

TCP/RAS/215 ASSISTANCE ON DIAGNOSIS AND MANAGEMENT OF PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME (PRRS)  
AND OTHER SWINE DISEASES TO IMPROVE SWINE HEALTH STATUS IN SELECTED COUNTRIES



## SWINE INDUSTRY PROFILE OF SELECTED SOUTH EAST ASIAN COUNTRIES

Cambodia, Lao PDR, Myanmar, Philippines, Thailand, Vietnam



**Cover photographs:** ©NavRI, Cambodia. Pig farms in Cambodia

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS  
REGIONAL OFFICE FOR ASIA AND THE PACIFIC  
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## Abbreviations

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ACIAR	Australian Center for International Agricultural Research
ADG	average daily gain
AH	Animal Health
AHD (Myanmar)	Animal Health and Development
AHD (Philippines)	Animal Health Division
AHDL	Animal Health and Development Law
AI	artificial insemination
APP	<i>Actinobacillus pleuropneumoniae</i>
ARMM	Autonomous Region of Muslim Mindanao
BAI	Bureau of Animal Industry
BAS	Bureau of Agricultural Statistics
BPO	business process outsourcing
BSL	biological safety levels
CALABARZON	Cavite, Laguna, Batangas, Rizal, Quezon
CAR	Cordillera Administrative Region
CP	Charoen Pokphand
CSF	classical swine fever
DA	Department of Agriculture
DAHP	Department of Animal Health and Production
DLD	Department of Livestock and Development
DoLF	Department of Livestock and Fisheries
DOST	Department of Science and Technology
EID	emerging infectious disease
ELISA	enzyme linked immunosorbent assay
ESA	Essential Supplies Act
FAO	Food and Agriculture Organization of the United Nations
FAT	fluorescent antibody test
FCR	feed conversion rate
FMD	foot and mouth disease
GAP	good agricultural practices
GDP	gross domestic product
GMP	good manufacturing practices
GNP	gross national product
GOM	Government of Union of Myanmar
GOV	gross output value
HACCP	hazard analysis and critical control points
HPAI	highly pathogenic avian influenza
IAEA	International Atomic Energy Agency
JE	Japanese encephalitis
JICA	Japan International Cooperative Agency
KHR	Cambodian riel
Lao PDR	Lao People's Democratic Republic
LAK	Laotian kip
LBVD	Livestock Breeding and Veterinary Department
LFDB	Livestock and Fisheries Development Bank

LFME	Livestock Feedstuff and Milk Products Enterprise
LGU	local government unit
LU	livestock unit
MAF	Ministry of Agriculture and Forestry
MoAI	Ministry of Agriculture and Irrigation
MAFF	Ministry of Agriculture, Forestry and Fisheries
MDG	millennium development goals
MoLF	Ministry of Livestock and Fisheries
MMK	Myanmar kyat
MLFD	Myanmar Livestock and Fisheries Development Bank
MOC	Ministry of Commerce
MOPH	Ministry of Public Health
NAHC	National Animal Health Center
NCR	National Capital Region
NESDB	National Economics and Social Development Board
NIAH	National Institute of Animal Health
NID	National Identification and Registration System
NSP	non-structural protein
NMTPP	national medium term priority plan
NaVRI	National Veterinary Research Institute
OIE	World Organisation for Animal Health
PAHC	Philippine Animal Health Center
PAHPO	Provincial Animal Health and Production Office
PCARRD	Philippine Council for Agricultural, Forestry and Natural Resources Research and Development
PCR	polymerase chain reaction
PCVAD	porcine circovirus associated diseases
PDNS	porcine dermatitis and nephropathy syndrome
PED	porcine epidemic diarrhea
PEL	parvovirus, erysipelas, leptospira
Phil-AHIS	Philippine Animal Health Information System
PHP	Philippine peso
PM	post mortem
PMWS	post-weaning multi-systemic wasting syndrome
PRRS	porcine reproductive and respiratory syndrome
RADDLs	regional animal disease diagnostic laboratories
RITM	Research Institute for Tropical Medicine
RFU	regional field unit
RBPT	rose bengal precipitation test
RDC	research and disease control
RT PCR	reverse transcriptase polymerase chain reaction
RVRDC	regional veterinary research and development centers
SI	swine influenza
SIV	swine influenza virus

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SLPP	Smallholder Livestock Production Programme
SOCCKSARGEN	South Cotabato, Cotabato, Sultan Kudarat, Sarangani and General Santos City
SOP	standard operating procedure
SVD	swine vesicular disease
TADs	transboundary animal diseases
TGE	transmissible gastroenteritis
THB	Thailand baht
USA	United States of America
USAID	United States Agency for International Development
USD	United States dollar
USDA	United States Department of Agriculture
UVS	University of Veterinary Science
VAHW	village animal health worker
WTO	World Trade Organization

## Introduction

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The countries of Cambodia, Lao PDR, Myanmar, Thailand, and Vietnam are part of the Mekong region. The Philippines on the other hand is an archipelago but joins the said countries as a member of the ASEAN. In all the six countries, livestock plays an important role for the livelihoods of poor farmers both as a food and income source. It is an important source of income for a large share of farmers in the Mekong region and its development has important repercussions for poverty reduction and income distribution, directly for the single household and through multiplier effects on local communities.

All six countries are producers of pork; trading swine and pork throughout the South East Asian Region and to some extent outside the region. Thailand is an exporter of pigs and its production is now moving into large scale farm operations. The Philippines is trying to enter the export market with the recognition of the whole country as free from FMD. Pigs are also an important livestock species in all six countries if smallholder assets are discussed. Most pigs are kept on family farms and are a source of cash when large scale household expenses are needed to be paid (e.g. school fees).

Animal disease outbreaks have been a constant threat to the whole livestock sector and to the millions of poor households dependent on them for their livelihood and food security. These diseases are impacting livestock production in various ways severely affecting the overall productive efficiency of animals, and reducing the conversion of available feed into marketable products.

The TCP/RAS/3215 Assistance on diagnosis and management of porcine reproductive and respiratory syndrome (PRRS) and other swine diseases to improve swine health status in selected countries aims to improve the swine health and production practices of the countries enabling smallholder farmers to earn more from swine raising. The assistance is aimed at developing a capacity building programme in the diagnosis and investigation of swine diseases starting with surveillance programmes, developing a network of decentralized laboratories for the South East Asian region, and establishing a swine health status in each country.

The compilation of the swine industry profiles of Cambodia, Lao PDR, Myanmar, Philippines, Thailand, and Vietnam gives information on the geography; economic profile; and role of the agriculture, livestock and swine sector. The swine industry profile for each country also includes a section on the swine sector players; trade and production systems; constraints encountered in swine production and health; and the policy and legislation governing the sector.

Acknowledgment is given to the governments and country focal points who drafted the swine industry profiles in this compilation.



# CAMBODIA

## Swine Industry Profile

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## INTRODUCTION

### I. COUNTRY PROFILE

#### A. Geographic Profile

Cambodia is situated in mainland South East Asia. It is strategically located with Thailand on the north and west, