

**BEEF GROWTH STRATEGY DOCUMENT
FOR
NUSA TENGGARA BARAT PROVINCE**

October 2015

BEING UPDATED

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Abbreviations

AI	Artificial insemination
BIBD	Balai Inseminasi Buatan Daerah (Regional Institute for Artificial Insemination)
BPTP	Balai Pengkajian Teknologi Pertanian (Assessmet Institute forAgriculatural Technology)
BSS	Bumi Sejuta Sapi (One Million Cattle)
GAP	Good Agricultural Practices
GHP	Good Handling Practices
GM	Genetically modified
ha	hectare
ILAF	Intervention Logic Analysis Framework
KKPE	Kredit Ketahanan Pangan dan Energi (Energy and Food Security Credit)
KUR	Kredit Usaha Rakyat (Business Credit for People)
MoA	Ministry of Agriculture
NTB	Nusa Tenggara Barat (West Nusa Tenggara)
NTT	Nusa Tenggara Timur (East Nusa Tenggara)
OPV	Open pollinated varieties
PKH	Peternakan dan Kesehatan Hewan (Livestock and Animal Health)
PSDSK	Program Swasembada Daging Sapi dan Kerbau (National Self-sufficiency Program of Beef Cattle and Buffalo)
ppb	parts per billion
PPL	Petugas Penyuluh Lapangan (livestock extension worker)
RDKK	Rencana Definitif Kebutuhan Kelompok (Definitive Plan for Group Need)
SMD	Sarjana Membangun Desa (Graduates Developing Villages)
UNRAM	Universitas Mataram (University of Mataram)
UPT	Unit Pelaksana Teknis (Technical Implementation Unit)
UPTD	Unit Pelaksana Teknis Daerah (Regional Technical Implementation Unit; Indonesia)

1 Executive Summary

Indonesia is the largest beef producer in South-east Asia, but a net importer of beef to meet the gap between fast growing demand and low local production. In 2013, total beef production in Indonesia reached 550,000 tonnes. In line with the global trend, demand for beef is growing and forecasted to grow faster in future. Cattle and beef production in Indonesia have been growing at an annual rate of between 4 and 5% over the past five years; demand for beef is expected to continue growing as Indonesian incomes and the country's middle class population grow. At present, imports are estimated to contribute 6% of the cattle herd and 38% of slaughter numbers in Indonesia.

Nusa Tenggara Barat (NTB) plays an important role by providing live cattle for beef production, and by supplying breeder animals for other provinces. Demand for NTB cattle and beef is rapidly increasing in DKI, West Java, Kalimantan, Sumatera, Maluku, and Papua region. However, there are some inconsistencies in the available statistics and it is hard to comprehend whether the NTB beef sector is responding to the increasing demand by producing more in the years when production and export decreases.

NTB has potential to further expand cattle production and this growth in livestock production can be one of the major drivers of poverty reduction in this province. NTB is one of Indonesia's key cattle producing regions, and an additional 50% of currently unused farm land in ten cities of Lombok and Sumbawa can be transformed into cattle grazing land. Natural conditions in NTB are suitable not only for producing cattle for beef but also for developing breeder cattle, for example the pure Bali breed, and other breeds. The province therefore could be major supplier of beef and feedlots for the country as a whole and become a key inter-island exporter.

Key impediments for increasing the productivity of NTB cattle farmers and production of cattle in NTB are a) the shortage of good quality breeding stock, b) farmers' poor knowledge of breed and feed management, c) inadequate artificial insemination service provisioning, and d) very low usage of composite and/or supplementary feed. Weak capacity of public agencies demonstrated through inadequate investment in maintaining water resources and in developing an efficient AI service delivery network, coupled with lack of access to services and information on proper breeding and feed, have led to 'low investment and low return' cattle rearing practices among the farmers in the province of NTB.

The vision of change for the beef sector in NTB is that the quality (assessed in terms of weight) of cattle produced by both the ranch and the enclosed systems will be improved¹. At service level, the vision of change is a) ranch cattle farmers have access to better ranch management services (including ranch breeding) provided by private businesses and public agencies, b) enclosed system cattle farmers have better access and services to good quality AI service offered by private and public agents and c) enclosed system cattle farmers have information and knowledge to produce and apply supplementary feed. To realise this vision, the report proposes three interventions:

- Support the development of improved ranch management services provided by public extension service providers and bull owners;
- Support the public extension service providers and feed ingredient suppliers in promoting supplementary feed application and production;

¹For an explanation of the two systems of cattle rearing practised in Indonesia, see section,3.2 below.

- Enhance the government capacity in solving the bottleneck (e.g. unreliable nitrogen supply).for efficient service delivery of AI

The first two interventions will be implemented from first half of 2015 and in parallel by co-facilitators. The third will be initiated by AIP PRISMA's own team.

2. Background

The Australia-Indonesia Partnership for Promoting Rural Income through Support for Markets in Agriculture (AIP-PRISMA) is a multi-year program that is a part of the Government of Indonesia's midterm development strategy to accelerate poverty reduction through inclusive economic growth. With the support of the Government of Australia, the program aims to achieve a 30% increase in the net incomes of 300,000 male and female smallholder farmers in eastern Indonesia by June 2017. AIP-PRISMA works in East Java, West Nusa Tenggara (NTB) and East Nusa Tenggara (NTT), Papua and West Papua.

PRISMA has selected beef as a sector to be developed in NTB province because of its importance as one of the main income sources for farmers in Indonesia, including in the province of NTB. This sub-sector growth strategy document aims to provide a logic and rationale for market-based interventions which can support the growth of the beef sector and benefit smallholder farmers in NTB.

3. Sector Description

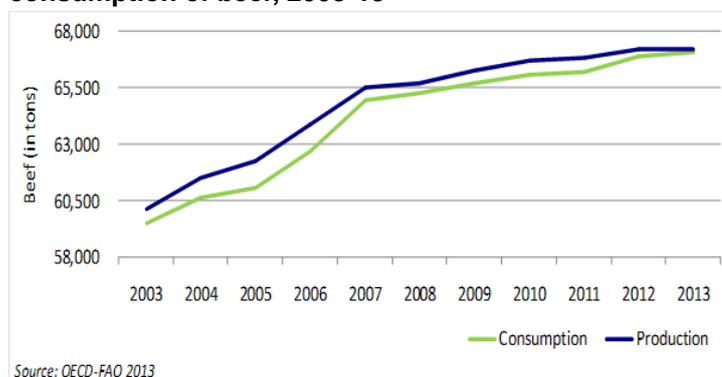
3.1 Sector profile

The sector profile provides information on the current status and potential of the target sector. This derives mainly from secondary data and literature relevant to the beef sector.

3.1.1 Overall context

Global production and demand for beef has been increasing steadily for more than a decade. In 2013, international beef production was 67.21 million tonnes while consumption reached 67.07 million tonnes. World beef consumption has been increasing by 1.2% annually over the past decade; production is also increasing and is dominated by a couple of countries. The USA is the world's leading beef producing and beef consuming country. Most of the major beef procuring countries are also the main beef consuming countries.

Figure 1: Global international production and consumption of beef, 2003-13



Demand for beef is forecasted to grow at a faster rate and is likely to put strong upward pressure on price, as growth in production is slower. In last eight years, increased per capita income in developing countries contributed to rapid increase of demand for beef. As a result,

global demand for beef is forecasted to grow rapidly. However, the growth in production of cattle and beef are not expected to grow at the same rate. This differential growth rate in demand and supply will continue to put an upward pressure on the global beef price. At the same time, as production is dominated by few large countries, any change in production in these countries will make the price volatile². This creates sufficient opportunity for countries like Indonesia to invest in the development of a competitive local beef sector through import substitution.

National

Indonesia is the largest beef producer in Southeast Asia but a net importer of beef to meet the gap between fast growing demand and low local production. In 2013, total beef production in Indonesia was 545,621 tonnes and the cattle population reached 16.6 million. In line with the global trend, demand for beef is growing and forecasted to grow faster. Cattle and beef production in Indonesia have been growing at an annual rate of 5% and 4% respectively over the past five years. Demand for beef is expected to continue growing as Indonesian middle class incomes grow. At present, imports are estimated to cover 6% of the total cattle herd in Indonesia.

