Food and Agriculture Organization of the United Nations

Ministry of Agriculture,
Livestock and Irrigation

LIFT

GOVERNMENT OF THE REPUBLIC OF THE UNION OF MYANMAR

Formulation and Operationalization of National Action Plan for Poverty Alleviation and Rural Development through Agriculture (NAPA)

Working Paper - 2

LIVESTOCK PRODUCTION, EXTENSION AND APPLIED RESEARCH

Yangon, June 2016

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ACRONYMS

AnGR	Animal Genetic Resources
ASEAN	Association of Southeast Asian Nations
CAHW	Community Animal Health Workers
CDC	City Development Committee
FDA	Food and Drug Administration
FMD	Foot and Mouth Disease
FAO	Food and Agriculture Organization of the United Nations
FETPV	Field Epidemiology Training Program for Veterinarians
GDP	Gross Domestic Product
HPAI	Highly Pathogenic Avian Influenza
HS	Haemorrhagic Septicaemia
LBVD	Livestock Breeding and Veterinary Department
LFME	Livestock Feed and Milk Enterprise
MBA	Ministry of Border Affairs
MoH	Ministry of Health
MoLFRD	Ministry of Livestock, Fisheries and Rural Development
MLF	Myanmar Livestock Federation
MVC	The Myanmar Veterinary Council
MVA	Myanmar Veterinary Association
NAPA	National Action Plan for Agriculture
PPR	Peste de Petites Ruminants
PRRS	Porcine Reproductive and Respiratory Syndrome
UVS	University of Veterinary Science

EXECUTIVE SUMMARY

Livestock plays a key role in the Myanmar agriculture sector. Farmers raise animals in smallholder livestock-cropping systems. They use cattle and buffalo for draught power, and pigs, chickens and ducks for cash income. In some areas, farmers collect milk from their cows and raise sheep and goats for additional income. Livestock mitigate poverty and the animals serve as a capital reserve in times of emergency.

Farmers close to or within urban areas raise livestock under commercial conditions. They raise layer and broiler chickens, pigs, dairy cattle and quail. This sector is dominated by relatively small family-run farms. The commercial sector is not well developed compared to other countries in the region. In recent years, there have been significant increases in the number of chickens and pigs raised in commercial conditions.

The key to reducing poverty and developing rural areas through investment in the livestock sector is raising smallholder incomes via improved livestock productivity and increasing the numbers of livestock raised.

Productivity gains rely on improving the health, feeding and breeding of smallholder livestock. Addressing these issues will require a comprehensive approach for investment in policy development, institutional capacity, inputs and services, including extension and applied research.

The specific areas of recommended investments are divided into three categories: national programmes, area-based programmes and commodity/subsector programmes. The recommended areas for investment are shown in the table below:

Programme type	Title	Period	Anticipated cost (US$ million)
National programmes	National Animal Health Programme	15 years. Pilot phase 5 years, expansion phase 10 years	US$60
	National Forage/Fodder Programme	15 years. Pilot phase 5 years, expansion phase 10 years	US$50
	National Livestock Breeding Programme	15 years. Pilot phase 5 years, expansion phase 10 years	US$40
	Education, Training and Research	15 years. First phase 5 years, expansion phase 10 years	US$20
Regional programmes	Central Dry Zone	15 years. First phase 5 years in one zone (e.g. Dry Zone), followed by expansion to other zones (10 years)	US$20
	Upland (Shan)		
	Upland (Chin)		
	Delta/coastal region		
	Rakhine		
Sector programmes	Duck sector development	5 years	US$3

1. INTRODUCTION

This technical study was conducted from 15 September to 16 October 2014.

The mission met stakeholders from all levels involved in the livestock sector. They included farmers raising livestock in smallholder (cattle, sheep/goats, pigs, chickens, ducks) and commercial (layer and broiler chickens, pigs, ducks) subsectors; actors providing inputs and services (e.g. private veterinarians, community animal health workers, medication retailers, credit suppliers); staff from the Livestock Breeding and Veterinary Department (LBVD) at all levels; staff of the Department of Rural Development at township and national levels; staff of the Ministry of Cooperatives at the township level; staff of the University of Veterinary Science; members of the Myanmar Livestock Federation (MLF), Myanmar Veterinary Council (MVC) and Myanmar Veterinary Association (MVA); senior staff of the Ministry of Livestock Fisheries and Rural Development, including Deputy Minister U Khin Maung Aye.

The mission included field trips to the states/regions of Magwe, Mandalay, Sagaing, Ayeyarwaddy, Bago and Yangon, as well as to Nay Pyi Taw and Yezin.

The mission report draws on FAO's *Myanmar livestock sector study* of 2011, also authored by the consultant, for general information and data.

The consultant would like to acknowledge all those who gave their time and provided valuable information to the mission, and to NAPA staff for providing logistical support.

2. BACKGROUND

2.1 Contribution to the overall national economy and farming systems

Myanmar is an agrarian country and the agriculture sector is the backbone of its economy. The agriculture sector contributed 36 percent of the GDP in 2013 and employed 63 percent of the labour force. About 75 percent of the total population resides in rural areas and is principally employed in the cropping, livestock, fishery and forestry sectors for subsistence.

Table 1: GDP and GDP per capita 2000-2013

Item	**Units**	**Year**		
		2000	**2005**	**2013**
GDP	US$ million	6 514	11 931	24 743
GDP per capita	US$	134	238	465
Share of sectors in GDP				
Agriculture	%	53	47	36
Mining, manufacturing, utilities	%	9	14	20
Wholesale, retail trade, restaurants and hotels	%	23	22	21
Transport, storage and communications	%	8	11	15
Construction	%	2	4	5

Source: ESCAP.

Within the agriculture sector, livestock plays a critical role in smallholder mixed crop-livestock systems that dominate the sector. Commercial livestock farms, especially layer and broiler chickens, pigs, ducks and to a lesser extent dairy cattle are also important components.

Income and employment. The livestock sector provides income and employment in both the public and private sectors. Labour in the private sector is both casual and permanent for people who raise animals, provide inputs and services, and who trade, transport, slaughter, process livestock and sell livestock products. Inputs include animal vaccines, medicines, feed and equipment for commercial farms. Services include public and private veterinary clinics. Governance of the supply chain, such as testing, inspection and regularity systems also provide employment in the public and private sectors as do education and training.

Efficiency of smallholder livestock-crop farming systems. Livestock contributes to the efficiency of smallholder farming households through livestock-crop farming systems. Cattle and buffalo supply most of the draught power in soil preparation for cropping in lowland areas, and their manure is used as fertilizer. Cattle and buffalo also provide the draught power for transportation in rural areas. Cattle, buffalo, sheep and goats make use of low quality residues (e.g. rice straw, crop stubbles) and crop by-products in farming systems. Some of the cows in smallholder systems provide milk for human consumption. In upland areas, especially in Chin State, 'Mithun' (*Bos frontalis*) cattle graze and are used for home consumption and ceremonies. Pigs make use of rice bran and other crop by-products, and household wastes. Village chickens act as scavengers in villages, and are used for home consumption or for social purpose such as ceremonies. Ducks utilize waterbodies and feed in growing and harvested rice fields.

Smallholder farming system economies. Livestock is an integral feature of the economies of smallholder systems. Farm animals act as income and saving mechanisms; they also serve as household capital that can be utilized when required. Smallholders commonly use borrowed funds to buy livestock. Landless and poor households in rural villages raise livestock to escape from the poverty trap.

Enhancing the social fabric. Livestock contributes to the social and natural capital of rural areas. Farmers take pride in their animals and discussions on various aspects of animal husbandry and trading are part of the social discourse in rural areas. Conversely, the demand for family labour to look after livestock (especially grazing animals) can, as with other agricultural activities, reduce time spent by youngsters in schools.

More income through intensification. *Farmers can increase income by intensifying their production. They can increase the number of livestock they raise, while limiting their additional investment in land.* This is done mostly with chicken layers, chicken broilers and pigs, but also to a more limited extent with ducks and dairy cattle. Commercial chicken layers provide the population with eggs and meat from semibroilers and cull layers. Commercial chicken broilers provide high-quality meat. Commercial duck farms provide eggs and meat from cull layer ducks. Commercial pig farms supply meat and fat. Commercial dairy farms provide milk and meat from culled animals. Commercial quail farms supply eggs to the market. These commercial farms are strongly linked to the crop sector owing to their high demand for feed. Private sector firms are active in the animal feed industry. Apiculture is mainly carried out by smallholders. While large commercial farms provide employment for hired labour, smaller-scale commercial farms are essentially family businesses with occasional casual labour.

Food security and nutrition. The livestock sector supplies high-quality nutrients (mainly protein but also energy sources such as fat, carbohydrates and micronutrients) through meat, eggs, milk and honey to consumers. The sector makes a considerable contribution to the domestic demand for meat and eggs, with some meat being imported for high-end markets in urban areas, and some eggs being imported from China, mainly for areas near to the Chinese border. The sector provides a portion of the domestic demand for milk and milk products, and a portion of the domestic demand for honey. Meat competes with fish as a high-quality protein source.

Fish farming systems. Many farmers raise layer or broiler chickens, ducks or pigs near fish ponds. The livestock waste is an input to the fish production system and this contributes to the overall farm economy. However, the risk of residues in the fish poses a potential problem, which needs to be assessed by the fishery sector.

Enhancing crop and vegetable production. Manure from commercial farms (layer and broiler chickens as well as pigs) is used as fertilizer for crops and vegetable plots.

Draught power in the forestry sector. The use of elephants for draught power allows selective logging, which is generally understood to promote the extraction of valuable timber while leaving the forest otherwise intact.

Export income. There are informal and formal exports of live cattle, buffalo, sheep, goats and pigs, and formal sales of salted hides and skins. The informal nature of much of the trade, especially the live cattle and buffalo trade, as well as the uncertainty in official livestock statistics, makes it difficult to estimate the total quantity and value of the trade. Myanmar also imports livestock and livestock products.

Occasional threats to humans. Livestock can on occasion pose a threat to humans. Diseases can be transmitted from sick or dead animals such as avian influenza from chickens, anthrax from cattle, buffalo and pigs, and rabies from dogs. Livestock products meant for consumption can pose a threat to humans if they contain pathogens that have become established in edible organs during the animal's life, or during processing or storage.

Potential threat to the environment. Solid, liquid and gaseous waste (faeces, urine, rumen gases) from the livestock sector can have negative effects on the environment. Waste from commercial pig farms is usually in the form of slurry and is a challenge to manage, especially if pigs are raised on a small-scale basis in non-rural (urban or peri-urban) settings. Waste from slaughterhouses is also a challenge to manage. Gases from ruminants and emissions from manure decomposition contribute to build-up of carbon dioxide in the environment and thus contribute to climate change and its impacts. Offensive smells can be a problem when large numbers of livestock are raised near populated areas. Grazing cattle, sheep and goats can damage the environment via overgrazing.

3. SPECIFIC AREAS/ASPECTS UNDER REVIEW

3.1 Conceptual framework

The overall conceptual framework for the livestock sector is shown in Figure 1. The systems and functions of the livestock sector are categorized into Policy, Institutions, Value Chain, and Data and Information for sector performance.

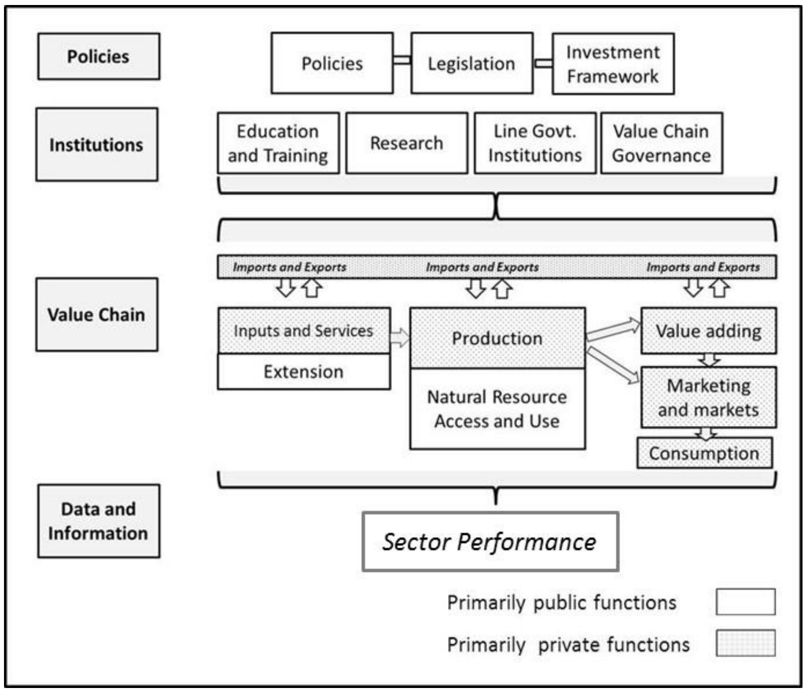

Figure 1: Conceptual framework for the livestock sector

Instruments and functions that provide the overall framework in which sector-specific activities occur are grouped at the policy level. These include policy, legislative and investment frameworks.

Education and training institutes, research, line government institutions responsible for the sector, and functions around value chain governance are part of the institutional level.

Inputs and services, e.g. vaccines, medicine, feed, equipment and supplies; extension services; livestock production; natural resources (land, water, grazing areas, feed) utilized for production; value-adding activities such as slaughtering, processing, packaging, wholesale, retail; marketing and markets; consumption of livestock products; imports and exports of inputs and services, production factors, and value-added, wholesale and retail items are found in the livestock value chains.

The data and information level pertains to what feedback is collected and managed to assess sector performance against the various policies and policy objectives which guide the sector.

3.2 Sector stakeholders

Stakeholders involved in policy, legislation and governance; supplying inputs and services; production; and downstream activities such as marketing and value adding, as well as consumption of livestock products are listed in Table 2.

Table 2: Livestock sector stakeholders

Agencies involved in policy, legislation and value chain governance	
Livestock Breeding and Veterinary Department (LBVD)	
City Development Committees (CDC)	
Food and Drug Administration (FDA) of the Ministry of Health	
Myanmar Veterinary Council (MVC)	
Myanmar Veterinary Association (MVA)	
Myanmar Livestock Federation (MLF)	
Educational institutions	
University of Veterinary Science (UVS)	
Input and service providers	**Producers**
Private veterinarians	**Rural smallholders who raise:**
Animal health assistants	*Native cattle and buffalo for draught*
Community animal health workers	*Native dairy cattle*
Traditional animal healers	*Cross-bred dairy cattle*
Private sector vaccine and medicine importers, distributors and retailers	*Sheep and goats*
Farmers growing crops destined for livestock feed	*Pigs*
Animal feed millers, distributors, retailers	*Backyard chickens and ducks*
Livestock equipment suppliers	Mithun *cattle*
Formal and informal credit agencies	Peri-urban smallholder pig owners
Artificial insemination centres	**Commercial farmers:**
LBVD producing, distributing and delivering selected vaccines	Commercial layer chickens
Downstream actors	Commercial broiler and semibroiler chickens
Live animal buyers, traders and transporters	Broiler chicken parent hatcheries
Live animal exporters/informal traders	Layer chicken parent hatcheries
Live animal market managers and workers	Small commercial quail farmers
Slaughterhouse owners, managers and workers	Commercial layer ducks
Meat distributors and retailers	Duck layer breeders and hatcheries
Livestock product (milk, eggs, hides) collectors, transporters, processors, distributors, retailers	Smallholder commercial meat ducks
Livestock/product importers	Commercial cross-bred dairy cattle
Meat and hide exporters	Commercial sheep and goats
Consumers	Commercial pigs
Domestic: Smallholder producers, domestic rural and urban population	Honey bees
Other populations who consume exported items (mainly meat from cattle, sheep and goats)	Other: Rural and urban dog owners (and strays); horses and pony owners

3.3 Livestock populations

There is significant variation in the locations where livestock is raised, depending largely on the prevailing agro-ecological zone, farming system and distance to markets. Buffalo are concentrated in the delta and coastal areas, as well as some upland areas. Cattle are spread throughout smallholder farming systems, but are found in high concentrations in the Dry Zone. Sheep and goats are concentrated in the Dry Zone. Cattle, sheep and goats are perfectly suited to the Dry Zone environment where the farmers essentially do not have to pay for any of the feed for them, unless they eat someone's crop and they have to pay a fine.

Chickens, including backyard chickens, are found throughout smallholder farming systems. Commercial layer chickens are concentrated in the Taunggyi area of Shan State, and near Mandalay, while broiler chickens are common near the main consumption centres of Mandalay and Yangon. Pig husbandry is focused in the delta and near Yangon, as well as in some townships of Magwe, while the main dairy cattle production occurs in the Mandalay and Yangon areas.

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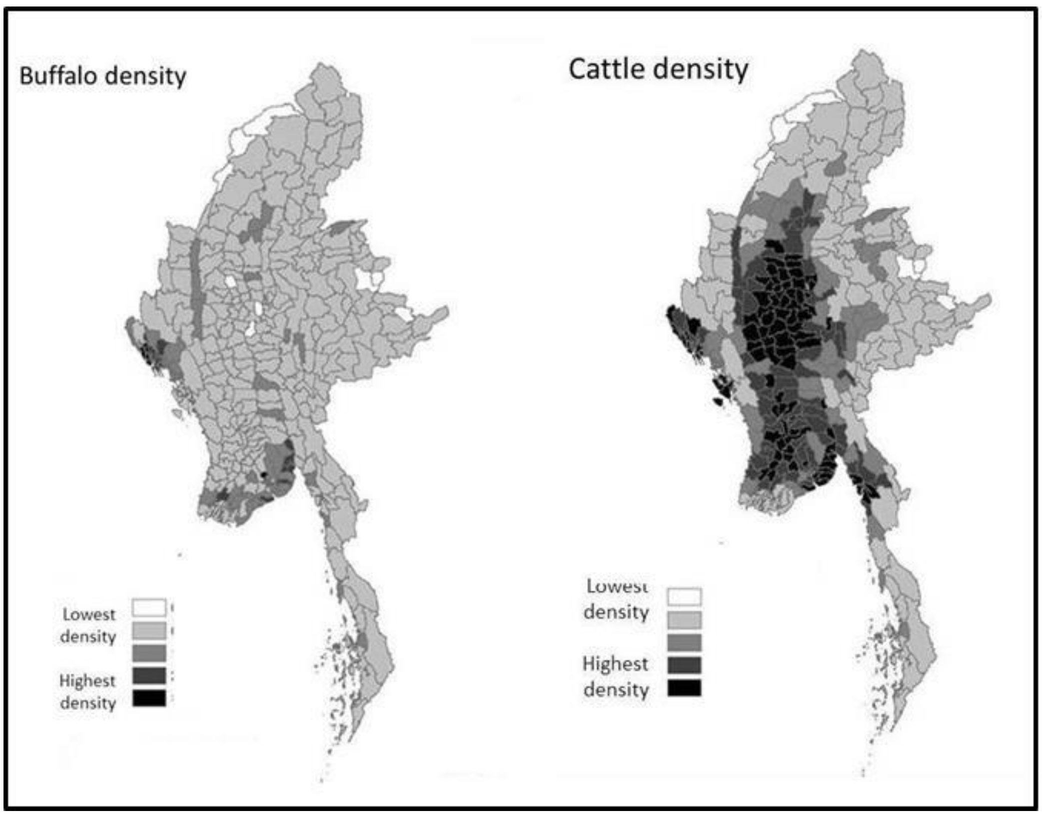

Figure 2: Buffalo and cattle density by township

Source: LBVD (2010).

