the most immediate constraint to industry development and for the operations of downstream actors
		By far the largest number of low income participants, where the project can have large impacts
		The least efficient sector in the industry, with the greatest potential for increased productivity and income gains
		Through simple, low cost, integrated measures established to increase productivity and incomes
	W	The production sector (esp. cow-calf and mixed) are subject to embedded constraints, slow pace of change, requires ongoing repetitive extension activities
		Few lead firms to provide embedded services, weak official extensions system
		Market-led partner-intermediary-target structures are pre-existing or strong, and have to be developed
		Cattle breeders have few incentives or capabilities to pay for extension and services
		Requires external / public / project funding for initial activities
	O	Field staff provide mechanisms to deliver extension services,
		Can be addressed through other Indonesian and Australian projects
		Banks may part-fund extension activities
		And be sustained over the long term through the development of business activities
	T	Dependent in the long term on capacity of field staff to develop own-funding
		Government programs in sector provide opportunities to leverage on, but also policy distortions

On-farm business development	Designed to foster development of cattle businesses (especially fattening), develop supporting businesses (forage and feed, manure, cattle trading, breeding services), finance, and increase linkages with input suppliers and buyers (traders, butchers, feedlots)	
	S	Progressive producers and groups have incentives to commercialise and develop business activities, which can 'lead' the commercialisation of other farmers
		At a substantial scale
		Input suppliers have incentives to participate to increase links to sell more product (esp. AI in EJ, feed products, banks)
		Buyers have incentives to participate to access supply to specification, especially given current tight supply conditions
		Provides a pathway for field staff to build businesses, and to integrate extension activities to build supply to buyer specification
		Market alignments suggest that selected small-scale business opportunities could be trialled
	W	High transaction costs in stimulating business activity in bottom up approach (compared to top-down through partner-intermediary model)
		Intensive business development training and structures required
	O	These have been implemented widely in Indonesia through program like ACCESS
	T	May threaten or crowd out established local business interests – e.g. brokers
		Commercial feasibility of proposed business activities would need to be tested, and designed on a flexible / case-by-case basis

3.9.4   Sectors recommended under AIPD-Rural

Other project measures to improve technical, management and business structures on-farm are complementary to the more specific interventions areas recommended for AIPD-Rural in particular. See Table 39.

Farm inputs sector

As outlined in Section 3.9.2, there is large scope to improve the supply and efficiency of inputs used in small-holder cattle systems. However, identifying market-led interventions to enable these improvements is a challenge. The vast majority of inputs are sourced on-farm and from the uncommercialised inputs sector (feed, genetics, veterinary products). There are, however, specific opportunities to partner with input suppliers in the AI and feed sectors.

Artificial insemination

There are several reasons to explore AI as a potential intervention area: artificial insemination is widely practiced in EJ so any intervention in the area would have wide outreach; improvements in AI practices can have a significant effect on productivity; there are well defined partner-intermediary-target structure;, and all actors have an incentive to develop closer linkages to improve practices that increase the AI success rate.

Any intervention in the area would entail challenges, most obviously in changing embedded practices in state-run and small-holder systems.

Feed trading

An intervention in the cattle feed sector is of particular interest because feed is a key input into cattle production and a major determinant of productivity and incomes. A burgeoning feed trading sector has developed, especially in EJ, to sell feed primarily to feedlots and fattening households that cannot produce sufficient feed from their own land and to service cattle traders and small-holders that require feed on a speculative basis. While most small-holders source the majority of their feed from their land or nearby land, feed purchases can even out variability in supply and quality.

Section 4 therefore outlines a case for AIPD-Rural to include feed trading in EJ as a project intervention area.

Table 39. SWOT analysis sectors recommended for AIPD-Rural - inputs

Sector	SWOT	Assessment
Artificial insemination in East Java		
	S	Significant factor in production efficiency
		Large outreach – to project groups initially, but with a potential market of up to 450,000 farmers in EJ that use AI
		Well defined partner-intermediary-target (breed centre – agent – producer) structure
	W	The AI sector is state-run, but with some quasi-private agents
	O	Opportunities to improve linkages between the AI network and farmers through on farm practices (feeding, weaning, oestrus detection, communication with AI agents) and the delivery of AI services (responsiveness, timeliness, quality).
		Incentives are in place. AI agents and farmers both have incentives to increase frequency of use of AI services. Incentives to increase successful services can be increased through change in fee structure / terms
	T	To be functional, improvements in AI systems must be must be implemented with other related on-farm animal management activities, that AI agents (intermediaries) have a small impact on. However, improved production systems exist in a proportion of groups, that often participate in projects, that AI agents can deal with and scale out from
Feed trading sector		
	S	Improvements in the supply and efficiency of use of feed inputs are a major source of productivity and income gains
		There is plentiful supply or potential supply of feeds in most parts of EI, though can be seasonal
		An intricate commercialised feed trading sector exists especially in EJ
		The feed trading sector is comprised of a large number of small-holders of various types, including feed growers, collectors, wholesalers, transport operators, so any intervention in the sector will have significant outreach
		This systems sells feed to larger feedlots, but also fattening households/clusters, and has potential to sell into small-holders formed into groups
	W	Households have low awareness of the value of better feeding
		Absence of large feed companies to work with
	O	Opportunities to increase linkages between feed traders and cattle producers to increase the supply and efficiency of use of feed
		Feed traders have incentives to expand sales volumes, value or channels for their feed through contacts with cattle groups and improved cattle production systems
	T	However, this depends on the willingness of households to pay for feed from off-farm sources, and the value compared to other feed sourcing options.

Cattle marketing sector

In addition to linking small-holders with a number of input suppliers, there is also potential to more closely link them with cattle buyers. Cattle traders, feedlots and butchers incur high search and holding costs in putting together consignments of cattle to specification. These costs can reduce returns to the buyers or mean that they pay lower costs for cattle bought from small-holders.

Buyers appear to have incentives to link more closely with cattle producers and groups to access cattle to specification, provide market feedback and to provide embedded services including technical and management advice. This would bring benefits for producers, especially in orienting and commercialising their production systems to more target-driven specific sales channels. Meeting the (product, lot) specifications of buyers can attract price premiums. Small-holders may have incentives to enter into supply contracts with feedlots and cattle traders, but the income effects are sensitive to the terms of the contracts, and sometimes policy settings.

Table 40 outlines the SWOT for cattle marketing.

Table 40. SWOT analysis sectors recommended for AIPD-Rural - cattle marketing

Sector	SWOT	Assessment
Partnerships with cattle buyers in specific value chains		
The chains are: • Breeder cattle trade from Lombok • Feedlots in EJ • Marketing companies in NTT • Butchers	S	In line with AIPD approach, designed to facilitate links with established partners, that have intermediaries to local level that have established links with project targets (cattle small-holders)
		Targeted interventions designed to build on existing business activities and scope and linkages
		Strong demand for breeding and slaughter cattle for inter-regional trade
		Traders have incentives to participate (need supply to specification, to reduce holding/transport costs), established structures, links etc.
	W	Outreach of cattle buyers (feedlots and traders) limited by quota and to existing networks of suppliers
		May be reluctant to invest (weak backward linkages – feedback and services)
	O	May be able to develop the [management capacities etc. / scale] of the businesses and catchment areas (to the footprint of groups / cattle / farmers in C1 and C2).
	T	Companies use preferential loans, preferential trade permit allocations etc. that are subject to change.
		Potential for predatory relations with small-holders that require oversight (through groups)

4 Pro-Poor Chain Development Opportunities

4.1 Rationale for Intervention Strategy

4.1.1 Background

In consultation with government and industry stakeholders for ADO-EI, beef was ranked as the commodity with the greatest potential for poverty reduction and market development in NTB and NTT, and second in EJ. Reasons include:

- The very large number of cattle producers in EI (approximately 950,000 in EJ, NTB, NTT), where cattle play a major role in livelihoods of poor men and women.

- The presence of inefficiencies in the cattle production and marketing sectors that can be alleviated through technically simple interventions and management systems

- Potentially large productivity and income effects

Analysis for this report confirms this potential, but also highlights the challenges in designing interventions for the beef industry under the AIPD-Rural approach. These include:

- Low penetration of commercial inputs or contract procurement to farmers and the low formation of large 'lead firm' structures in beef, compared to other commodities.

- Sustainable practice change in the beef industry cannot be achieved through single technical interventions – there are no single 'technical fixes'. Interventions must be delivered as an integrated package of interventions through long-term, repetitive, capacity-building measures and linkages.

A nuanced approach that accounts for the characteristics of the beef industry is therefore required. The AIPD-Rural approach of linking agribusiness firms with farmers has a significant role to play, and the efficacy of this approach will be increased by coordination with other beef projects that use complementary approaches.

4.1.2 Recommended AIPD-Rural interventions

Interventions recommended for AIPD-Rural focus on early stages of the beef value chain and the upstream and downstream linkages of small-holder cattle producers (see Section 3.9). Agribusiness actors that link with small-holders are analysed in this report as 'nucleus-plasma relationships' (see Section 2.11.1). Of these, seven interventions have been identified that:

- Have potential to introduce technical change, to commercialise small-holder operations, improve their market access or stimulate market development.

- Are located in established region- and sector-specific value chains with established and substantial supply chains.

- Provide sustainable delivery models through the aligning interests of partners, intermediaries and targets.

- Lead to significant productivity and income gains for project targets. Targets are primarily small-holder cattle producers, although in some cases are also upstream and downstream actors (e.g. feed traders and butchers).

- Are with companies or agency partners that have significant supply or procurement catchments that link with significant numbers of small-holders.

Interventions in the inputs sector are for AI services and feed in EJ where there are established input markets. Success rates of artificial insemination (AI) can be increased if suppliers (breed centres and their agents) work more closely with producers for timely oestrus detection and service delivery. Feed traders can expand their markets if they participate in feed training programs with project fattening groups and households, and disseminate advice and training to other non-project groups and actors.

On the downstream side, it is proposed AIPD-Rural partner with cattle buyers (feedlots, butchers, traders, cattle marketing companies) in specific cattle supply chains and facilitate linkages back to production groups. These links provide buyers with more profitable procurement channels, provide feedback and markets for small-holders, and can assist in the dissemination of extension information.

Four of the recommended interventions are located in EJ due to the higher level of commercial activity in the province, one in Lombok and one in West Timor and one potentially across major cities in EJ, NTB and NTT. The recommended intervention areas are:

Inputs

- Improve the success rates of artificial insemination for beef cattle in East Java through closer agent-producer linkages.

- Improve cattle feeding practices through business development of feed traders and cattle fatteners in East Java.

Outputs

- Increase productivity and returns from contract fattening in East Java.

- Increase small-holder returns from the production of feeder cattle for feedlots in East Java.

- Increase small-holder returns from the production of slaughter cattle for butchers in major cities in Eastern Indonesia.

- Improve the small-holder production and marketing systems for the inter-regional trade of breeder cattle in Lombok.

- Increase small-holder returns from the production and marketing of slaughter cattle for cattle marketing organisations in West Timor.

While the feasibility of these AIPD-Rural interventions is not dependent on other projects, the likelihood of quick and large impacts will be increased through co-ordination with beef-specific projects operating in EI. These include: large numbers of Indonesian beef cattle projects in Indonesia especially in NTB and NTT (see Section 2.10.3); the DFAT-funded,

ACIAR-managed project, 'IndoBeef'[13]; and activities mooted under the 'Red Meat Forum' (still in very early stages of development). These programs link directly with large numbers of cattle producers in project groups. It is proposed that AIPD-Rural partner with firms and agencies that supply inputs into, or buy cattle from, these groups. 'Top down' AIPD-Rural interventions in partnership with input suppliers and cattle buyers will benefit from links into the 'bottom up' activities centered around cattle groups.

These resources are highly attractive to agribusiness actors and provide incentives for them to link with the groups and to partner with AIPD-Rural. That is, the structures provide 'the deal' for agribusiness actors, to be facilitated by AIPD-Rural through activities conducted in partnership with the firms and provide a source of outreach for AIPD-Rural.

4.2 A 'Vision of Change' for Increasing Productivity and Incomes in the Cattle Production Sector

As established in Section 3.9 the focus of AIPD-Rural should be in and around the cattle production sector where the greatest productivity and income gains are able to be achieved at scale. The production-side constraints in this sector are similar to other commodities – inefficient production systems and the under-utilization or inefficient use of resources.

It is not technically demanding to address these constraints. Multiple projects have established simple technologies and management systems that can be assimilated into household and village systems. Research shows that households have economic incentives to adopt the practice changes and increase productivity.

However, cattle production occurs within a deeply embedded set of practices and social systems where farmers keep cattle for 'savings' or even cultural reasons rather than to maximize profits (see Section 2.12.1). Not all farmers want to, or can, commercialise operations, but an enabling environment provides opportunities for those that do. Progressive farmers that are interested in integrating into input, output and finance markets, and to adopt technically sound practices, should be the primary target of the AIPD-Rural interventions in beef.

Changing practices and systems to increase productivity and incomes requires repetitive, ongoing training, capacity-building and contact. This is rarely provided through the official extension system, most Indonesian cattle distribution schemes, or linkages with the agribusiness sector. Just as importantly, practice change also requires that farmers become more target-driven and commercialised in their cattle and farming operations. Linkages with the market, the formal finance sector, or upstream or downstream firms are not strong or direct enough to induce farmers to commercialise in many parts of EI.

Thus, any project aiming to bring about significant and sustainable increases in productivity and incomes in the beef industry needs to take an integrated, concerted

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[13] *While IndoBeef had not yet been designed at the time of writing, EOI documents (ACIAR, 2013) outline project components that include: value chain efficiency; on-farm management; animal health and welfare; genetic improvement; and socioeconomics. The project aims to impact on 70,000 beef producers formed into groups (that may number up to 15,000 households and 150 "core" project groups in EJ, NTB and NTT) in which field staff will be embedded. The project calls for whole-of-chain interventions and linkages with agribusiness.*

approach to development based on effective organizational models and delivery mechanisms.

4.2.1 Practice change and income effects

Section 2.4.3 provides details on technical constraints and successful solutions in small-holder systems. To reiterate, this section summarises the key technical interventions that have been trialed and proven in a series of inter-related ACIAR projects, and the productivity and income effects that flow from this practice change.

ACIAR project AS2/2000/103 implemented a series of inter-related, low-cost improvements to small-holder Bali cattle production systems in Lombok and Sumbawa. These include:

- Increased production or strategic utilisation of feeds. In all areas of EI, roughage is sourced from crop residues (especially rice straw and maize stover) but additional sources of green feed provide a valuable supplement in peak times of nutritional demand. Forages and legumes are grown throughout EI, but tree forages (sesbania and leucaena) are particularly well adapted to areas of NTB and NTT that have extended dry seasons. Directing effluent from cattle pens can promote the growth of small plots of native and improved grasses.

- Lower quality feedstuffs (especially untreated crop residues) are allocated for the maintenance requirements of dry cows, while higher quality feed is fed strategically.

- One target of strategic supplementation is cows at calving and lactation. Maintenance of body condition during this period reduces calf mortality, promotes faster growth of the weaned calf and allows cows to resume cycling.

- Early weaning of calves at 6 months or earlier further increases the capacity of the cow to maintain body condition.

- Methods to improve oestrus detection and to increase access to bulls or AI services further reduces anoestrus periods and calving intervals.

- Increased lactation, the introduction of solid feed to calves prior to weaning, and the allocation of higher-quality feeds to the young growing calf results in puberty at a younger age and higher physiological growth potential and growth rates at later stages. This leads to reduced sales age and increases turnoff rates and revenues.[14]

- Weaning pens, pen sanitation and the composting of animal waste for farm fertiliser have also been demonstrated as simple, low cost investments that can increase productivity.