Low production and import restrictions on beef caused a spiralling rise in beef price; however, farmers did not benefit much from the rising price. On a point-to-point comparison, the beef price in Indonesia increased by 10.17% between December 2011-2013³. Because of import restrictions, utilisation of local stock increased very rapidly and the price of beef increased without much effect on the price of live cattle. As a result, most of the small farmers (with two to three cattle, contributing to 70% of national supply) did not benefit as much as the traders did from the growing price of beef. This market imperfection is restricting farmers' ability to invest and also disincentivising farmers from increasing the size of their cattle herds. Overall, if farmers continue to receive a lower price, the overall production of cattle will not increase and the gap between demand and supply will widen further.

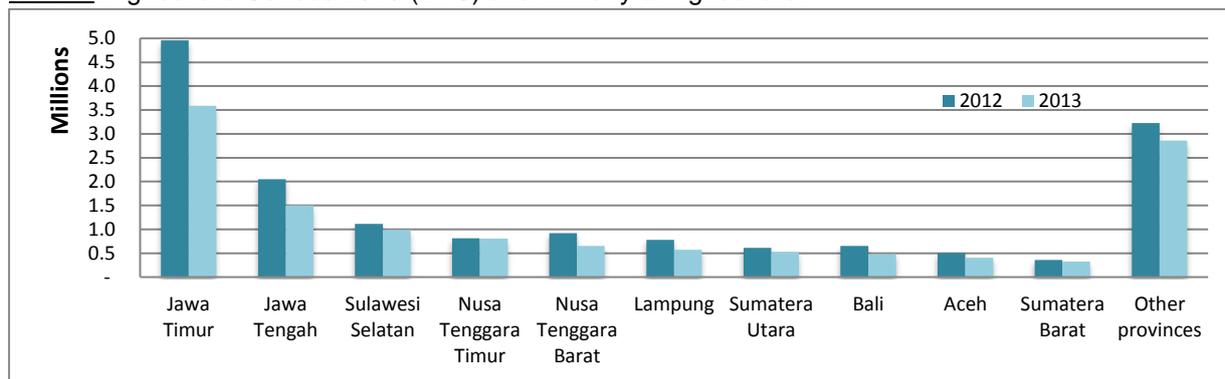
East Java, West Nusa Tenggara (NTB), and East Nusa Tenggara (NTT) provinces are important cattle producers in Indonesia and most of the animals are transported live from NTB and NTT to East Java. For example, although NTB and NTT accounts for 5% of total cattle production in Indonesia, only 2% of national beef production comes from these provinces. East Java is the largest cattle producing province in Indonesia, contributing around 30% of national production, while NTB and NTT are the fourth and fifth major suppliers. However, MoA data suggests that in all three districts, in 2012-13, cattle herd size reduced by 25-30%. Such a dramatic fall in livestock is likely to have been caused by import restriction on beef during this period. It's too early to conclude whether this decline will continue or not; however, it clearly indicates that there is a strong potential for the cattle and beef production to grow further and create additional income earning opportunities for farmers in Indonesia.

² Studi Identifikasi Ketahanan Pangan dan Preferensi Konsumen Terhadap Konsumsi Bahan Pangan Pokok Daging Sapi, Direktorat Pangan Dan Pertanian Bappenas, 2012.

³ Dody Rangga Sdkk, Analisis Faktor Yang Mempengaruhi Daya Saing Indonesia, Universitas Trunojoyo Madura, 2014.

Figure 2: Cattle population by province 2012-2013

Source: Agriculture Census 2013 (BPS) and Ministry of Agriculture.

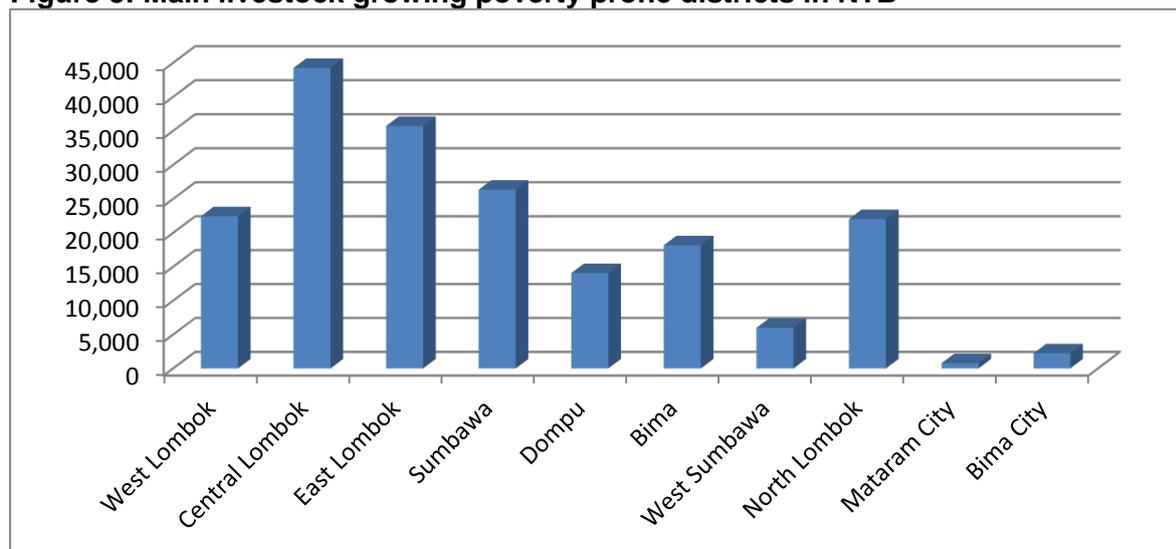


3.1.2 Local context

NTB plays an important role by providing live cattle for beef production, as well as by supplying breeder animals for other provinces. NTB plays a major role in national cattle development and in meeting national beef demand. Demand for NTB cattle and beef is rapidly increasing in DKI, West Java, Kalimantan, Sumatera, Maluku, and Papua regions. However, there are some inconsistencies in the available statistics and it is very hard to comprehend whether the NTB beef sector is responding to the increasing demand by producing more in the years when production and export decrease.

Poverty levels in NTB are declining; livestock for beef production is one of the major contributory factors. According to the national poverty statistics of 2012, at least 6.5% of the total poor population is involved in NTB's livestock sector. North Lombok district is the most poverty prone area, with 36% of its inhabitants living below the poverty line. Poverty levels are also very high in East Lombok, Sumbawa, West Lombok, West Sumbawa, Central Lombok, Dompu and Bima districts; these are the main livestock rearing regions in NTB (see Figure 3, below) with a large number of small cattle producers (that is, with two to three animals per household). Additional income from increased livestock production is therefore the major source of income for cattle-rearing households (especially for small producers) and has thus contributed to poverty reduction.

Figure 3: Main livestock growing poverty prone districts in NTB



NTB has potential to produce an additional two million heads of cattle annually; this can drive future poverty reduction in this province. This is one of the key cattle producing regions in Indonesia and its cattle grazing land can be expanded into 50% unused land in ten cities of Lombok and Sumbawa districts. Natural conditions in NTB are suitable not only for producing cattle for beef but also for developing breeder cattle, among others the pure Bali breed. These breeder cattle can be exported to other islands for rearing and increasing livestock production in other districts. The province therefore could be major supplier of beef and feedlots for the country as a whole and become a key inter-island exporter.

3.2 Sector dynamics

3.2.1 Market overview

Cattle farming in NTB is evolving around three main markets: (1) the slaughter of cattle (mainly females) for local beef consumption, (2) the regional export of live cattle (only male cattle which reach minimum export weight requirements) to Jakarta, South Sulawesi, and Kalimantan for slaughter and beef consumption, and (3) the supply of breeder cows (mainly Bali bulls) to other islands. In the national context, NTB is a major source of breeder cows; this is one of the major businesses in the province. In addition, NTB has a strong domestic demand for beef.