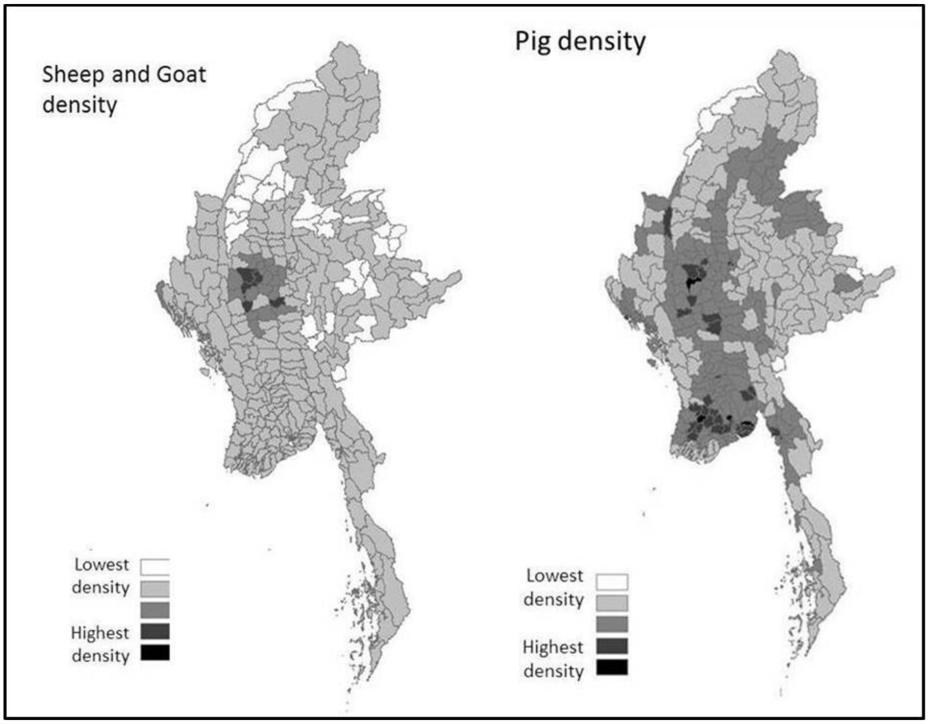

Figure 3: Sheep, goat and pig density by township

Source: LBVD (2010).

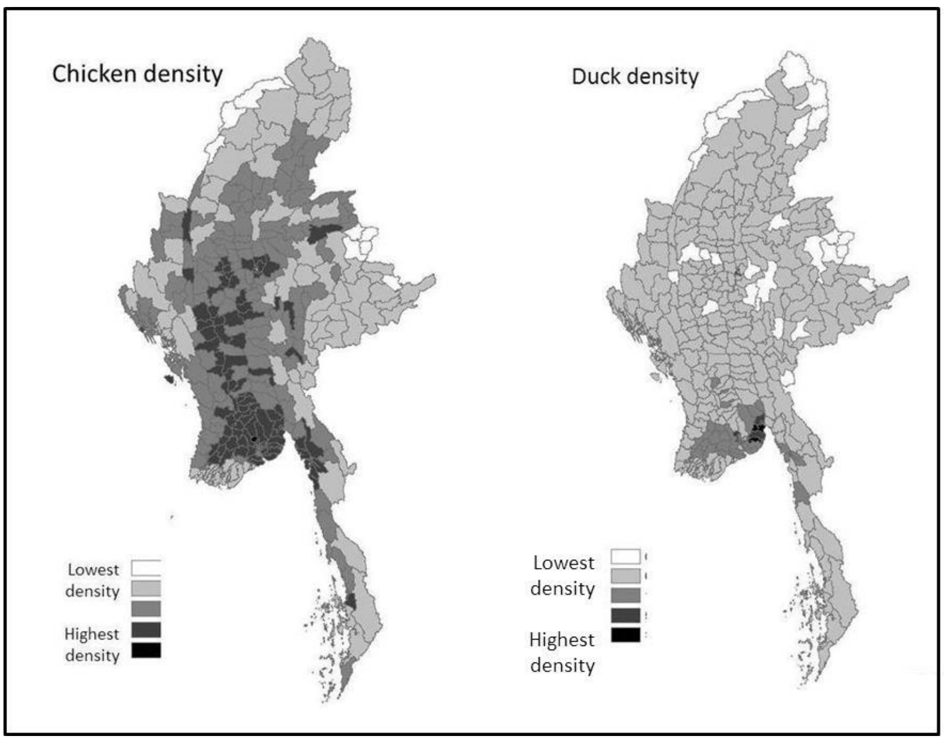

Figure 4: Chicken and duck density by township

Source: LBVD (2010).

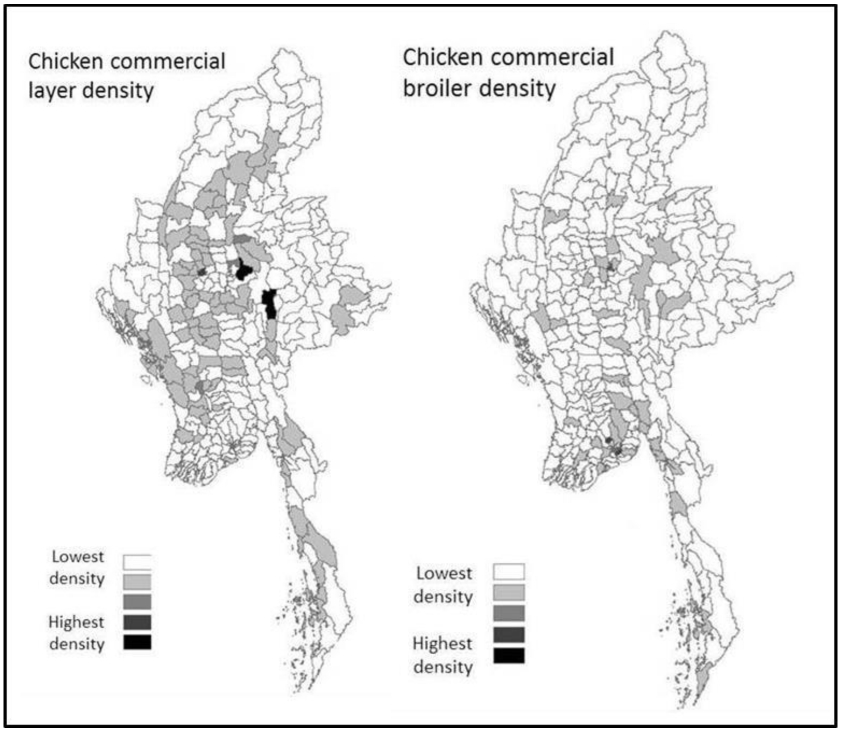

Figure 5: Commercial layer and broiler chicken density

Source: LBVD (2010).

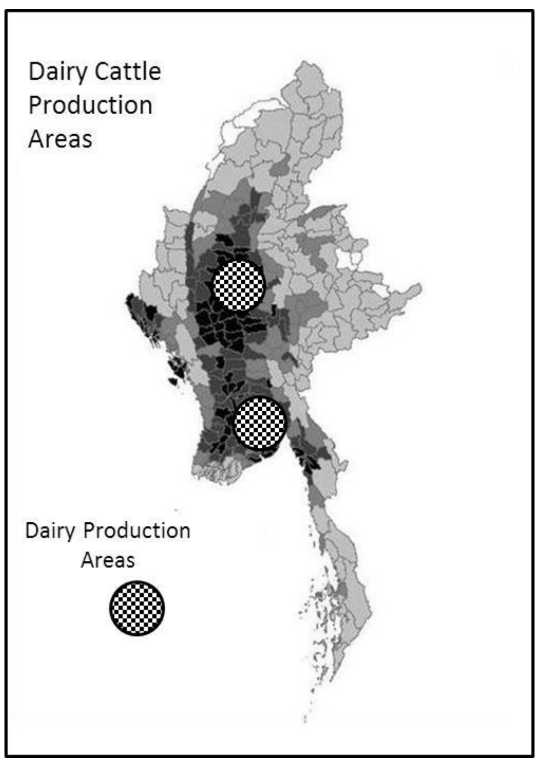

Figure 6: Dairy cattle production areas

Source: LBVD (2010).

When aggregated to the agro-ecological zone level, different patterns of livestock raising can be seen, both in the context of the cropping system, but also in the context of broader agricultural activities such as fisheries and forestry, and in relation to issues such as land tenure. This analysis indicates that livestock plays an important role in farming systems in all agro-ecological zones. In terms of general trends, the following are significant:

The Dry Zone is a very important area for livestock production, and arguably is the zone where livestock plays the most important role in farming systems. The zone is especially important for cattle, sheep and goat production.

The delta and coastal areas have high populations of buffalo, pigs and ducks.

Dairy cattle are concentrated largely in the Mandalay region of the Dry Zone, and Yangon Region where there is good access to markets.

Pigs are important in the upland areas in Chin State near the Indian border, where there is active export trade of live pigs to India.

Table 3: Agro-ecological zones

	Hilly and mountainous	**Central Dry Zone**	**Delta**	**Coastal**
States/ regions	Kachin, Kayan, Shan, Chin states	Sagaing, Mandalay, Magwe regions	Ayeyarwaddy, Bago, Yangon regions	Rakhine, Mon states, Tanintharyi Region
Topography	High mountain ranges and forests; crops in valleys, shifting cultivation in uplands	Flat topography; arid, semi-arid conditions; some paddy grown in riverbank areas	Lowland paddy monoculture	Narrow, low lying coastal regions rising towards hilly regions
Crops	Northern: Rice-vegetables Pulses-groundnut Rice-rape seed Tea/coffee Western Yoma: Maize-rice Rice-pulses/oilseeds Rice-rice Shan Plateau: Potato-wheat/niger Rice-vegetables Mandarin/pear/coffee/tea	Sesame-groundnut Rice-pulses/oilseeds Rice-cotton Groundnut/pigeon pea mixed Sesame/pigeon pea mixed Mango/banana/guava etc.	Ayeyarwaddy: Rice-rice Rice-pulses Mango/banana Bago: Rice-pulses Sugar cane Rice-cotton Rice-rice Rice-pulses Sittaung River Basin: Rice-rice Rice-pulses	Rakhine Coastal: Monsoon rice-green gram Monsoon rice-pulses Monsoon rice-vegetables Coconut/rubber/oil palm/cashew/durian Tanintharyi: Rice-rice Rice-vegetables Jute Rubber/oil-palm /coconut/cashew /durian
Livestock	Buffalo, cattle, pigs, chickens, Mithun cattle; commercial chicken layers in the Taunggyi area	Cattle, sheep, goats, pigs, chickens; commercial pigs, chickens (layers, broilers) near Mandalay	Buffalo, cattle, pigs, ducks, chickens; commercial duck raising, pigs, chickens	Buffalo, cattle, pigs, ducks, chickens
Fisheries	Relatively low importance	Inland capture along	Marine capture	Marine capture

		rivers	Inland capture Leasable fisheries Aquaculture	Inland capture Leasable fisheries Aquaculture
Forestry	High importance: afforestation is a key issue; agroforestry on farming land	Afforestation is a key issue; agroforestry on farming land	Mangrove loss due to cropping expansion and wood for fuel	Mangrove loss due to cropping expansion and wood for fuel
Land tenure issues	Land issues related to shifting cultivation, customary practices and community titling	Increasing landlessness; area held by smallholders is beginning to shrink	Increasing landlessness; area held by smallholders is beginning to shrink	Destruction of mangrove ecosystems

Distance and access to markets – both for inputs and output products – and climatic conditions also affect the location of livestock production. Within urban areas, pigs are raised in backyard conditions to supplement people's incomes from urban-based employment. There are no hard data available on the number of households raising pigs in such a fashion, but this was highlighted when the Porcine Reproductive and Respiratory Syndrome (PRRS) disease struck Myanmar in 2011, and high mortality was witnessed in pigs in the urban Mandalay area. In peri-urban, or rural areas close to urban areas, there is a range of commercial intensive production systems. These include broiler chicken farms, layer chicken farms, intensive pig farms, commercial dairy cattle and commercial duck farms. Smallholder farms dominate the more distant rural areas, but some commercial enterprises are also found, such as the large concentrations of commercial ducks in the Bago and Delta areas and chicken layers in the Taunggyi area and in Monywa District in Sagaing Region. The Taunggyi area has a favourable climate for layer production.

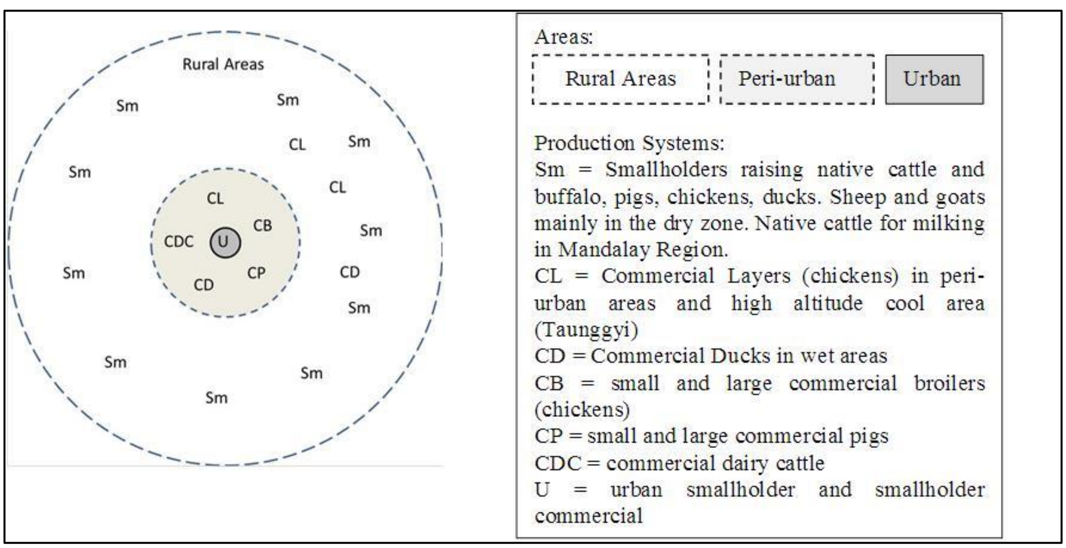

Figure 7: Location of farms in relation to urban areas

Source: FAO (2011).

The breeds of livestock raised by farmers vary according to production system and local environmental conditions. Draught cattle mostly comprise two breeds – the Shwe Ni breed is red in colour and dominant in Lower Myanmar, while the Pyar Sein breed is white and dominant in the Dry Zone and Upper Myanmar. Exotic dairy cattle are mostly various levels of cross between Holstein Friesian and local breeds. There are few or no pure breeds of exotic bovine cattle but artificial insemination with bovine semen is starting in some areas. Buffalo are of the swamp variety with no breed divisions, although it is reported that buffalo in upland areas are generally larger in size than those in lowland areas.[1]

Landrace, Yorkshire, Duroc and Berkshire pig breeds are found in most lowland backyard smallholder systems, with smaller black native pigs extant in upland areas. Backyard chickens are mostly described as 'native breeds'. Goat breeds vary between districts; there are two major types: black and white with drooping ears and their red counterparts. There seems to be little variation in sheep breeds – they are referred to simply as native breeds. Commercial layers and broilers are specialized imported breeds. Commercial layer ducks are local breeds with apparently little imported breed types being introduced.

3.4 Recent sector history

The total population of the major livestock species is shown in Table 4.

Table 4: Livestock population in Myanmar, 2013-2014

Species	Head (million)
Chickens	217.1
Ducks	18.3
Cattle	15.0
Pigs	12.6
Goats	5.0
Buffalo	3.3
Turkey/Geese/Muscovy ducks	1.3
Sheep	1.0

Source: LBVD.

All livestock species have increased in numbers over the last two decades, but the increase has varied by species. The trends in livestock populations are shown in Figures 8 and 9.

Chicken populations have increased the most. While there was relatively low net growth in 1985 to 1997, rapid growth occurred subsequently. This can be only partly explained by the increase in commercial layer and broiler chicken populations during this period. In 2009, the combined commercial layer and broiler population was estimated to be about 12 million, or about 7 percent of the total reported chicken population. It has been suggested that the backyard chicken population has increased substantially due to the application of Newcastle Disease vaccine, but this is not fully verified. Pig and duck populations have both grown significantly from 2000 onwards. Both goat and sheep populations have increased significantly with goats growing more

[1] *National report on animal genetic resources*, The Union of Myanmar, National Consultative Committee, Myanmar.

than sheep. Cattle and buffalo have grown more steadily. The data do not enable an estimation of the rise in the number of cross-breed dairy cattle, but it is well-recognized that these cattle have increased in numbers in the last 15 years or so.

The increase in livestock populations, especially in chickens and pigs, and to a lesser extent in dairy cattle, has widespread implications for both private and public sector actors in the whole sector, which is discussed later in this report.

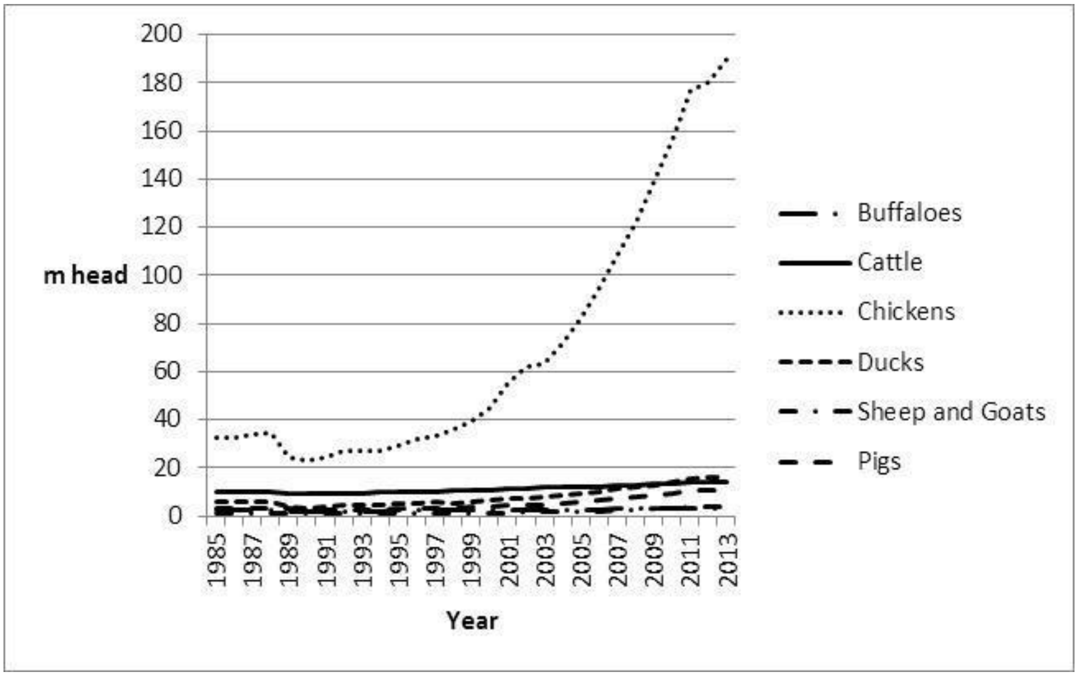

Figure 8: Livestock populations, 1985-2013

Source: FAOSTAT.