Economic research conducted for AS2/2000/103 found that if the improved practices were adopted, and weaned calves were retained and grew at 0.2 kg/day, it would lead to a 65% increase in farm cash flow. A 120% increase was generated if the weaned calves were retained until 12 months of age and grew at 0.36 kg/day.

This package of interventions was adapted and scaled out to 36 groups and 720 households in Lombok (ACIAR project SMAR/2006/096). The interventions doubled the productivity of Bali cattle cow-calf systems through: increased calving rates (from 52 to

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[14] *ACIAR Project LPS/2006/005 in West Timor found that post-natal calf loss rates in NTT were very high (>30 percent) but could be greatly reduced (to <5 percent) when calves were given a supplementary feed.*

87%); decreased calf mortalities (from 15 to 5%); increased birth weight (from 13 to 16 kg); and increased weaning weight (from 70 to 90 kg). Compared to existing NTB figures, project groups could over five years, increase the number of animals sold by over 80% and more than double the quantity of beef produced and sold.

The strategies and principles of these projects were carried over into East Java with Ongole, Brahman and European crosses in ACIAR Project LPS/2008/038. The problems, interventions and impacts are similar to those outlined above, as detailed in full in Section 2.4.3 'Productivity'. Analysis in Section 3.3.1 finds that, for a household with two Ongole cows in upland EJ (Malang), a shift from a low to higher productivity system will:

- Increase the turnoff of cattle (20%) and the liveweights of cattle sold (by 35%) which increases revenue by 100%;

- Increase costs by 100% (collecting feed and higher depreciation of pens);

- Double gross returns to >IDR 6 million;

- Increase opportunity costs of inventory and labour, but returns to management (net returns) are still positive; and

- In addition, price premiums of 5-10% through improved marketing and sales channels lead to a corresponding increase in returns (i.e. there are no significant increases in costs).

These results are broadly comparable to those of other long-term studies on the economics of small-holder cattle production in eastern Indonesia (Rutherford et al. 2004; MacLeod et al. 2007).

In addition to improved animal husbandry, increased quantities and quality of forages clearly play a central role in increasing the productivity of cattle systems. Tree forages (leucaena and sesbania) can become an important component of crop-livestock systems especially in NTB and NTT. The forages are grown in parts of the farm that do not necessarily displace crops (common areas, fences, dykes, and rocky or infertile areas) as 'managed weeds' with low labour demands. The forages provide good-value nutrition for strategic feeding to cows and calves (see above) or for cattle fattening (e.g. Jati Sari in Western Sumbawa and Amarasi in Kupang District). For more information and references see Section 2.3.4 'Improved forages and legumes' and the references cited there.

4.2.2 Delivery models

While there is broad agreement on the key technical priorities and production systems required to increase small-holder productivity and incomes, there has been less progress in dissemination and uptake at scale. This section outlines measures that have or could be taken to implement and extend practices, which leads to interventions proposed by AIPD-Rural as another vehicle for practice change and commercialisation.

Group management systems

There has been a growing appreciation that cattle programs aiming to increase productivity must contain the following principles[15]:

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[15] *These principles were developed in the Integrated Village Management System (IVMS) developed in NTB (AS2/2000/013). Successful piloting led to scale-out in Lombok (SMAR/2006/096) and transferred to East*

- Cattle production should address the priority technical interventions (see previous section) that are inter-connected. That is, cattle production must be undertaken on a systems level that addresses the major components of the cattle production and household system in an integrated way.

- Management systems are based on a set of simple interventions and management rules that are easily understood and applied with acceptable risk and short term benefits to the household.

- Change in systems should be designed to meet agreed outcomes, which are monitored and recorded (e.g. calving rates, weaning rates, liveweight gain, number of cattle sold from a stable herd size).

- The incorporation of cattle scales into groups provides direct and objective information to producers on performance, for decision-making (e.g. weaning and selling) and when entering into cattle sales.[16]

- These form the basis of feedback mechanisms to the farmer, for capacity building (skills, technologies, management) and modifications of the program in subsequent years. Farmers are active participants in the program. There are no 'one size fits all' pro-formas.

- This approach works at a range of scales (farmer, group, village, regional).

Field staff

A key operational aspect of management systems in ACIAR projects and some Indonesian beef cattle projects (SMD, or 'Graduates Building the Village') has been the presence of 'on-the–ground staff', 'junior scientists' or 'field staff' embedded in project groups. They implement and monitor project systems, communicate with farmers directly through day-to-day contact and support and liaise with local stakeholders (local leaders).

There is scope to extend the role of these staff in several areas.

- The staff have traditionally addressed project-specific, production related issues, but there is scope for this to be expanded to business activities.

- The staff have traditionally been animal or agricultural science graduates, but some field staff could be management graduates, extension agents or even progressive local farmers or business people. Arrangements with local research and extension systems can facilitate training and certification of the staff.

Java (LPS/2008/038), with close resemblances to other ACIAR projects. The principles are increasingly reflected in Indonesian cattle programs including SMD, LM3 and kopel programs and (more recent) village breeding centre programs (see Section 2.10.3). The refinement and tailoring to particular systems, areas, groups and farmers form best management practices that would be formalised in any cattle on-farm program.

[16] *Producers often have little idea of the productivity of their cattle systems, assessed on a reliable or objective basis. This is a constraint to improved productivity and adoption of improved systems. Weighing scales provide an immediate signal on the effects of practice change and a form of benchmarking (against other group members). Cattle sales are usually conducted on a per head basis, with no or only estimated consideration of liveweight. Buyers inevitably have more experience in estimating the weight and value of the animal, so scales would reduce these information asymmetries. Unit pricing (i.e. Rp/kg liveweight) would provide producers with a concrete measure of the revenues gained from cattle reproduction and weight gain on short-term periods.*

- Staff wages have traditionally been paid by the project but there is scope to increase self-funding through business activities (cattle fattening or broking fees for cattle sales, AI and feed).

- Under an expanded role, 'staff' become more independent intermediaries between groups and other stakeholders such as banks, agribusiness actors and research organisations. There is scope for the brokers or business agents to generate fees – through for example, commission on performing loans, cattle, feed and AI sales – and to become independent and sustainable agents of industry development.

The presence and support of dedicated project personnel in the groups is an important factor in the functioning of cattle groups, the production of quality and quantity of cattle and to facilitate linkages with input suppliers and buyers for partners in AIPD-Rural.

Training, dissemination and institutionalisation

'Bottom-up' development projects necessarily include a major training and dissemination component. Amongst the activities conducted in ACIAR and Indonesian cattle projects are:

- The conduct of training in the full range of activities[17] by Indonesian and Australian project members with farmers, field staff group leaders and extension staff. Training sessions should include capacity and team building, review and planning, and problem solving.

- The production, adaption and distribution of extension and learning materials, including simple farmer guides (for example those developed in SMAR/2006/096 and Indonesian programs).

- Farmer interaction through visits to trial and demonstration areas and lead farmer and farmer-to-farmer and group-to-group visits. Exchange across groups in the project 'network' that could incorporate cattle groups established by Indonesian agencies, companies and NGOs.

- Mobile, internet and radio communication and technical support network for whole of chain engagement, with and between farmer groups and chain actors.

- Two-way training and participation of extension, AI and veterinary staff, agribusiness actors and policy-makers at multiple levels and the formation of formal advisory groups.

Community business development

While existing programs have an emphasis on cattle production that can and should be strengthened, interventions are much more likely to be adopted if households have clear signals about the benefits to the household of uptake, and can tailor cattle production systems to suit household resources (land, labour, capital) and objectives (incomes, risk, social) – that is, to become more 'target-driven' rather than 'fatalistic'. Targets may include production goals (e.g. one calf per year, ADGs), family goals (to pay for children's education) or economic (risk minimisation, profit maximisation). Households that aim to

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[17] Training sessions and material conducted in SMAR/2006/096 included that on: forage and feed (monitoring, quality, sampling, nurseries and feed budgeting); cattle feeding and nutrition; breeding and reproduction (controlled mating, bull selection, oestrus detection, AI); kandang sanitation and infrastructure; livestock health; use of manure as fertiliser.

increase productivity and become more commercialised and market-oriented should be the primary project targets.

An obvious project activity that could be piloted would be to provide basic farm management and planning services to households, matching their resources and objectives with enterprise choice (cow-calf, backgrounding, fattening or mixed systems), production systems, input and output selection and finance. Resources and goals vary group-by-group and household-by-household, so advice and planning would be individualised. Farm advisors and especially field staff embedded in groups would assist farmers to develop their own farm management and planning skills that could be applied beyond the life of the project. More in-depth business training could be provided for lead farmers (especially fattening households and small feedlots) and businesspeople in supporting industries within the community (feed, breeding services, cattle trading and broking). Basic budgeting and project field staff would play key roles in delivery. Importantly, private banks in Indonesia, including NTT, are interested in loaning to households that have a well-developed technical base. In order to attract customers and reduce non-performing loans, banks can distribute a proportion of interest payments to organisations to provide research and extension services.

The development of farm plans provides a basis for addressing finance issues, which can significantly constrain or enable the uptake of improved systems. Lack of access to capital perpetuates owner-keeper relationships in low productivity systems and limits the efficient use of AI, veterinary and feed inputs – even if these costs are minimal. Cattle are also an important means by which many small-holders in Eastern Indonesia 'save' money for household needs, but this approach is not necessarily profit-maximising.[18] Alternative financial management systems that should be explored include increasing the turnover of cattle (fattening or annual calf turnoff) and savings in the formal bank sector or within groups (e.g. group bulls). Farm and financial planning (above) would also assist households to prepare applications for loans and credit schemes, while better defined marketing strategies would increase the certainty around loan repayments.

The next logical extension of particular relevance to AIPD-Rural would be to develop cattle marketing systems within groups. This would include; the use of scales to weigh and value animals, pro-active price discovery (through markets, buyers, localised reporting systems) and assessment of the most profitable markets to produce for. Group leaders and field staff would develop relationships with buyers (traders, butchers, feedlots) with the aim of improving sales continuity, price or terms. Buyer preferences would be relayed back to households and groups that may include age-weight-conformation specifications and delivering lot sizes. This places extra demands on producers (e.g. controlled mating or aggregation between groups) so the value of entering into relationships would have to be carefully assessed.

Also of direct relevance to AIPD-Rural, is that the commercialisation of household and group structures also means closer linkages with input suppliers. For example, households and groups in EJ (especially those specialised in fattening) may buy a

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[18] *Households incur high opportunity costs of capital in cattle kept in the farming system for long periods; cattle are not raised to maximise efficiencies (i.e. lose and gain weight over seasons, enter into marginal declines in growth rates or decline in fertility, and inefficient animals are not culled); and entry into a forced sale reduces prices (timing in market and bargaining position).*

truckload of feed from feed traders or feedlots, develop closer relationships with AI agents or purchase groups bulls (for breeding, fattening and groups finance). Again, there are productivity effects but also costs in buying these inputs that would have to be carefully assessed.

Finally, the commercialisation of cattle systems can involve the formalisation of legal structures (to enter into contracts), financial status and accounts (for savings and loans) and governance structures (for financial and legal matters in groups) within and between farmer groups (poktan and gapoktan levels). For some groups, formation of these structures may be worthwhile and can be facilitated through projects.

Public-private partnerships

While each of the components above are inter-related and self-reinforced by mutual interests, higher-level institutional linkages into the public sector are particularly important in the case of beef.

- Public agencies play key roles delivering inputs (extension, veterinary, breeding) and especially in animal health and food safety services (vaccinations, quarantine, slaughter-level and retail inspections).

- Government plays a pro-active role in forging industry development that impacts on local-level chain functioning in areas like inter-regional trade quotas and permits and cattle distribution programs (see Sections 2.9 to 1.1).

The pervasive role of government must be taken into account in any programs in the beef industry. This need not be seen as a threat. Indeed, the policy attention paid to the industry provides opportunities for beef programs including AIPD-Rural. Active participation from a range of private and public actors will assist in:

- Delivering an integrated development approach that, as outlined above, is required to sustainably develop the industry;

- Project coordination and in solving problems in design and operations; and

- Providing channels by which successful elements of the projects can be embedded, expanded and continued.

Thus, any projects conducted in the beef cattle sector should have strong functional linkages and formal governance structures. Amongst the key stakeholders are:

- Farmers, groups and representative organisations (e.g. poktan, gapoktan).

- Agribusiness actors discussed in this report and their peak groups and associations.

- Extension, AI, and veterinary service providers.

- Key policy-makers.[19]

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[19] In SMAR/2006/096 this included: Provincial Dinas Livestock (provincial livestock policy, input into provincial planning on livestock issues); Extension Office (of Bupati) (responsible for delivery of agricultural information to farmers), Bappeda (provincial planning and funding across all sectors), Governor's Office (provincial planning, policy and funding across all sectors), District Bupati Office (responsible for activities of Dinas and Extension at district level), District Dinas Livestock (implements provincial livestock policy, engages with farmers on technical livestock issues), District Extension Office (engages with farmers on agricultural issues; potential custodians of knowledge and skills post-project).

- Shipping companies, quarantine, customs.

- Research institutions (IAARD, universities, BPTPs).

- Banks.

- NGOs and consultancies that provide specialised services (e.g. rural finance, village governance).

Public-private partnerships (PPP)'s are and could be formed on provincial down to local levels. The AIPD-Rural approach is well-suited to the formation of PPP's around specific intervention areas and value chains as recommended below. The groups would be charged with overseeing and assisting in project activities. Representatives could interact formally and informally through meetings, training activities and visits to project sites and agribusiness activities.

There are risks involved in threatening established interests and inter-agency relationships, and also in agencies imposing their interests and structures on project activities. These must be managed though close consultation.

A final consideration that AIPD-Rural must take into account relates to the policy environment in which AIPD-Rural would be operating. The domestic industry is distorted by cattle and beef import restrictions and Indonesian domestic cattle programs, both of which have increased demand and prices for domestic cattle. When/if these policy measures are wound back, a price correction will occur that may disincentivise small-holders, while some butchers and feedlots in EJ will switch back to sourcing imported cattle. However, this short- to medium-term correction will have a modest effect over the medium- to long-term terms and the life of AIPD-Rural. The fundamentals of (constrained) supply and (growing) demand for beef in Indonesia will remain.

4.2.3 Location

Technical interventions and delivery models outlined above are broadly applicable through all AIPD-Rural areas (Malang, Probolinggo, Tuban, Surabaya, Central Lombok, Bima, West Lombok, Mataram, Kupang District, Sumba Timur, TTU, Kupang City). The interventions are also applicable across other areas with concentrations of beef cattle and producers. Local permutations would of course need to be accounted for in project design.

As mentioned, 'top down' intervention areas recommended for AIPD-Rural are not dependent on other 'bottom' focused beef cattle projects, but would greatly benefit from integration with them. Indonesian cattle projects and groups occur throughout EI but are especially prevalent in NTB and NTT, while other Indo-Australian projects are or will be conducted in NTB, NTT, EJ and other areas.

4.2.4 Outreach

AIPD-Rural would partner with companies and organisations that have significant sales and catchment areas. Numbers of cattle and producers are listed in each intervention area below.

Selective integration of AIPD-Rural with other beef cattle projects will further increase outreach. Importantly, agribusiness partners in AIPD-Rural would link with and disseminate information from cattle groups to other parts of their sales and catchment areas, thus impacting on additional households and enhancing effects for the beef cattle projects.