Two different cattle rearing techniques were observed in NTB, with a spatial pattern to each. Farmers in the Sumbawa area raise cattle following the ranch system – an extensive farming practice relying on pastures and open water sources. In Lombok on the other hand, an enclosed system is the most common; here, cattle rearing practices are intense. The enclosed system is more investment intensive and allows greater control over breeder selection, feed management and disease control. In the case of cattle and beef trading in NTB, abattoirs play a major role in trade in Sumbawa Island, while in Lombok the role of intra-island traders is key.

In inter-island trading, live cattle are traded both for meat and as breeder cows. However, overall industry practice revolves around a low investment, low return cycle, mainly at farmer level, with low productivity, which is particularly demonstrated through the low weight of the animals. Very

few investments have been made in the improving of the support functions and service delivery provided by the various public and private actors (for example, those involved in artificial insemination, feed and feed management).

3.2.2 Core value chain

Inputs

Feed is considered the most important input in cattle production, affecting reproduction, mortality and growth rates. Good cow nutrition is essential for high reproduction rates; cows need a 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 increased calving intervals and reduced calving percentages. At the same time, inadequate nutrition in growing calves can delay the development of puberty in heifers. It can also reduce growth rates of fattening cattle, resulting in longer fattening periods.

The farmers in Sumbawa depend entirely on pasture grass to feed their animals, which offers inadequate nutrition for the cattle. Most of the farmers do not plant improved grass and tree forage for use to supplement their cattle's diet. As a result, during dry conditions in summer when the availability of fodder and forage is limited, cattle have very low levels of nutrition and their growth is limited. Farmers practice enclosed cattle rearing in Lombok and in certain parts of Sumbawa, and provide their cattle with only fresh forage. Their use of ready feed and/or supplementary feed is very low, mainly because of lack of knowledge about feed quality and feed management. Farmers practicing enclosed cattle rearing in both areas also have very little knowledge of the benefits of improved feed for increased animal productivity. A number of NTB institutions, such as Mataram University, and Agency of Assessment and Application of Technology (*Badan Pengkajian Teknologi dan Penerapan*, or BPTP) have developed a range of composite feeds using locally available ingredients and have introduced these to cattle farmers. Their success however has been limited: none of these agencies made a concerted effort to popularise the products, they did not have a business model to ensure product availability, and most importantly did not spend resources on improving the farmers' knowledge of the benefits of feed management. The end result was that NTB's cattle farmers did not accept these new practices.

Drinking water is also important to prevent stunting, mortality and low growth. In Indonesia, the extended dry season results in water shortage for most of the year. Both underground and surface water are limited in the dry season; this mostly affects the cattle in Sumbawa, as they have to travel a long way to reach waterholes. The availability of water is also a challenge under the enclosed system of cattle rearing in Lombok, especially during long summers. Farmers need to travel long distances to collect water for animals and the responsibility of carrying water usually falls upon women. Because of the unavailability of water in Sumbawa and difficulty in sourcing water in Lombok, cattle take in less than the required amount of water and as a result feed conversion ratio is low and animals gain less weight in NTT.

Farmers mostly rely on natural breeding using their own bulls; however, in some locations farmers manage the natural breeding process using community-owned bulls (commonly referred as a "group bull") for breeding. Poor prime bull selection and low quality breeding management affect the overall quality of calves. Approximately one third of cattle productivity improvements are derived from better genetics, mostly through the use of superior

bulls. In Sumbawa because of the ranch system of cattle rearing, incidence of natural breeding is high and because of the poor breeding management practices of farmers, incidence of inbreeding is very high. The use of inferior breeds of bulls coupled with high incidence of inbreeding has led to low quality offspring, characterised by low weight growth and high mortality rates. There are limited examples of an improved quality of bull being used for commercial breeding, mostly in Lombok using the enclosed system of cattle rearing. Here however the total number of bull service providers is low and farmers' knowledge of breeding management is poor. As a result, natural breeding (and resultant inbreeding) is also very high in Lombok.

The AI network is state-run by a number of government agents and quasi-private agents with limited outreach. In NTB, there are 270 AI agents employed by *Balai Inseminasi Buatan Daerah* (Regional Institute of Artificial Insemination, or BIBD); around 80% are working in Lombok Island. According to 2013 statistics, each AI agent has an average of 1,656 cows to cover. The TAF case study (2014) conducted in West Lombok and North Lombok (NTB) shows that the three quasi-government AI agents in North Lombok cover around four villages, while in West Lombok one AI agent (a livestock extension worker, a *petugas penyuluh lapangan*, or PPL) covers five villages. On the whole, the AI agents are quite widely spread across the province; at the same time, the number at sub-district level is disproportionate to need. For example, one of the sub-districts in West Lombok with 28% of the district's cattle has only one inseminator, while another sub-district with only 1% of the herd size has three.

In addition to the relatively limited outreach of AI agents, the quality of AI products and services is also low and leads to lower conception rates. Indonesia's Ministry of Agriculture (MoA) has set a target⁴ for conception rate to measure the success rate of AI. This stipulates that the conception rate should reach 50% in the regions where AI has been newly introduced and 80% in regions where it is relatively well-developed. Based on case studies in West Lombok and North Lombok (TAF 2014), the conception rates in the two regencies were only around 30%, well below the MoA target. A range of issues contribute to this low conception rate. In particular, AI agents need to collect and store semen appropriately so that the quality persists until it is used for insemination. Semen straws used in AI are sourced from Singosari in Malang and need to be stored in a box with liquid nitrogen at an appropriate temperature. However, AI agents have a limited supply of these boxes, resulting in inappropriate storage of semen, compromised quality and a lower conception rate.

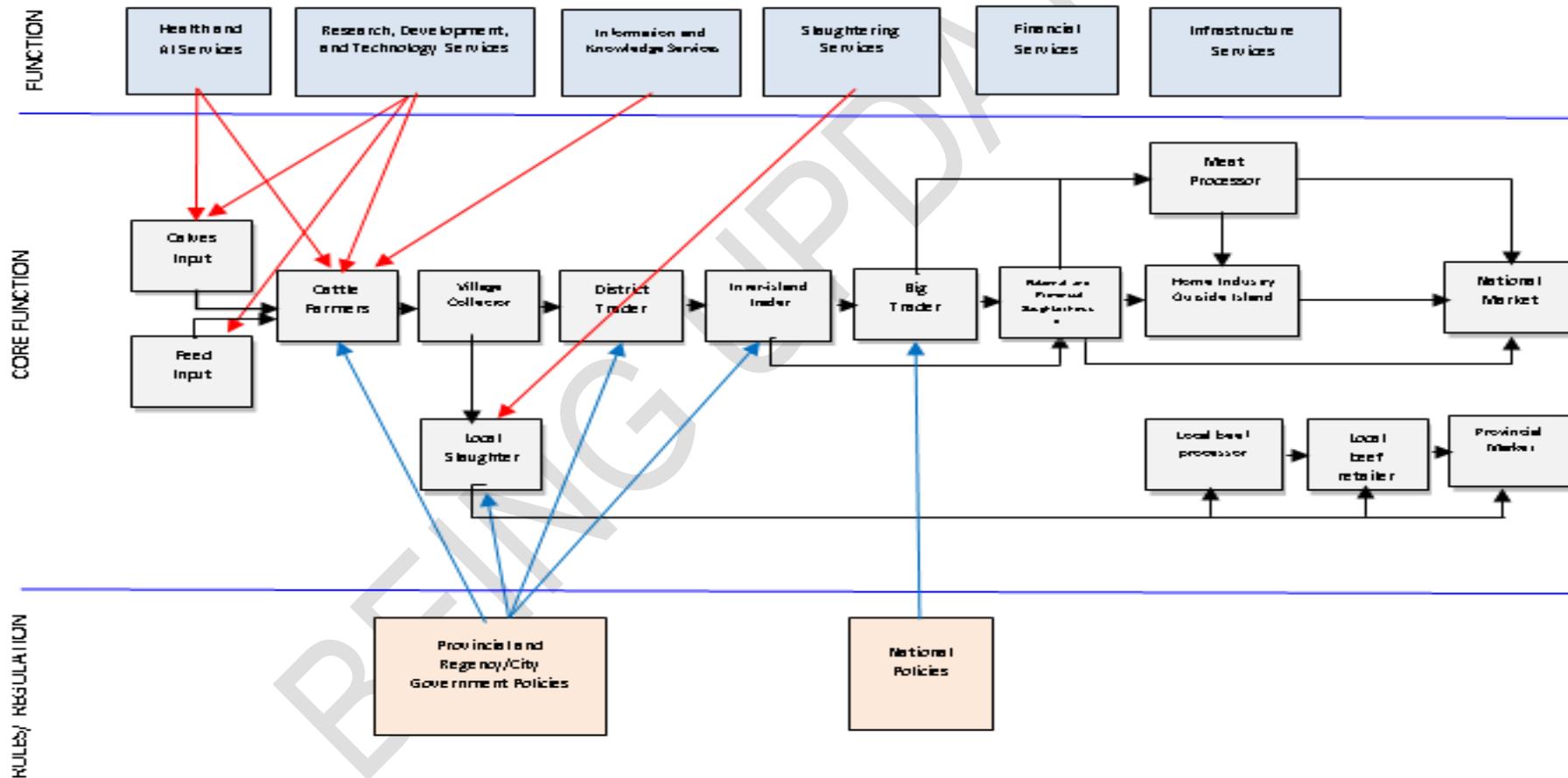
The AI agents lack adequate skills; farmers lack sufficient knowledge; costs act as a disincentive. Herawati et al. (2012)⁵ stated that appropriate skill levels of the AI agent are essential to increase the conception rate; in NTB, AI agents have not been trained properly. In addition, many farmers do not have the necessary knowledge to properly monitoring the oestrus period. AI services are inefficient as a result. TAF (2014) also identified two payment schemes operated by AI agents in Lombok: a 'package' (under which farmers pay IDR100,000 with a guarantee of pregnancy) and 'shot-based' (costing IDR25,000 per shot). The latter provides a reduced incentive for AI agents to increase the conception rate.