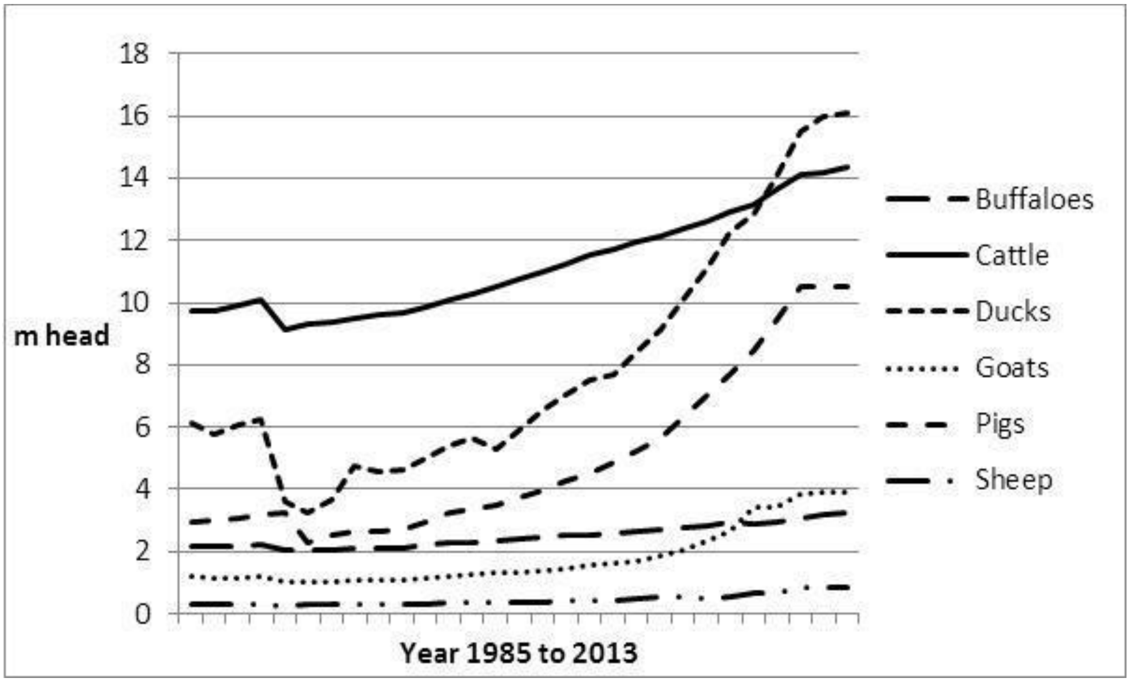

Figure 9: Livestock populations 1985-2013, not including chickens

Source: FAOSTAT.

3.5 Livestock producers

Livestock producers are the central actors of the sector; estimates of the numbers and types of producers in the major smallholder and commercial sectors are shown in Table 5.

Table 5: Estimated numbers of producers

Producer	Estimated no. farms	Head or other unit (million)	Details	Source
Smallholder households*	8.2 million households	C: 15 B: 3.3 DC: 0.6 G: 5 S: 1 D: 7.7 Ch: 127 M: 0.3	Includes households that own livestock (draught cattle and buffalo, dairy cattle, pigs, ducks, chickens, sheep, goats, Mithun cattle) and households that raise them on contract or share farming arrangements	Estimate of rural population from 2014 census
Commercial layer ducks	48 238 farms	5.5	Small: 33 480 farms: less than 150 ducks Medium: 260 farmers with 500-999 ducks Large: 119 farms with 1 000-4 999 ducks Very large: seven farms: over 5 000 ducks	FAO-LBVD survey (2009)
Commercial layer chickens	3 777 farms	6.6 m	Small: 3 235 farms: 500-2 000 birds Medium: 316 farms: 2 000-5 000 birds Large: 226 farms: 5 000 birds	FAO-LBVD survey (2009)
Commercial cross-bred dairy	1 216 farms	19 367	Small: 805 farms with 6-10 head Medium: 230 farms with 11-20 head	FAO-LBVD survey (2009);

cattle			Large: 124 farms with 20-50 head Very large: 56 farms with over 50 head	The Myanmar Dairy Sector (2014); mission estimates
Commercial pigs	566 farms	57 352	Small: 442 farms with 20-49 head Medium: 124 farms with 50-999 head Large: 7 farms with over 1 000 head	FAO-LBVD survey (2011)
Commercial broiler chickens**	505 farms	1 861 708	Small: 189 farms: less than 1 000 birds Medium: 221 farms: 1 000-5 000 birds Large: 95 farms: over 5 000 birds	FAO-LBVD survey (2009)
Commercial sheep and goats	110 farms	57 000	Medium: 106 farms with 100-999 head Large: 4 farms with over 1 000 head	FAO-LBVD survey 2011
Apiculture	720	62 000 beehives	Small: 600 farms: 50-300 beehives Medium: 100 farms: 300-600 beehives Large: 20 farms: over 600 beehives	LBVD
* C = cattle; DC= dairy cattle (native or cross-breed) SG= sheep and goats; D = ducks; Ch = chickens; M = Mithun cattle				
** This also includes so-called ‘semibroiler’ farms which are farms where the male chickens from layer production systems are grown for sale as meat.				

Smallholders

Smallholders generally raise livestock as a component of mixed crop-livestock farming systems, in what can be termed as traditional or ‘low-input low-output systems’. Probably the easiest way to understand how livestock is used is to divide households into two types: those with and without land. While hard data are not available, if it is assumed that there are about 8.2 million smallholder households in rural areas, about 2.2 million households (30 percent) are considered as landless.

Households with land and who practise cropping use either pairs of working bullocks, or pairs of buffalo (either male or female), or individual buffaloes for draught power for operations such as soil preparation, threshing and transport. They either own the animals, or rent them from other farmers. They use the manure to fertilize their fields, often supplemented with additional manure they have bought from other farmers. The more land they have, the more draught animals they need. As a guide, one pair of animals can prepare the soil of 2.5 to 3 ha in a season. As farmers often use the draught animals for a variety of jobs through much of the year, they often prefer to look after these animals themselves rather than hiring other people to do so, feeding them well so they can work well. Some of these households will not own their own breeding cows, preferring to buy the draught replacements from households who do. Alternatively, many better-off households own cows but contract other farmers, usually the poor or landless who have available labour, to look after them and pay them either in cash or a share of the calves. Mechanization of draught power is on the increase, with some farmers either owning or renting tractors. Mechanization has been most rapid in peri-urban farming of pulses and vegetables.

Farmers who own draught cattle or buffalo also have considerable complementary assets such as ploughs, harrows and carts.

Landless households[2] often raise livestock for cash income. They may raise breeding cows or buffalo, as they do not need draught animals. They can sell the calves and old cows for cash income. In the Dry Zone, they raise sheep and goats so they can sell the young animals and old-aged culls for cash. Although 'landless' in the sense that they do not own land for cropping, they can freely utilize the land not suitable for cropping and cropped land when it is not being cropped, to graze their livestock, or browse in the case of goats. Landless households, who tend to be poorer, will look after the cows, calves, sheep and goats of the better-off households for cash income or for a share of the offspring.

Based on an estimated average flock size of 30 head, it can be estimated that about 118 000 farmers raise small ruminants in Myanmar. Magway Region has the highest proportion of small ruminant farmers, with about 5 percent of households raising small ruminants. However, when examined at a village or village tract level, it is apparent that in some villages up to 50percent of households may raise sheep or goats.

Some farmers own breeding males – bulls or boars - and make some income from farmers who pay for mating services.

Many households, especially in Mandalay Region, collect some milk every day from their native-breed cows in the morning before the calf has had a chance to drink it, and sell it to a local trader who processes it into a variety of local products for sale, including to local tea-shops.

Households of any wealth or land category in any farming system can raise pigs which they feed generally low quality crop by-products and maybe a few feed scraps from the house. Pigs are especially important in the delta and coastal areas, where rice bran and broken rice are feed sources. While it is difficult to generalize, the wealthier households, or at least those that wish to invest more in pigs will own one or two sows. They feed them low quality feed and sell the piglets. The sows are quite a high investment; they need to keep feeding them all year and some skill is required to get them to give birth, stop them from squashing their piglets, get their piglets to suckle and keep the piglets alive long enough to sell them. If poorer farmers have enough money and feel like taking a risk, they can buy one to two piglets and feed them for six to eight months. If other farmers have more money and want to take on more risk, they can buy more. The matured pigs are sold for cash.

Households of any kind can have a few chickens running around the house and scavenging whatever they can for feed, sometimes feed from pigs, sheep and goats, and occasionally being thrown some scraps from the house. The chickens are either sold, eaten or used as gifts.

Dogs – not to be ignored – are a constant feature of village life; while not necessarily a source of income, there is always a suspicion that they could bite someone and transmit rabies and this should not be overlooked.

An example of the mix of livestock raised by smallholders, and of the asset value held in livestock is well illustrated by a survey of farmers in the Dry Zone. Table 6 shows the mix of

[2]In the LIFT baseline survey, 42.6 percent of households in the dry zone were landless; figures are reported to be lower in upland and delta areas.

livestock assets owned or managed by farmers in several villages in Myingyan Township, from an FAO/UVS survey in 2009. The table shows that nearly all households raise livestock of some type or another, and that there is a range of livestock enterprise mixes. More than half of all households raised only cattle, while many farmers raised various combinations of cattle, sheep/goats, pigs and chickens. Further analysis would show further variations, because cattle can include breeding or draught cattle; sheep/goats can be either mixed or single species flocks of either type; pigs can include either breeding sows or pigs for fattening.

The importance of livestock is further illustrated when looking at asset values. Based on the populations and assumptions in the table, the average asset value per household for livestock was nearly US$2 000. This is approximately the value of 4-5 acres of agricultural land.

Table 6: Mix and value of livestock owned/managed by farmers in several villages in Myingyan Township

Household (hh) category*	No. hh	Total head per farmer category				Average head/hh by farmer category				Average asset value US$ per hh**
		Cattle	Sheep/ goats	Pigs	Chickens (hens)	Cattle	Sheep/ goats	Pig	Chicken (hens)	
C.SG.P	2	23	89	5		12	45	3		**6 505**
C.SG.P.Ch	3	23	69	42	16	8	23	14	5	**4 703**
C.SG.Ch	6	37	242		50	6	40	0	8	**4 105**
C.SG	18	90	613			5	34			**3 362**
C.P.Ch	23	140		140	219	6		6	10	**2 768**
C.Ch	108	615			679	6			6	**2 297**
SG.P	1		40	10			40	10		**2 100**
C	481	2 245				5				**1 867**
C.P	28	115		79		4		3		**1 784**
SG.Ch	3		111		19		37		6	**1 499**
SG	12		367				31			**1 223**
SG.P.Ch	3		82	3	9		27	1	3	**1 152**
P.Ch	2			7	4			4	2	**181**
P	6			20				3	0	**167**
Ch	1				15				15	**45**
None	7									**0**
Total	704	3 288	1 613	306	1 011					
Average						5	34	5	7	**1 986**

*Refers to the mix of species owned/managed by various farmers. C = cattle; SG = sheep/goats; P= pigs; Ch = chickens (hens)

**Cattle: US$400/hh; sheep/goats US$40/head, pigs US$50/head, chickens US$3/head. Does not include physical assets such as pens, yards, ploughs, harrows, carts.

Source: FAO/University of Veterinary Science Study (2011).

The table shows the significant variation in the mix of livestock raised by smallholders of different wealth levels. Less wealthy households tend to invest in low-capital-value, short-cycle-of-return livestock, while wealthier households can afford to invest in higher-capital, higher operating costs and longer-cycle-of-return livestock. An analysis of the different livestock types that can be raised by farmers is shown in Table 7.

Table 7: Analysis of livestock enterprise options for smallholders

Livestock type	Capital value	Costs	Cycle of return	Other comments
Draught cattle and buffalo	Very high individual/pair value, including associated equipment, such as ploughs, carts	High costs of feed and management and supervision	Regular income from use or rental	Need to have land and available time, and social capital for renting out; need skills for animal management
Breeding cattle and buffalo	High individual value, but little need for additional equipment	Costs are labour for supervision only	Long: calves can be sold from 1.5 years old	
Sheep and goats	Individual animal value is low, but flock value is high: flock numbers can be built steadily over time. Upper limit for a household is in the order of 40-50 head	High supervision labour costs	Medium: birth to sale is about 6 months to 1 year	Sheep and goats can be easily liquidated
Breeding sows	Medium value of individual sow; low cost of housing	Medium: costs of feed; high supervision during farrowing, weaning	Medium: sale of piglets each six months	Requires good management and experience
Native dairy cattle	High individual value, but little need for additional equipment	Medium costs: collecting daily feed	Short: daily milk sales	Need to have available markets
Fattening piglets	Low: one piglet is a low cost. Investment can be incrementally increased by buying more than one pig. There is an upper limit of 2-3 pigs until feed needs to be purchased. The cost of penning/ confinement also increases with more piglets	Low: use local, cheap and waste feed; low supervision costs	Medium: sale after 6-10 months	High risk due to disease

Smallholder livestock production can generally be termed as a ‘low-input low-output system’. Inputs, apart from the initial capital costs of livestock consist of family labour. In general, the productivity of smallholder livestock is poor. Reproductive rates, growth rates, survival rates and turnoff rates and weights are less than what is consistent with good productivity. Productivity is low in breeding cattle, with intercalving intervals reported as being up to 18 months. Sheep and goat productivity is also low, with females lambing/kidding over all seasons, often with poor lactation, and poor growth rates in young animals. Sows and pigs for fattening are usually raised with poor quality feed, with no allowance for different rations for different production stages. There are no structured breed improvement programmes.

Commercial farmers: pig, layer chicken, broiler chicken, quail farmers

Commercial farmers raise either pigs, layer chickens, broiler chickens, quail, dairy cattle or sheep/goats[3] in an intensive fashion. Generally speaking, individual intensive commercial enterprises do not have more than one species. Apart from practical reasons of management, it is also good for biosecurity to not mix different enterprises or species. For example, broiler production relies on a regular all-in all-out system for cleaning and biosecurity and this does not suit the production cycle for layers. However, it is common in some areas, such as the Delta and some areas near Mandalay, to find intensive broilers or layers being raised in pens over the top of pond aquaculture. Whether they have small-, medium- or large-scale enterprises, they all have significant investments in livestock, buildings, land and equipment, and have high operating costs, especially for animal feed, which typically accounts for 70 percent of their costs.

Many small commercial farms are found in urban and peri-urban areas, especially small broiler, layer or pig farms. These are essentially small family businesses that find it difficult to expand due to restricted land. The larger the enterprise the more likely it is to be found in rural areas where more land is available.

As shown in Table 8, most commercial farms are categorized as 'small'.

Table 8: Sizes of commercial farms

Farm type	Small	Medium	Large	Very Large
Commercial layer ducks	33 480	260	119	7
Commercial layer chickens	3 235	316	226	
Commercial cross-bred dairy cattle	805	230	124	56
Commercial pigs	442	124	7	
Commercial broiler chickens	189	221	95	
Commercial sheep and goats		106	4	

So-called 'livestock production zones' are a feature of the commercial chicken sector. In Sagaing Region, there are several poultry production zones in which chicken layer farms are concentrated within a specific area. Many of these zones were established in response to outbreaks of Highly Pathogenic Avian Influenza (HPAI) in 2006, which posed a threat to human health; as a result the authorities restricted intensive chicken raising in populated urban and semi-urban areas.

Commercial farms make significant start-up investments in housing and equipment and have substantial operating costs in purchasing feed (which usually constitutes about 70 percent of costs) and vaccines and medicines, as well as the initial investment in housing and equipment. Smaller commercial farms often rely mainly on family labour, with more people being employed as the farms get larger. Many small commercial farmers have learned their business 'on the job'

[3] Commercial sheep/goat enterprises are not a significant sector.

with little or no formal training on livestock production, health or business, while larger farms have better access to knowledge and information on housing, feeding, health and marketing issues.

Ambient temperatures have a large impact on productivity in intensive livestock farms, being especially important in intensive chicken and layer farms. As temperatures rise, feed intake decreases and growth rates and egg laying rates are affected. Management of waste is also a challenge on these farms. Investment in cooling and waste management systems, including biogas, is a technical option which is open to larger farms, but not for many smaller farms, due to economy of scale. Biosecurity to limit the introduction of harmful pathogens to the farm is also more difficult to manage on small farms. Due to these factors, the productivity of the small commercial farms may be limited in comparison to the larger farms.

3.6 Natural resource access and use

Land for grazing of ruminants and water for livestock are the two key natural resource issues relevant to livestock production. There a few examples of where the utilization and tenure of land impacts in a direct sense on livestock production. Cattle, buffalo, sheep and goats all rely to some extent on land to graze on, considered common land, including roadsides, and on land that may be owned by others but not utilized, for example on postharvest stubble. Ducks also feed in rice-fields postharvest. Because of some lack of clarity in tenure, and in defining land use, conflicts can arise when grazing lands or water points are allocated to agribusiness interests. If grazing land or water points are lost, livestock production and smallholder income can be negatively impacted.

Overgrazing on pastures by ruminants can potentially lead to progressive loss of the resource. The Dry Zone, with its large population of cattle, sheep and goats, and susceptibility to droughts, is considered to be the highest risk area for such land loss. Long-term changes in water availability, especially in the Dry Zone, also need to be considered.

Government regulations on land use that requires certain types of crops to be grown can affect farmers' ability to diversify into growing pasture for forage or fodder.

In a more general sense, smallholders who own land and can use it for collateral for loans, are in a much better position to access the formal credit market, than landless households. It is therefore easier for landed households to build up livestock assets, survive shocks and make profits due to the better access and lower interest rates from the formal sector.

An important aspect of the resource base for livestock production is the productivity of the land resource base: in other words, the quality of pastures and the availability of improved forage and fodder, either for grazing or to cut and carry. Experience from regional countries shows that demand for improved forages can expand rapidly as the markets for ruminants and milk products expand. To date, there has been no national strategy or significant investment in improved forages.

3.7 Input and service suppliers

Inputs and services largely relate to the provision of animal health services and feed, but the provision of capital in the form of credit can also be considered an input. Artificial insemination services are also provided in some areas, mainly for dairy cattle. Artificial insemination (AI) is expanding for draught cattle.

Animal health services delivered to farmers include vaccination of livestock against infectious diseases[4] and treatment of sick animals, usually at the request of the animal owner. Front-line services to smallholders are largely supplied by Community Animal Health Workers (CAHWs), while services to commercial farmers are more likely to be delivered by graduate veterinarians. Shops sell animal medicines, so farmers can purchase and administer them by themselves if they wish. Behind the front-line services are the support functions, which include:

Government training and technical support for the veterinarians and CAHWs;

Government vaccine production and distribution;

Private sector import and distribution of vaccines and medicine;

Private sector import and distribution of medicine;

Government disease control programmes, including disease control planning, emergency disease response; epidemiology functions such as surveys; laboratory functions; and

Government regulatory frameworks on veterinary practice, medicines, emergency management.

Smallholders rely mostly on CAHWs for front-line delivery of vaccines and medicines, and the related government support functions. Commercial farmers rely mostly on the private sector to supply medicines, vaccines and services, but on government support functions such as occasional laboratory support, and emergency disease control that requires a broad sectoral response, such as in the case of HPAI in poultry and Porcine Reproductive and Respiratory Syndrome (PRRS) in pigs.

Smallholder animal health services are poor and farmers generally have a little understanding of animal health issues, especially with respect to the benefits of vaccination. Reliable data on the extent of livestock mortality and morbidity are lacking, but the existence of CAHWs that treat livestock on a user-pays basis demonstrates there is a demand for their services.