4.2.5 Implications for AIPD-rural interventions

Before presenting specific intervention areas for AIPD-Rural, this section outlines the incentives for proposed AIPD-Rural partners to link with progressive beef cattle groups.

On the output side, cattle buyers (traders, butchers, feedlots, cattle marketing companies) have incentives to coordinate with groups to source cattle to specification. Buyers incur high search, aggregation and holding costs to put together consignments of cattle to specification, and in some cases cannot access sufficient supply to meet orders. Links with progressive groups reduces costs and increases continuity for the buyers. Feedlots and fattening households/groups have incentives to access feeder cattle from groups that are known to apply production practices (feeding, weaning) that have carry-over effects into higher growth in feeding.

These benefits provide incentives for buyers to:

- Partner with AIPD-Rural to link with groups and cattle supply;

- Pay higher prices due to lower costs and increased access to cattle of specification;

- Provide services to groups including market feedback, training, and in some cases finance or financial backing; and

- And to disseminate production practices and systems that work to other groups and areas to broaden their catchment areas.

While different interventions are required for different buyers, types of cattle, regions and markets, there are some common steps:

- Consult with cattle buyers to identify requirements on lot size, breed, weight, height and other specifications, timing and pricing.

- Consult with cattle groups to establish interest, feasibility and incentives to meet these requirements.

- Provide mechanisms through which buyers can increase the provision of services to producers via feedback, training, extension material, veterinary products and credit – both inside and outside of project groups.

- Incorporate agreed demands into more targeted and market-driven production and marketing systems in cattle groups.

- Establish, where beneficial, formal structures – off-take agreements, preferred supplier structures, supply contracts, standards or standard operating procedures (SOP's).

- Establish mechanisms for dissemination of successful arrangements to other areas and groups.

On the inputs side, AI agents and feed traders sell a significant volume and value of product to large numbers of cattle producers. The uptake and extension of improved breeding and feeding practices amongst clients would increase their markets and returns. The suppliers have incentives to partner with AIPD-Rural to improve technical aspects of their operations, to link with cattle groups to use and demonstrate improved practices, and to extend these to other groups in the broader sales areas. A series of joint training, business development and extension activities are proposed.

AIPD-Rural can fund and facilitate closer linkages between producers/groups and agribusiness firms on the both input and output sides through a series of activities:

- Technical and management development of firms through specialist advice. This can include business development through management tools including enterprise budgeting.

- Field days where agribusiness firms visit and communicate with groups and households to directly communicate supplier preferences and to understand the production systems and goals of the producers and groups.

- This could be incorporated into group training and demonstration activities and/or dedicated field days to connect the actors.

- Assistance to agribusiness firms to disseminate successful practices of project producers/groups to other non-project producers/groups in the catchment areas.

4.2.6   Note on report structure

Section 4.2 outlined broadly the types of activities that are required to bring about sustainable development of the beef industry, especially through 'bottom-up' interventions that are and will be undertaken in Indonesian and Australian beef programs. These structures provide context and opportunities for the seven AIPD-Rural intervention areas that are recommended for the remainder of Section 4.

4.3   Intervention Area 1. Improving the Success Rates of Artificial Insemination for Beef Cattle in East Java Through Closer Agent-Producer Linkages

An intervention in the AI sector in EJ is recommended because: it is a significant source of productivity in cattle systems; there are well-defined partner-intermediary-target systems (through state-dominated); all stakeholders have incentives to increase the success rate of AI services; and there is large coverage in East Java.

4.3.1   Practice change and income effects

Artificial insemination is widely practiced in East Java with a coverage rate of 90%. Farmers have taken up the technology and established demand for improved (especially European) breeds. While genetic improvement is not regarded as a major factor in small-holder productivity (see Section 2.3.2), there may be opportunities to address genotype within a package of reproductive interventions.[20] However, the focus of this intervention is on the more important area of timely delivery of genetic material. This is a function of:

- The ability of farmers to detect oestrus in their cows (mucus, riding etc.). Many farmers miss these signs because they are busy with other work, look for other (behavioural) signs and kandang design can mean cows are usually standing with the tails against a wall. Some farmers can deliberately delay insemination because they don't want to

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[20] *There may be opportunities for genetic improvement to develop economically important traits relating to fertility and reproductive performance, growth, calf birth weight, and carcass yield and, where possible, the use of objective selection (estimated breeding values rather than through subjective measures or pedigree).*

mate cows on the first oestrous after calving, or because they lack capital to pay for AI services;

- AI success rates also depend on farmers communicating with AI agents to provide the service within the oestrus period. When the service is delivered, success rates are also affected by live sperm counts and motility, collection, storage and distribution of straws frozen (in liquid nitrogen canisters); and

- If quality semen cannot be delivered within a day or two, the oestrus period will be missed, further lengthening inter-calving intervals for (on average) another 21 days. Worse still, farmers can assume that the cow is pregnant, not check for oestrus, and not know that she is not pregnant until she doesn't calf 9 months later.[21]

Research in ACIAR Project LPS/2008/038 in East Java aims to reduce calving intervals to 12 months, requiring that cows cycle and conceive within 90 days of calving. The average post-partum anoestrous interval is still greater than 90 days at all sites due to lactation anoestrous, poor body condition, and poor detection of oestrous. However, the average body condition score of cows at calving has improved at all sites, and it is hypothesised that the biggest constraint to reduced calving intervals is oestrous detection by farmers. Once oestrus has been detected, and a service delivered, conception rates vary from 1.1 to 1.4 depending on breed (fertility under different feed conditions) (see Section 2.3.2). The conception rate in Malang was said to be 1.33 services per conception.

Budgeting of a mixed cow-calf / fattening household in an upland system in Malang (see 'high productivity' scenario in Section 3.3.1), shows that household returns are highly sensitive to calving intervals and percentages. If more accurate oestrus detection and timely delivery of AI services can bring forward pregnancy by one oestrus cycle (21 days), then this increases annual calving percentages by 5.8% and increases gross returns from cattle by 14.3%. Net returns are increased by much more because capital and labour are increased only slightly by the higher calving rates. If a combination of better animal nutrition, oestrus detection and service delivery brings forward pregnancy by two cycles (42 days) gross returns increase by 29%.

4.3.2 Sustainable delivery model

Semen and straws for AI in EJ originates from Singosari, one of three national breeding centres in Indonesia, and the proposed AIPD-Rural partner. Straws are disseminated through the AI network, comprised of centres to manage liquid nitrogen and storage and distribution, and a network of AI agents, which are the proposed AIPD-Rural intermediaries. There are many dozens of AI technicians in each district of EJ that deliver AI services to cattle producers, which are the proposed AIPD-Rural targets.

AI agents can be Dinas Livestock employees (IDR 1.8 million per month in NTB), or there are larger numbers of 'independent' or 'quasi-private' AI agents that are not on the payroll and earn money through AI fees. There are training programs ('independent inseminator programs') and they report to Dinas and use Dinas resources. Government AI agents were said in some fieldwork areas to be more highly trained and accurate, with 15-20

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[21] Research is being conducted at The University of Queensland on measuring faecal progesterone metabolites as a means of confirming pregnancy in cows and determining stage of oestrus cycle, but it will many years before an on-farm test kit is developed.

successful pregnancies per month. The pricing structure charged by AI agents has been outlined in section 3.2.1.

It is recommended that AIPR-Rural partner with the Singosari breed station and Dinas Livestock to develop closer working relationships between local AI agents and project groups in EJ. Amongst the activities that could be done in this intervention area are:

- The training of AI administrators, technicians and agents in AI delivery and the establishment of QA protocols for semen storage, handling, delivery;

- Training in broader animal husbandry practices that effect oestrus (nutrition, BCS, weaning), and the development of resources (training material, exchanges) to disseminate to other (non-project) groups;

- Field days for AI agents to conduct training with farmers on oestrus detection, and establish protocols for communication with AI agents; and

- Measures to increase household access to small amounts of credit to pay for AI services (e.g. from groups or banks) may be important in some groups.

AI agents have incentives to participate in these programs because it increases the number of services they provide and can earn fees from. Fee structures that reward successful conceptions (not just attempts) would increase incentives for agents to achieve higher success rates through closer communication with farmers, the provision of training on oestrus detection, and timely delivery of AI services and quality semen.

4.3.3 Location

While AI is practiced in some parts of NTB, the adoption rate is low (10%), constrained by distance and transport from Singosari and under-development of the local breed centre and distribution network. Interventions in AI would focus on EJ.

The intervention area requires close AI agent–farmer linkages and interaction would be most manageable and feasible if conducted with organized cattle groups. Data, management systems, learnings and experiences are transferrable throughout most of East Java.

4.3.4 Outreach

There are 900,000 conceptions from AI in EJ that, at an average of two cows per household, would service about 450,000 households. However, only a proportion of these households – perhaps 10% – would have the sufficient levels of organisation and capacity to adopt the proposed interventions. These are most likely to participate in cattle groups and projects.

4.4 Intervention Area 2. Improving Cattle Feeding Practices Through Business Development for Feed Traders and Cattle Fatteners in East Java

This intervention is concerned with market development and stimulation for a key production input and a promising market that incorporates large numbers of low-income feed traders.

4.4.1 Practice change and income effects

Feed is the major input and major determinant of productivity in the full range of cattle production systems in East Java. Feed traders play an important role in the supply of feed to the fattening sector, and may play a growing role in supplying small-holder breeder operations.

As outlined in Section 2.4.3, there are three large commercial feedlots in EJ that source feed from feed markets[22] and mill for their own operations. Some feedlots also sell the feed as mixed rations to smaller feedlots or fattening households. There are approximately 10-12 smaller feedlots (around 500 head) in East Java, and significant and growing numbers of smaller specialised cattle fattening households that fatten cattle independently, on contract for feedlots or that are clustered around soybean processors[23]. In addition, there are large numbers of cattle traders and butchers in EJ that require feed for speculative feeding, aggregation and holding before sale or slaughter.

The development of the fattening and trading sector has stimulated increased demand for off-farm feed sources and established a vibrant feed market in EJ in recent years. Raw feed is sourced from farms, contract corn growers, rice and soybean processors (residues) and plantations. Unlike other livestock (poultry, dairy), feed is not processed and distributed by commercial feed companies, but rather by feed traders. Priyanti *et al.* (2013) report that traders are formed into a hierarchy comprised of:

- Small-scale traders (supply about 500 kg per day);

- Medium-scale traders (500-2,000 kg per day); and

- Wholesalers (or large-scale traders) that handle large volumes. These traders supply cattle fattening operations that could be in another sub-district or district, perhaps 50-60 km from the site where the feed was collected or purchased.[24]

There are several constraints to the development of the feed market on both the demand and supply sides:

- Feed traders can access plentiful supplies of feed in the wet season (December-April), but demand is low because buyers can access more feed locally or on-farm;

- In the dry season (May to November), feed supply for traders declines or becomes more expensive. Some traders travel to different agro-ecological zones to source supply, incurring higher costs and risks, but many traders run down their stocks and stop operating; and

- Equally, cattle producers can have a feed gap in the dry season, and the scarcity or high price of feed and lack of finance or skills to store feed, can reduce productivity in fattening systems.

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[22] *Feed inputs includes rice straw, coffee skin, peanut husk, copra meal, wheat pollard, onggok (from cassava skin), kulit sawit (palm oil skins), kankung, corn cobs, rice bran, cassava tubers and molasses*

[23] *In clusters around soy processors in Malang, there are reported to be 10 cattle groups. 15-20 members in each, and each member has 10-15 cattle.*

[24] *Feed sold included maize stover (43 percent), rice straw (27 percent), grasses (native grasses and elephant grass, 20 percent), sugarcane tops and leaves (9 percent), and small amounts of legume hay (2 percent). A ration of native grasses, crop residues, tree fodder and green feed is common.*

Imbalances in feed supply and demand also occur in small-holder cow-calf systems. To maintain productive cow-calf systems (calving intervals and development of calves), cows need to maintain body condition and be strategically fed during peak periods (calving and lactation), while calves need good nutrition from weaning. Sources of supplementary or higher-quality feeds can have large productivity effects. Small-holders in EJ source the majority of their own feed on-farm or from neighbours and group collection (see Section 2.3.4). While better and more strategic feeding can have large productivity effects, off-farm feed purchases are costly and the economics would have to be assessed. However, there may be cases where small-holders have incentives to purchase smaller amounts of particular types of supplementary feed if there are clear incentives and financing options.

A broader constraint to improved feed supply and practice is that stakeholders – feed traders, fattening households, small feedlots and small-holders – tend to have only rudimentary knowledge of animal nutrition and the cost-benefits of different feeding practices. That is, feeding practices are sub-optimal from both productivity and economic perspectives.

4.4.2 Sustainable delivery model

It is recommended that AIPD-Rural partner with large feed traders in EJ to develop their businesses through:

- Training and infrastructure on feed storage to even out feed supply and demand. This could be facilitated through specialist training or trips to companies that use: round bales, straw pits, treatment (silage, ammoniation), drying prior to storage/baling and bagging.

- There may also be opportunities for feedlots to develop closer links with specialist feed suppliers – e.g. contract corn seed producers, specialist forage growers that can supply feed year-round, food processors (e.g. soybean processors) or inter-regional suppliers (e.g. plantations). There may be particular technical, logistic or regulatory constraints to procurement from these channels that could be can be addressed through specialist advice.

- Various projects in EI have done or will conduct trials, demonstrations, training and develop training material on animal nutrition tailored to the production system of the groups (feed base and enterprise mix – fattening, cow-calf, mixed). Training could use and expand tools to identify least-cost rations and optimise profitability for fattening households and feedlots. Traders that operate in the buying/selling area of the groups would be invited to participate in the training or through dedicated events for groups and traders to discuss feed requirements and supply.[25]

- Traders would be provided with training materials and tools developed through the project and encouraged to disseminate to other cattle groups and fattening operations. This provides traders with mechanisms to expand their feed markets and for project activities to be disseminated beyond project groups.

- Finance options for both feed traders and buyers would have to be explored.

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[25] There are parallels with feed traders in Sumatra that source wastes from plantations (e.g. pineapple) sell feed to household fattening households in contract fattening schemes.

4.4.3 Location

The feed market is most developed in lowland areas of EJ (e.g. Probolinggo) due to intensive land use. However, fattening – both feedlots and fattening households – occurs in large tracts of EJ, including Probolinggo, Tuban and Malang. There is also potential to apply this intervention to intensive cattle and feed production areas of Lombok. It is recommended that partners are chosen with the geographical region (sales channels) that have a significant number of fattening households, or that are specialised in fattening.

4.4.4 Outreach

The proposed intervention area provides outreach through actors that both supply feed to traders and buy from them, making this a high-outreach and pro-poor intervention.

For feed supply, a large trader that sells 1 tonne of feed per day, might buy from five medium-sized feed traders, which in turn might source from 20 small traders or collectors. These collectors can be low-income but that have access to small-scale transport (including motorbikes) and feed collection areas (near households or roadsides). The traders connect with large numbers of farmers that can either sell their own crop residues or exchange them for labour (harvesting) thus providing an additional source of income or labour.

On the sales side, a wholesaler that sells 1 tonne of feed per day (365 tonnes per year) may sell enough feed to fatten 80 bulls weighing an average of 400 kg for one year. This is about the size of a small feedlot or specialised fattening group (e.g. 40 head on a 180 day fattening regime).

It is relevant to note that many small-holders in EJ are landless, so in addition to sourcing feed locally (e.g. from harvesting the neighbors' crop), they may also source from feed markets. This is particularly the case for fattening households that require larger quantities or higher quality of feed.