⁴ Ministry of Agriculture (2012), *Guidelines on Optimisation of AI*.

⁵ Sumber: Herawati, Tati dkk. (2012), Peran Inseminator dalam Keberhasilan Inseminasi Buatan pada Sapi Perah, Balai Penelitian Ternak Ciawi, Bogor.

3.2.2 Sector map

Figure 5 presents the sector map for beef in NTB. Though two distinct practices for raising cattle have been observed, the core functions and nature of relationships between and among market actors remain the same; a single map is therefore sufficient to express this.



Production

In NTB both the ranch and the enclosed systems of cattle rearing are followed. Farmers in the Sumbawa area raise cattle according to the ranch system, an extensive farming practice relying on pastures and open water sources. In Lombok on the other hand, the enclosed system is most common; cattle rearing practice here is intense. The enclosed system is more investment-intensive and allows greater control over breeder selection, feed management and disease control. Female members of the household are involved in the enclosed cattle rearing process (mainly in breeder management and the provision of fodder); under the ranch system their involvement is minimal.

Most households are involved in both the breeding and fattening processes, often producing their own breeding stock, selling part of the stock as breeder cows, and raising and fattening some of the offspring until they reach slaughter weight. Most of NTB's cattle farmers are smallholders, owning two to three animals per household in Lombok and five animals in Sumbawa. The majority receive business capital to invest in breeding or fattening from a well-off breeder or traders. In the case of fattening, post-sales profits are shared between farmers and investors; usually the ratio varies between 50:50 or 40:60, depending on who bears what type of costs. With breeding lots, the calves are shared between the breeder and the livestock owner.

Cattle marketing

In Lombok Island region, the breeders sell cattle in the animal market; in Sumbawa Island the district traders/butchers sell through the collector traders/brokers who come to the breeder's house. In animal markets, breeders or farmers sell their cattle through intermediaries or brokers to the traders (specifically, collector-traders and district traders/butchers). In some cases, collector-traders and district traders/butchers buy directly from the breeders/farmers. The cattle price fluctuates quite sharply; it is mostly determined by the traders, based on their experience and visual observation.

As part of its livestock development programme, the government distributes superior quality breeder cows to different parts of the country. NTB is a major supplier of breeder cows, the public procurement of which is an important part of cattle trading in NTB. The NTB provincial government's 'One Million Cattle' program (*Bumi Sejuta Sapi*), procures breeding stock from traders in the province and redistributes them to poor farmers⁶ The amount and price of public procurement thus affects the price of the cattle in NTB's various markets. In 2012, almost 10,000 calves (62% of which were from Lombok) were exported to various provinces in Indonesia, including East Kalimantan, South Kalimantan, NTT, Papua and West Papua.

Several large traders in NTB control the breeding stock procurement market. Although in theory any private entity can participate in government procurement in Indonesia without any geographic restrictions, in practice most of the breeding stock procurement tenders are won by companies located in the procuring provinces. These companies then come to NTB (sometimes with the procuring government officials) to identify the suppliers from the provinces (sometimes with help from NTB's provincial government). Traditionally, three large traders control this market in Lombok (*H. Saad Husni, H. Sabri and H. Fathulah*) and one large trader in Sumbawa (*CV Agro Samawa*). All four have longterm relationships with traders from the procuring provinces and with NTB's provincial government. New players are however emerging, such as alumni of the Graduates Developing Villages (*Sarjana Membangun Desa, or SMD*) program

⁶ Usually private businesses from other islands supply breeder cows to the government.

which established a company named Samada and in 2013 supplied breeding stock to Gorontalo. According to TAF (2014), NTB traders achieve about 8%-15% profit, and traders from the procuring provinces 8%-20%.

Processing and beef marketing

Slaughterhouses in NTB are moderately developed, with a larger number of operational slaughterhouses in Lombok than in Sumbawa. There are 53 functional slaughterhouses in NTB (34 in Lombok Island and 20 on Sumbawa Island). An additional four slaughterhouses with modern facilities are in the process of being established (one in Lombok and three in Sumbawa). These can play an important role in inter-island beef trading; they are however yet to become fully functional because most cattle currently traded between islands are live.

Some slaughterhouses in NTB have been awarded the Indonesia National Standard certificate and deliver beef to Jakarta; the potential for a leather industry has not been capitalised. Only two out of four certified slaughterhouses provide a consistent supply of beef to hotels and restaurants; that of the other two is sporadic. In NTB, beef retailing is mainly carried out by butchers. However, a number of small-scale processing industries have also developed the capacity to cater for the needs of local consumers. At the same time, as large number of cattle are traded live, the leather industry has not developed in NTB. The leather processing units which exist in NTB are small and insignificant in number.

3.2.4 Supporting functions and services

Some animal health extension services are provided by government, through animal health centres (*pukeswan*) at sub-district level. The Department of Agriculture (*Dinas Pertanian*) at the provincial and district levels provides on-the-ground technical extension services; these include monitoring of animal health, providing information to farmers, and supplying veterinarian services, vitamins, supplements and medicine. There are 137 field livestock officers supporting ten districts in NTB. This number is insignificant compared to need; they are hardly able to provide services to farmers living in remote villages.

The extension service infrastructure in NTB includes the Livestock Breeding and Forage Fodder Agency (*Balai Pembibitan Ternak dan Hijauan Makanan Ternak*, or BPTHMT), the Development and Ruminant Fodder Processing Agency (*Pengembangan dan Pengolahan Pakan Ternak Ruminansia*, or BP3TR), the Animal Hospital and Veterinary Laboratory Agency (*Balai Rumah Sakit Hewan dan Laboratorium Veteriner*, or BRSHLV) and the Artificial Insemination Agency (*Balai Inseminasi Buatan*, or BIB). In addition to the Regional Technical Implementation Unit (*Unit Pelaksana Teknis Daerah*, or UPTD), three livestock breeding and forage fodder facilities are spread across three locations: the Technical Implementation Unit (Unit Pelaksana Teknis, or UPT) facility at Amor-Amor Tanjung sub-district of North Lombok district, the livestock breeding facility in Pekat Dompu district and the Forage Fodder Breeding facility in Woha sub-district in Bima (*Livestock and Animal Health Agency - Dinas Peternakan dan Kesehatan Hewan*, or *Dinas PKH of NTB*, 2014).