The supply of commercial feed to commercial livestock farmers exclusively belongs to the private sector. Up to several years ago, the government entity, the Livestock Feed and Meat Enterprise (LFME) had a role in feed production but that has recently been privatized. The government role is limited to some feed testing facilities and on registration and labelling issues. Smallholders generally do not purchase commercial feed for their livestock. If a household does buy feed, it is most likely to be for raising multiple numbers of fattening pigs. It should be noted that farmers who raise large numbers of ducks and are classified as ‘commercial farmers’ utilize animal health services infrequently, if at all, and also do not usually buy commercial feed, as they commonly mix their own traditional feed from local ingredients.

[4] Lists of diseases of importance by species and vaccine production are shown in Annex 1.

Table 9: Input and service suppliers

	Animal health services		Feed		Credit
	Front-line services	**Support functions**	**Front-line delivery**	**Support functions**	
Smallholders	CAHWs for services; retail outlets for medicines	Government training and technical support; government and private sector vaccine production and distribution; private sector import and distribution of medicines; government disease control programmes; government laboratory system; government regulatory frameworks	Generally not applicable	Not applicable	Mostly informal suppliers
Commercial farmers	Veterinarians; retail outlets for medicines		Retail outlets of animal feed	Private sector commercial feed production and distribution; some governance on feed testing and labelling	Both formal and informal suppliers

Smallholders need funds either to buy livestock or to fund operating costs, mostly feed for pigs. Being rural households, they have limited access to formal credit systems, so informal systems are commonly used. Animal feed retailers often act as informal credit agents in that they advance the feed to the farmer, who will pay later when the pigs are sold. Where formal credit is available, field reports suggest that a significant percentage of loans are for livestock. However, some lines of credit, managed through line government agencies, are earmarked specifically for cropping.[5] Commercial farmers, depending on their size and individual situation, are more likely to be able to get such access.

While credit, or use of available capital, to purchase livestock is one way of increasing livestock numbers, it needs to be pointed out that a farmer can increase livestock numbers through natural increase via reproduction. This commonly occurs in sheep and goat production in the Dry Zone, where a household starts with a few animals – maybe 10 or 15 females, and over time keeps the female offspring to build numbers.

Community animal health workers

The LBVD recognized that it is impossible for the few number of township-level LBVD staff to provide services to all farms in a township, so it established the CAHW system several decades ago in which CAHWs were referred to as ‘Blue Cross Workers’. With lack of funding, establishment of CAHWs over the years has declined. The CAHWs working in the field are a combination of the old Blue Cross Workers, some who have self-trained and some who have received short-term training from the LBVD, and from international agencies with various degrees of collaboration with the LBVD. There is some variation between townships on the

[5] Credit issues are covered extensively in the NAPA rural finance report

structure of CAHWs. In some townships, CAHWs are highly organized with leaders and members, while others are less organized.

Discussions with LBVD staff and CAHWs suggest that CAHWs receive most of their income from providing services for cattle and pigs. Services include treatments, castrations, surgical procedures and vaccinations. Some of the services provided by CAHWs, most notably the administration of medicines by injection, are not supported by the existing legal and regulatory instruments: this is a key policy area. Some CAHWs report that cattle vaccinations are only a small and unimportant part of their income because farmers expect the service for free, but others report that it is a source of income. Incomes for CAHWs can vary widely from 20-100 000 kyat /month, but CAHWs report that the income is only part of their motivation: providing services confers some status, gives a connection to government and training opportunities and provides a valuable service to the community. The 'practice area' for an individual CAHW can vary, but in lowland areas can be of the order of 2 000 head of cattle and 2 000 pigs. The CAHWs are usually farmers with their own farms and animals to care for. There is a great thirst for knowledge and skills amongst CAHWs on animal disease and management, and use of medicines.

There are no hard data on the number of CAHWs, their qualifications and services on a nationwide basis: but township-level LBVD staff are well aware of the local structures and functions that operate in their local area. CAHWs in some areas are organized into groups or associations with two or more tiers. At the top of the tier is often a private veterinarian, with CAHWs in the next tier, and sometimes village-level workers who assist the CAHWs during vaccination programmes. There is significant variation in structures between areas.

Veterinarians

Veterinarians working in the private sector who have graduated from the University of Veterinary Science (UVS) supply services to commercial farmers as well as to traditional urban small animal practices. Some provide services to smallholders near urban centres or in their area of practice. Government LBVD staff also provide such services to supplement their income. It is not uncommon to find veterinarians engaged in commercial livestock production themselves.

Animal feed and medicine outlets

Animal feed and medicine outlets are found in many townships. The outlet is sometimes combined with other businesses, for example pharmacists may also stock a number of animal medicines. Some private veterinarians manage these outlets, but there are also many that are managed by nontechnical people who are no more than retailers with a modicum of technical knowledge. As noted above, feed sellers often act as credit agents when they advance feed to farmers.

Breeding services

Smallholder pig farmers pay for the service of a boar either in cash or later payment in piglets. The boars are supplied by local farmers who take the boar from farm to farm. Bulls are similarly supplied by local farmers, although AI is on the increase in very limited areas. There is no functional system to make sheep/goat breeding males available to farmers, which can lead to inbreeding problems.

Artificial insemination services are important for cross-breed dairy producers. A number of bulls are kept at the Ministry of Livestock, Fisheries and Rural Development (MoLFRD) AI centre near Yangon. Straws are distributed for use and farmers pay a service fee but not for the semen. Official data on the number of cows inseminated over the period 2008-2013 are given in Table 10, which shows that the number of draught cows being inseminated has increased, while the number of dairy cows being inseminated has decreased. The latter could be explained by increased use of live bull mating.

Table 10: Number of cows artificially inseminated, 2008-2013

Year	No. of cows		
	Dairy cows	**Draught cows**	**Total**
2008-09	5 491	890	6 381
2009-10	5 661	1 042	6 703
2010-11	5 059	925	5 984
2011-12	3 869	1 082	4 951
2012-13	3 668	1 883	5 551

Livestock inputs in commercial systems

Not all commercial livestock systems produce their own replacements through reproduction, and as such must buy replacement stock. Each commercial sector has its own particular system for breeding replacement stock to flow through the system. Thus, the output from one link in the chain of supply represents an input to the next link in the chain. The most structured chains are found in the commercial layer, broiler and chicken systems. Commercial chicken farmers occasionally complain that the price of day-old chicks is excessive and suffers from a concentration of supply (Table 11).

Table 11: Flow of replacement stock

<table>
<tr><th>Commercial system</th><th>Breeder farms</th><th>Hatcheries</th><th>Commercial farmer</th></tr>
<tr><td>Commercial ducks</td><td>Supply fertile eggs to hatcheries</td><td>Hatch fertile eggs and sell female day-old ducks (DOD) to commercial farmers</td><td>Buy female DODs from hatcheries</td></tr>
<tr><td>Commercial chicken layers</td><td colspan="2">Import parent and grandparent stock as day-old chicks (DOC), raise them and produce female DOC for sale to commercial layer farmers and male DOC for sale to semibroiler farmers</td><td>Buy female DOC from parent farms</td></tr>
<tr><td>Commercial chicken broilers and semibroilers</td><td colspan="2">Import parent stock as DOC, raise them and produce DOC for sale to commercial farmers</td><td>Buy male and female DOC from parent farms; farmers also buy the male DOC from the commercial layer system</td></tr>
</table>

Other inputs in commercial systems

Electricity is an important input for commercial farms who may wish to install cooling systems to increase productivity. Both the price and reliability of electricity is sometimes cited by larger commercial farms as a limiting factor in establishing such systems.

Labour costs on commercial farms appear to be US$2-3/day or thereabouts, with men being paid more than women by about 25 percent.

3.8 Extension

There is no structured or formal system of extension of improved livestock technology or husbandry to smallholder or commercial livestock farmers. Smallholders rely on traditional farmer-to-farmer exchange of information, and information from traders, medicine and feed outlets and CAHWs. Commercial farmers rely on their own sectoral contacts, veterinarians, feed suppliers and larger farmers.

3.9 Markets and marketing

Cattle and buffalo

The major flows of cattle and buffalo are between farmers from rural areas to urban centres for slaughter, with Yangon and Mandalay being the major markets. Farmers sell their cattle and buffalo for a variety of reasons: when they need cash, when the animals are beyond productive age and need to be replaced, or for whatever reason they may not need them anymore. They sell them in a variety of ways. Farmers may sell directly to other farmers, to buyers at the farmgate, or let intermediaries take them to live markets on trust; the farmers receive the cash after the intermediary has sold the cattle and received a commission. Farmers may take them to sell at live cattle markets.

When farmers sell animals in response to an urgent need for cash, they sometimes sell below market price. Farmers may prefer to sell cows under these conditions, being reluctant to sell their male draught cattle. This would make sense because the sale of a single draught animal would make the remaining member of the pair less than useful. The sale of one head of cattle could yield between 300 000-800 000 kyat, more than enough to finance rice for a family for a year, which could cost about 200 000 kyat. The period between the end of the harvest and the new ploughing season is when most trade of draught cattle and buffalo occurs, as farmers get rid of old animals and look to purchase replacements if need be. Many farmers sell their old draught cattle at the end of the harvest season, and buy new ones before the start of the ploughing season.

Issue of licences is a feature of cattle and buffalo marketing. There are licences which give individuals the sole rights to buy and slaughter cattle within an individual township. These are issued on an annual basis after a bidding system. The person who is awarded the licence is commonly referred to as a 'licencee'. These licences carry high annual fees. There are licences to manage municipal livestock markets. These are also issued on an annual basis after a bidding process. The person who is awarded the licence is commonly referred to as a 'market licencee'. These licences also carry very high annual fees. When interviewed by the study team, cattle market and slaughtering licencees claimed that they cannot compete with illegal, nonlicenced slaughterers.

When licencees move animals from one state/region to another, they need permission from local authorities, animal ownership certificates issued from the police and a 'PC3' (Pass Certificate) from the source township LBVD. Licencees have networks agents with whom they have ongoing arrangements for sourcing animals. There are also other traders and intermediaries, some of whom may be trading animals under informal arrangements that are often in competition with the licenced traders. Such traders have some advantages over licencees in that they do not have to pay the high licence charges, but they face risks and costs due to the informal nature of the activity.

Livestock markets are a striking feature of the Myanma livestock trading system. There are a total of 49 markets registered with the LBVD, and additional nonregistered markets. These markets are areas of land in the municipal areas set aside solely for the purpose of livestock trading, and essentially service the trading needs of the area between Mandalay and Yangon, including the Dry Zone and southern Shan State. They enable the farmer-to-farmer trade of productive animals, the supply of slaughter animals to the local and Yangon and Mandalay market, and the supply of animals to the informal cross-border trade. They are mostly sites for cattle and buffalo sales, but goats and sheep are also sold at some markets.

Each of the markets operates in a similar fashion. Farmers or traders bring animals to markets either on foot or on vehicles. Upon entering the market, they register the animals and pay a fee per head to the licencee. Inside the market, sellers, traders and buyers mingle with buyers and traders, and make deals. There are no weighing scales at any of the markets; buyers assess weight and condition visually. A fee is paid to the market licencee if the animals are sold. Some local speculators buy cattle and keep them locally in the hope that they can make a profit if they resell them again at the same market at a later date. Near some markets, informal trading of livestock sometimes takes place to avoid market fees.

Cattle and buffalo are slaughtered at official slaughterhouses. After slaughtering, the meat and offal is passed on through wholesalers and then to retailers. There is no differentiation between meat from cattle and buffalo. Beef is retailed freshly slaughtered and sold in the morning at local markets.

Sheep and goats

Animals are purchased either directly from farmers or at livestock markets, which are usually licensed by the City Development Committee to a private manager. The importance of market as opposed to farmgate trading varies between regions, usually depending on how close livestock markets are to farms. Animals may be purchased on farm by licencee agents, who are paid a commission per head, or independent traders who purchase animals locally and transport them to livestock markets for on-selling. There is virtually no difference in the prices for goats compared to sheep, whether for slaughter or live trade. Animals sold for breeding may either be traded directly between local farmers or via livestock markets.

Markets in several regions are important for national trade. In Meikhtila, about one-third of traded animals is slaughtered locally and two-thirds is transported to Yangon. Animals destined for Yangon, sold in Meikhtila, as well as Pakokku, Myingyan and Nyaung U, are often collected in Pyawbwe, from where they are trucked to the capital. Similarly, Yangon traders are active in Minhla, but less so in Magway, even though they probably pass through Magway to get to Minhla from Yangon. The Mandalay livestock market is much smaller than Meikhtila, despite the city's size, and mainly caters to trade in animals for domestic consumption. However, buyers from Yangon and Pakokku are active in Nyaung U and compete for animals otherwise consumed locally. Pakokku buyers are sourcing animals for live export by ship via Yangon to Malaysia.

A licence must be held for slaughter and sale of meat products. Licences pertain to one animal species only, although in some regions one person may hold multiple licences. Licences are awarded annually, usually with a baseline increase in the fee of 10-30 percent per year. Licences may be open to tender each year, although it often appears that licence renewal occurs automatically if the City Development Committee (CDC) or Ministry of Border Affairs (MBA) has been happy with the licencee's performance. In some smaller districts, such as Nyaung U, only one person bids for the licence each year. Slaughter facilities, which are simply partially-walled buildings, are owned by CDCs. In addition to the annual licence fee, licencees pay a per-head slaughter fee.

Animals are normally purchased by licencees every few days and then held at a farm near the slaughterhouse. A few animals are then taken to slaughter each day. Veterinary inspection may occur ante-mortem, depending on the availability of LBVD staff. Carcass inspection is more routinely performed than ante-mortem inspection. Rates of animal condemnation, or carcass condemnation or trimming appear to be very low. Animals are slaughtered late at night or very early in the morning and are immediately distributed to retailers for sale.

In Yangon, licencees act as wholesalers, selling carcasses to shopkeepers who then prepare the meat for sale in their own shops. In other areas, licencees act as retailers.

Pigs

Smallholder farmers mostly sell their pigs destined for slaughter – finished growers or cull sows – to traders who travel through the villages. These traders then take them to a collection point, where they are kept to be loaded onto larger vehicles to be taken to a slaughterhouse. Normally no official documents are required for transportation of pigs except during disease outbreak such as PRRS, in which case a PC3 certificate is required at a cost of 50 kyat/pig. In some areas, smallholder farmers complain that low farmgate prices are due to a lack of competition amongst pig buyers, leading to low prices.

Some farmers or traders take pigs, including those due for slaughter or weaners to be sold to other farmers, to live animal markets, where these exist in the Dry Zone area.

Only licensees are allowed to slaughter pigs. Generally, licensees themselves are traders, wholesalers and retailers too. This is true in almost all small towns where only a few pigs are slaughtered. Pre- and post-mortem inspection is done by government veterinary officers. Yangon and Mandalay are the major markets for pork. The Yangon market is supplied from the Ayeyarwaddy Delta, from the Dry Zone, Bago Region and from Mon State.

Most pork is sold freshly slaughtered in small local markets. Licencees deliver the pork to retailers usually on a credit or advance basis. Private pork processors may come and contact the licencees to buy pork for their products as sausages and meat-balls. The packed sausages are sold through the local markets and supermarkets.

Carcasses from pigs raised by smallholders generally have a higher proportion of fat than those from commercial farms because the latter feed on higher levels of protein for fast growth rates. The trend in other countries is that urban dwellers tend to drive a demand for pork that has more meat and less fat, and it is expected that this trend could appear in Myanmar and drive some changes in feeding practices in smallholders, based on farmgate prices.

Chickens and ducks

Farmers usually sell backyard chickens to traders who travel regularly through villages on bicycles or motorbikes. The chickens then enter into a supply chain that can have several tiers, depending on the final consumer segment to be targeted – for example, the local village, township centre, large towns or city. Transfer between tiers involves the chickens going through collection points and exchange between traders. While backyard chickens make up a large proportion of chicken meat available at local village or township-level markets, at larger town markets, or main markets in Yangon and Mandalay, they compete with broiler chickens and spent layers. The meat from backyard chickens is different from the meat of broilers and spent layers. It is darker, stronger in taste and has more texture. As such it usually enjoys a price advantage, commonly being worth 15-20 percent more on a weight basis.

Spent layers and broilers are largely but not exclusively, marketed in urban centres, given the location of the farms. Broiler marketing has recently been regulated by the industry to some extent to avoid an oversupply at any given time. Layer chicken egg marketing has not been subject to any specific marketing strategy. Meat ducks and spent layer ducks also make their way to much the same marketing system as the chickens.

An important issue, especially after HPAI outbreaks that began in 2006, is the biosecurity of the live bird markets in major urban centres. It was considered that many live birds coming to either large live bird markets (as happens in Yangon), or many small trader markets (as in Mandalay) could lead to spread of pathogens from bird to bird, trader to trader and then farm to farm. The process of trying to improve biosecurity led to a general understanding that the live bird market system – both the regulatory and infrastructure aspects – had failed to expand and improve in line with population changes and the massive increases in consumer demand for chicken, and the supply of chicken meat, that began from the mid-1980s. As such, the system still needs significant upgrade.

Chicken and duck eggs flow from the farms to retail markets through networks of traders and wholesale markets. There is an increasing amount of value adding in terms of labelling of chicken eggs in supermarkets in urban areas.

Dairy products

Some smallholder farmers with native cattle take the milk from the cows themselves, and sell the raw milk directly to local people who consume it as fresh or warmed milk, or to local tea shops where it is added to tea for consumers. In some cases, collectors buy the milk and process it into 'solid milk' – a jelly-like substance – by mixing the milk with the sap of a locally available plant, and sell it at local markets. The solid milk can be fried, which increases its shelf life.

In most cases, the collectors buy the milk and put it into the supply chain that leads to the milk processing system. Milk from the medium- and large-scale production systems mostly enters into the supply chain that goes through the milk processing system. The supply chain can consist of several tiers from the cow to the processing factory, with milk being transferred into progressively larger containers. Collectors take the milk from the cows and put the milk into small plastic bottles. They then take the bottles to collection points where the bottles are emptied into larger containers, which are transported by motorbike to larger collection points, where again the milk is transferred to larger containers for transport by truck to processing factories. At one of the tier collection points, processing factory workers take a sample of the milk to their laboratory to test it for quality.

Processing sites and factories, which produce a range of different products, range in size. Small-scale processors take in up to 100 viss (1.6 kg) of milk per day and for the most part turn this into sweetened condensed milk, which they sell to local tea shops. Some processors also run their own tea shops. Medium-scale processors take in about 100-5 000 viss of milk per day and generally turn this into sweetened condensed milk, which they sell to local tea shops. Some processors also have their own large-scale dairy farms. Large-scale processors take in about 5-10 000 viss/day. They process this into a variety of products: sweetened condensed milk, fresh pasteurized milk, yoghurt, evaporated milk or powdered milk. Some large-scale processors own their own large-scale dairy farms. There is only one very large processor in Myanmar. This is the Ma Bu Yin business in Mandalay, which handles most milk that enters processing factories in the Mandalay area.

Hides, skins, bones and wool

Skins are sold – usually a quota to the military must be filled – at a set price. Extra skins are sold privately, usually for about twice the military's specified price. Bones may be sold to factories to be made into fertilizer. Wool, which may have previously been sold separate to skins, is now discarded.

Animal wastes

There is an active trade in cattle, buffalo and sheep/goat manure for fertilizer in smallholder systems. Sheep/goat manure can be sold for about 1 500 kyat/cart load. Farmers usually collect and store cattle and buffalo manure deposited in the animal house, and put it on their fields as fertilizer after soil preparation. They commonly use a ‘a bullock-cart’ as a unit of measure for cattle or buffalo manure for fertilizer purposes, and it can be estimated that a pair of adult animals will produce of the order of 4-5 bullock carts of manure per year, which could have a cash value of 24-30 000 kyat, assuming 6 000 kyat per bullock cart. According to some farmers in the Dry Zone, this amount of manure is probably enough to maintain fertility on 1 ha of land for a single planting. Given that the ratio of draught animals to land is about 1 pair per 2.5-5 ha, the amount of manure is not adequate for the ploughed area, even if manure from breeding cattle is also added. In many of these areas, manure is the sole source of fertilizer.