4.5 Intervention Area 3. Increasing Productivity and Returns From Contract Fattening in East Java

This intervention area would partner with an existing contract fattening operation in East Java. The feedlot-fattening household contract system has been established on a small scale (100 households) and appears to be functioning well, but there is potential to expand the system through technical input and links with other cattle groups.

4.5.1 Practice change and income effects

Short-term cattle fattening is an attractive development activity because the fast turnover of cattle allows for cashflow that can be used to fund subsequent lots ('packages') of feed, cattle and capital. Fattening is not land-intensive if households can access feed locally or on markets, and it is a commercialised activity.

However, profitable operations require a degree of skill in: selecting and buying cattle; feeding the right feed regimes; veterinary care; and marketing skills to achieve favourable sales prices. This can be demanding for individual small-holders. Poor cattle selection and inefficient fattening – low feed conversion and growth rates – can easily push the fattening households into the red. There are significant capital costs associated with cattle and feed purchase, so it involves risk, while access to capital can be a constraint.

Contract fattening can alleviate some of these constraints. While common overseas (e.g. China) and in Sumatra (cattle importers and plantations) contract fattening is less common in EI. One such operation – and there was said to be only one – was encountered in EJ, called Wahyu Utama in Tuban (see Section 2.11.1 'Nucleus-plasma relationships' and Table 25). Wahyu Utama is an SME comprised of a feedlot (1,200 head), with integrated feed mill, slaughter, meat retail and restaurant operations. The company has developed contractual relationships with about 100 fattening households, to which it provides feeder cattle and backing for subsidised loans under the KKPE scheme (see Section 2.10). The company provides technical advice and training through technicians and extension staff employed or contracted by the company.

More specifically, the contractual arrangement is:

- Wahyu Utama sells four cross-bred or Ongole bulls from its feedlot to farmers at 350 kg, 2.5 y.o, for IDR 27,000/kg LW.

- Farmers buy cattle drawing on funds from a subsidised loan scheme (KKPE) at 4% for 4 months.

- Cattle are fed 12kg/head/day Wahyu Utama concentrate feed mix[26], fatten for 120 days, 1 kg ADG.

- Wahyu Utama then buys back the cattle at 470 kg LW.

Cost-revenue results are presented in Table 32. The budgeting suggests that contract fattening households can generate net profits of IDR 3.8 million per 'package' of 4 head that (in a 120 day feeding regime) can be repeated three times per year. It is important to note, however, that households access subsidised credit at 4% (with support from Wahyu Utama). If households take out collateralised loans at market rates (13%) then capital costs are IDR 7 million, sending net profits negative. Uncollateralised loans are either not accessible or (at 26%) unviable for producers. If ADG are low at 0.7 kg/day then net profits are also negative.

4.5.2 Sustainable delivery model

Wahyu Utama is an attractive possible partner for AIPD-Rural because it has an integrated business model that provides technical, management and financial support to significant numbers of small-holders. The company is said by independent observers to be viable and well managed. The company is seeking to expand the number of contracted households, but is limited by households that have the capacity to take on the technical challenges and risks. In turn, the households are only able to access cattle, feed and credit (including KKPE subsidised credit) because Wahyu Utama provides technical support and contractual certainty to the households. While Wahyu Utama does act as guarantor for the loans, it assists the households with their applications and provides assurance that technical support, management systems and contracts are in place so that households can pay back their loans.

If contracted households can achieve an ADG of 1kg then production practices are likely to be sound. However, there are ways in which feeding, penning animal health and

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[26] *12 percent CP, IDR1,600/kg (rice straw 4 percent, coffee skin, peanut husk, copra meal, wheat pollard, onggok (from cassava skin), kulit sawit (palm oil skins), kankung, corn cobs, rice bran, cassava tubers, molasses)*

marketing systems can be improved in the (small) Wahyu Utama feedlot, and for expansion of contracted or new households.

It is important to note that the sustainability of the model appears to be dependent on continuation of access to subsidised credit. The KKPE scheme is expected to continue for some time. When it finishes, other finance institutions may enter this market.

4.5.3 Location

Wahyu Utama is located in Tuban which has a significant cattle population (200,000 head) and a large live cattle market.

4.5.4 Outreach

The outreach of Wahyu Utama is modest at around 100 households. There is scope to increase this through the measures outlined above.

4.6 Intervention Area 4. Increasing Smallholder Returns From the Production of Feeder Cattle for Feedlots in East Java

This intervention area aims to increase the linkages between the producers of feeder cattle and feedlots to induce specialisation and increased returns in the small-holder feeder cattle production stage. The feedlots have a well-defined cattle procurement system, but would benefit from increased continuity and certainty of supply, through development of closer linkages and provision of technical support to farmers.

4.6.1 Practice change and income effects

Cattle production systems in EJ have traditionally been dominated by 'mixed' breeding-fattening systems where households hold cows and raise offspring to slaughter weight. This system still predominates in upland areas, but lowland producers have become increasing specialised in cow-calf production sector in recent years (Cahyadi *et al*. (2012).

At the same time, EJ has a large fattening sector comprised of fattening households and feedlots, the latter of which are of particular interest in the intervention. These include Sapindo (in Malang), Santosa (Probolinggo) and Wahyu Utama (Tuban) that together fatten from a minimum of 250 kg LW for an average of 120 days (making a total turnoff of about 47,700 head per year).

This raises the question of who fills the production stage between cow-calf and fattening/finishing stages– i.e. in the backgrounding of feeder cattle. Many feeder cattle derive from 'mixed' systems, but a growing number of households must be specialised in buying and raising calves to a weight to enter feedlots. Little information or data is available in the literature on this stage of the value chain, but increasing specialisation provides opportunities for small-holders to fill the market.

Large feedlots in EJ (Santosa and Sapindo) purchase cattle through a limited number (about five) of selected independent traders or their own purchasers. The intermediaries buy predominantly at markets. While they have well-developed networks, there are transaction costs involved and buyers do not know the background and therefore growth potential of the cattle purchased.

Large feedlots have incentives to diversify and expand purchase channels to increase access to feeder cattle in a tightening cattle market. In particular feeder cattle of higher

physiological growth potential due to even nutrition in suckling and backgrounding stages, skeletal growth, and that have sound conformation and feet and are free of major diseases. These are critical factors in the efficiency and profitability of feedlot operations. Links with cattle groups that produce a concentration of feeder cattle will be of interest to these buyers.

Budgeting based on the specialised fattening household in Probolinggo in Section 3.3.3, shows that this specialised activity can be profitable. If improved weaners from 'high productivity' cow-calf households (see Section 3.3.1) are purchased at 89 kg, and fed for 400 days at an ADWG of 0.4 kg/day, then cattle will reach the target weight of 250 kg in 400 days. This generates gross returns of IDR 1.8 million per head, but negative net returns. If an ADWG of 0.5 can be achieved, then gross returns are IDR 2.4 million and net returns are positive. If price premiums for feeder cattle can be increased by 10%, gross returns increase to IDR 3 million.

4.6.2 Sustainable delivery model

It is proposed that AIPD-Rural partners with large feedlots that have a network of buyers (intermediaries) that can link with groups and producers (targets).

AIPD-Rural could facilitate feedlot-trader-producer linkages through:

- Participation in group training and field days. Feedlots can communicate their preferences and specifications and have extensive commercial and localised expertise in the nutrition, animal health and management systems required to produce specified feeder cattle.

- AIPD-Rural could also provide technical support in the areas of nutrition, ration formulation, animal health and management.

- Feedlots also have bulk feed purchase and milling facilities, so arrangements could be extended to backward linkages in feed supply.

- Formal or informal sales agreements could be discussed (lot size, specification-price schedule, finance). Santosa have off-take agreements with larger suppliers of feeders (e.g. Wahyu Utama, and indeed backed one of their loans). Preferred supplier arrangements could be established with groups that are a trusted source of feeder cattle with growth potential. The experience of Wahyu Utama in establishing relationships with, and providing services to, households may be useful for extension purposes.

- Feedlots and their buyers would be encouraged to share training material, experiences in feedlot-group relationships and demonstration groups/households with non-project areas.

4.6.3 Location

Sapindo is based in Malang, Santosa in Probolinggo and Wahyu Utama in Tuban. However, these feedlots have procurement channels well beyond the districts.

4.6.4 Outreach

These buying areas of the feedlots are large and are likely densely populated in Malang, Probolinggo and Tuban, so could potentially reach 20 groups or 2,000 households. Of

these perhaps five groups (500 households) may have the resources and interest to produce feeder cattle for feedlots.

Agrisatwa (Sapindo) has a feeding capacity (head in stock) of 2,500, Santosa has 12,000 and Wahyu Utama 1,400 head. On a 120 day feed regime (three lines per year), this amounts to 47,700 head per year. If each household produces two feeder cattle per year, the feedlots would reach 19,000 households.

While these three feedlots account for a small proportion of cattle numbers in East Java (1%), they account for about 6% of the provincial turnoff (including certified and uncertified slaughter and inter-regional trade). This is a significant volume and share of the largest cattle production and trade market in Indonesia.

4.7 Intervention Area 5. Increasing Smallholder Returns From the Production of Slaughter Cattle for Butchers in Major Cities in Eastern Indonesia

This intervention area is designed to increase local-level linkages between production groups and butchers. Butchers run efficient (low cost) slaughter and distribution operations, but there is scope to increase efficiencies in cattle procurement, which is a major aspect of their operations. This intervention is more about developing markets and market linkages than addressing any specific technological problems. Successful interventions in this area could have large potential flow-on effects both on- and off-farm that are pro-poor and disproportionately oriented toward women.

4.7.1 Practice change and income effects

Butchers are key players in beef value chains. While the majority of cattle in NTB and NTT are traded out of the islands or provinces, there is still substantial local consumption in major consumption areas. More than 500,000 cattle per year are slaughtered in EJ for local consumption, five times more than are traded. Butchers also play a key role in integrating the beef value chain through their small-scale, integrated networks that buy cattle from markets and production areas, slaughter in service-kill facilities and retail beef and offal in wet market stalls.

While butchers are key chain actors, they have weak linkages back to producers. Butchers buy mainly from markets and their preferences are implicitly passed back through price signals. However, the signals are transmitted through a layer of traders and brokers, with no direct feedback to producers. That is, most producers will only have distorted information on the preferences of downstream buyers, or how to measure them.

The main preferences of butchers are:

- Butchers appraise, price and buy cattle based on body and muscle conformation, to estimate dressed weight on different types and breeds of cattle, aggregated back to a per beast price.

- Butchers require cattle that are not going to be rejected or discounted for disease reasons. Cattle are notionally inspected at slaughterhouses for diseases that can lead to their burning and disposal. More importantly, carcasses are notionally inspected and parts of the carcass can be rejected, especially due to liver fluke. On a 400 kg LW animal, a liver can weigh at least 5 kgs which at IDR 40,000/kg is worth

IDR 200,000. Rejection of the liver can mean a profit or a loss for the butcher on the animal.

- Butchers slaughter consistent numbers of cattle per day and week (e.g. two per day / 14 per week). In addition, they buy higher numbers in peak slaughter season (e.g. Idul Fitri).

While some butchers have some incentives to conceal some of this information, more progressive butchers have stronger incentives to develop closer links with groups that meet these requirements. In particular, it reduces the search, negotiation, transport, road fee, bribery and holding costs, especially if the cattle can be sourced near to point of slaughter. Because it is such an important task, cattle buying is done by the head butcher (boss) himself, taking up 2 days of his time per week at a significant cost of more than IDR 313,000 per head slaughtered, far higher than slaughter costs combined.

Groups able to supply healthy cattle with high dressing percentages and in the numbers required are in a position to negotiate favorable prices and terms. If households are already feeding slaughter cattle in 'high productivity systems' to produce cattle with relatively high dressing percentages, and if the costs of vaccination for liver fluke are modest (e.g. IDR 10,000), then butchers may be willing to offer premiums of up to 10%. This will translate into household returns of the roughly the same order.

There are also benefits in selling to buyers that require only small lots of cattle on a consistent basis (e.g. 7 head twice a week), negating the need to aggregate large lots of homogenous cattle. However, the numbers required by a butcher over a year (700-800) exceed that produced from a given group, so the butcher would have to work with several groups, or stagger them over different peak turnoff periods. This sort of arrangement allows farmers to enter into more target-driven farm planning and financial management.

4.7.2   Sustainable delivery model

One of the problems in this intervention area is that there is no well-defined corporate 'lead firm' partner. Butchers operate individually in service slaughter plants. They do, however, work within strong networks and in some areas (e.g. Surabaya) butchers are represented by a peak agency (the Association of Cattle and Beef Traders, East Java). The managers of major slaughterhouses (Mataram, Pegirian, Malang) liaise closely with butchers and would be an initial point of contact. Slaughterhouses provide a focal point for both upstream and down-stream activities, including the management of disease and inspection (Dinas Livestock) and are actively involved in chain integration initiatives including links into retail.[27]

Butchers have traditionally had little contact with producers. There are mutual advantages in increased and direct dissemination of information about the preferences of butchers through a range of activities.

- Field days where butchers would be invited to articulate their preferences for cattle and the reasons.

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[27] *There may be scope for butchers to integrate into higher value beef retail chains. Supermarkets in EI source beef from beef traders that can come from individual butchers that are known to use safe butcher practices. One slaughter operation in Kupang is integrated into 3 butcher shops. Wahyu Utma is integrated into restaurants.*

- This could be followed up with visits by some farmers or group leaders to slaughter facilities (to see their cattle being slaughtered, butchered and sold).

- Assistance could be given to producers to assess the feasibility, costs and benefits of servicing this sales channel (relative to other channels).

4.7.3 Location

Butchers operate throughout EI, although the butchers most likely to enter into the proposed activities will be located in province- and district-level cities of EJ, and province-level cities in NTB and NTT. Pilots are best initiated with butchers in cities like Surabaya, Malang and Mataram and Kupang.

4.7.4 Outreach

Butcher operations are highly labour-intensive and extend across much of the value chain. To provide an indication of the flow-on effects of interventions in partnership with butchers, an average individual butcher in EJ that kills 14 head per week might provide employment for: one boss; four slaughter workers; and two beef distributors and stall-holders. An average butcher would buy 728 cattle per year through traders and brokers, using trucks 2 days a week for transport. Assuming that households sell two slaughter cattle per year, the butchers would buy from 364 farmers. If partnerships were formed with limited numbers of more progressive butchers (e.g. five butchers in Surabaya, three in Malang, three in Lombok and two in Kupang) this would have substantial multiplier effects. Based on the numbers above, 15 butchers would have employment effects on 105 slaughter workers and up to 5,460 cattle producers.

Potential for scale-out is high because butchers work with strong informal (social and kinship) networks on both horizontal and vertical levels. Table 6 estimates that 19,000 people work in small-scale slaughter and by-product trading (60% women); and 7,000 people in beef retailing (75% women). Butchers buy cattle (through traders and brokers) from perhaps one million households.

4.8 Intervention Area 6. Improving the Smallholder Production and Marketing Systems for the Inter-Regional Trade of Breeder Cattle in Lombok

This intervention aims to capitalize on the competitive advantage of Lombok in the production and sale of Bali breeding cattle through closer linkages between inter-regional breeder cattle traders and groups. There appears little scope to develop formal supply agreements, but there appears to be substantial scope for cattle groups in parts of Lombok (especially Central Lombok) to specialise in the production of breeder cattle for sale to an oligopoly of inter-regional traders.

4.8.1 Practice change and income effects

There is high demand for Bali breeding cattle (heifers and young bulls) throughout Indonesia. The disease status of Lombok (especially for brucellosis) makes it by far the largest exporter of Bali breeding cattle in Indonesia. Trade flows would be higher if not limited by quota allocation (13,600 head in 2012, 15,000 head in 2013).