In NTB two institutions take a leading role in the research and development of breeder and livestock development technology. The Agency of Assessment and Application of Technology (*Badan Pengkajian Teknologi dan Penerapan*, or BPTP) and the farming faculty of Mataram University (UNRAM) are Indonesia's two leading institutions for livestock development research. Both BPTP and (UNRAM) frequently collaborate for research projects, providing

support (including technical support) to breeders in the villages to improve cattle productivity. However, this support is provided only as part of the institutions' research work and its scale is thus highly limited. In the absence of a framework for collaboration between these research institutes and the PKH, effective results obtained from the research projects are not disseminated at scale among NTB's breeders and farmers.

The government provides subsidised loans to groups of cattle farmers; individual small farmers however have almost no access to formal finance. Public banks such as BRI and BPD provide subsidised credit facilities to cattle farmers in almost all of the ten districts and cities in NTB⁷. However, these credit facilities can only be accessed by breeder groups; during the field study it was revealed that mostly large traders or farmers access these services, while the small individual farmers remain outside the formal financial services. For the individual breeders, large breeders or traders are the source of credit; this is repaid through profit sharing system.

In NTB, road and sea transportation services are less developed than in East Java. According to LPEM-FEUI and TAF (2010)⁸ land transportation costs in NTB are relatively high. The cost of moving goods from Sumbawa to Mataram (NTB) was IDR5,690/km, while the average cost of three routes surveyed in NTT was IDR4,910/km, and that of nine transportation routes in Indonesia (LPEM-FEUI and TAF 2008) was IDR4,392/km (all according to 2010 prices). The costs of transporting live cattle from NTB to other regions are also relatively high. Based on TAF (2014), the cost of chartering two boats, each carrying around 650 heads of cattle, one way from NTB to i) Gorontalo and ii) East Kalimantan was IDR300 million and IDR175 million respectively. This contributed to 83% and 33% of the costs borne by the respective cattle traders in Gorontalo and East Kalimantan. Moreover, the holding sheds for the animals are very underdeveloped and there is only one shed in Lembar Port West Lombok. In addition to high costs, the traders also bear the risks of transport, as no insurance scheme provides cover for shipments.

3.2.5 Supporting rules and regulations (the enabling environment)

The beef industry in Indonesia is regulated and supported by different sets of national sector policies, regulations and programs, including the PSDSK programme. To achieve self-sufficiency in beef production, the Indonesian government rolled out its National Self-sufficiency Program of Beef Cattle and Buffalo (PSDSK) with the aim of increasing the annual average growth rate of Indonesia's beef cattle herd by 12.4% and increasing beef production by 10.4%. A budget of IDR 10.65 trillion was allocated for the five-year program.

Indonesia's current president Joko Widodo (elected in July 2014) is also prioritising the development of the agriculture sector in Indonesia, including the beef sector. His vision includes the establishment of village level breeding cooperatives in every cattle producing village, and the provision of technologies and information to improve cattle feed and rearing management.

In line with national policy, NTB provincial government has launched the *Bumi Sejuta Sapi (BSS)* program. This is focused on developing local resources and infrastructure to support livestock development in NTB. The objectives of the program are to improve the productivity of cattle to increase rural household income, contribute to fulfilling the national

⁷ The credit schemes are: Fodder and Energy Endurance Credit, Cattle Breeding Business Credit (*Kredit Usaha Pembibitan Sapi* or KUPS) and SP3 Credit (which provides service, financing, farming schemes).

⁸ LPEM-FEUI and TAF (2010), *Transportation of Goods in East Nusa Tenggara: Problems and Costs*.

demand for meat, increase supply of breeder animals in other provinces, and ensure that the overall beef industry emerges as one of the key drivers of economic development in NTB. So far however, with a range of support from BSS, NTB farmers have managed to produce less than one million heads of cattle in 2014. Little progress has been achieved in developing the beef industry, and overall progress on improving productivity and establishing a strong local resource infrastructure has been limited.

In 2000, NTB's PKH department enacted a law introducing quotas on the amount of export of breeder cows and large animals. An annual governor decree sets the yearly quota for breeder cattle exports to other provinces. In recent years the approved amount of quota has been decreasing, from 13,000 heads in 2010 to 8,500 heads in 2012. The quota does not take into account potential demand from Jakarta and other provinces; it is based instead on a percentage of projected births of male cattle in NTB. As a result, one way to increase the quota is to grow the cattle population in NTB. Potential to increase the quota can be an incentive for traders and other stakeholders to form a partnership with AIP-PRISMA.

NTB province has a regulation which limits the butchery of female productive cows; the aim is to increase the herd of productive cattle in the province. This regulation represents an effort to reduce the percentage of productive cows being butchered; the provincial government reduced the butchery of productive cows in registered slaughterhouses to 10% in 2013. However, field reality suggests that this is very hard to control; the number of unregistered slaughterhouses (where there is no enforcement of regulations) is increasing.

The national beef standard (SNI 3932:2008) has been enacted. However, there is very little enforcement of the standard and it is therefore irrelevant to trade. These standards specify quality parameters of cattle (age, breed, sex), beef (cuts, muscle and fat colour, marbling), processes (freezing), certification and labelling (halal), and microbiological standards. However, these are not widely recognised, accepted or used. As a result, quality standards have very little influence on the price of the cattle or beef.

4 Analysis

4.1 Problems in core functions and their underlying causes

4.1.1 Problems faced by farmers and their underlying causes

The problems faced by farmers and their underlying causes are specific to the poor target groups which AIP-PRISMA seeks to support through interventions in the beef market system in NTB. These problems have been identified in the Sector Dynamics section above and are also presented in the Intervention Logic Analysis Framework (ILAF) table (Annex 1). The three key problems faced by farmers and their underlying causes can be summarised as:

Ranch system (especially Sumbawa)

- Farmers use low quality calves, largely obtained through inbreeding; they have limited knowledge of animal and breeding management
- Farmers face difficulties sourcing quality fodder especially during the dry season; they have limited knowledge of fodder production
- Farmers have limited availability of water resources for animal grazing

Enclosed system

- Farmers have limited access to effective and quality AI service; they have limited knowledge of proper AI timing
- Farmers have limited knowledge of the benefits of supplementary feed and limited access to ready-to-use supplementary feed

Ranch system

Farmers use low quality calves largely obtained through inbreeding; they have limited knowledge of animal and breeding management. Productivity of cattle in the ranch system is low, demonstrated by low animal weight and high mortality rate. The first step towards improving cattle productivity is to ensure the availability of good quality breeding stock (prime bulls and productive female cows) to increase the supply of calves and consequently the overall cattle population. However, farmers in NTB lack access to services and information on proper breeding, including the management and selection of prime bulls. As a result, in-breeding is prevalent, and less superior bulls are often allowed to mate with female cows. Such unmanaged breeding is leading to in-breeding, which is not only producing weak calves but also reducing the overall genetic quality of cattle in the province. At the same time, despite the existing shortage of good quality cattle for breeding, farmers are selling productive female cows and prime bulls for slaughter. A combination of economics and regulatory enforcement failure leads to indiscriminate consumption of female and prime bulls, further reducing the availability of good quality breeder cattle.

Farmers face difficulties sourcing quality fodder especially during dry season; they have limited knowledge on fodder production. Farmers in Sumbawa practice ranch system livestock development and rely entirely on natural grazing land to feed their animals. Availability of fodder and forage is limited during summer. Although some forage tree legumes have the potential to withstand dry conditions, most farmers do not plant improved grass and tree forages to supplement the diet of their cattle; instead they rely on grazing which provides inadequate nutrition for cattle. Farmers also do not cultivate quality forage and there is no public initiative to

create and maintain pastoral lands. With limited and inappropriate food, the cattle do not reach optimal weight and calf mortality rate is high.

Farmers have limited availability of water resources for animal grazing. In Sumbawa the livestock system depends on natural resources and little investment is made to supplement the availability of feed and water. During summer both surface and ground water dries up and availability of water is extremely limited. Dams and reservoirs do not exist, and the resultant inadequate water supply significantly affects the feed conversion ratio and the animals do not reach their optimal weight.