3.10 Value adding

There is generally a very low level of value adding in the livestock supply chain, apart from the dairy sector. Most meat – from cattle and buffalo, sheep and goats, chickens, ducks and pigs – is sold as freshly killed meat in so-called ‘wet markets’, with very limited value adding, such as sausage making. Eggs are similarly largely sold as fresh eggs in retail markets. Hides are salted before export.

Dairy

The major milk-based consumer item is sweetened condensed milk (SCM). Most processors package the SCM in cans, while some small-scale processors package it in plastic bags. The condensed milk is added to tea in tea shops. The most common serving is about 100 cc of tea, in which about 5-10 cc of condensed milk has been added.

Evaporated milk is added to hot tea at varying levels to complete the taste. Liquid pasteurized milk requires a good cold chain, so the market has only been expanding recently with the increased number of supermarkets in Yangon, and to a far lesser extent in Mandalay. In the Yangon area a school milk programme for one village school has been initiated and funded by a dairy processing plant. Milk, both sweetened and unsweetened, and low fat and full cream, is marketed in plastic bottles or bags in supermarkets. In supermarkets, the domestically produced milk competes with imported UHT milk.

There is a range of other milk-based products that are sold in local markets, such as Indian descendent communities which produce a large variety of traditional products. Some processors make their own yoghurt and market it mostly through supermarkets in Yangon and to a lesser extent in Mandalay. In the markets, the local product competes with imports.

3.11 Consumers

Livestock products are an essential part of the diet of the domestic population. The diet of the domestic population is influenced by the mix of ethnic groups (especially Bamar, Chinese, Indian, Shan and Rakhine), geographical location, and religious customs. Typical meal items can include steamed rice and accompanying dishes such as curried, pickled or dried fish or eggs, curried meat dishes, a light soup, and fresh or boiled vegetables, as well as bean dishes. Tea shops are ubiquitous, of which milk, usually condensed or evaporated milk is a key ingredient. Muslim populations do not eat pork.

Compared to other countries in the region, Myanmar has a high per capita protein supply. In terms of specific livestock and fish food supply, Myanmar per capita supply of various livestock and fish food sources has the following characteristics:

- Bovine meat supply is comparable to the average for the region;[6]
- Egg supply is below average, and about half that of Thailand and Malaysia;
- Supply of fish is much greater than the average;
- Milk supply is nearly double the average;
- Goat and mutton supply is the highest in the region;
- Pig meat supply is below average, although it is above Malaysia and Cambodia, about equal to Thailand and far below that of Viet Nam; and
- Poultry meat supply is above average.

[6] This should be considered in the context that Myanma cattle and buffalo population statistics are subject to conjecture, and the full extent of live export cattle is difficult to determine due to its largely informal nature.

Table 12: Regional per capita annual supply of livestock and fish foods

	Supply per capita per year (kg)					
Items	**Myanmar**	**Malaysia**	**Thailand**	**Viet Nam**	**Cambodia**	**Average**
Bovine meat	5	5.9	2.6	7.2	5	**5.1**
Eggs	6.3	13.8	11.8	3.6	1.4	**7.4**
Freshwater fish	26.1	6.7	7.8	13.2	29.6	**16.7**
Marine fish, other	28.5	12.2	0.2	12.7	4.1	**11.5**
Milk, whole	17.3	6.2	15.8	6.4	1.8	**9.5**
Mutton & goat meat	0.9	0.7	0	0.1	0	**0.3**
Pig meat	11.4	8.6	12.8	34.4	8	**15.0**
Poultry meat	22	38.1	12.3	15.6	1.9	**18.0**
Protein supply (all animal and fish sources)						
kg protein/cap/day	82	79.3	58.7	77.7	63.2	**72.2**

Source: FAOSTAT.

3.12 Imports and exports

A range of livestock and livestock products is traded across Myanma borders, through both formal and informal channels (Table 13).

Table 13: Cross-border trade in livestock and livestock products

Livestock and products brought into Myanmar	**Livestock and products taken out of Myanmar**
Official imports	**Official exports**
Parent and grandparent day-old chicks for the layer and broiler chicken sector	Frozen and dried beef, frozen mutton
Milk retail items – milk powder, condensed milk, evaporated milk, UHT milk, yoghurt, cheese	Live small ruminants, live pigs to India
Retail processed meats, small volumes of frozen meats	Sheep and goat skins
Frozen semen for AI in dairy cattle	Cattle and buffalo hides
Breeding boars	Raw dried bone gristle, inedible tallow
Eggs from China to internal areas	Official export of cattle, sheep and goats to Malaysia in 2009 to 2013 through official channels
Informal trade	**Informal trade**
Retail livestock products such as chicken and pork meat, and eggs are brought into border towns, especially along the Chinese and Thai borders	A large informal cross-border trade of live cattle and buffalo to neighbouring countries, especially to China and Thailand, but also to Bangladesh
Pigs for slaughter to towns on the Chinese border	Live young pigs to India, mostly from neighbouring Chin State
Broiler day-old chicks to local border towns on the Thai border	

Amongst the informal trade items, the numbers of live cattle and buffalo exported are of special interest due to the reported large size of the trade. China and Thailand are the major immediate destinations for cattle and buffalo, but cattle and buffalo are also exported to Bangladesh.

FAOSTAT estimated, using trading partners' databases, that live cattle exports in 2011 numbered 71 920 head. An FAO study in 2011 estimated the trade at nearly 60 000 head. Other informal reports[7] suggest that 3 000 cattle and 1 000 buffalo were being exported from Myanmar each week and sold at Mae Sot in Thailand. While this rate of export cannot be maintained throughout the wet season, nevertheless this represents a large volume of trade, with live animals being transported as far as Viet Nam through Southeast Asia. General discussions with industry stakeholders also indicated a large trade to China that is expected to increase although no hard data were available.

Official data are available for livestock products exported, as shown in Table 14. The data show that exports of frozen beef made up the great majority (78 percent) of the value of exports, with cattle/buffalo hides and skins constituting 18 percent.

Table 14: Export of livestock products (2012-2013)

Item	Unit	Normal trade		Border trade		Total		
		No. units	Price (US$)	No. units	Price (US$)	Qty	Price (US$)	% total price (US$)
Frozen beef	Tonnes	-	-	4 027	15 302 600	4 027	15 302 600	**78**
Buffalo/cow hides	Tonnes	3 696	2 419 680	1 832	1 195 800	5 528	3 615 480	**18**
By-products of cattle/buffalo	Tonnes	180	90 000	195	153 250	375	243 250	**1**
Dried beef	Tonnes	-	-	40	200 000	40	200 000	**1**
Sheep/goat hides	Tonnes	234	93 654	16	7 200	250	100 854	**1**
Raw dried bone gristle	Tonnes	600	63 000	-	-	600	63 000	**0**
Frozen mutton	Tonnes	12	48 000	-	-	12	48 000	**0**
Inedible tallow	Tonnes	10	5 000	-	-	10	5 000	**0**
Total	**Tonnes**	**4 732**	**2 719 334**	**6 110**	**16 858 850**	**10 842**	**19 578 184**	**100**

Source: CSO

To give some sense of the relative values of the informal live cattle and buffalo trade, and the official export of livestock products, Table 15 shows the potential gross value of a live export trade of between 40 000 to 100 000 head at a per head value varying from US$400 to US$800. Under these assumptions, the trade could be worth the order of US$16 to US$80 million in comparison to the official export trade of the order of US$20 million.

[7] Ross Ainsworth's *South East Asia report*, 6 March 2015.

Table 15: Sensitivity table of the potential value of live cattle and buffalo exports

No. head exported	Average US$ per head of cattle/buffalo		
	400	600	800
40 000	16	24	32
50 000	20	30	40
60 000	24	36	48
70 000	28	42	56
80 000	32	48	64
90 000	36	54	72
100 000	40	60	80
Units = US$ million			

Source: Mission analysis

Animal medicine production in Myanmar is negligible with such items being imported. Table 16 shows the value of imported livestock merchandise. This shows a very high increase in the value of such imported material: from US$12.9 million in 2008-2009 to US$54.6 million in 2012-2013, an increase of 423 percent. Animal feed imports make up 47 percent of the value of imports and account for most of the rapid increase over those years.

Table 16: Import of livestock production items by value 2008-2013

Item	US$'000 value					
	2008-09	2009-10	2010-11	2011-12	2012-13	%
Animal feed	347.81	55.03	938.87	9 589.20	25 952.69	**47**
Vitamins	8 438.29	9 519.40	18 678.59	17 835.98	17 607.89	**32**
Farm equipment	368.71	1 079.86	6 130.93	6 779.51	3 851.88	**7**
Pharmaceutical drugs	2 276.17	1 940.13	1 495.68	2 225.53	3 711.40	**7**
Poultry vaccine	1 063.48	2 264.73	1 748.07	2 860.80	2 790.99	**5**
Disinfectant	230.95	214.48	208.18	330.41	447.02	**1**
Anti-helminth	91.45	122.61	142.73	91.56	199.62	**0**
Rabies vaccine	49.12	31.55	58.49	55.44	54.46	**0**
Swine vaccine	49.53	10.86	79.15	16.50	25.48	**0**
Total	**12 915.52**	**15 238.66**	**29 480.69**	**39 784.92**	**54 641.42**	
% of 2008-09	**0%**	**118**	**228**	**308**	**423**	

Source: CSO.

Of the imported livestock products, imported dairy products are those that are of most significance to domestic production, as they compete with domestic products. A recent study of the dairy sector, estimated that, on a milk equivalent basis, imported products accounted for nearly 60 percent of the domestic dairy product consumption, with the highest imported items being evaporated creamer, sweetened beverage creamer, milk powder and beverage creamer

3.13 Sector performance

As can be seen in this report, a large amount of data on livestock populations, imports and exports, and government institutional functions such as vaccine production are available. However, the type of data collected, the way in which they are collected, recorded, stored and managed needs to be reviewed. Much of it is paper-based at the lower levels and is aggregated before being put into electronic form. There is a general concern about the validity of official data on livestock populations.

3.14 Current and future trends

In general, the expected upward trend of domestic economic and social development, increasing regional and global engagement and trade is anticipated to have a range of influences on the livestock sector. This will include changing demands for food items from the growing urban middle class in terms of food quality, labelling, purchasing habits and energy requirements. Urban supermarkets are expected to expand further, which drives demand for more value-added and differentiated products. In this environment there is opportunity for more value adding in the sector.

Within the sector, the increase in livestock populations over recent years, especially in chickens and pigs, and to a lesser extent in dairy cattle, has widespread implications for both private and public sector actors. The implications include:

- Increased demand for commercial feed for chickens and pigs, which influences crop choice by farmers, and has led to the establishment of an active animal feed industry, and an associated need for governance, such as testing and standards.
- Increased demand for improved breeds of pigs, chickens and dairy cattle. For chickens, this will involve more vertical systems of grandparent and parent systems, and for pigs involves import of boars and use of AI. For dairy cattle, this will involve importing dairy cattle, dairy bulls, semen and use of AI.
- Increase in poultry and pig diseases due to higher densities, and increased demand for veterinary services to the chicken and pig farms, including vaccines, medicines and trained veterinarians. This also means that laboratory diagnostic services need to be expanded and improved.
- Increased demand for people with skills in intensive pig and chicken husbandry and farm management and increased demand for credit to expand chicken and pig farms.
- Increased consumption of broiler and spent layer chicken meat, pork, chicken eggs and related products.
- Challenges in upgrading the live animal market infrastructure, and processing and trading systems especially in poultry and pigs.
- Increased demand for sector policy development, supply chain governance and public-private sector engagement in a dynamic environment.

Disease shocks. Shocks from introductions of new diseases have been a feature of the sector in recent years. HPAI struck the poultry industry in 2006, with sporadic outbreaks since then. PRRS hit the pig industry with devastating effect when introduced in 2010, and has now become endemic.

Threat of new diseases. The introduction of new livestock diseases remains a threat. Peste de Petites Ruminants (PPR), a disease of sheep and goats, swept through China in 2013-2014 and although the likelihood of introduction to Myanmar is low, nevertheless presents a risk to the sheep and goat sector. African Swine Fever, a lethal disease of pigs, has already spread to the Russian Federation, and further spread to China will bring with it a risk to Myanma pig populations. There is an ongoing threat of introduction of new avian influenza subtypes that could affect the chicken and duck industries.

Environmental shocks. Environmental shocks, of both sudden and slow onset, have affected the livestock sector. Cyclone Nargis in 2008 caused the deaths of thousands of livestock in the Delta Region, with the loss of draught cattle and buffalo in particular impacting on smallholders' capacity to prepare fields for cultivation. Cyclone Giri in 2010 destroyed many livestock, as have floods along the Ayeyarwaddy.

Climate change. Climate change is expected to particularly affect the Central Dry Zone leading to irregular rainfall, more regular droughts, less reliance on crops, and a potential shift to more investment in livestock. While livestock production systems are more resilient to these conditions than cropping, livestock suffer during droughts due to lack of feed and water; the need for supervision of livestock that farmers prefer not to sell can reduce the opportunities for temporary migration for income generation. Increased grazing pressure due to higher numbers of cattle, sheep and goats may cause a degree of soil degradation.

Changing domestic governance arrangements. Changed governance arrangements have meant that responsibilities for livestock development have been decentralized to the state/regions, while animal health technical issues have remained central-level responsibilities. New laws on animal health and livestock development have been drafted.

New strategic policy directions. Recent government policy with an emphasis on poverty alleviation, employment and rural development compared to previous policies which were more driven by commodity development, influences investment priorities in the livestock sector.

Increasing credit availability. Increasing availability of credit for livestock production in the smallholder system is allowing more smallholders to procure livestock. The terms of loans through microcredit agencies varies. For example, the monthly interest rate charged for loans from the Cooperative Department is 1.5 percent, while the rate for loans from the Rural Development Department, is 0.5 percent.

Increasing farm mechanization. Mechanization is in general on the increase, and as time elapses, will be expected to reduce the demand for draught cattle and buffalo, although there will be some geographical variation. Such a change can have a range of impacts: on herd structure and breed as farmers move to replace draught cattle and buffalo with breeding cattle for meat production; on fertilizer availability; and on use of farm labour. A shift to emphasis on breeding could also drive demand for AI services that could include a shift to more beef-type breeds.

Improving border security. Security and infrastructure improvements in border areas will make formalization of the cross-border trade in cattle and buffalo to China and Southeast Asia more likely.

Expanding regional market opportunities. As regional economies develop and trade infrastructure improves, it is expected that there will be further opportunities for export of live cattle and buffalo and live sheep and goats. This could drive a shift to beef-type cattle. The export of large numbers of breeding animals could affect the long-term productive capacity of the country.

Improving communication infrastructure. Mobile phone communications and Internet connectivity are on an upward trend and this could have widespread implications for the transfer of information on inputs, services, marketing and trading in addition to general economic efficiency.

Improving the investment environment. There is a general expectation that the investment environment in Myanmar will improve. This includes communication infrastructure, financial services and legal frameworks. As a result, there may be opportunities for investment in value adding in the livestock sector. The development of the ASEAN Economic Community in 2015 may also bring additional investment opportunities, as well as challenges.

Potential for increased farmgate prices. The net impact of improved market growth and access has the potential to lead to improved farmgate prices for livestock.

Increasing international development assistance. International development assistance, much of which began in earnest in emergency mode after Cyclone Nargis in 2008, has expanded rapidly in recent years. This brings the opportunity for sector development as well as challenges of coordination, aligning priorities and avoiding duplication. Opportunities for employment in the development sector, and indeed the burgeoning private sector, while yielding many positive outcomes, weaken the attractiveness of working in the public sector. Leadership staff in institutions such as the MLFRD and LBVD can be kept busy in meeting many donor missions and participating in project workshops and events that are a challenge, given the numbers of available staff.

4. INSTITUTIONAL ENVIRONMENT

4.1 Ministry of Livestock, Fisheries and Rural Development (MLFRD)

The MLFRD is the key ministry with responsibility for the livestock sector.

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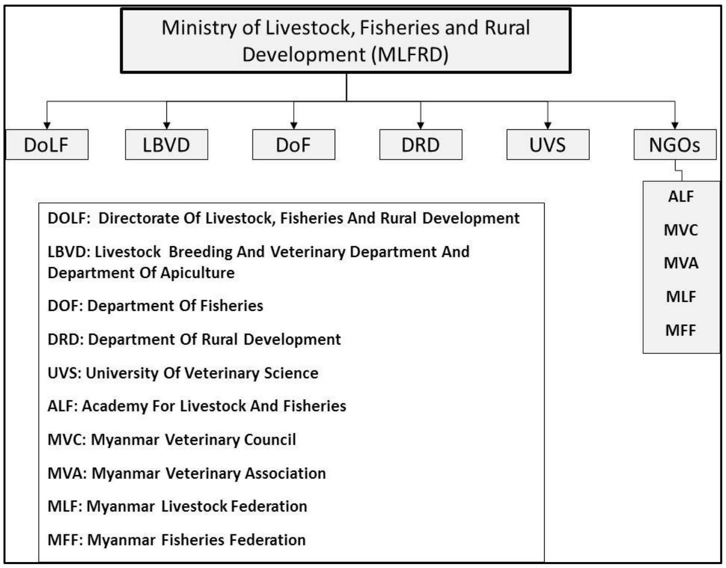

Figure 10: Structure of the MLFRD

Table 17: Livestock sector policies

Ministry-level policies relevant to the livestock sector	**Policies of the livestock sector**
To improve livestock and livestock products for the requirements of domestic consumption through improved animal health care.	To promote all-round development of the livestock sector.
To increase draught cattle populations in line with agricultural expansion.	To increase livestock production for domestic consumption and share the surplus with other countries.
To increase meat and fish production for domestic consumption and share the surplus with neighbouring countries.	To undertake effective use of livestock resources. To harmonize livestock development and sustainability.
To upgrade the socio-economic status of livestock and fishery communities.	To uplift the socio-economic status of livestock communities.
Policies for animal health and biosecurity	**National policy of the livestock sector**
To strengthen capacity building for epidemiological survey and animal disease control programmes in territorial and border areas.	All-round development of the livestock sector.
To strengthen the facilities and equipment for disease diagnostic laboratories.	To enhance the production of livestock in order to fulfil the needs of local demand.
To strengthen capacity building for biological	To support extension on research and

production and quality control laboratories.	development.
To strengthen international relationships and participation in the livestock sector development programme.	To develop livestock sector socio-economy.

While there are considerable official policies of a general nature in place, there are few strategies and frameworks to apply practically in the field.

There is no clear framework on how animal health services should be delivered to smallholders. The major legislative instrument that defines the role of the government in the livestock sector is the Animal Health and Development Law (1993), and related regulations (e.g. the Veterinary Act). This law deals with a range of issues including infectious disease control, animal treatments, the public-funded vaccination campaign and animal movement management. While stakeholders recognize that CAHWs are the key frontline providers of animal health services to smallholders in villages and regularly treat livestock with medicines such as antibiotics, this role is not reflected in the current legislation.