The Lombok breeder trade is conducted through orders received from inter-regional buyers that set out numbers that range from 300 to 1,200 head for different classes of

breeder cattle. The NTB government sets price standards for different classes of breeders (sex, age, weight, girth, height, length) to control prices (see Section 2.6, Table 21). Export permits are issued to only three large traders that are specialised and skilled in the trade and that work closely together to fill orders. The traders aggregate cattle through two main channels:

- A network of collectors and buyers that buy mainly from markets but also direct from groups.

- One trader (H Saad Husni) has holding and feeding areas in his home village integrated through an intricate system of kandangs, forage areas, individual household, group activities and finance.

While the trade is lucrative, two main problems have been identified by several interviewees:

- The prices set out in orders and government standards are considerably higher than those paid to producers,[28] and traders are widely thought to be the main beneficiaries of the tradestandards; and

- However, traders have considerable costs in conducting the trade, especially in aggregating cattle. They spend many months and large outlays to find and aggregate breeder cattle to specifications to meet orders.

This raises the prospect that if traders could reduce these search and aggregation costs, then these cost savings could be passed back to producers in the form of higher cattle prices. This, however, is not straightforward. Traders receive orders at variable times of the year for variable numbers of cattle to various specifications. It is therefore not possible to enter into formal supply agreements or contracts with groups or producers to deliver cattle for an order through, for example, controlled mating or targeted feeding (which in any event is technically demanding in a natural breeding system).

Never the less, there may be benefits f particular areas to specialise in the production of breeder cattle for inter-regional trade to produce a critical mass of breeder cattle for orders when they do occur.

Budgeting suggests that this would be a profitable enterprise choice for households. A budget was established for a 'high productivity' cow-calf household in Central Lombok where two Bali cows are kept with calving rates of 80% to produce calves that were weaned at 6 months of age at 90 kg. These were fed on both crop residues and forages at an ADG of 0.3 kg and are sold out at 12 months of age at 144 kg, 104 cm height at shoulder and 96 cm body length. Under NTB standards, these are classified as Class 2 breeders with an export price (ex-trader) of IDR 5.5 million for females and IDR 6 million for males. These prices increased in 2013.

In a baseline scenario, weaned calves would be have an ADG of 0.3 kg and would be sold at 12 months old for IDR 3.5 million for females and IDR4 million for males (ex-farmer), leading to gross profits of IDR 3.8 million. If a concentration of young breeding cattle reduced costs to traders to the extent that they would be prepared to pay IDR 4.5 million for females and IRD 5 million for males, then gross profits increase 43% to IDR 5.5

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[28] *Several traders interviewed bought 102cm heifers (from producers and groups) at IDR3.6 to 4 million per head and then exported at governor decree prices (IDR6 million)*

million. If ADG increased to 0.4 through participation in 'high productivity' systems and feedback and services from traders, then profit increase by 45%.

4.8.2 Sustainable delivery model

In this intervention, AIPD-Rural partners would be one or more of the three large exporters of Bali breeding stock on Lombok – H Saad Husni (see 'nucleus-plasma relationships' in Section 2.10), H. Sabri or H. Fathullah. These traders would develop relationships with cattle groups through:

- Communicating directly with the groups on their requirements through field days and other channels. The traders have extensive experience in producing cattle to these specifications so could assist with training and in establishing systems.

- The costs and benefits of an animal health program to ensure inspection and quarantine requirements are met could be explored (see Section 2.9.3 'Domestic Trade Policy').

- Agreements on specifications / price could be explored.

Different models of interaction between groups and traders could be tested to reduce costs and risk for both. Measures to increase the scale and efficiency of cow-calf production in Lombok may also help to expand the market through increased quota allocation. Government sets export quotas based on estimates on the numbers of breeders required to sustain Lombok's (higher quality) breeding herd. If the breeding herd is expanded through increased specialisation in cow-calf production, this may be factored into quota allocation policy.

4.8.3 Location

A program of this sort would be developed in areas best suited to cow-calf production, with a dense cattle population in close proximity to the traders, such as Central Lombok.

4.8.4 Outreach

H Saad Husni is the largest of only three traders in Lombok licensed to export cattle (breeders) (2,800 head for export, 600 for local market). Again, if households sold two per year, this would be 1,400 households. Other traders have similar numbers.

4.9 Intervention Area 7. Increasing Smallholder Returns From the Production and Marketing of Slaughter Cattle for Cattle Marketing Organisations in West Timor

4.9.1 Practice change and income effects

NTT has a large trade of slaughter cattle, 'exporting' 66,000 head in 2010 (the export of females is not permitted due to brucellosis) of which most come from West Timor (Kupang accounted for 26,453 head and TTU for 8,212). One of the features of the West Timor cattle industry is the presence of dedicated cattle marketing companies with established links to cattle groups and about 3,000 households. The companies operate under different models.

- Pusat Koperasi Unit Desa (PUSKUD) is a private company that buys 3-4,000 cattle per year through 8 buyers, then distributes them to 1,500-2,000 households for

contract fattening for 8-12 months. The cattle are then returned to PUSKUD and sold at auction to inter-regional traders based on weight-price schedule (see Section 2.11.1). The value of the difference between the purchase and sale liveweight is then distributed back to households after various deductions (veterinary product costs, a 70:30 split to account for capital and administrative costs), while the farmer pays other costs (feed, labour).

- Tanaoba Lais Manekat (TLM) is an NGO that operates on a similar model to PUSKUD, but on a smaller scale (500 cattle, 250 farmers). It sells to traders that sell to Kalimantan (see Section 2.11.1)

- Gejati Cooperative is a cooperative comprised of 22 breeding groups and 5 fattening groups (2,434 cattle) that enter into various profit-sharing, finance and marketing arrangements. Non-members also sell 3,000 head per year through Gejati, which takes a commission on the sales. Sales are made directly to the local collectors of cattle importers in Jakarta (see Section 2.11.1)

Thus, these companies have established links with large numbers of households, have established company and governance systems, and provide a range of services including 'embedded finance' and marketing. PUSKUD and TLM provide technical extension and veterinary support to contracted households.

However, all organisations acknowledge that productivity is low, fattening periods are 'too long' and have expressed interest to researchers and projects in West Timor in measures to increase the productivity of systems, including improving the flow of feeder cattle into the groups and in establishing tree forages and 'feed banks'. Several researchers have entered in discussions about technical cooperation with PUSKUD but these have not yet materialised. Visits to Gejati sites confirmed that households and holding areas have sub-optimal feed, production, penning and sanitation. The base of Gejati (Amarasi in Kupang City) has very large areas of land planted to leucaena but some areas require replanting and improved varieties. There appears to be significant potential to increase the productivity of households contracted to these marketing companies.

There are also likely to be ways to refine the contractual terms to increase incentives and returns to households, which should be closely investigated if any intervention occurs in this area.[29] Households linked to TLM and PUSKUD were not visited as a part of the report to to assess the benefits from participation in the programs. However, these benefits depend strongly on the valuation of household inputs (labour, feed) and company inputs (veterinary products, technical services and marketing). These require detailed examination to ascertain whether any project that builds on these structures will have the desired livelihood effects. Ownership structures – where the marketing companies own the cattle rather than the households – increases accessibility for the poor, but may also reduce net margins and incentives to maximise productivity and profitability.

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[29] *TLM was is considering paying households a flat rate per kg increase (IDR 4,000) to cover all costs and payments, presumably to provide more direct incentives for households to increase productivity.*

4.9.2 Sustainable delivery model

There are clear – though very different – partners for this intervention that have established links to large numbers of producers through a network of buyers and technical staff. Opportunities to strengthen the system include:

- Inviting the PUSKUD, TLM and Gejati to attend training events, visiting and sourcing research and training material for training programs.

- Identify successful households and groups in contractual relationships with the marketing organisations. These provide cases to investigate returns to contracted households and means by which these could be improved through more efficient production systems and contract terms.

- Pilot and explore the possibility of scale-out.

- Assist the agencies to establish more productive fattening systems tailored to their contracted households, groups and areas.

- Importantly the purchase of feeder cattle is also a key part of PUSKUD and TLM operations so there may also be opportunity to link the marketing organisations with groups that sell feeders.

4.9.3 Location

- PUSKUD operate in every district in West Timor and one in Flores.

- TLM across a network (through a large number of cattle and non-cattle activities) in large tracts of West Timor.

- Gejati is based in Kupang City (Amarasi sub-district).

4.9.4 Outreach

It will be prudent to initiate this intervention through modest training, research and piloting activities. Depending on the outcomes, there may be scope to incorporate more widely.

Any stand-alone or extension into the broader catchments of the organisations will impact on large numbers of farmers. PUSKUD links with 1,500 to 2,000 farmers and TLM with 250 farmers. Gejati has 540 cooperative members with cattle, and markets 3,000 cattle from non-members that at three per household is 1,000 farmers.

4.10 Areas for Further Research

There were also cases where potential intervention areas were identified, however, sustainable business models could not be established, or insufficient information was available. These are outlined here as options for investigation in further research.

4.10.1 Banks and finance

Limited access to savings and loans facilities is a key constraint to more productive and profitable cattle production systems and discussed in several of the proposed interventions and in previous sections of the report (Sections 2.2.5 and 3.3). Cattle are kept as a source of 'savings' for a large proportion of cattle producers, but the value of the savings in cattle can devalue in unproductive systems or downward-trending markets and

returns on the capital are likely to be higher if either re-invested or kept in a bank. With the exception of households that receive remittances, few households have savings accounts.

Access to credit can also provide impetus for more productive systems. The amounts need not be large – to fund for example AI fees, veterinary products or a modest amount of supplementary feed. Larger loans are required to enter into cattle feeding (to buy the cattle and feed), but this can be turned over in short periods (of 3-4 months). Loans over longer periods are required in the breeding sector if cattle 'keepers' are to become the owners of cows. Market rates for loans in the formal bank sector can be competitive with loan terms in the informal sector.

There are examples of households that had accessed credit through:

- Access to credit schemes for cattle if attached to 'nucleus' organisations that could support the loans – e.g. households contracted to Wahyu Utama accessed KKPE loans for fattening; households in the home village of the inter-regional trader H Saad accessed KUPS loans for breeding.

- Some groups had used group structures for credit purposes. Groups in Central Lombok had used breeding bulls as a source of savings and credit, and members of the Gejati co-operative can access loans.

However, groups outside these particular structures have little access to credit at market rates. Households rarely have collateral, business plans or a technical base from which to apply. One of the constraints that banks face especially in NTB and NTT is that they are crowded out by cattle distribution programs. Households are unlikely to take out commercial loans if they can get cattle for free (but with calf repayment obligations). When/if these programs wind down, banks may have more scope to lend in open markets. Banks interviewed in EJ and NTB are willing to lend to cattle producers if they can meet normal bank lending criteria, especially productive and profitable systems, and co-investment and collateral.

That is, credit would be more accessible if group and households can establish and document sound technical practices, farm and financial management plans, marketing channels, access to assistance in writing applications and support from technical and research agencies and agribusiness companies. Loans would need to be given for a cluster of households to reduce bank transaction costs (that are effectively transferred to groups and households). That is, the type of systems envisioned in Section 4.2 of this report.

Other innovative measures that can increase access to finance that should be explored include:

- In the mungbeans sector, NTT bank invests a proportion of interest on loans in technical development of groups (delivered through BPTP) to reduce the risk of non-performing loans. BPTP NTT are interested talking with NTT Bank about similar options with cattle;

- This model of re-investing capital back into technical development could be used instead of schemes where government subsidises loans to reduce interest payments for households under cattle finance schemes (see 2.10.5);

- Groups of larger households can act as guarantors for each other to increase peer pressure to pay back loans; and

- As outlined above, there is scope for field staff or business agents embedded within groups to act as brokers of finance, to receive a commission and to provide technical and management support to producers.

Increasing access of cattle producers and groups to formal as well informal finance should be investigated. Banks should be invited to participate in project and PPP activities. Specialist rural credit and micro-credit advisors should be contracted to facilitate the process and identify innovative solutions in this area.

4.10.2 Feed value chains

Cattle feed supply and utilisation is the major input and constraint to more productive cattle production systems. There are large volumes of forages and crop residues that are not fully or efficiently utilised throughout EI. The feed market in EJ is growing and commercialising rapidly. And there is very large potential for the expansion and utilisation of tree forages especially in NTB and NTT.

Indonesian and Australian research organisations have invested heavily in improving feeding systems in EI that demonstrate substantial productivity effects. However, there is a lack of data about the structures and incentives of actors in the dynamic and complex cattle feed sector. A dedicated study on feed value chains in EI would provide valuable knowledge for the identification and design of initiatives and business models. Section 4.4 above outlines some of the gaps in the EJ feed chain. Other questions that could be explored are:

- The business potential for the development of nurseries and trading operations to increase the propagation of forages (cuttings for grasses and seeds for tree forages). There are leucaena seed growers and traders in West Timor, but the availability of seeds is not a major constraint to propagation for farmers. SMAR/2006/096 recommended that producers develop nurseries as a group activity. Pathways for commercialisation may be possible or able to be piloted.

- The potential for feed supply to become a significant activity and source of income for farmers is also worthy of further research. The increased demand for feed may provide opportunities for farmers or indeed groups/hamlets to specialise in forage production. This is unlikely to be viable over extensive systems and distances, but may be in more intensive systems (e.g. EJ and Lombok).

4.10.3 Indonesian cattle distribution programs and groups

Cattle programs have been run in Indonesia for many years but under the latest Beef Self-sufficiency Program have been scaled up to form very large programs. There may be more than 500 cattle production groups in EI (mainly NTB and NTT) that participated in cattle distribution programs between 2010 and 2012 with more to come on line in 2013-14.[30] The programs are run by a range of government agencies, NGOs, and are incorporated into corporate responsibility programs (see Section 2.10.3).

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[30] *For example, one program conducted by Dinas Livestock in NTB between 2010 and 2012 distributed cattle to 221 groups, with funding of Rp160 billion, which may amount to 20,000 head. There are at least 10 other central government agencies that run cattle distribution programs, many local government and NGO programs, and many national and provincial level corporations that use cattle in corporate responsibility programs.*

Most programs purchase and then distribute cows or heifers to farmers who are necessarily organised in groups, with obligations to return a specified number of offspring before they can take over ownership of the cow (e.g. two calves in 5 years). Some programs offer increasingly favourable terms for farmers. Economic analysis shows that participating producers have low returns until obligations are met, after which cattle production becomes an attractive opportunity.

There is some healthy scepticism about the programs on the basis that 'handout' and incomplete ownership rights provide no incentive or disempower producers to sustainably increase productivity, and the systems certainly distort cattle (and finance) markets. Nevertheless, cattle distribution programs should be factored into any cattle program in EI, especially NTB and NTT for several reasons:

- Any project of significant scale in NTB and NTT will inevitably encounter these groups.

- Assessments that the programs are dysfunctional or counter-productive over-generalise. More progressive programs and agencies have designed programs not just to distribute cattle, but also to address problems in the broader production system (pens, feed, water, AI and health services, compost/biogas etc.). They also offer services through linkages with the extension system and some ('Graduates Building the Village') have on the ground staff (e.g. 'graduates').

- Households in many of the programs are nearing the end of their cattle return obligations so have full ownership over their cattle.

- Because of their prevalence in NTB and NTT, agribusiness companies and project groups and will almost certainly have contact with these distribution programs.

- If results and systems from project groups can be extended to groups formed under the Indonesian program, there will be very large outreach effects.