Enclosed system

Farmers have limited access to effective, quality AI services and limited knowledge of proper AI timing. Farmers practicing the enclosed system also experience low productivity, again mainly because of the low quality of calves. Artificial insemination is a way of improving calf quality; however, the success of calf quality improvement depends on the skills of the AI providers, the knowledge of farmers on breeding timing management, and the availability of AI service providers. In NTB, the availability of AI providers is vastly less than optimal and success rates are low; semen quality is compromised by improper storage and farmers do not adhere to the proper breeding time. The result is low quality calves.

Farmers have limited knowledge of the benefits of supplementary feed and limited access to ready-to-use supplementary feed. Farmers in both Sumbawa and Lombok lack knowledge and understanding of the use of supplementary or composite feed and therefore do not use it. Feeding practices are very basic, consisting largely of fresh forage. There are few commercial ready-to-use feed producers and sellers in NTB. Overall, the nutritional quality of the cattle feed used is well below average.

4.1.2 Problems, underlying causes and their impact on farmers faced by other actors

The other actors in the core function also face key problems and these affect the farmers.

The two key problems faced by farmers can be summarised thus:

- Traders cannot expand their business because of the low weight of the animal
- Inter-island traders lose out on profits because of poor trade logistics and infrastructure

Traders cannot expand their business because of the low weight of the animal. Demand for high weight animals is high in Jakarta, West Java and Kalimantan (cattle below a certain weight threshold fetch a very low price here). However, as the availability of animals with a good weight is low, traders cannot take advantage of the growing demand for beef. Instead, traders and farmers are often reduced to selling off their prime bulls, further reducing the potential for improving the breed.

Inter-island traders lose profit because of poor logistics and infrastructure. Even though there are enough seaports in different parts of NTB, the infrastructure for cattle transportation is weak and inadequate. For example, in Bima port ramps are not used for getting cattle from trucks to the vessel; as a result cattle are often wounded and traders lose profit. Cattle are also transported in ships which are not purpose-built; during the long inter-island journey they lose

weight and again, traders lose money. The same phenomenon happens while animals are kept in quarantine before shipment.

4.2 Weaknesses in services, rules and regulations

The key services weaknesses are detailed in the ILAF table (see Annex 1) and include:

- Limited provision of information and knowledge on proper breeding management
- Limited information on quality fodder production and unavailability of commercial feed
- Low public investment in improving physical water resource infrastructure
- Unavailability of AI services and weak distribution and quality assurance processes

Limited provision of information and knowledge on proper breeding management. The provincial and district level governments provide agricultural extension agents (PPLs) who monitor animal health, provide training and information to farmers, and supply veterinarian services, vitamins, supplements and medicine. According to Ministry of Agriculture statistics, only seven PPLs in 12 AIPD regencies in the three provinces have a livestock background; in Bima regencies (NTB) there is no PPL with a livestock background. Even in the best cases, one livestock PPL needs to cover on average 5-12 villages. The government also provides animal health centres (*puskesmas*) at the sub-district level and animal health laboratories at the provincial level. However, there is no systematic and consistent channel for public or private agencies to provide appropriate information on breeding management.

Information on quality fodder production is limited and commercial feed producers are unavailable in NTB. Access to feed and good feed practices is important for fattening, as well as for reducing mortality and improving the growth of calves. The long dry season in NTB limits the quantity and quality of feed and affects the price of raw materials needed for the production of feed supplements and concentrates. Available commercial concentrate is not affordable, and there are limited or no feed producers and traders in NTB. In short, farmers have few alternative feed options outside of natural grazing and the use of fresh forage. This is exacerbated by limited knowledge and sources of feed requirements on the part of farmers and other potential stakeholders.

Unavailability of AI services, weak distribution and quality assurance processes leads to poor conversion rate and poor calf quality. NTB's AI service is run as part of the public extension system. The number of AI agents is inadequate and the semen is stored inappropriately. The overall service delivery model is weak and there are problems at both the supply and demand ends. The quality of the AI service (as indicated by the conception rate) is low and fails to convince farmers of the reliability of the service, resulting in its low demand.

Low public investment in improving physical water resource infrastructure leads to unavailability of water for animals. To ensure availability of water during summer, there is a need to build and maintain water resource infrastructure. In NTB however there has been little public investment in improvements to this infrastructure. Without sources of water in close proximity, cattle have to travel long distances with sub-optimal water consumption.

4.3 Cross-cutting issues (gender and environment)

Women play a significant role in the industry, but their role is concentrated in the early stages of the chain (input and production) and the latter stages (boning and retail). Assuming that women account for 50% of cattle producers, this translates into an approximate 100,000 female producers in NTB. Women are responsible for collecting feed and water, feeding the cattle, taking them to and from the grazing fields, building and fixing pens, and monitoring cattle health. They generally spend more time than men with the cattle and as a result are more knowledgeable about their condition and health.

Measures to reduce the amount of time required to collect feed and water will have a significant effect on the labour of women. This is particularly relevant for the dry season when collecting feed can be extremely burdensome. The scarcity of feed means that women often have no choice but to spend more time and walk longer distances to find and carry it back. Any intervention targeting feed and improved breed selection and management needs to be inclusive of women, and ensure that any embedded services and training are accessible to women and tailored to their needs.

5. Strategy for Change

5.1 Market potential

There is a clear market opportunity to expand NTB’s inter-regional export potential and to ensure that farmers are better able to capture benefits from an expanding export market. There is growing demand for beef from provinces other than NTB and currently Indonesia is reliant on imports to fulfil this. As a result, there is potential for NTB to increase the quantity of cattle it supplies to satisfy national beef demand. In addition, NTB can expand its share of breeder cows to the remainder of Indonesia’s cattle growing provinces.

To realise this potential, cattle farmers will need to increase overall production and productivity at the breeding stage. At the same time they will need to improve productivity at the fattening stage to ensure they meet the minimum export weight requirement to take advantage of the expanded export opportunities. Based on our calculations, there is potential to unlock an additional AUD20.6M in the proposed intervention districts for the beef sector in NTB.

The following table presents the market potential of the NTB beef sector:

Table 1: Market potential of NTB beef sector

Description/years	Total business in the target area(s)		
	Total	Up to 2016	Up to 2018
Average selling price/kg (million IDR)	35,000	35,000	35,000
Current value of production (million IDR)	57,098,370	683,200	4,132,800
Total value of potential production (million IDR)	74,228,700	889,616	5,375,370
Total value of potential production (AUD)	7,422,870,000	88,961,600	537,537,000
Total potential value of increased production (million IDR)	17,130,330	206,416	1,242,570
Total potential value of increased production (AUD)	1,713,033,000	20,641,600	124,257,000

Description/years	Total business in the target area(s)		
	Total	Up to 2016	Up to 2018
Market share due to program		0%	2%

5.2 Vision of change

Vision of change

The vision of change for PRISMA's NTB beef sector is to “**improve[e] the quality of cattle (weight) of ranch and enclosed system farmers in NTB**”. In terms of service level the vision of change is that a) ranch cattle farmers have access to better ranch management services (including ranch breeding), b) enclosed system cattle farmers have better access and services to good quality AI, and c) enclosed system cattle farmers have accurate, updated information and knowledge needed to produce and apply supplementary feed.

5.3 Interventions

To unlock the potential of the beef sector in NTB by improving the function of service markets in support functions, PRISMA proposes the following interventions:

- Support the development of improved ranch management services by public extension service provider and bull owners
- Support the public extension service/ingredient suppliers to efficiently promote supplementary feed application and production
- Support government capacity to resolve the bottleneck (e.g. unreliable nitrogen supply) to ensure efficient service delivery of AI

Intervention 1: Support the development of improved ranch management services by public extension service providers and bull owners. Under this intervention, support will be provided to develop a commercial bull service. The bull service providers will establish a breeding service using a qualified primary bull, and disseminate information and knowledge to cattle farmers on breed management and other aspects of ranch management. To ensure the supply of quality primary bulls, the program will also partner with Indonesia's public livestock development agency. This public extension service will not only provide the bull to the bull service provider, but also will train them in managing its quality. An estimated 800 farmers can be reached through this intervention by 2018.