There is no clear framework on how breed improvement in village livestock will be managed. As such, livestock genetic quality could be declining due to inbreeding in many areas, or at best remaining static. A commonly heard action is to import exotic breeds to ‘improve’ local breeds, but often this leads to disappointment as the ‘improved breeds’ have been performing in a totally different environment.

A new law, the Livestock Development Law, is reportedly being developed that will include reference to animal breed improvement. FAO has clear global guidelines on genetic improvement in livestock and the application of these guidelines to Myanmar is critical if Myanmar is to begin to capture the opportunities it has for genetic improvement.

There is no clear framework to describe the roles and functions of the government in the area of extension of improved technologies for improving village livestock productivity. The focus of the LBVD is on its core mandate of animal health. However, as government work focuses more on rural development, the mandate of the LBVD will inevitably move more towards systems of livestock applied research, extension and productivity technology.

The governance of livestock trading has traditionally led to less than optimal competition at the farmgate and high transaction costs. Restrictions on the slaughter of some kinds of livestock have led to a lack of transparency. The government has recently been examining existing policies in the area of trading systems, including instruments that regulate the slaughter of livestock of different species and age; and also regulate the issue of licences for traders and slaughterers, especially those that affect competition at the farmgate and that influence transaction costs of trading.

4.2 Livestock Breeding and Veterinary Department (LBVD)

The LBVD is the line technical agency responsible for animal health and production. Currently the major focus of the LBVD is on animal health. The facilities operated by the LBVD include a vaccine production programme, a veterinary assay laboratory, the central diagnostic laboratory, three regional veterinary diagnostic laboratories, four border area animal quarantine laboratories, an AI centre and offices of the LBVD at state/region, district and township levels. At the township level there is a township veterinary officer (TVO) and, depending on the township, deputy TVOs as well as animal health assistants who have undergone diploma-level training. The LBVD has established capacity in epidemiology in recent years.

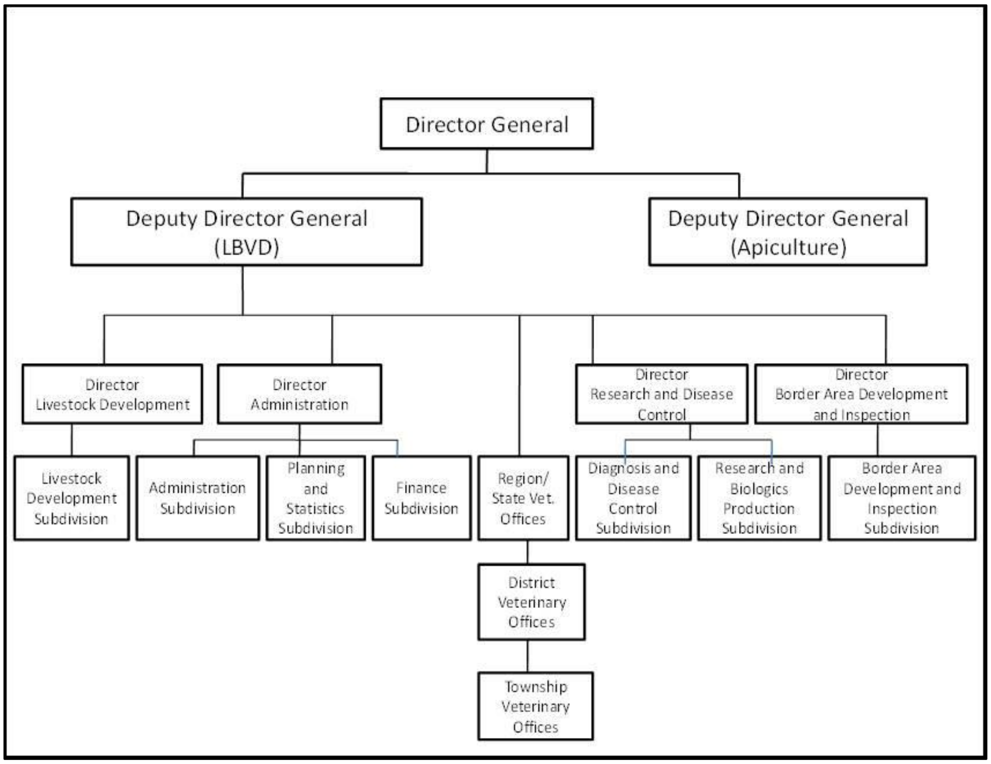

Figure 11: Structure of the LBVD

Table 18: Duties and functions of the LBVD

Undertaking of preventive and control measure against infectious disease that could cause great economic losses to farmers, based on the Animal Health and Development Law.
Assisting livestock owners in accurate diagnosis of diseases through the regional diagnostic laboratory service.
Providing of health care and veterinary service to extension services.
Undertaking of artificial breeding for livestock improvement.
Encouraging pasture development for the improvement of ruminant animal production.
Conducting courses and workshops for farmers, training staff for extension work.
Conducting border area development, provision of special facilities and training related to livestock production.
Veterinary administration for feed and medicine; issuing manufacture licences and permits for importation.
Issuing health certificates for the export of animals and animal products in compliance with the sanitary requirements of the importing countries.
Controlling animal diseases through animal movement across borders and importation by establishing check points and quarantine facilities at points of entry.

Source: LBVD.

The LBVD had 1 886 staff in 2012-2013.

Table 19: LBVD staff by status over the period 2008-2013

Status	2008-09	2009-10	2010-11	2011-12	2012-13
Official veterinarians	919	929	928	933	1 154
Veterinary assistants	131	99	213	204	255
Others	891	818	671	421	477
Total	1 941	1 846	1 812	1 558	1 886

Source: LBVD.

Animal health and disease control is the core function of the LBVD. The original basis for establishment of the LBVD was the control of infectious diseases in the draught animal – cattle and buffalo – population. This remains the core function, but animal health services have had to expand in recent years in response to the proliferating pig, chicken and dairy cattle industries. As a result, amongst the four divisions of the LBVD, the Research and Disease Control division is the most active. The Livestock Development division is less active, and the Border Area and Development division has comparatively little activity. The LBVD approves imports of live animals, and animal medicines and vaccines. The LBVD also produces a variety of vaccines. The production of Newcastle Disease I2 vaccine was halted temporarily in 2012, but has since resumed.

Table 20: Vaccines produced by the LBVD, 2009-2010

Species and vaccine	Year (doses)	
	2009-2010	2010-2011
Cattle and buffalo		
Haemorrhagic septicaemia	2 852 000	3 120 000
Black quarter	1 452 000	1 453 000
Anthrax	2 041 000	2 213 000
Foot and mouth*	169 000	169 000
Live brucellosis	300	0
Poultry		
Avian pasteurellosis (injectable)	71 000	54 000
Live avian pasteurellosis (WW)	3 128 000	4 237 000
Newcastle disease I 2 strain	70 601 000	73 436 000
Newcastle disease**	319 000	222 000
Fowl pox***	94 000	64 000
Infectious bursal disease	0	0
Pigs		
Foot and mouth – 'O' type	52 000	52 000
Swine fever	128 000	98 000
Others		
Rabies	4 000	0
Anthrax for elephants, horses & donkeys	0	4 000
Anthrax for goats	0	0

Total	80 911 300	85 122 000
*For cattle, buffalo, sheep & goats, type 'O' ** Komorov strain and Weybridge F strain ***M strain and 'S' strain		

Source: LBVD.

The LBVD township-level staff work includes planning and implementing cattle and buffalo vaccination programmes with the active involvement of community animal health workers, to whom they provide training and support, and conducting outbreak investigations in cattle and buffalo for which they submit official outbreak reports. They submit monthly reports including livestock population data collected from local authorities, issue health certificates for cattle and buffalo at livestock markets, and for transport of cattle and buffalo. Since the emergence of avian influenza and PRRS in pigs, townships have also issued health certificates for poultry and pigs, although the application varies over time and place. Township staff often conduct other veterinary work such as animal treatment and surgery to supplement their government salaries and also supervise or conduct AI in cattle in some areas.

The infrastructure of LBVD offices at the township level is generally quite poor. The office buildings are old and mostly in need of repair, although they are large enough to allow for separate offices and for meetings to be held. The refrigerators to store vaccine are also old and in bad repair, and are not fit for this purpose. Communication facilities are also generally inadequate.

4.3 The University of Veterinary Science (UVS)

The UVS, located at Yezin, near Nay Pyi Taw, is responsible for undergraduate and postgraduate education for the livestock sector. The UVS has a long and admirable history of educating veterinarians, a large percentage of whom traditionally joined the LBVD. Entry points for employment are at the township level. With opportunities expanding in the private sector within or external to the sector, and often better salary and conditions, the destinations of graduates are changing. Urbanization is increasing the demand for urban small animal practice. In recent years, the LBVD has had many vacancies at the township level that are not filled by graduates. The most important recent event is the establishment of the Diploma in Livestock Production Animals. This course is intended to fill a gap in education in production animals that was largely missing from the veterinary course which was strongly health-oriented. It is recently becoming LBVD policy to establish a new position at the township level for graduates of this course to be employed in the area of livestock production and extension.

Table 21: Courses conducted by the UVS

Current courses		Period
Bachelor Veterinary Science	BVSc	6 years
Master Veterinary Science	MVSc	2 years
Master Veterinary Medicine	MVM	2 years
Doctor Philosophy	PhD	3 years
Diploma Livestock Intensive Systems	Dip. L.I.S.	(9 months in Israel, 1.5 months in UVS)
Diploma Livestock Production Animals	Dip. L.P.A.	9 months

Planned course		Period
Bachelor Animal Science	B. An. Sci.	4 years

The number of graduates in the BVSc has increased rapidly in recent years – from 86 in 2010-2011 to 222 in 2013-2014. This has stretched the capacity of the UVS, as has the recent establishment of the Diploma Livestock Production Animals course.

Table 22: Graduates from UVS, 2010-2014

Degree	Year	No of graduates		
		Male	Female	Total
BVSc	2010-2011	46	40	86
	2011-2012	54	88	142
	2012-2013	63	107	170
	2013-2014	101	121	222
PhD	2010	1	-	1
	2012	-	1	1
	2013	-	2	2
	2014	-	-	-
MVSc	2010	2	12	14
	2011	5	3	8
	2012	6	12	18
	2013	2	4	6
	2014	2	12	14
Dip. L.I.S	2010	38	-	38
	2011	21	-	21
	2012	21	-	21
	2013	26	-	26
Dip. L.P.A	2013	246	203	449

Given an estimated turnover of 10 percent of LBVD staff per year, the demand for graduates within the LBVD is probably about 100 staff per year, or about one staff member for about a third of the townships. A review of the sector's education and training component, and how it links to the public and private sector requirements for graduates, is included as one of the investment recommendations.

A major challenge for all courses at the UVS is the capacity and practical experience of the teaching staff, and the lack of opportunities for practical experience for the students. Being located at Yezin, there is little opportunity to operate a functional small animal clinic for teachers and students to build and maintain clinical skills. To gain practical skills in large animals requires significant time and travel to rural areas, which is both expensive and time-consuming, especially when class sizes are so high. To assist with practical training, a chicken layer farm has been established with the support of CP Ltd.; some dairy cattle are also run on the campus, and a forage plot has been established with the support of the Australian Centre for International Agricultural Research (ACIAR). FAO has supported student practical epidemiology field trips and supported establishment of epidemiology in the veterinary course.

Research capacity at UVS is low, and suffers from a lack of budgetary support, as well as human resources. Another important aspect of the courses run by UVS is to aim for compliance with regional and international standards, and this issue should also be addressed in any investment programme.

4.4 Non-government organizations

Myanmar Veterinary Council (MVC). The MVC is responsible for registration and standards for veterinary professionals.

Myanmar Veterinary Association (MVA). The MVA acts for veterinarians in the public and private sector. The MVA manages an annual conference and occasional meetings on technical issues. The MVA has also established the Myanmar Veterinary Continuing Education Society.

Myanmar Livestock Federation (MLF). The MLF is an umbrella organization for producers and private sector actors in the livestock sector, including those providing inputs and services, and involved in downstream activities. There are some specific sector associations, such as the Broilers Association, who act in their members' interest on a range of issues.

4.5 Other government organizations

States and regions are responsible for budget allocation of the LBVD offices in their areas. While the LBVD retains line management control of animal health issues, the states/regions are responsible for livestock development issues.

City and Township Development Committees are responsible for administration of markets and slaughterhouses and wholesale and retail trading operations in their areas.

The Food and Drug Administration (FDA) is responsible for registration of veterinary medicines and for policy and technical issues on food safety.

5. KEY CONSTRAINTS AND OPPORTUNITIES

The key opportunity to reduce poverty and develop rural areas through investment in the livestock sector is by increasing smallholder incomes through improved productivity of livestock, and an increase in the number of livestock raised. Productivity gains rely essentially on improving the health, feeding and breeding of smallholder livestock. Addressing these issues will require a comprehensive approach on investment in policy development, institutional capacity, inputs and services, including extension.

Productivity gains require application of better technology and husbandry techniques, and once applied, can be continued for as long as the farmer perceives them as desirable. As farmers learn from each other, improved management techniques steadily spread through communities. While technologies to improve productivity vary between species, the general approach is twofold:

Firstly, to improve

- Management of reproduction, of late pregnant and early lactating breeding females to increase growth rates of their progeny;
- Earlier weaning strategies combined with improved feeding;
- Decreased turnoff age of young animals;
- Value of sale stock destined for slaughter, either older culled animals, or young animals as the case may be; and
- The flock and herd structure, which includes culling of unproductive animals.

Secondly, to begin the long-term, but important, process of breed improvement, especially in cattle, sheep and goats, and to a lesser extent pigs. The emphasis for breed improvement will be on selecting well-performing locally adapted animals, and developing the management systems required to breed them and make them available to as many farmers as possible.

Health and productivity gains are closely linked: without confidence that an animal will not die from disease, or need to be sold cheaply for salvage value if ill, a farmer will not invest in better feeding and higher levels of management, and breed improvement programmes will be compromised.

Mission estimates of the increased income from improved productivity in cattle, sheep/goat and pig raising is shown in Table 23. This analysis focuses on improvements in reproduction, survival and sale weight, while farmgate prices remain constant. The analysis shows significant improvements in income from improved livestock productivity.

Table 23: Estimated increased annual income from adoption of improved technologies

Item	Reproduction	Decrease in annual mortality	Sale weight	% increase annual income in herds that adopt
Increased income from the adoption of health (only) technologies				
Cattle	No change	From 2 to 1%	No change	8
Sheep/goats	No change	From 2 to 1%	No change	3
Pigs	No change	Sows: 3 to 2% Fatteners: 8 to 5%	No change	1.60
Increased income from the adoption of productivity technologies				
Draught cattle	Intercalving period shortens from 18 to 15 months	From 2 to 1%	Increases 5%	18
Sheep/goats	From 75 to 85%	From 2 to 1%	Increases 5%	11
Pigs	From 1.6 to 2 litters/year	Sows: 3 to 1% Fatteners: 8 to 3%	Increases 10%	13
Chickens	No change	Annual chick mortality from average 10% to 5%	No change	5

Source: FAO mission estimates.

Given that many smallholders raise more than one species, the income gains from improved productivity can be substantial. Table 24 shows that a household that has three breeding cows and two sows would increase its income by 73 percent over the eight-year period of the analysis.

Table 24: Example of income of a household with three breeding cows and two sows over eight years

Livestock owned by the household	Income with traditional raising systems (MK)	Income with improved raising systems (MK)
Three breeding cows for eight years	3 840 000	4 971 000
Two sows for four years, then another two sows for four years	590 400	2 728 000
Total	4 430 400	7 699 000
Additional income from improved systems		3 268 600
Note: Interest on capital not included as a cost. Labour not included as a cost.		

Source: FAO mission estimates.

Table 25 summarizes the opportunities and constraints related to addressing smallholder livestock productivity in the short, medium and long term.

Table 25: Opportunities and constraints related to addressing smallholder livestock productivity

Specific area	Opportunities	Constraints
Animal health and disease control in smallholder systems	Improve livelihoods through decreasing animal mortality and morbidity in smallholder livestock; build on the core competence and mandate of the LBVD in animal health control; strengthen and expand existing CAHW networks based on a user-pays system and demand for services.	Low farmer knowledge and understanding of animal health issues; investment (including physical infrastructure), operating budgets, and human resources for disease control programmes; enabling institutional framework for CAHW establishment, training, registration, and business development; need investment and operating budgets for training, establishment and ongoing technical and coordination support for CAHW networks.
Animal breeding in smallholder systems	Steadily build the genetic quality of cattle, sheep and goats to suit local conditions and markets; reduce inbreeding; improved productivity and suit the market; build on existing CAHW networks to support breed improvement programmes; deliver AI services; strengthen AI stations and performance recording and breeding value systems.	Need an enabling institutional framework in the public sector; need to improve knowledge and understanding of stakeholders on opportunities and mechanisms for improving animal breeds; need investment and operating budgets for breed improvement programmes for cattle, sheep and goats.
Animal nutrition in smallholder systems	Improve livelihoods through better nutrition of sheep, goats, cattle to improve survival, reproduction, and turn-off rates; improved pig productivity through better feeding practices.	Need introduction of new improved species of grasses, legumes, fodder trees adapted to local conditions; Need the extension system to promote improved animal feeding in all species.
Extension and research	Improve livelihoods through improved productivity through better husbandry, management and marketing of cattle, sheep and goats, pigs and chickens; build on existing CAHW networks to act as extension agents; establish key farmer status for extension activities.	Lack of enabling institutional framework, and policy and strategy on extension and research; need investment and operating budgets for extension activities; need livestock-extension-oriented staff at the township level; need business models for the engagement of CAHWs as extension agents.
Marketing	Livestock production more closely matched to domestic and export markets; expanded export markets (e.g. cattle, buffalo, sheep and goats).	Need an effective extension system to promote improved husbandry, feeding and breeds; need a strategy and implementation of measures to reduce transaction costs in the downstream trading system.
Governance	Develop commodity/species development strategies to promote and direct public and private sector investment; expand governance of the	Need commodity/species development structures to develop strategies and operating budgets to support the strategy development process (surveys, stakeholder workshops).

	veterinary system to include CAHWs.	
Poor people's access to, and benefits from, the livestock sector	Poor people can move out of poverty by buying livestock, share-farming livestock or being employed in the livestock sector.	Need the extension system to target poor households; need a credit system that is accessible to poor households.
Education and training	Build on policy decision to establish Animal Science education at the UVS to provide extension staff at the township level to strengthen practical field experience of teachers and students.	Lack of experience at the UVS in implementing Animal Science courses; lack of budgets for physical facilities for students (accommodation, practices).

Policies and institutional capacity are important aspects of both constraints and opportunities. While there are considerable official policies of a general nature in place, there are few strategies and frameworks to apply them practically in the field.

6. POVERTY AND SOCIAL INCLUSIVENESS

Livestock raising is generally regarded as an attractive activity for poor households in rural villages. Poor households can buy animals to raise themselves, they can be paid a labour fee to look after animals for other households or they can manage livestock on a share-farm basis. In general, the less expensive and the shorter production cycle animals (e.g. backyard chickens, growing pigs) are suitable for entry point poor households. These households can then increase their livestock assets in a step-by-step fashion to improve their livelihoods. Livestock are generally a liquid asset and as such funds can be mobilized if needed. While livestock cannot be a formal asset to be used as collateral for loans, livestock owned may be a factor if a household wants to join a group credit scheme. An analysis of the characteristics of different livestock raising systems and how they relate to poorer farmers' options, is shown in Table 26.