It is recommended that:

- That a study is done to establish the features and determinants of successful cattle distribution programs;

- Scoping is done on the groups that have been formed under Indonesian cattle distribution programs, that are close to or that have common interests with AIPD-Rural, and that could potentially participate in AIPD-Rural interventions; and

- That is, selective integration with groups that participate in various Indonesian cattle distribution programs should be investigated, along with measures to strengthen the groups.

4.10.4 'Modern / mechanized' abattoirs – e.g. MBC

Local governments and companies in EI (EJ, Lombok, Sumbawa) also have ambitious plans to refurbish and/or build 'modern' mechanised abattoirs (see Section 3.5.1). These projects are a potential investment target for development projects as they aim to target higher value (e.g. supermarket) or niche markets (e.g. mines and hotels), buy cattle and sell their own beef and therefore have incentives to establish direct linkages with farmer groups. The Meat Business Centre in Mataram has commenced establishment and plans to expand contracts with fatten households, as well as feed suppliers (see Section 3.5.1).

Feasibility studies of these plants are beyond the scope of this study and were not provided by interviewees. However, viability appears limited by undeveloped high-value beef markets that require supply from 'modern' abattoirs and, in generic markets, the uncompetitiveness of mechanised abattoirs compared with low cost individual butcher operations. Unviable abattoirs will be under pressure to reduce costs, especially through reduced input prices, downgrading or reneging on contracts. Under these conditions, formal links with producers can have adverse livelihood impacts.

Investments or partnership with modern abattoirs is therefore not recommended as an AIPD-Rural intervention. However, measures to increase the viability of abattoirs may be of interest to other programs (e.g. the Red Meat Forum) through measures in which Australia has a wealth of expertise. This includes cold chain management, cattle and carcass handling, increased operational efficiency and efficient cattle procurement, and measures to develop higher value or niche markets (see Sections 2.8.2 'Quality premiums' and Section 3.6).

4.10.5 The slaughter cattle trade in Sumbawa, West Timor and Sumbawa

Large numbers of 'beef cattle' (slaughter cattle that may also be fattened before slaughter but are not classed as breeders) are 'exported' from provinces in EI - 147,000 from EJ, 13,476 from NTB (including Lombok and Sumbawa) and 66,000 from NTT (West Timor and Sumba). Numbers for NTB and NTT are constrained by quota allocation from exporting areas. The majority of cattle turned off in NTB and NTT are 'exported' by traders, feedlots and slaughterhouses in West and Central Java and Kalimantan. Trade numbers have not fluctuated significantly over the last 10 years, which suggests that the trade will not be reduced significantly when/if trade restrictions on the import of Australian cattle are relaxed.

As a major trade flow that impacts on perhaps 100,000 cattle producers and that can contribute importantly to local economies especially in NTT, the prospect of closer chain integration between buyers in end markets, traders in exporting islands and households was considered. If households could produce cattle with physical and physiological attributes that favour buyers (high dressing percentages for slaughter or growth potential in feedlots), then premiums and services could conceivably be passed back down the chain to producers.

However:

- Intermediate traders (in 'exporting areas') buy from large numbers of highly dispersed households in large numbers. They buy slaughter cattle on the basis of liveweight and basic animal health.[31] As far as could be ascertained, traders are paid on the liveweight of the animal at export area, not on the performance of the animal at destination feedlot or abattoir[32] and few other attributes are demanded or priced. That is, it is generic market.

- Changing this requires that buyers at destination have reliable means of assessing performance of the cattle (growth potential, dressing percentage or other quality

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[31] Breed and colour can be a factored in for EJ, but not in NTB and West Timor where there are only Bali cattle, and Sumba where there are Ongoles and Brahman crosses.

[32] This also means that the importing trader bears the costs of liveweight gain in quarantine and shipping, but there can be compensatory weight gain at destination.

characteristics). In the absence of objective measurement or, crucially, local and direct knowledge of the production areas, they would have to rely on traders to provide this assurance and information.[33]

- As far as can be ascertained, exporters have little capacity or incentive to do this, especially in the absence of standards or corporatised supply chains. While some traders provide some veterinary products to more progressive producers (vitamin supplements) they are unlikely to provide other services or enter into supply agreements with farmers.

As a result, this trade is not listed as an intervention area above. There may however be particular niche markets, where highly pro-active importers, exporters and groups could coordinate to establish a value chain. Particular organisations like Gejati in Kupang and industry associations could be approached[34] and progressive traders especially in NTB and NTT could be invited to participate in training activities. However, pro-smallholder development of this trade would require long-term development of standards and partnerships across multiple geographical areas and stakeholders, so would require institutional development (e.g. as Lombok has done for breeders) and a pilot project.

4.10.6 Cattle owners in West Timor and Sumba

Large cattle owners that own cattle which are raised by keepers in 'profit-sharing' relationships play a major role in the cattle industry throughout EI, but account for a large proportion of cattle in West Timor, Sumbawa and Sumba. As described in Section 2.11.1 owners can have thousands of cattle and dozens of intermediate buyers and managers to link with the keepers in grazing systems. Households are often poor, indebted and raise the cattle in very low productivity systems.

This model was considered because pro-active owners notionally have incentives and potential to increase productivity through provision of basic support and services to the producers. Under 'fair' terms, this would increase incomes of marginalised producers in the most underdeveloped parts of EI.

This model was discounted as an AIPD-Rural intervention because of the exploitative nature of the relationships and the system, which some owners may not have willingness or incentive to change. Rather than change these systems, industry development in these areas is focused on developing ranches.

A far-sighted and high-risk project activity might be to partner with one of the cattle owners to increase the capacity of their intermediaries to assist keepers to increase productivity. There may also be scope to improve the marketing systems of the owners in inter-regional

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[33] *This is different to the Bali breeder cattle trade (where there are objective standards at local levels and assurance that the cattle will perform because they are highly fertile). It is also different to other trades in recommended interventions (for feeder cattle for feedlots in EJ, slaughter for butchers, slaughter cattle for butchers and feeder and slaughter cattle for marketing organisations in West Timor) where buyers have localized and direct contact with production areas, and can attribute (feeding and slaughter) results back to that area.*

[34] *There is for example an Indonesia Animal Traders Association (Persatuan Pedgre Hewan Indonesia, Pepehani), and local associations (e.g. Bima). Because of the importance and power of cattle traders in local economies in NTB and NTT, there is large representation of cattle traders in local business associations (district chamber of commerce), and APINDO Associasi Pengusaha Indonesia, Indonesian Businessmen Association).*

slaughter cattle markets. The viability and due diligence on such a model could be investigated further.

4.10.7 Ranches

Ranches in Sumbawa and Sumba have been widely discussed amongst Indonesian, Australian and local governments and has generated interest from domestic and overseas investors. Sites have been identified and plans developed. It is not recommended that AIPD-Rural consider this intervention because they appear to involve little participation from small-holders. Indeed, ranches would displace some small-holders and compensation programs would need to be carefully designed and negotiated (see Section 2.11.4 and SWOT analysis in Section 3.9.2). However, sites visited appear to have potential for the development of larger-scale grazing systems and may help to bring about broader corporatisation and industry development goals, so could be investigated for other initiatives such as the Red Meat Forum.

5 Cross-Cutting Issues: Poverty, Gender and the Environment

This section draws on issues raised in section 2.12 and other sections to present conclusions about the likely impacts of any beef development project might have on poverty, gender and the environment. It is not likely that the proposed interventions will have any significant negative net impacts on poverty, gender or the environment. There are significant positive impacts that can be capitalised on in any project interventions. These offset negative impacts, which can also be mitigated.

5.1 Poverty

Cattle production is accessible to households that are poor in land (cattle can be tethered around house) and capital (in owner-keeper relationships). Cattle can be raised in low input – low output systems with rudimentary husbandry skills. Cattle are commonly kept as a form of savings (sold for immediate cash outlays) in the absence of other forms of social security.

While cattle play an important role in social systems and in alleviating poverty, they also perpetuate low income / semi-subsistent livelihoods. Cattle production systems must be more productive and commercial to bring about income gains. The oft-used adage is that cattle farmers must make the transition from 'keepers' to 'producers'.

The suite of production, market and institutional changes proposed in the study are not high cost or necessarily demanding of technical and management skills for farmers or groups. However, not all farmers or groups will have the incentives or capacity to make the transition. Rather the project provides opportunities for those households that do, through integrated structures and regular, direct support.

Cattle marketing does not appear to be a pro-poor sector. Traders have an established capital base often within exclusive and concentrated structures especially for inter-island/region trade. However:

- Cattle trading provides an entrepreneurial activity for a few locals per village, with mobility paths if they can accumulate capital, assets and trading skills. Transport operators (trucks) can also be a localised activity;

- Cattle trading in Indonesia is labour-intensive, involving a large number of labourers to load/unload and transport cattle and to feed and tend to cattle in holding yards; and

- There are a large number of small brokers that search for cattle, broker sales and that hold cattle and negotiate sales at markets.

It is unlikely that recommended project interventions will impact significantly on employment structures in the trading sector or the labour intensive cattle transport systems. The study recommends that more direct linkages are made between groups and buyers (inter-regional/island buyers and butchers and feedlots). This would seem to reduce demand for the services of local brokers. However, brokers can also be incorporated into the local group structures (or even recruited as business OTGS).

Indeed, the local connections and expertise of local brokers is seen as a resource that should be capitalised on rather than displaced.

The slaughter and retail sectors are highly labour intensive, and comprised mainly of women. These would be impacted by any measures to replace hand slaughtering with mechanised slaughter, or wet markets with modern retailing (e.g. supermarkets). These transitions may occur incrementally, but will take many years (decades) and the recommendations of the project do not extend to restructuring of these sectors.

5.2 Gender

As established in Section 2.12, women play major roles at the beginning of the value chain (cattle production) and at the end (final slaughter stages and retailing). The recommendations of the study do not have any major implications for gender equality.

Measures to increase cattle productivity will necessarily involve women. Some activities may reduce demands on female labour. For example, if tree forages are planted or more feed is stored, then women will spend less time collecting feed, freeing them up to do other activities on and off-farm. However, the improved practices do require more intensive cattle 'husbandry', which would largely be done by women (mixing and feeding rations, animal health, oestrus detection, calf management). Thus women would seem to be an important target in any production related training and extension activities.

Issues raised above about mechanisation of slaughter and the introduction of modern retailing would have large negative effects on labour demand for women.

5.3 Environment

Section 2.12 argues that there are negative environmental effects from the intensification of cattle production (resource depletion, grassland degradation, weed invasion, effluent runoff, possibly methane emissions). These have to be balanced against positive effects (utilisation of straw otherwise burnt, manure for soil improvement and to reduce the use of chemical fertilisers, forages for soil nitrogen (N) improvement and opportunities to incorporate biogas converters).

Projects can accentuate positive environmental effects and mitigate negative effects by:

- Locating kandangs away from water courses or slopes that lead to them;

- Incorporating compost facilities and/or biogas converters into kandangs; and

- Introducing forages around fields for nitrogen build-up.

It should also be stressed that the project does not propose to increase cattle numbers per se. Cattle numbers may increase due to increased productivity (i.e. calving rates), but there is also an emphasis on increased turnoff of animals at a younger age. That is, more cattle will be raised efficiently but sold out of the farming system, which may actually reduce input demands (feed and water) consumed per kilogram of output.

Environmental concerns regarding effluent runoff and management acts as an argument for centralisation of the slaughter sector.

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7 Annexes

Annex 1: Field work schedule

Surabaya Oct 2 to 3, 2012

- Team workshop and fieldwork preparation

Surabaya, Oct 4 to 6, 2012

- Surabaya abattoir
- Surabaya animal quarantine
- Inter-regional cattle traders
- Dinas Livestock – Planning and Program Division
- Giant hypermarket - Maspion Center
- Pupuk (NGO)
- Surabaya slaughterhouse
- Wet Market

Tuban, Oct 7, 2012

- Tuban livestock market
- Wahyu Utama

Malang, October 8-10, 2012

- Singosari cattle market
- Malang slaughter house
- Dinas Livestock, Malang
- Feed trader
- Sapindo
- Srigonco Village

Propolingo, October 11, 2012

- Santori feedlot
- PUSKUD feed company

Suryaba, October 12-14, 2012

- Bank Rakyat Indonesia, EJ
- Association of cattle and beef traders, East Java
- RPH Surya Jaya

Mataram Oct 15-16, October 8, 2012

- Dinas Livestock NTB

- PT Gerbang NTB Emas

- Meat Business Centre

- BAPPENDA, NTB

- Supermarket and wet market

Central Lombok, October 17, 2012

- Inter-regional trader and KT2M kelompok

- Pade Girang group

- Kelompok and farmer focus group discussion

Mataram, October 18-19, 2012

- NTB port, holding yards and quarantine

- Mataram beef trader

- Mataram cattle market

- Mataram RPH

- Bank NTB

- Dinas Livestock

Bima, October 20-23, 2012

- Livestock traders association

- Bima farms

- Bima Dinas Livestock

Kupang, October 25-27, 2012

- Dinas Livestock NTT

- Dinas Livestock Kupang District

- PUSKUD NTT

- Apindo NTT

- Gejati cattle co-op

- RPH, wet market, butcher shop

- Ag college conference

Sumba Timur, October 28-30, 2012

- Sumba Timur semi-intensive household

- Cattle keeper on grazing area

- Big cattle owner – and proposed ranch

- Dinas Livestock, Sumba Timur

- Big trader

- Waingapu RPH

- ACCESS
- Quarantine Sumba Timur

Kupang, October 31, 2012

- TLM
- Quarantine NTT
- Kupang cattle market

TTU, November 1-2, 2012

- Dinas Livestock TTU
- Grazing household and group

Annex 2: Checklists

Cattle producer questionnaire (for household, but with knowledgeable village leaders, group leaders or extension staff)

Purpose / background	- Explain that we have sought to understand the village system, the household has been chosen as "typical" or "progressive" - Would therefore like to conduct an in-depth interview to fill out a data sheet (hours)
Background	- Household demography - History in cattle production - Land - What activities do men vs women do?