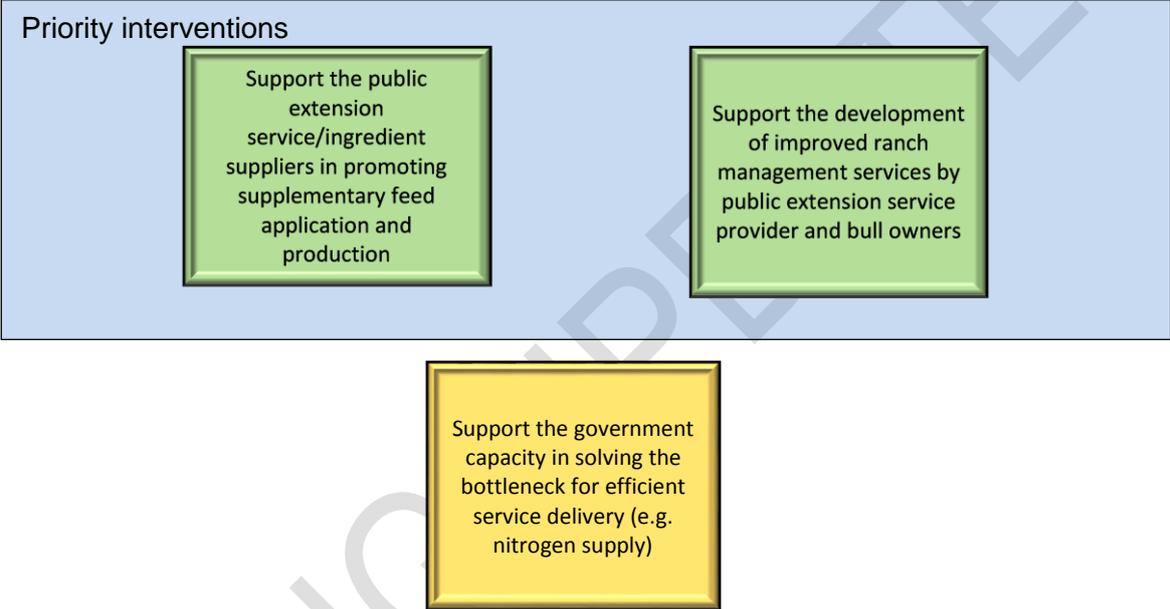
Intervention 2: Support the public extension service/ingredient suppliers in promoting supplementary feed application and production. The objective of this intervention is to improve the knowledge and capacity of the farmers in producing composite and supplementary feed. The project will partner with Mataram University as the knowledge hub with the technology to produce composite feed. The rollout partner of this intervention will be the ingredient/nutrient suppliers. These retailers have a commercial interest in promoting the technology in partnership with the university because adoption of this feed-producing technique will increase their sales. This intervention is a pilot aimed at raising the awareness of livestock farmers about the benefits of using composite and supplementary feed. Estimates suggest that this intervention will benefit around 3,000 farmers in five districts of the province.

Intervention 3: Support government capacity to solve the bottlenecks (e.g. nitrogen supply) preventing efficient service delivery. Issues related to the availability and quality of AI services have emerged as one of the key constraints for the beef sector in all the other provinces. This is a national issue which cannot be resolved merely through provincial intervention. AIP-PRISMA therefore plans to initiate a national intervention to improve the supply, distribution and service delivery of AI services across Indonesia.

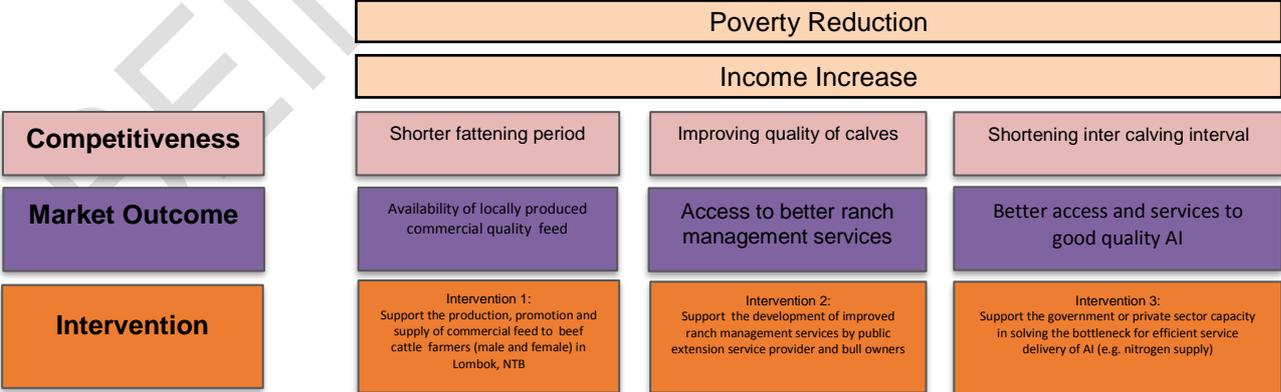
5.4 Sequencing and prioritisation of interventions

As Figure 4 shows, of the three proposed interventions two will be prioritised and implemented immediately and in parallel. The third intervention, supporting the government capacity to solve the bottlenecks (e.g. nitrogen supply) preventing efficient service delivery of AI will be initiated by AIP-PRISMA and implemented at a later stage.

Figure 4: Sequence of interventions



5.5 Sector vision of change logic



Annex 1: Intervention logic analysis framework (ILAF)

(1) Problem/symptom	(2) Underlying cause	(3)(4) Supporting function/rules	(5) Weaknesses
<p>RANCH SYSTEM: Low weight of ranch beef cattle, particularly in Sumbawa Island</p> <p><i>Why 1: Farmers use low quality calves largely from inbreeding</i></p> <ul style="list-style-type: none"> Limited knowledge of animal and breeding management at farmer level <p><i>Why 2: Unavailability of quality fodder during dry season in grazing area</i></p> <ul style="list-style-type: none"> Farmers depend on natural production and do not have a) knowledge of quality fodder production or b) understanding of the need for fodder cultivation <p><i>Why 3: Lack of water resources for cattle</i></p>	<p>Limited provision of information and knowledge on proper breeding management in ranches</p> <p>Limited information on quality fodder production and benefits of growing fodder among cattle farmers</p> <p>Weak physical infrastructure</p>	<p>Information and knowledge services</p> <p>Supply of inputs (e.g. seed for fodder) and relevant knowledge Infrastructure</p>	<p>Limited capacity and resources of public extension services</p> <p>Absence of private service provisioning</p> <p>Absence of public and (or) private provisioning of input and information</p> <p>Lack of public financing capacity for infrastructure development</p>
<p>ENCLOSED SYSTEM: Low weight of cattle in enclosed system, particularly in Sumbawa and remote areas of Lombok Island</p> <p><i>Why: Unavailability of good quality calves and inbreeding</i></p> <ul style="list-style-type: none"> Farmers' knowledge of proper timing of AI is low 	<p>Availability of AI service provider and distribution network of improved semen is weak</p>	<p>Input distribution; information and knowledge</p>	<p>Weak planning and coordination of public AI service delivery</p> <p>Limited number of private AI service providers with weaker</p>

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(1) Problem/symptom	(2) Underlying cause	(3)(4) Supporting function/rules	(5) Weaknesses
<ul style="list-style-type: none"> Farmers have limited access to effective and quality AI services 			capacity and low credibility (caused by perception and poor performance)
<p>ENCLOSED SYSTEM: Sub-optimal weight of cattle in enclosed system across the province</p> <p><i>Why: Low usage of supplementary feed</i></p> <ul style="list-style-type: none"> Farmers are not aware of the benefit of using supplementary feed Farmers do not know how to produce supplementary feed Non-availability of ready-to-use supplementary feed 	<p>Limited provisioning of knowledge and information on supplementary feed application and production for farmers</p> <p>Because of the limited awareness of farmers, market for ready-to-use supplementary feed is non-existent</p>	<p>Information and knowledge</p> <p>Input distribution and marketing</p>	<p>Limited capacity and resources of public and private agencies to popularise supplementary feed and production of supplementary feed at farm level</p> <p>Limited awareness and capacity of private companies in promoting usage of supplementary feed</p>