Table 26: Opportunities for poor households in rural villages in livestock production

Production system	Raise own animals	Labour for care	Share-farm basis
Draught cattle			
Breeding cows	High capital value and 12-15-month income cycle can reduce attractiveness.	Attractive for poor farmers to be paid a labour fee for care, e.g. during grazing	Attractive for a poor household to manage a group of cows on a share-farm basis, e.g. share of calves born
Adult males for draught	Not usually an option for poor households, due to high capital costs of two animals, and the high cost of equipment. Also poor households do not have much land.	Attractive for poor farmers to be paid a labour fee for care, e.g. during grazing. However farmers with draught animals are usually using them themselves.	Attractive but not commonly available
Bull for breeding	Not usually an option for poor households, due to high capital cost.	Attractive, but not a common option.	Attractive, but not a common option.

Draught buffalo			
Breeding female	High capital value and 18-month-income cycle can reduce attractiveness.	Attractive for poor farmers to be paid a labour fee for care, e.g. during grazing.	Attractive for a poor household to manage a group of cows on a share-farm basis e.g. share of calves born
Adult working male	Not usually an option for poor households, due to high capital costs of one/two animals, and the high cost of equipment. Also poor households do not have much land.	Attractive for poor farmers to be paid a labour fee for looking after e.g. during grazing. However farmers with draft animals are usually using them themselves	Attractive but not commonly available.
Sheep/goats			
Breeding flock	Attractive option as low capital value for individual animals, and can steadily build flock. Short (5-6 months) income cycle.	Attractive for poor farmers to be paid a labour fee for care, e.g. during grazing.	Attractive for a poor household to manage on a share-farm basis
Smallholder pigs			
Breeding sow	Medium capital value and 6-month-income cycle can be attractive, but year-round management required.	Attractive, but not commonly available.	Attractive, but not commonly available.
Growing pigs	Low capital value, 6-month cycle and choice of buying one or more pigs, makes this an attractive option. Can be purchased opportunely.	Attractive, but not commonly available.	Attractive, but not commonly available.
Backyard chickens			
Breeding flock	Easy management, low cost, and 3-4 month cycle makes them attractive but total income not high.	Not applicable.	Not applicable.
Duck raising			
Duck egg layer flock	Attractive option, with entry point of about 50-100 ducks, relatively low capital.	Attractive option for larger flocks.	Attractive option for larger flocks.

There are many different options for poorer households to increase their livelihoods through progressively increasing their livestock assets, and in improving productivity. Table 27 illustrates some of these options for poor farmers, assuming three levels of asset growth: entry level, stage of asset growth and maturity. In this example, it is assumed that the household is either landless or does not have sufficient land to justify the purchase of draught male animals, and has sources of cash income from casual labour. Note that some of the options include raising breeding cattle, or sheep/goats for cash (labour) or share-contract arrangements (share of offspring). Note that while animal health is critical at all stages of the asset growth period, it is particularly important in the entry stages. Feeding and productivity (reproduction, breeds) issues become increasingly critical at the later stages of asset growth.

Table 27: Livestock asset growth options for poor households

Livestock production system	Stage of asset growth		
	Entry level	Asset growth	Mature
Backyard chickens	4-5 hens	8-10 hens	10-15 hens (management and feeding)
Growing piglets	1-2 piglets	3-4 piglets	7-8 piglets (using commercial feed)
Breeding sow		1 sow	2-3 sows (using commercial feed)
Sheep/goat flock ownership	10 head	20 head	30-50 head
Sheep/goat flock share-farming/labour	50 head	50 head	50 head
Breeding draught cow ownership	Not applicable	1 head	3-4 head
Breeding cow share-farming/ labour	10 head	10 head	10 head
Duck egg layer flock	20-30 ducks	50-60 ducks	100-150 ducks
Adult draught male cattle	Not applicable	Not applicable	Not applicable
Draught bull for breeding	Not applicable	Not applicable	Not applicable
Draught buffalo	Not applicable	Not applicable	Not applicable
Breeding buffalo female	Not applicable	Not applicable	Not applicable
Adult draught male buffalo	Not applicable	Not applicable	Not applicable

Livestock raising in a rural village setting can confer a certain amount of social inclusiveness. The raising of livestock gives some social capital, as people discuss purchasing, husbandry methods, breeds and marketing. If a poor household has some backyard chickens, they can contribute them to local ceremonies and events.

Both men and women play important roles in raising livestock in rural villages. Women often play a lead role in raising pigs and chickens. Draught cattle are usually managed by men. Children and youths are commonly involved with supervising grazing animals such as cattle, buffalo, and sheep and goats. For enterprises that require a significant amount of marketing, such as regularly selling duck eggs, women tend to take a lead role. Financial management around livestock raising is usually women’s responsibility. It is essential to understand gender roles in designing extension programmes.

Commercial livestock raising gives an opportunity for poor households to gain employment as labourers. This is not open to the average rural villager, because commercial farms are not located in their locations. In so doing, the labourers gain knowledge and skills, which they can utilize to later establish their own farms, if they can get access to the required capital.

Commercial chicken farms of the order of 3 000-3 500 broilers or 500 layers can be an entry point, but require significant capital and land.

7. RECOMMENDED AREAS OF INTERVENTION AND INVESTMENT

The basic assumption is that interventions that require a significant amount of investment will be most effective if they are guided by policies and strategies, and appropriate institutional reforms; and conversely that field interventions in any given area can feed into the policy, strategy and development process.

A summary of the recommended areas of investment and intervention is shown in Table 28. These are based on a combination of the specific areas reviewed by the mission with respect to technical areas, institutions, species/production systems and geographical areas. The recommendations are divided into two areas: firstly, issues related to sectorial and subsectorial development and institutional capacity and policies, which are largely focused at the national level; and secondly, specific investments for implementation of activities that are guided and directed by the strategies, institutions and policies developed in the first area.

7.1 Sector strategies, institutions and policies

The ‘long list’ of areas for intervention on sector development, and institutional and policy development is shown in Table 28. From this list, priorities need to be developed during the next stage of the NAPA.

Sector strategies or institutional development should align with global recommendations and guidelines, where available. For overall issues, the FAO document *Livestock sector development for poverty reduction: an economic and policy perspective: Livestock’s many virtues* can be referred to as a guide. In the case of animal genetic resources, FAO’s *Animal genetics resources guidelines* can be referred to. In the area of animal health, institutional development can refer to the World Organisation for Animal Health’s guidelines on *Performance of veterinary services and gap analysis.*

Policy options should address issues such as decentralization of power and authority within the public sector, and delegation to the private sector.

There are many regional linkages and issues that arise in the institutional and policy development area. For example:

- Laboratory networks need to link to regional networks for training, standards and referrals;
- Epidemiology capacity needs to link to regional networks; and
- Strategies on transboundary animal diseases should link to regional control programmes.

Table 28: Interventions related to institutions and policies

Institution	Institutional and policy issues
Subsector development	
Industry and subsector governance and representative bodies	Strengthen capacity of industry and subsector bodies to act as a forum for stakeholders (e.g. LBVD and MLF) from the public and private sector to promote dialogue on sector policy and development and investments, including investment in value adding. Priority areas would be • Draught cattle sector • Sheep and goat sector • Smallholder pig sector • Duck sector • Backyard chicken sector • Dairy cattle sector • CAHW associations • Apiculture sector Second priority areas would be: • Commercial pig sector • Veterinary associations • Professional body for UVS animal science graduates • Animal breed associations • Commercial animal feed sector • Chicken layer sector • Broiler sector The mechanism whereby the viewpoints of poor people and smallholders can be articulated and responded to in the subsector bodies should be an integral part of the strengthening process. In the commercial pig, chicken and broiler sectors, the interests of the smaller, often family-run production units need to be taken into account. Also the interests of labourers on the larger commercial farms need to be taken into account. The development of special interest groups, e.g. related to poultry production zones, should also be considered.
Development strategy processes	Subsector development strategy processes for poverty alleviation and rural development. Smallholder systems (higher priority) • Cattle/buffalo • Dairy cattle • Sheep/goats • Backyard chicken • Smallholder pigs Commercial systems (lower priority) • Broiler chickens • Layer chickens • Quail • Apiculture • Commercial animal feeds

	The strategy development process should be people-centred, and include processes that engage the views of poor people, and lead to poor people benefiting from strategy implementation. This includes how poor people can gain access to those benefits, as producers (e.g. credit to buy livestock, share farmers), or in other parts of the supply chain (e.g. labourers). The strategy development process should include significant stakeholder engagement through workshops and meetings, assessments of the political, economic, social and technological environment in which the sector operates, and the availability of resources to develop the sector, both public and private sector. Specific studies for secondary and primary data collection would also usually be required. The approach recognizes that policy and strategy development is an ongoing process, taking place in a dynamic environment, but one which requires a structure.
Professional associations	MVA to establish continuing education for private veterinarians and recognition of specialist training. The demand for specialist training is likely to be high in the commercial pig, chicken and dairy sectors. LBVD, MVA and MVC to define the system of governance of CAHWs and CAHW associations. Develop a professional association for UVS animal science graduates.
CAHW associations	Strengthen the association of CAHWs to represent their views and role in sector development
LBVD	
Animal Health and Disease Control	National strategic plans for control of endemic (infectious, parasitic, nutritional) diseases related to productivity, trade, and public health. Productivity diseases: These strategies should reflect differences between geographical areas. Trade diseases: Strategies for diseases that have a trade-related component (e.g. FMD) should be linked to broader trade strategy. Public health: Diseases of public health importance (e.g. avian influenzas, rabies) should be developed with a One Health approach, with the human health sector.
	National surveillance plan. This would include both active and passive surveillance systems, and refer to areas where delegation to the private sector (farmers, veterinarians, CAHWs) is appropriate and feasible.
	Animal health information system. This would capture information on vaccinations and disease events.
	Guidelines for township-level animal health and disease control assessments and plans.
	Strengthening epidemiology capacity. This includes international and regional graduate training for staff of the epidemiology unit, and in-country training through the FAO-developed Field Epidemiology Training Program for Veterinarians (FETPV), in order to develop capacities at state/region, district and township levels. Epidemiology capacity building needs to be linked to regional partnerships and programmes on epidemiology.
	Strengthening the disease outbreak emergency response function.
	Strengthening the laboratory system. This includes international and regional graduate training for laboratory staff. Capacity building needs to be linked to regional partnerships and programmes on laboratory development.
	Strengthening the system of vaccine production, distribution, storage and delivery.
	Policy, legislation, regulations to support community animal health workers (CAHWs)
	National Emergency Preparedness Plans for transboundary animal diseases including Contingency Plan. T
Animal breeding and	Develop a National Strategy and Action Plan for Animal Genetic Resources (AnGR)

breed improvement **(Overall guidelines refer to Animal genetics resources guidelines)**	Legislation, regulations for AnGR
	Establish national focal point for AnGR
	Guidelines for township-level breed improvement and conservation assessments and plans.
	Licensing, accreditation, standards for AI centres, embryo transfer centres, inseminators, breeding programmes and breeding programme managers.
	Characterize livestock breeds.
	Species and breed development/improvement strategies and programmes.
	Breed conservation strategies and programmes (e.g. Mithun).
	Regulate the import and export of AnGR.
	Describe indigenous and local production systems and associated knowledge systems.
	National breed improvement information system
Animal nutrition	National inventory and database of animal feeds and local feeding systems.
	National information system on animal nutrition.
	National strategy for forage and fodder development.
	Guidelines and procedures for the regulation of the commercial animal feed sector; strengthen capacity for feed testing and inspection.
	Guidelines for township level nutritional, forage and feeding assessments and plans.
	Strengthen the assay laboratory system for analysis of animal feeds.
	Strengthen capacity of the LBVD in the area of forage and animal nutrition policy and coordination.
Extension and research	National livestock extension and research system policy and strategy. The research priority is adaptive, field-based research done with farmers in the field. Applied research for adaptation of technologies is the second priority. Basic research is the lowest priority. Policy should include funding mechanisms and can include options: competitive, matching, industry funding; Development/endorsement of technical extension packages, guidelines and supporting modalities. The extension services need to go beyond the mere transfer of technology support. Empowering target communities by getting them organized, facilitating access to government/NGO/private sector-led services and incentives, accessing markets and enhancing their role in value chain management. The extension policy can include mechanisms for distribution of booklets, brochures, handouts in Myanmar language on basic livestock breeding and emergency animal health care. Seeing is believing and hence farmer-led demonstrations on recommended packages of practices are important for convincing the farming households in the locality and also for conducting hands on skill development training in their own vicinity. Research in people-centred areas such as access and benefits for poor people in livestock supply chains; and research on bottom-up demand-driven systems in the livestock sector. Most important is to strengthen meaningful and functional linkages among research, extension and primary producers of the sector. Active participation of farmers and extension agents in the identification and prioritization of research agenda may be recommended for consideration.
Access and benefits	LBVD engagement with entities (e.g. credit, microfinance) that enable poor people to have access to livestock, or livestock services, or to income from the livestock supply chain. LBVD capacity in analysing the benefits that poor people can get from engagement in the livestock supply chain. System for bottom-up planning principles to be applied in the area of livestock

	development programmes.
Trade, marketing and value adding	National policy and strategy on domestic livestock trade and market systems including licensing, utilization of fees, physical infrastructure standards.
	National policy and strategy for the export of live cattle and buffalo and meat, including engagement with transition/destination countries.
	National policy and strategy for the export of live sheep and goats and meat, including engagement with transition/destination countries.
	National policy and strategy for the export of live pigs and meat, including engagement with transition/destination countries.
	Action plan to strengthen LBVD capacity in inspection and testing of imports.
	Strengthening the function of border security, and internal movement control points to be activated when required for disease control purposes.
	Discussion paper on opportunities for value adding in the livestock sector (private investment or public-private partnership).
Disaster preparedness, response and recovery	Contingency, early warning system; livestock response; recovery strategy for natural disasters (e.g. droughts, floods).
Veterinary public health	Road map to define the LBVD's role in a national residue testing plan, and regulation for food safety, biology, meat inspection.
LBVD core functions	Strengthening statistics on collection and management. This includes reviewing the content and processes in the current system and implementing an improved system.
	Continuing the education programme for LBVD staff at all levels, with a specially-designed programme for new graduates for the first two years of service.
	Standards and guidelines for strengthening the physical infrastructure and assets of the state/region-, district- and township-level offices of the LBVD.
	Development of national policy on animal owner, animal group, and animal, identification/registration for genetic improvement/conservation, disease control, trade and farm management of different species and production systems.
	Establish monitoring and evaluation (M&E) capacity and function. This would act to establish M&E systems for international programmes and projects in the sector. Establishment requires staff training.
	Establish subject matter specialist/focal point functions (e.g. sheep and goats, forage, cattle, pigs).
	Strategy development processes. In order to engage effectively in strategy development, training is needed in strategy development processes.
	Capacity in analysis and evaluation of public and private investment in the sector.
	Systems and processes for coordinating NGO/international programmes/projects in the livestock sector to promote synergy and avoid duplication.
	National strategy for animal owner, farm and animal identification systems required for breed improvement/conservation programmes; for commodity trace-back in certain sectors (e.g. dairy) and for improved farmer management.
State/region authorities	
Resource allocation	Improve understanding of impact on poverty alleviation and rural development of investment in the livestock sector, in order to allocate resources accordingly.
University of Veterinary Science	
Quality of education programme	Development of a UVS Master Plan, cognizant of potential changes in the governance of the UVS, including potential shifts to Ministry of Education, or independent universities' governance, with potential for a measure of autonomy.
	Strengthen teaching and research capacity of UVS teachers, and research programmes. This would include regional study tours, regional and international

	postgraduate training and sponsoring of field research.
	Curriculum, delivery, practical aspects of the Animal Science Degree. Support is required to ensure the quality of graduates from this new degree aimed at producing graduates to work in the public sector on extension, and in the commercial livestock sector.
	Curriculum, delivery and practical aspects of the DVM. The current course needs to have more practical field work.
	Off-campus practical training for undergraduate programmes. UVS has successfully piloted epidemiology field trips for students, where they conduct surveys in the field, and this system can be built upon to link with field programmes.
	Competency-based programme for teaching and qualification. The skills and practical experience of graduates need to be quantified in a systematic way.
	Postgraduate programmes with emphasis on addressing the practical problems of smallholders.
	Physical infrastructure (student accommodation, teaching facilities, laboratory facilities and production farms for dairy, chickens, pigs, sheep and goats and cattle, and forage and fodder production.
	Twinning programmes for veterinary and animal science courses.
	Regional and international accreditation of curriculum and student qualifications.

7.2 Specific areas of investment

The specific areas of investment are divided into three categories: national programmes, area-based programmes and commodity/subsector programmes.

National programmes would be implemented at state/region/district/township level and be guided by LBVD policies and strategies developed as described above. National programmes should include a component that is linked to strengthening of UVS practical undergraduate training, postgraduate programmes and teachers' practical experience.

Area development projects should have a strong management input from the state/region level. Projects should either be one state/region only, or if they have more than one state/region, then each state/region should have its own component. Projects should also have a component for Union-level issues, and also at least an activity or component for involvement of the UVS (students, teachers) from animal science and veterinary courses. Investment should be focused on local priorities for poverty, rural development from livestock, including bottom-up principles. Interventions should target health, feeding, breeding, marketing, value chains, grazing systems, extension, and address benefits and access issues.

Commodity/subsector programmes would be based on the strategies developed as described above.

The list of recommended investments is shown in Table 29. In the table they are described as 'programmes' to suggest that more than one investment project could come under the umbrella of a programme which is guided by agreed policies and strategies. Investments include infrastructure, equipment and supplies, technical assistance and support to operating and training costs. Investments include engagement with private sector actors for co-investment in agreed business plans. Investments in the public sector should demonstrate the value for money in such investments and engage in co-investment with public agencies on agreed investment plans.

Table 29: Interventions and investments at the national level, area level and on specific commodities/subsectors

Programme type	Title	Period	Broad expected cost (US$ million)
National programmes	National Animal Health Programme	15 years. Pilot phase 5 years, expansion phase 10 years	US$60
	National Forage/Fodder Programme	15 years. Pilot phase 5 years, expansion phase 10 years	US$50
	National Livestock Breeding Programme	15 years. Pilot phase 5 years, expansion phase 10 years	US$40
	Education, Training and Research	15 years. First phase 5 years, expansion phase 10 years	US$20
Regional programmes	Central Dry Zone	15 years. First phase 5 years in one zone (e.g. dry zone), followed by expansion to other zones (10 years)	US$20
	Upland (Shan)		
	Upland (Chin)		
	Delta/coastal		
	Rakhine		
Sector programmes	Duck sector development	5 years	US$3

8. RELATIONS TO OTHER RURAL SECTORS

The livestock sector has many linkages to other rural sectors. A summary is given in Table 30.