Inputs, outputs, operations	Go through budget and production regime sheets below (note that many values will already be derived from other sources, so only need to fill in some cells)

Crop/forage type	Area	multiple crop?	Produce yield/price						
			Main product (e.g. grain, tubers)	Price main product	Husk	Straw	Green tops	Oilseed	Forage
Unit	ha	1=1st, 2=2nd	tonne/ha	IDR/tonne	tonne/ha	tonne/ha	tonne/ha	tonne/ha	tonne/TDM/ha
rice 1st crop	3.8	1	3.2	1,400,000	1	3.2	0	0	0
rice 2nd crop	3.8	2	3.8	1,400,000	1.3	3.8	0	0	0
corn	2	1	1.5	3,600,000	0	0	1.0	0	0
peanut	0	1	0	7,000,000	0	0	0	0	0
etc.	0	1	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0
	0	1	0	0	0	0	0	0	0
Leucaena	1	1							5
Other forage	2	2							5
native grasses	10	1							5
	0	0							0
Waste/other	-15.8								
Total	1		Secondary product price		440,000	120,000	200,000	-	500,000
			Transport cost inputs		10,000	20,000	10,000	10,000	20,000

Crop/forage type	Area	multiple crop?	Input demand			Other input rates/costs					
			Manure	Labour	Draught	Non-feed, fertiliser, labour costs	Non-organic fertiliser applic. rate	Non-organic fertiliser cost	seeding rate	seed costs	transport costs
Unit	ha	1=1st, 2=2nd	tonne/ha	labour units/ha	animal units/ha	IDR/ha	kg/ha	IDR/kg	kg/ha	IDR/kg	IDR/tonne
rice 1st crop	3.8	1	0.70	1.00	1.0	20,000	10	34,800	10	12,000	10,000
rice 2nd crop	3.8	2	0.70	1.00	1.0	20,000	10	4,100	10	12,000	10,000
corn	2	1	0.0	0.40	0.0	0	10	2,800	50	4,000	10,000
peanut	0	1	0.0	0.00	0.0	0	0	0	0	0	0
etc.	0	1	0.0	0.00	0.0	0	0	0	0	0	0
	0	1	0.0	0.00	0.0	0	0	0	0	0	0
	0	1	0.0	0.00	0.0	0	0	0	0	0	0
Leucaena	1	1	0.0	0.80	0.0	0	10	103,200	150	1,000	
Other forage	2	2	0.0	0.10	0.0	0	0	-	10	12,000	
native grasses	10	1	0.0	0.00	0.0	0	0	0	0	0	
	0	0	0.0	0.00	0.0	0	0	0	0	0	
Waste/other	#VALUE!										
Total	11		60,000	3,900	#DIV/0!						
			20,000	Hire draught	-						

B. Livestock Activities															

Type of livestock	Head	Mortality	Av. Weight	Calving	Weaning age	Weaning weight	Selling age	Selling price	Purchase price	Av. purchase weight	Av. duration of feeding	Liveweight gain	Breeding Xs, AI etc	Non-feed, labour costs	Transport costs
	no.	%	kgs	%	months	kgs	months	Rp/kg	Rp	kgs	days	kg/hd/day	Rp	Rp	Rp
A. Cattle															
Breeding cows	1	5	300	50									50,000	10,000	0
Calves - male	0.2				12	150	24	20,000				0		same	0
Calves - female	0.2				same	0	0	0				0		same	0
Feeder cattle	3	same						20,000	15,000	100	250	0.3		same	0
B. Other livestock	no.							Rp/head						Rp	Rp
Pigs	3							61,000						2,000	0
Poultry	10							12,000						0	0
	0							0						0	0

C.Livestock resource demands/supply

Type of livestock	Crop produce (grain/tubers) demand							Crop produce (by-products)/forage demand					Other demands/supplies				
	Produce/ crop 1	Produce/ crop 2	Produce/ crop 3	Produce/ crop 4	Produce/ crop 5	Produce/ crop 6	Produce/ crop 7	Husk	Straw	Green tops	Oilseed	Forage	Concentrate		Manure	Labour	Draught
	hd/tonnes/yr	hd/tonnes/yr	hd/tonnes/yr	hd/tonnes/yr	hd/tonnes/yr	hd/tonnes/yr	hd/tonnes/yr	hd/tonnes/yr	hd/tonnes/yr	hd/tonnes/yr	hd/tonnes/yr	hd/tonnes/yr	type	hd/tonnes/yr	hd/tonnes/yr	labour units/yr	animal units/yr
A. Cattle																	
Breeding cows	0	0	0	0	0	0	0	0.14	0.88	0.07	0	0.3	1	0.2	3	0.08	3.7
Calves - male	0	0	0	0	0	0	0	0.07	0.44	0.035	0	0.15	1	0.1	1.5	0.04	
Calves - female	0	0	0	0	0	0	0	0.07	0.44	0.035	0	0.15	1	0.1	1.5	0.04	
Feeder cattle	0	0	0	0	0	0	0	0.14	0.88	0.07	0	0.3	1	0.2	3	0.08	3.7
B. Other livestock																	
Pigs	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0	0.0	0.04	0.02	
Poultry	0.001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3	0.0	0.0	0.002	
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0.0	0.0	0.0	

D. Labour Availability

Family Status	Adult no.	Teenager no.	Child no.	Aged adult no.	Adult labour equivalent	Maxiham Off-farm labour	Off-farm equivalent
Male	1		1				
Female	1			1			
Labour unit equivalent	1.00	0.50	0.25	0.50	3.00	0.80	1.00

E. Capital

Category	Av. value Rp
Cattle inventory	8,962,500
Other livestock inventory	303,000
Non-livestock assets	20,000,000
Allocation of non-livestock assets	
Cattle %	25%
Other livestock %	25%
Crops/fodder %	50%
Depreciation rate (%)	5%
Interest rate (%)	5%

Constraints and opportunities	- Key production problems and constraints; ranking of problems and constraints (e.g. access to inputs, cost of inputs, access to credit, lack of irrigation infrastructure, poor technical know-how, unreliable weather, shortage of labour, shortage of land, government regulations, etc) - Key marketing problems and constraints; ranking of problems and constraints (e.g. poor roads, limited number of buyers, declining prices, poor know-how etc) - Strategies to overcome problems and constraints in the production and marketing spheres - Key opportunities in the production and marketing spheres - Barriers to access these opportunities - Strategies to take advantage of these opportunities - Recommendations for intervention: what type of interventions would enable farmers to improve cattle production and marketing? Please prioritise…

Feedlot questionnaire

1. Background information	▪ Feedlot name ▪ Contact details ▪ Town, Sub-district, district, province ▪ Year established, other history details ▪ Background of manager / interviewee ▪ Ownership / investors / structure of feedlot ▪ Integration up/downstream, especially trading or slaughter ▪ Participation in schemes (credit, government, NGO etc.) ▪ Investment, registered capital ▪ Turnover 2011 ▪ Land area ▪ Other companies and actors in the feedlot sector / region ▪ What activities do men vs women do? ▪ Other background information
2. Inputs, outputs, operations	• Go through budget and feed regime sheets below

Item	Value 2011	Comments & change in recent years
Feedlot capacity (head)		Land area
- in store		
- turnoff per year		
Actual number (head)		
- in store		
- turnoff/year		
Cattle purchase and source (inputs)		**For all below** ▪ What are the purchase channels (skip to section) ▪ Breed, weight range, age, other specs ▪ Specify areas cattle are sourced from ▪ Availability, seasonality ▪ Information sources on cattle and price ▪ Prices over recent years ▪ Change over time and region

		▪ Constraints (quantity and continuity of supply, quota, disease) ▪ Regulations
Direct from market		Does the feedlot have its own purchasers?
- number		
- price (per kg liveweight)		
- average weight (kg)		
- transport costs (per head)		
Traders/agents		▪ Linkages with these, number, basis of payment to trader (percent, fixed) ▪ Do the traders have ownership of the cattle or buying on commission for feedlot (brokers)
- number		
- price (per kg liveweight)		
- average weight		
- transport costs (per head)		
Imported from other Ind regions		
- number		
- price (per kg liveweight)		
- average weight		
- transport costs (per head)		Time delays, quarantine
Imported from o/s		
- number		
- price (per kg liveweight)		
- average weight		
- transport costs (per head)		Time delays, quarantine
Mortalities		
- average deaths/year in lot		
- average deaths/year in transport		
Cost of construction (IDR)		
- total		

- housing/stalls		
- feed mill / storage		
- machinery		
- transport		
- waste treatment		
- Straw/crop residue treatment		
- other		
- depreciation		Calculated in model
Capital		
- total amount borrowed (IDR / over year)		Might need to break down source and terms
- interest rate (month or year?)		Any subsidies (e.g. KUPS)
- interest payments (IDR / head)		Calculated in model
Taxes and fees (specify type)		Need to specify type, are these major costs, change over time, area?
- rate on profit / turnover		
- per year		
- per head		
Feed		Covered in feed regime table
- average cost (head/day)		
- total price feed purchased in (head/day)		
- feed processing & treatment costs (head/day)		
- minerals & supplements costs (head/day)		
Health (per head)		Details on disease, health services form within or outside company
- cost of medicinal products		
- disease prevention costs		
- inspection fees (head)		
Labour		
- number of employees		

- labour expenses (IDR/head/day)		Calculated in model
Managerial/technical		
- number of employees		
- average wages/month		
- housing & welfare		
Manual labour		
- number of employees		
- average wages/month		
- housing & welfare		
Cattle sales (outputs)		▪ Supply agreements or contracts ▪ Specs (weight, age, fat, condition), grades or grids used, premiums and discounts ▪ Copy of any documents ▪ Relationships, information, linkages ▪ What (final) market do you service (premium, generic, processing)
- average weight turned off (kg)		
- liveweight price (IDR)		Liveweight or over the hooks?
Transport (for sales)		
- cost (IDR/head)		
- transport distance (km)		
- Total Costs (IDR/head)		Calculated in model
Manure		
- amount sold per year (cubic metres)		
- price (IDR/cubic metre)		
Gross profit (yuan/head)		Calculated in model
Net profit (yuan/head)		Calculated in model

Feed regimes (unit: kg/head/day)														
	No. of days	feed 1	feed 2	feed 3	feed 4	waste	Straw & grass	treated straw	Minerals (percent)	Antibiotics (g)	growth promotants (mg)	Salt (percent)	Bone (percent)	average daily weight gain (kg)
Starting period (specify days)														
Middle (specify days)														
Finishing (specify days)														
Prices/kg														
Derived data (calculated in model)														
Total days on feed														
Total feed consumption														
Total feed cost														
Weight gain over total feeding period														
ADWG total feeding over period														

3. Constraints, opportunities and interventions (wrap-up)	▪ Strategic direction and objectives of company ▪ Opportunities for development of the feedlot and the sector, to increase competitiveness ▪ Major drivers ▪ Major constraints (inputs, outputs, operations, regulatory, policy, services) ▪ Market-led interventions that may assist ▪ Partnerships that you would like to explore / form ▪ Does the company see any opportunities for collaboration with the project?

Cattle traders

Background information	- Location/address/contact (last) - Main business - Number of employees (by activity) - Number of cattle traded, 2011, previous years - Area of operation (i.e. establish level of trader – village, sub-district, district, inter-regional) - How many other traders in the region - What activities do men vs women do?
Related activities	- Integration up or downstream (if in slaughter sector, can use the slaughter questionnaire, if in cattle production, can use household or feedlot questionnaire) - Any holding yards / feeding facilities? Where? Source of feed - Transport facilities? How many trucks? From where to where? - Do you trade in any other commodities?
Cattle trading operations	- Number of years trading cattle, history - Number of cattle traded by the company in the past three years (2009, 2010, 2011). Number of cattle expected to be traded in 2012. Reasons behind annual variations - Trends in cattle trading: volumes, quality; reasons - Timing of cattle trading by the company (months); reasons (domestic supply conditions versus market gaps in importing provinces/districts) - Do you take ownership of cattle, or buy on commission for others? Do you commission other traders to buy for you? - What size lots do you usually aggregate? How even / variable? How long to aggregate lot (diffrent. by season?) - Source of credit for your own trading operations - Can you enter into legally binding contracts? - Potential for development (technical and business training, legal, credit, formation of business groups (trader and trader-farmer and trader-slaughter etc.).
Supply / inputs	- Where do you buy from ?(farmers, markets, other traders, brokers) - How do you know where cattle are available? - What information flows from suppliers to you? - How to do suppliers transmit interest / demand to potential suppliers? - What information flows from you to the suppliers? (e.g. cattle specifications, price etc.) - What services do you provide to your suppliers? (e.g. credit, technical, information). - Do you provide loans? What type, to who etc. - What are the conditions set by you? (specifications, volumes, delivery times, pricing, payment procedures, other) - How do you link with suppliers? Informal, formal, contract …

	▪ Do you buy through brokers (of sellers?) – pros and cons of this ▪ Degree of cooperation with other traders (information, aggregation, shared facilities etc.). ▪ Strengths and weaknesses in the relationship with suppliers.
Buyers / outputs	▪ Who buys from you? What is their business (trading, slaughter)? ▪ What services do they provide to you? (e.g. advisory, market information) ▪ What information flows from you to buyers? ▪ How do buyers inform you of demand and preferences? What information flows from buyers to you (slaughter results, feedback from beef sales, downstream clients etc.)? ▪ What conditions are set by buyers (specifications, volumes, delivery times, pricing, payment procedures, other)? ▪ How do you link with buyers? Formal, informal mechanisms. Agreements, contracts. If contract, what are the terms of the contract? How are transactions negotiated? (Trust, guarantees, deterrents, rewards/sanctions for compliance/non-compliance) ▪ Strengths and weaknesses in the relationship with buyers
Prices	▪ Current prices in your location? ▪ Price trends (over the past three or five years) ▪ Expectations about future price trends in location and In Indonesia in general ▪ Price seasonality ▪ Spatial aspects of pricing ▪ How do you know what prevailing cattle prices are (markets, other traders, any formal reporting, conversion from beef prices?) ▪ What are the measurements (per head, per kg liveweight, estimated carcass weight, dressing percent, over-the-hooks). Are scales used? ▪ What are the determinants? (age, weight, sex, breed, hide etc.) ▪ If buying on commission for other traders, or engage other traders to buy for you, how are prices set? [Other info on advances of cash, commission rate etc.]
Costs	▪ Main costs (variable and fixed) – infrastructure, working capital, labour, feed etc. (to be expanded in budget). ▪ Costs per herd or lot traded.
Business environment	▪ Company's assessment of the policy and regulatory environment in the region (e.g. road fees, market fees, policy, disease regs, quarantine,). ▪ Company's assessment of support infrastructure. ▪ Company's assessment of cattle production system in the region. ▪ What services could be improved? (credit, infrastructure, information, training, legal/contractual etc.)
Constraints, opportunities and interventions (wrap-up)	▪ Key opportunities for the development of cattle business in the province. ▪ Key challenges and constraints to business development and

	competitiveness.
	▪ What are the key changes or developments that can enable your region to develop the cattle industry? What needs to change? What are the key innovations required?
	▪ Recommendations for public and project interventions aimed at enabling these developments.
	▪ Does the company see any opportunities for collaboration with a development project intervening in the cattle sub-sector?
	▪ Information, training, business planning, credit, linkages with producers etc.

Abattoirs

Background information	- Abattoir name - Contact details - Town, Sub-district, district, province - Year established, other history details - Background of manager / interviewee - Ownership / investors / structure of feedlot - How many other slaughter facilities in Indonesia /region? - Ownership of cattle or service slaughter? - Integrated up or downstream (feedlots, processing)? - Other background information - What activities do men vs women do?
Cattle inputs (if the abattoir buys cattle)	**Supply** - Requirements (specifications, volumes / size of lots, delivery times, pricing, payment procedures, other)? - Measurement. - Advantages and disadvantages of different types of cattle. - Share of locally procured vs imported cattle, and key changes (last 3 years). - Origin of local, inter-regional, imported cattle. - Recent trends in cattle procurement (over the past three years) and drivers. - Expectations about future cattle supply and prices **Transactions** - Where do you buy from (farmers, markets, other traders, brokers) - Do you have company purchasers / dpt or buy through independent agents? Any formal cattle grading system / standards? - Source and type of information on cattle availability and price. - Links with suppliers. Informal, formal, contract … (trust, guarantees, deterrents, rewards/sanctions for compliance/non-compliance. - Basis of payment (forward, spot, post-slaughter). - Do you provide any services to suppliers? (credit, technical, information). - Do you provide loans? What type, i.e. in kind or in cash? To whom? Explain the system. - Strengths and weaknesses in the relationship with suppliers. **Price** - Any cattle grading system used? How are price-grade differentials formed? - Current cattle purchase prices? - Price trends (say, over the past three or five years). - Expectations about future maize price trends .