Annex 2: Identified market actors

Market actors

No	Description	Name	Address	Contact No.	Notes
1	Input supplier shops				
2	Cattle groups				
3.	Bull rental owners				
4.	Concentrated feed-making expert	Professor Ir. Chairussyuhur Arman, MSc, PhD	Kota Mataram, NTB	081238212849	Lecturer/ researcher, Farming faculty, University of Mataram
5.	Concentrated feed-making expert	Ir.H. Mastur, MSc	Kota Mataram, NTB	081803615515	Lecturer/ researcher, Farming faculty, University of Mataram

Annex 3: List of respondents interviewed

No	Name	Address	Job/Status	Contact No.	Note
1.	Lalu Sukri	Pemenang Barat village, KLU, NTB	Village chief	085339717476	
2.	Hamzanwadi	Pemenang Barat village, KLU, NTB	Livestock group chair	081907688225	
3.	Dody	Ganggalang village, KLU, NTB	Livestock group chair	085737976016	
4.	Muhadis	Ganggalang village, KLU, NTB	Livestock group chair	085237272999	
5.	Sofian Isnaini	Ganggalang village, KLU, NTB	Livestock group chair	082340980949	
6.	Ahmad Firman Zaki	Ganggalang village, KLU, NTB	Member of livestock group	085333633095	
7.	Sulasih	Ganggalang village KLU, NTB	Livestock group chair	-	
8.	Mahmud	Narmada village, West Lombok district, NTB	Livestock group chair	-	
9.	Dayat	Kopang sub-district, Central Lombok district, NTB	Livestock group chair	081803710981	
10.	Nengah	Jati Sari village, Ree sub-district, Sumbawa district, NTB	Livestock group chair	-	
11.	Made	Doro Kobo village Manggelewa sub-district, Dompu district, NTB	Livestock group chair	-	
12.	Abdul Hamid	Oi Saro village, Sanggar sub-district, Bima district, NTB	Livestock group chair	081239481713	
13.	Sarifudin	Oi Saro village, Sanggar sub-district, Bima district, NTB	Livestock group chair	081339776885	

No	Name	Address	Job/Status	Contact No.	Note
14.	Arsyad	Tolo Kalo village, Kempo sub-district, Bima district, NTB	Pengkadas breeder	-	
15.	A. Gani Yasin	Nunggi village, Wera sub-district, Bima district, NTB	Pengkadas breeder	-	
16.	Efendi	Oi Tui village, Wera sub-district, Bima district, NTB	Livestock group chair	082359458402	
17.	Suhardin	Pekat village Pekat Sub-district, Dompus district NTB	Livestock group chair	087866923369	
18.	Abu Jaya	Tawali village, Wera sub-district, Bima district, NTB	Livestock group chair	-	
19.	Ahmad Yasin	Nipa village, Ambalawi sub-district, Bima district, NTB	Livestock group chair	-	
20.	Mufnan	Oi Tui village, Wera sub-district, Bima district NTB	Village chief	-	
21.	Zulkarnain	Kore village, Sanggar Sub-district, Bima district NTB	Livestock group chair	081237304252	
22.	Dirmansyah.S.Pt	Taa village, Kempo sub-district, Dompus district, NTB	Livestock group chair	081238180438	
23.	H. Bahar	Kopang, Central Lombok district, NTB	Inter-province trader		
24.	H. Doris	Bima city, NTB	Inter-province trader		
25.	H. Marjan	Jatiwangi village, Asakota village, Bima city, NTB	Inter-province trader	085338895596	
26.	Pak Erwin	Turide Mataram city, NTB	Butcher	081915978169	
27.	Muhammad	Desa Tente Kec.Woha Kab. Bima, NTB	Butcher	085339538661	
28.		Kota Mataram, NTB	GNE Manager		
29.	Made Budiana	Kota Mataram, NTB	GNE Director	081936784949	
30.	H.Hasan	Seganteng, Mataram city, NTB	Skin crackers maker	-	
31.	Ibu Saidah	Majeluk, Mataram city, NTB	Meat retailer	-	
32.	Ibu Mariamah	Majeluk, Mataram city, NTB	Meat retailer	-	
33.	Prof. Ir. Chairussyuhur Arman, MSc, PhD	Mataram city, NTB	Teacher/researcher, Farming faculty, Unram	081238212849	
34.	Ir.H. Mastur, MSc	Mataram city, NTB	Teacher/researcher, Farming faculty, Unram	081803615515	
35.	Drh.Hijriah	Mataram city, NTB	BPTP, NTB	082146034633	
36.	Ir. Kaharudin	Mataram city, NTB	BPTP, NTB	081803603395	
37.	Baiq Rusniyati	Mataram city, NTB	Kabid Ekonomi Bappeda, NTB	081353646861	
38.	Rusmayadi	Mataram city, NTB	Bappeda, NTB	087865212313	
39.	Iis Isnaini	Mataram city, NTB	Bappeda, NTB	081907178698	
40.	Ir.Hj. Budi Septiani	Mataram city, NTB	Kadis Peternakan dan Kesehatan Hewan, NTB	0818365566	
41.	Ir.Safii	Sumbawa Besar, NTB	Ka.UPT Pakan Serading Sumbawa Besar	081339581634	
42.	Ir.Iskandar Zulkarnain	Mataram city, NTB	Kasi Ruminansia PKH department, NTB	081353641102	
43.	Ir. Isnan Zarkasi	Mataram city, NTB	Head of IB agency, NTB	-	
44.	Drh. Rr. Rizqomaryati	Mataram city, NTB	Testing section and quality supervision, IB agency, NTB	-	

No	Name	Address	Job/Status	Contact No.	Note
45.	Taufiqurahman, SPt	Mataram city, NTB	Testing section and quality supervision, IB agency, NTB	081339844944	
46.	Ir. Arifudin	Mataram city, NTB	Staff of Ruminant Fodder Development and Management Agency, NTB	-	
47.	H. Sudirman	Mataram city, NTB	Animal market manager, Selagalas, Mataram city	081803793979	
48.	Ir. Baharudin	Bima city, NTB	Head of livestock department, Bima district		
49.	Ir. Indra Jaya	Bima city, NTB	Head of Bappeda, Bima district	085239863159	
50.	DR.Mahjulan	Bima city, NTB	Kabid Ekonomi Bappeda, Bima district	08123106507	
51.		Bima city, NTB	Kabid IB livestock department, Bima district		
52.	Drs.Risman	Dompu, NTB	Kasi Ekonomi Bappeda Dompu district	081339753555	
53.	Ir.Syafrudin Nur	Sumbawa Besar, NTB	Head of livestock department, Sumbawa district	081353445714	
54.	Ir.Lutfi	Sumbawa Besar, NTB	Kabid. livestock department, Sumbawa	087865130169	
55.	Ir. Qori Baladewa	Sumbawa Besar, NTB	Livestock department staff, Sumbawa	081915847797	
56.	DR.Amry Rachman	Taliwang Sumbawa Barat	Head of Bappeda, West Sumbawa	08123705175	
57.	Mars	Taliwang Sumbawa Barat	Kabid. Ekonomi Bappeda, West Sumbawa	082342255009	
58.		Taliwang Sumbawa Barat, NTB	Head of livestock department, West Sumbawa		
59.	Drh. Hairul Jibril MM	Taliwang Sumbawa Barat, NTB	DKPP Secretariat KSB		
60.	Kusmirin S.Pt	Taliwang Sumbawa Barat, NTB	Kabid Peternakan DKPP KSB, NTB		
61.	Ir. Gunardi	Bima city, NTB	Secretariat of Agriculture and Livestock department, Bima city	082146034035	
62.	Arif Rahman.S.Pt	Bima city NTB	Kasubag Programme, livestock department Bima district		
63.	Abdul Haris.S.Pt	Taa. village, Kempo sub-district, Dompu district, NTB	Head of UPT livestock, Kempo sub-district, Dompu district		
64.	Chandra	Taa.village, Kempo, sub-district, Dompu district, NTB	IB livestock department staff, Dompu district		

No	Name	Address	Job/Status	Contact No.	Note
65.	Ir.Guntur	Kore village, Sanggar sub-district, Bima city, NTB	Ka.UPT livestock, Sanggar sub-district, Bima city		
66.	Herfan	Sori village, Tatanga Kec.Pekat Kab., Dompu district, NTB	Ka.UPT Feed Installation, Sori Tatanga.	081917622775	

Annex 4: Investigation team

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