Table 30: Linkages to other sectors

Rural sector	Linkages
Forestry	A national forage/fodder programme could include the planting of fodder trees on long-term community-leased public land. Such a system would require close collaboration with authorities responsible for land use management, which in many eligible areas could be the forestry authorities.
Environment	A national forage/fodder programme could include rehabilitation of degraded areas through smallholder leaseholds with planting of edible grasses, legumes and fodder trees. This would need to be linked to general environmental management.
	Grazing management of sheep and goats in the Dry Zone has an impact on the environment. Studies are needed on the overall impact of agriculture and land-use policy on the Dry Zone environment.
	Policies on zoning of livestock production or processing facilities are often driven by environmental concerns, e.g. on waste, offensive smells, human health risk. This can impact livestock production in urban and semi-urban areas and slaughterhouse management and location. It also could be the case for processing of hides and skins.
Fisheries	Livestock-fish production systems are found in many low-lying areas. These can be layer or broiler chickens or pigs. There is a need for better data collection (typology, location) of these systems; clarification of research and extension needs; and better understanding of the implications for fish marketing given the potential of residues in the fish, especially when antibiotics are used extensively in feed of animals reared in the livestock-fish culture system. Freshwater fish production competes with livestock (pigs mainly) for inputs such as rice bran. Study is needed on the dynamics of the market for rice bran, and its use in fish and pigs. On the other hand aquaculture also complements animal farming in many ways. Freshwater aquaculture is heavily dominated by carp culture which requires feed from external sources only at the supplemental level. Carp depend largely on natural fish food organisms produced in the pond ecosystem and the detritus cycle operating therein. By adopting a low cost carp culture system one can produce a reasonable amount of fish (3-4 tonnes/ha/year) exclusively through use of animal manure (cattle dung, poultry and pig manure, etc.). Fishmeal is a common ingredient in commercial feed for chickens and pigs. Fishmeal can be used as an ingredient for locally-mixed feeds. Study is needed on the price and quality of fish meal and the market in which it operates.
Science and technology	Waste management from intensive commercial livestock farms (broiler, layer chickens, pigs and dairy cattle) is an issue and research is needed on appropriate and affordable biogas systems to utilize the waste. The shape of an extension system to promote proven biogas systems needs to be determined. The shape of public support to develop a private biogas industry needs to be determined.
Cropping	Crop residues and by-products are used for animal feeding. A national forage and fodder programme will develop an inventory of feeds, their quality and use.

	Crops (e.g. sorghum) are reportedly being grown specifically for livestock feed, and some crops (e.g. soybean and maize) are being grown for sale to commercial animal feed producers. The research and extension system for crops destined for livestock needs to be developed.
Animal feed sector	Private sector outlets for prepared livestock feed also act as outlets for medicines, and also on occasion for vaccines. The role of such retailers in the extension system needs to be defined as they are a source of information for farmers. Governance of the animal feed sector (quality, labelling) has an impact on the use of feed by smallholders.
Mechanization	Mechanization will lead to a decrease in the use of draught animals and either a drop in the draught cattle/buffalo population or a change in structure to breeding cattle. This will also have implications for breed improvement, as the market demand changes from a demand for draught cattle to beef cattle. Significant decrease of draught animals incidental to farm mechanization has also resulted in significant depletion of organic carbon levels in many parts of the region thus negatively affecting soil microflora and fertility. Mechanization trends need to be tracked and farmers' responses determined.
Food safety and City Development Councils	Livestock populations have dramatically increased, but processing (live markets and slaughterhouses) facilities have not always kept pace. Plans for upgraded live animal markets (e.g. poultry in Yangon) need to be made and investment sought. Reduction in transaction costs for marketing, and governance of the downstream trading system will require close collaboration with food safety and city and township authorities.
Commerce and trade	Subsector strategies that include cross-border trade will need to link with authorities responsible for commerce and trade.
Credit and microfinance	Livestock are often procured through credit. Close collaboration is needed between LBVD and credit agencies when credit is being made available for livestock purchase. There should be some monitoring from the LBVD on the use of credit for livestock aimed at poverty alleviation.
Rural infrastructure	Developments in rural infrastructure can open up more opportunities for livestock. Irrigation and wells provide more water for livestock. Roads improve marketing and access to inputs and services. Communication services (mobile phone services, Internet) improve market information flow, and information flow in general.
Media	Media (television, radio) can be important channels for supplying information to farmers. The extension system policy needs to define the role of media in livestock extension. The role of the Internet and social media is also an emerging issue.

ANNEX 1: RELEVANT DATA

Table 1: Production system, diseases and responsibility for control

Production/Animal System	Common Disease Problems	Public/private* responsibility for services**
Native cattle and buffalo for draft	Haemorrhagic Septicaemia, Anthrax, Foot and Mouth Disease, Black Quarter.	LBVD responsible for vaccine production and distribution of vaccines; cooperate with CAHWs for vaccine delivery
Smallholder native dairy cattle		
Smallholder crossbred dairy cattle	Mainly production diseases such as mastitis, lameness; Foot and Mouth Disease	Private** responsibility LBVD vaccinates for infectious diseases
Commercial cross bred dairy cattle		
Smallholder sheep and goats	Ectoparasites, internal parasites	Private responsibility. No LBVD involvement
Commercial sheep and goats		
Smallholder pigs	Classical Swine Fever (CSF), PRRS, Pasteurellosis, Internal and External Parasites	Private sector responsible. LBVD produces limited amounts of CSF vaccine. Private sector imports vaccines. Limited delivery of vaccines. No PRRS vaccine
Peri-urban smallholder pigs	Classical Swine Fever (CSF), PRRS, Pasteurellosis	
Commercial pigs		
Smallholder backyard chickens	Newcastle Disease. Impact of HPAI not yet determined.	LBVD produces and distributes heat labile vaccines. Private sector or farmers deliver the vaccine
Commercial layer chickens	Infectious diseases, HPAI outbreaks especially in small commercial layer farms	Private sector responsible for clinical services and vaccinations. LBVD responsible for diagnostic services and HPAI control.
Small commercial broiler chickens		
Large commercial broiler chickens		
Broiler chicken parent hatcheries		
Small commercial layer farms		
Large commercial layer chickens		
Layer chicken parent hatcheries		
Small commercial quail farmers	No significant diseases affecting production yet determined. HPAI is endemic in ducks but limited evidence of impact on health and no evidence of impact on production.	No significant actions taken, although ducks can act as a reservoir for HPAI, so their role in epidemiology needs to be understood
Smallholder backyard ducks		
Smallholder commercial layer ducks		
Duck layer breeders and hatcheries		
Smallholder commercial meat ducks		
Rural and urban dogs	Rabies is the major concern	Private sector imports and delivers vaccine. LBVD produces limited amount of vaccine and diagnostic services
Horses and ponies	No data	

* Private sector includes private veterinarians, community animal health workers and farmers themselves
**Animal Health Services also include surgical procedures such as castration, as well as treatment of sick animals, and vaccination.

Table 2: Import of day-old-chicks and hatching eggs of layers and broilers

Year	Grand Parent Stock			Parent Stock			
	Layer		Broiler	Layer		Broiler	
	DOC	HE	DOC	DOC	HE	DOC	HE
2006-07	392	-	-	22190	119420	8404	371528
2007-08	-	-	-	-	-	-	-
2008-09	1296	-	9161	9300	299040	139850	441240
2009-10	5241	246200	-	-	-	87611	101475
2010-11	-	-	-	30356	236120	191223	309105
2011-12	-	-	21672	11760	510060	171600	394140
2012-13	-	-	29200	31160	266760	789942	560408

Table 3: Diagnostic services

Type of Testing	2008-09	2009-10	2010-11	2011-12	2012-13
Post Mortems	10,631	4,798	2,601	3,335	3,222
Parasitology	10,075	10,293	10,237	11,578	12,151
Bacteriology	5,895	6,687	7,606	6,561	6,981
Serology	5,665	4,805	2,121	10,947	6,941
Virology	19,014	27,238	29,996	708	769
Bio- chemistry	2,554	1,215	1,807	1,487	1,068
Histology	2,883	4,710	4,558	5,040	2,854
Others	3,529	2,765	3,045	5,994	2,493
Total	**60,246**	**62,511**	**61,971**	**45,650**	**36,479**

Sources: Central Disease Diagnostic Section, LBVD

Table 4: Quarantine stations and check points

Quarantine /Check Points / Quarantine Lab	Location	Starting Dates
Yangon International Airport Quarantine	Yangon, Yangon Region	1998-1999
Mandalay International Airport Quarantine	TadaOo Ts , Mandalay Region	1999-2000
Thilawa International Seaport Quarantine	Kyauk Tan Ts, Yangon Region	1998-1999
Kyaukphyu Deep Seaport Quarantine Station	Kyaukphyu Ts, Rakhine State	1999-2000
Myeik Seaport Quarantine Station	Myeik District, Tanintharyi Region (Southern Part of Myanmar-Thai Border)	2007-2008
Muse Check Point	Muse District, Shan State (North) (Northern Part of Myanmar-China Border)	1998-1999
Tachileik Check Point	Tachileik District, Shan State (East) (Eastern Part of Myanmar-Thai Border)	1998-1999
Myawaddy Check Point	Myawaddy District, Kayin State (Southern Part of Myanmar-Thai Border)	1998-1999
Kauthaung Check Point	Kawthaung District, Tanintharyi Region (Southern Part of Myanmar-Thai Border)	1998-1999

Maungtaw Check Point	Maungtaw District, Rakhine State (South-Western Part of Myanmar-Bangladesh Border)	1998-1999
Tamu Check Point	Tamu District, Sagaing Region (Middle-West of Myanmar-India Border)	1998-1999
Kyaington Quarantine Laboratory	Kyaington Ts, Shan State (East) (Eastern Part of Myanmar-Thai Border)	2005, Jan
Lashio Quarantine Laboratory	Lashio District, Shan State (North) (Northern Part of Myanmar-China Border)	2007, Oct
Myintgyina Quarantine Laboratory	Myintgyina District, Kachin State (Eastern Part of Myanmar-China Border)	2007, Oct
Muse Quarantine Laboratory	Muse District, Shan State (North) (Northern Part of Myanmar-China Border)	2003

ANNEX 2: INTERVENTION DESCRIPTION AND INVESTMENT PROFILES

The interventions described below and the associated budgets are indicative only. Investment in each intervention will be in both physical assets and technical assistance. Operating funds (e.g. for training, workshops, travel, M&E) are also included. Some interventions include pilot and expansion phases.

Three national interventions are shown, one example of a regional intervention, and one species focused intervention.

Three national interventions are shown, one example of a regional intervention, and one species focused intervention.

Intervention 1: National Animal Health Programme

Justification	Animal morbidity and mortality caused by infectious, parasitic and nutritional diseases results in losses to smallholders throughout the country. The control of animal diseases is the core responsibility of government services including planning, vaccine production, distribution and delivery, and outbreak management. Community Animal Health Workers (CAHWs) operate on a user-pays basis with the technical support of government and are the front-line service providers for vaccinations, animal treatments and surgical interventions such as castrations. The animal health system has suffered from a lack of investment for many years.
Priority	The animal health programme is the first priority amongst the national interventions given that investments in feeding and breeding are most effective when a solid basis of animal health control is established. A functioning animal health program operating through networks of CAHWs forms the basis of a livestock extension system which can be utilised for extension activities in feed, breeding and marketing improvements.
Scope	National level policy and institution capacity building
Activities	
Animal health policy and strategy development	Includes policy development on: • disease control strategies development (productivity, trade, and public health diseases) • vaccine production and distribution • animal health information system • National Surveillance Plan • statistic strengthening • CAHW establishment and management

	• policies to target poor households • continuing education policy for veterinarians • contingency planning for emerging disease threats
Institutional capability strengthening	Includes strengthening vaccination production and distribution system • laboratory strengthening • epidemiology strengthening • township animal health planning • surveillance and response • strengthening UVS veterinary practical training through surveys on animal health • LBVD office rehabilitation • Cold chain facilities in all LBVD township offices • strengthen MVA, MVC role in governance and continuing education • strengthen linkages to human health services in the area of zoonoses and emerging infectious diseases
Animal health services	• CAHW establishment and capacity building (technical training and business management) • CAHW associations • vaccination programs • private sector input supplier strengthening • animal health extension activities • targeted activities for poor farmers • animal health epidemiological studies, surveys, outbreak investigations and emergency response • in-service training and capability improvement of LBVD staff • Involvement of UVS lecturers, post-graduate students, undergraduate students in Veterinary Science and Animal Science in field activities, especially in field of epidemiology and laboratories, and animal health service provision
Intervention management	• monitoring and evaluation • strategic oversight • managing linkages with other programs and projects
Expected duration	15 years. Pilot phase 5 years, expansion phase 10 years
Broad expected cost	Pilot USD 10 m, expansion USD 50m

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Intervention 2: National Forage/Fodder Programme

Justification	There are opportunities to improve the nutrition of ruminant livestock (mainly cattle, sheep and goats) to improve survival, growth rates, reproduction and turnoff rates. A national programme to introduce new feed species and feeding technologies will have a positive impact on livelihoods of farmers throughout the country.
Priority	High priority, after the animal health programme
Scope	National
Activities	
Forage policy and strategy development	• Includes policy development on: • National forage development policy and strategy • National inventory and database of animal feeds and local feeding systems and National Information System on Animal Nutrition • policies to target poor households
Institutional capability strengthening	• laboratory feed testing strengthening • feed and nutrition information system management • township animal forage planning • Involvement of UVS in field and in on-campus forage production and engagement in field programs
Forage/fodder establishment and extension services	• Baseline of forage, crop by-products and commercial available feeds for comparative cost and availability. • Import of high-quality planting material. • Extension system of demonstration plots; local study tours. • Establish plots of smallholder forage/fodder production for home use or sale. Planting material (seeds, seedlings, vegetative planting material) can be distributed through networks of township LBVD staff, community animal health workers, milk collectors; artificial inseminators. • Potential planting forage/fodder on smallholder lease of community forest land • Planting of forage/fodder on degraded lands • Inter-planting legumes in young tree plantations • Applied research and multiplier plots • Trial forage processing options (e.g. Harvest, storage, pelleting) and mixing of low quality roughages such as rice straw with legumes; use of prosopis juliflora pods and pod flour (in the dry zone) in feed mixes for

	livestock • Institution capability for fodder/forage in management, field extension, information system (e.g. GPS records of sites), testing research and education; training and accreditation scheme for nutrition service providers • Involvement of UVS lecturers, post-graduate students, undergraduate students in Veterinary Science and Animal Science in field activities, and support to incorporating principles of forage development in teaching programs, and in on-campus forage production and animal feeding response trials • Extensive functional linkages to interventions aimed at development in cattle, buffaloes, sheep and goats, pigs. • Development of guidelines for feeding recommendations for forages in combination with other locally available feeds.
Intervention management	Includes • monitoring and evaluation • strategic oversight • managing linkages with other programs and projects
Expected duration	10 years. Pilot phase 5 years, expansion phase 10 years
Broad expected cost	Pilot phase USD 10 m, expansion phase USD 30m

Intervention 3: National Livestock Breeding Programme

Justification	Improvements in livestock breeds can result in permanent increases in productivity. There is currently no structured breed improvement programs in smallholder livestock, causing lack of genetic progress, and in-breeding especially in sheep and goat populations
Priority	High, after animal health
Scope	National, encompasses smallholder livestock: cattle, sheep and goats, pigs, ducks
Activities	
Animal genetic resource policy and strategy development	• Includes policy development on: • Develop a National Strategy and Action Plan for Animal Genetic Resources (AnGR) • Legislation, regulations for AnGR • Guidelines for township breed improvement and conservation plans

	• regulations for AI centres, embryo transfer centres, inseminators, breeding programs and breeding program managers • Characterise livestock breeds • Species and breed development/improvement strategies • Breed conservation strategies and programmes (e.g. Mithun) • Regulate the import and export of AnGR • Describe indigenous production systems/ knowledge systems • National Breed Improvement Information System • farmer, herd/flock, and animal identification systems • performance recording and breeding value assignation
Institutional capability strengthening	• Includes • strengthen AI centers and liquid nitrogen production • strengthen human resources in breed improvement • training for AI technicians and breeding service providers • import of breeding material • data management of breed improvement program • strengthen UVS capability in breed improvement through involvement in field activities • identification system management
Breed improvement programs	• Includes • Draft, beef, and dairy cattle breed improvement programme • Sheep and goat breed improvement programme, including establishment and management of nucleus flock systems • Pig breed improvement programme. • Mithun conservation programme.
Intervention management	• Includes • monitoring and evaluation; strategic oversight • managing linkages with other programs and projects
Expected duration	15 years. Pilot phase 5 years, expansion phase 10 years
Broad expected cost	Pilot phase USD 10 m, expansion phase USD 30m

Intervention 4: Education, training and research

Justification	Human resource capacity in both public and private sector is a critical issue for the development of the livestock sector. Adequate degree, diploma, certificate level and in-service training systems are required to supply the human resource requirements for the sector. There is little or no applied research on smallholder livestock production. Such research is required to link to extension services to develop and adapt appropriate technologies on health, feeding, and breeding that can contribute to productivity improvements. Applied research is also needed on social aspects related to livestock, such as impact on food security, livelihoods, nutrition, and poverty.
Priority	High
Scope	National
Activities	
	Review current education, training and research systems, and linkages between extension and research Review career paths of previous graduates of degree, diploma, certificate and other sector courses; review future options and review the current and future demands of the sector. Develop policy options for education, training and research
	support curriculum development in the courses at UVS, including the newly developed Diploma in Livestock Production, in line with domestic, regional and international standards develop CAHW training standards develop LBVD in-service training and human resource standards
	develop on-campus practical livestock production units at UVS in poultry, dairy, pigs, cattle, sheep and goats, artificial insemination, forage and fodder plots support professional training for UVS staff, including international further study and study tour support practical field work by undergraduate and post-graduate students develop infrastructure at UVS, including student accommodation, laboratories, lecture rooms, and access to

	educational materials
Expected duration	15 years. First phase 5 years, Second Phase phase 10 years
Broad expected cost	First phase USD 5 m, expansion phase USD 15m

Intervention 5: Regional Livestock Development Programme

Justification	Smallholder livestock production is mostly carried out in an integrated fashion with cropping, and with farmers raising various mixes of livestock enterprises. The improvement of productivity relies on a comprehensive approach to policies, institutions, and investment in improved inputs, services and productivity extension.
Priority	High
Scope	Regional basis
Activities	
Livestock policy and strategy development	• Includes policy development on: • CAHWs and animal health services • extension-research policy • bottom-up, demand driven systems development • breed improvement • forage/fodder development • sheep/goats, cattle strategy process • policies to target poor households as beneficiaries
Animal health improvement	• LBVD office rehabilitation, including cold chain • CAHW establishment and training and business planning • CAHW associations • vaccination programs • animal health extension activities • surveillance and response
Livestock extension	• demonstrations on improved feeding, husbandry, breeds • breed improvement programs (sheep, goats, cattle, pigs) • communication programs • strengthen UVS capability in breed improvement through involvement in field activities
Project management	• monitoring and evaluation • strategic oversight • managing linkages with other programs and projects
Expected duration	10 years. Pilot phase 5 years in Central Dry zone; expansion phase 10 years in CDZ, Upland Shan, Upland Chin, Delta, Coastal

Broad expected cost	Pilot phase USD 5 m, expansion phase USD 30 m

Intervention 6: Duck Sector Development Programme

Justification	Small scale commercial duck raising is an important source of income for farmers in the Delta and coastal areas near Yangon and in the Mandalay area. Ducks are raised in traditional fashion in a low cost system. There are opportunities to improve sector performance and smallholder livelihoods through improved productivity, especially in the area of breed improvement.
Priority	Medium
Scope	Duck raising areas in delta, coastal and Mandalay areas
Activities	
Component 1 Sector policy and strategy development	Policy development on: • duck sector development strategy • duck sector governance strengthening, including MLF strengthening • engagement of poor people in duck sector • breed improvement • marketing improvement • accreditation of duck sector service and input providers • duck sector information system
Component 2 Breed improvement	• breed characterisation and performance • establish breeding objectives • establishment of breed improvement program, including nucleus flocks and import of new genetic material
Component 3 Extension	• demonstrations on improved feeding, husbandry, breeds • business planning • hatchery technology improvement • communication programs • improved supply chain linkages
Intervention management	• monitoring and evaluation • strategic oversight • managing linkages with other programs and projects
Expected duration	4 years.
Broad expected cost	USD 3 m