	▪ Seasonality.
Operations (for abattoir and service facility)	**Facilities** ▪ Overview of facilities (transport, holding facilities, slaughter line, boning room, packing, cold storage, effluent management). ▪ Time and amount of investment in each, estimate depreciation. ▪ What are bottlenecks? – logistics or to increase returns **Labour** ▪ Number of staff in each activity. ▪ Wages by activity. ▪ Training (e.g. butchers for target product). **Capital** ▪ Loans for working capital (cattle purchase etc.). ▪ Plant – what are the main investments. ▪ Main overheads. ▪ Etc – see budget sheet.
Outputs (if the abattoir sells its own beef/products)	**Beef** ▪ What products do you produce? (carcass to cuts) ▪ What are the target markets? ▪ What cattle and products for what markets? ▪ Do you have a product schedule ?(products and price) ▪ Are the names of the products widely understood by clients and customers? **Offal** ▪ In product list? ▪ Quantities, percentages of liveweight. ▪ Prices. ▪ In lots or separated? **Hides** ▪ How sold? – wet, blue, salted ▪ On what basis? – per piece, size ▪ Types and prices? – customer preferences **Sales** ▪ Wholesalers, direct to retailers etc.. ▪ Payment terms. ▪ Incidence of default and measures to manage.
Regulatory	**Regulatory** ▪ Registration requirements (registered capital, cold storage facilities / infrastructure, inspection, effluent management, distribution). What is likely in the future? ▪ Inspection systems – internal and external – for hygiene, food safety, disease.

	▪ Main taxes and fees (slaughter, profit, VAT, transport, health, water, environmental) . **Broader industry** ▪ Please describe the slaughter sector in region/prov/country (service vs ownership, scale, certification/uncertified etc.). ▪ Likely changes into the future.
Opportunities and interventions (wrap-up)	▪ Key opportunities for the development of the abattoir and its suppliers ▪ What are the biggest constraints, what stops you making more profit or producing higher value beef? ▪ What are the key innovations, technologies, investments required for the development of high-quality abattoir sector? ▪ Recommendations for public and project interventions aimed at developing high-value beef chains. ▪ Does the abattoir see any opportunities for collaboration with a development project intervening in the cattle sub-sector? If yes, what should be the focus of the collaboration? If not, why not?

Supermarkets

Background information	- Location/address/contact (last) - Geographical presence in Indonesia - Number of supermarkets and geographical distribution - Offices responsible for procurement of meat - Other background information - How many other retailers in the region - What activities do men vs women do?
Fresh beef sales	- Annual beef sales - Monthly beef sales - Recent trends in beef sales (say over the past three years) and drivers - Type of beef sold and reasons behind change - Share of different types of beef in total sales, and key changes (last 3 years) - Beef procured locally vs imported beef - Share of locally procured beef and imported beef in total sales, and key changes (last 3 years) - Origin of local beef - Origin of imported beef - Advantages and disadvantages of locally procured beef versus imported beef
Quality management systems	- Beef quality standards / specs of the supermarket and how these have changed over the past 3 years - Quality management systems by the supermarket and upstream suppliers, and changes (last 3 years) - Rewards/sanctions for compliance/non-compliance with product standards - Strengths and weaknesses in quality management systems - Typical quantitative product losses at the supermarket retailing stage - Qualitative product losses at the supermarket
Linkages with suppliers	- Who supplies beef to the supermarket? Any changes over the past 3 years? - What is the profile of suppliers (location, business activities, scale, legal status, etc)? - For how long has the supermarket had a business relationship with different suppliers? - What are the functions performed by suppliers (e.g. cultivation, sorting, grading, treatments, packaging, other) - What are the information flows between the supermarket and suppliers? - What are the terms of the contract between the supermarket and

	suppliers? (e.g. quality, volumes, delivery times, pricing, payment procedures, other) ▪ Strengths and weaknesses in the relationship with beef suppliers
4. Product promotion	▪ Does the supermarket develop promotion campaigns for meat / beef? What type of campaigns? What has been the experience?
Prices	▪ Price differences across types and grades? ▪ Differences between local beef prices and imported beef prices? ▪ Seasonality of beef prices ▪ Beef price trends (say, over the past three or five years) ▪ Current beef purchasing prices? ▪ Expectations about future beef price trends
Opportunities and interventions (wrap-up)	▪ Key opportunities for the development of local beef supplies to the supermarket ▪ Key challenges and constraints: what is preventing local suppliers from selling to the supermarket? ▪ What are the key innovations required for the development of high-quality domestic supermarket chains for beef? ▪ Recommendations for public and project interventions aimed at developing high-value beef chains ▪ Does the supermarket see any opportunities for collaboration with a development project intervening in the beef sub-sector? If yes, what should be the focus of the collaboration? If not, why not?

Village questionnaire on cattle production (for village leaders, cattle group leaders or cattle extension staff)

Purpose / background	▪ Explain project ▪ The purpose of this interview is to: a) understand production and socio-economic systems in the village; b) establish a "typical" cattle production system, and a "progressive" farmer, for in-depth interviewing. ▪ Would also like a technic expert (village leader, extension official, group leader) to accompany us to do the household interview
Background information	▪ Village/district/province ▪ No. of households, village population ▪ Av rainfall, seasonality ▪ Land characteristics, (upland, lowland, grazing etc.) ▪ Av annual income, stratification (poorer, medium, wealthier) ▪ Ranking of main sources of household cash income (farm and non-farm) in the village ▪ Main crops ▪ Main livestock ▪ Other sources of income ▪ Access to off-farm labour / employment, seasonality ▪ Farmer groups, any cattle groups (if so, see cattle group questionnaire) ▪ Other villages etc. in the region
Socio-economic importance of cattle	▪ Activities where the women participate. How do they participate? Do they receive the money from their work? Do they get paid the same as men? ▪ How typical is the village compared nearby villages?
Typology of a cattle producer	▪ Timeline of cattle production and marketing development processes in the village. Comparison with other villages in the district ▪ Number of households that raise cattle ▪ Approximate contribution of cattle to household cash income (> 10 percent; >20 percent; >30 percent, …) ▪ Approximate distribution by size (small, medium, large) ▪ Approximate distribution by activity (cow-calf, fattening, mixed) ▪ Approximate distribution by owner-manager, owner and manager ▪ Key changes in scale of maize farmers (last five years) ▪ Any cattle groups? (if so, see cattle group questionnaire)
Inputs and services	For all below, identify key constraints and opportunities in service and technology adoption (delivery, knowledge, costs) **Breeding** ▪ Breed profile, reasons, change ▪ Breeding systems

	▪ Natural (household bulls, group/village bulls) – selection, ownership, maintenance, fees etc.
	▪ AI – describe system, choices for households, suitability, conception rates, average number of time for successful service, fees
	▪ Distribution of breeding or other cattle (describe scheme etc.)
	Veterinary
	▪ Major diseases , incidence,
	▪ Treatment
	▪ Provider(s)
	▪ Effects on productivity, purchases and sales
	Feeding
	▪ Describe major feed inputs
	▪ Use of crop residues, cut and carry, concentrates etc.
	▪ Any feed purchased in (seasonally?), from other households or feed traders, type of feed
	▪ Area for grazing. Rules on common grazing
	▪ Any forage planted in the village?
	Information
	▪ Farmers' assessment of their access to technical information
	▪ Assessment of different sources of technical information (regularity of interaction, type of information provided, and reliability of the information provided)
Credit	▪ Informal credit arrangements (money or live animals, other households or traders)
	▪ Is there access to formal credit (bank etc).
	▪ Any credit schemes (e.g. KUPS)
	▪ Constraints (collatoral etc.)
	▪ Opportunities (e.g. loans based on a business plan)
Gender	▪ Allocation of male and female labour throughout year for cattle
	▪ Production (feeding)
	▪ Sales
	▪ Decision making and management
	▪ Changes in gender roles over the past 5 years and reasons
Environment	▪ Key environmental impacts (both positive and negative) associated with cattle
	▪ Grazing
	▪ Use of manure
	▪ Effluent run-off / water tables and courses
Buyers and transactions	**Sales channels**
	▪ Do farmers have direct access to cattle markets?
	▪ Number of cattle collectors/buyers in the village

	- Do distant (e.g. sub-district) traders buy direct from households - Proportion breakdown of each **Transactions** - Measurement (per head, per kg lw, estimated dressing percent) - Preferences (premiums and discounts for age, weight, breed, sex, hide – against a "standard animal") - Farmer awareness of type of cattle they produce and demand - Forms of payment (advances payments, spot, delayed payments, tied credit) - Transport options - Cattle assembly and lots **Linkages** - Stability in farmer-collector/ buyer relations. (Trust, guarantees, deterrents, rewards/sanctions for compliance/non-compliance of formal and informal contracts, incidence of repeat transactions) - Services provided by collectors and other buyers (input provision, credit, technical know-how, market information, … embedded services) - Key changes in the type of buyer and the relationship between farmers and buyers (last three years) **Prices** - Price trends over the past three years (farm-gate) - Expectations about future prices - Price seasonality (farm-gate) **Information** - Source of information for farmers on demand, price etc. (other households, traders reported etc.) - Farmers' assessment of their access to information about cattle price/market information - Main sources of information about cattle price/market information (ranking) - Assessment of different sources of price/market information (regularity of interaction, type of information provided, and reliability of the information provided)
Constraints and opportunities	- Key production problems and constraints; ranking of problems and constraints (e.g. access to inputs, cost of inputs, access to credit, lack of irrigation infrastructure, poor technical know-how, unreliable weather, shortage of labour, shortage of land, government regulations, etc) - Key marketing problems and constraints; ranking of problems and constraints (e.g. poor roads, limited number of buyers, declining prices, poor know-how etc) - Strategies to overcome problems and constraints in the production and marketing spheres - Key opportunities in the production and marketing spheres - Barriers to access these opportunities

	- Strategies to take advantage of these opportunities - Recommendations for intervention: what type of interventions would enable farmers to improve cattle production and marketing? Please prioritize…

Govt dpt questionnaire

Purpose of meeting	▪ Explain project ▪ To acknowledge Dinas, authority to conduct fieldwork ▪ Utilise the experience and knowledge of Dinas in cattle and beef ▪ Collect data necessary for the project ▪ Get input on ways that the project can assist the cattle and beef industry – public and private interventions and partnerships
Background information	▪ Department name ▪ Contact details ▪ Sub-district, district, province ▪ Jurisdiction – commodities, sectors in commodities, services, regulatory etc. ▪ Other background information
Data	See data sheets below ▪ Note some of the data will have already been collected. Some questions arise from the data (e.g. NTB that would be good to explore) ▪ However, because some data already collected, can skip some of the sections ▪ Will have to be selective about what questions to focus on
Opportunities and interventions (wrap-up)	▪ Key opportunities for the development of the cattle and beef industry in the region ▪ What are the biggest constraints ▪ What are the key innovations, technologies, investments required for the development of high-quality abattoir sector? ▪ Recommendations for public and project interventions aimed at developing high-value beef chains ▪ Does Dinas see any opportunities for collaboration with a development project intervening in the cattle sub-sector? If yes, what should be the focus of the collaboration? If not, why not?

Data

Government statistics

Sector & item	Source	Level	Period
Combined production indicators (from below) - Cattle numbers - Cattle slaughter - Beef production	Dinas Livestock and/or Ag (Statistics division)	Province, district, sub-district	For as long as possible (10+ years)
Socio-economic - Value of cattle sector (and how this is calculated) - percent value in livestock, agriculture and area GDP - Employment (in cattle production, cattle marketing, slaughter, by-products and retail) - No. of farmer groups in cattle (by type - . beginner, intermediate, pre-self-sufficient and self-sufficient)	Dinas Livestock and/or Ag (Statistics division) Dinas Ag (Extension div)	Province, fieldwork district, fieldwork sub-district (and fieldwork village where possible?)	- For GDP figures - 5+ years - For employment – recent years only
Inputs - diseases incidence (by type), cow mortality - veterinary facilities and non-veterinarian administered care etc. - use and type of AI - grassland area, useable grassland area, forage area - feed carrying capacity -	Dinas Livestock and/or Ag (Statistics division)	Province, fieldwork district, fieldwork sub-district (and fieldwork village where possible?)	Recent years only
Production - Scale of cattle production (e.g. no. of farmers in different categories) - number of cattle - cattle composition (age, sex, breed) - animal units - calving rates - turnoff rates	Dinas Livestock and/or Ag (Statistics division)	Province, fieldwork district, fieldwork sub-district (and fieldwork village where possible?)	As long as possible (10+ years)
Local trading - number and location of cattle markets (including non-active markets)	Dinas Livestock and/or Ag (Statistics division)	Province, fieldwork district, fieldwork sub-district (and fieldwork	5 years

		village where possible?)	
- Number of cattle traded on different markets - Price of cattle traded on markets (??)			
Inter-regional trading - cattle traded out (no. of breeders, no. of slaughter cattle) - cattle bought in (no. of breeders, no. of slaughter cattle) - origin - destination - prices / value of trade	Dinas Livestock and/or Ag (Statistics division, Agribusiness Div),Dinas Trade	Province, (island?), district (sub-district?) as origin	As long as possible (10+) years
Slaughter sector - number of registered slaughtered cattle - Number of active slaughterhouses (gov and private, size/throughput) - Beef production - carcass weights - dressing percentages	Dinas Livestock and/or Ag (Statistics division)	Province, fieldwork district, fieldwork sub-district (and fieldwork village where possible?)	- For production data – as long as possible (10+ years) - For no. of slaughterhouses, recent years OK
Beef / downstream sector - beef production - beef consumption (per person, rural, urban?) - beef prices [very important!!!!)	Dinas Livestock and/or Ag (Statistics division)	Province, district	- For production – as long as possible (10+ years) - For consumption, 5 years - For prices, as many years as possible, by month, probably in a particular market)

[for government statistics above, please add where possible, the source of the data, how it is collected, by who, what is needed to understand/interpret the data]

Policy information and documents (especially for province and district levels, esp. ag and trade Dinas)

Sector & item	Policy item
Socio-economic and industry-wide	- Promotion of farmer groups in cattle - General / industry development policies to increase value and employment creation - Madura Sapi Berlian - Bumi Sejuta Sapi - anggur merah
Inputs	- Cattle credit schemes - AI / breeding policy and providers - Disease prevention / treatment programs - Property rights over grasslands - Forages policy (vis-vis staples) - How carrying capacity and land use potential is calculated
Production	- policies and programs aimed at production (cattle management, pen facilities, breeders and distribution)
Local trading	- Policy on movement of cattle within the island (e.g. certificate of ownership, disease status, types of cattle able to be traded etc.) - Restrictions on sale of cattle (breed, age) - Market regulations and fees
Inter-regional trading ●	- Quotas - Restrictions (breed, age, weight) - Levies and fees - Access to permits (for traders, importers and exporters) - Guidance prices for traded cattle (in NTB and NTT and maybe Jatim too)
Slaughter sector	- Regulations / eligibility for certified slaughter houses (size, standards etc.)

	- Regulations on type of cattle that can be slaughtered
	- Monitoring and enforcement – processes
	- Taxes and fees
Beef / downstream sector	- Regulations on beef retailing in markets, stallholders etc.

Major actors in the sector – government, business, associations, NGOs

[pls provide any lists that and contacts that are available. This will be an appendix in the final report**]**

Sector & item	Actors
Socio-economic	- Producers associations - Industry associations / groups - NGOs
Inputs	- AI providers - Providers of cattle (breeders, fatteners, calves etc.) - Feed companies - Credit providers - Other
Production	- Feedlots
Local trading	- Market places - Significant cattle traders
Inter-regional trading, traders, companies	- Significant traders - Terminals, holding yards etc. - Transport providers (ship, truck)
Slaughter sector	- Abattoirs - processors
Beef / downstream sector	- By-product traders - Major beef retailers (supermarkets etc.)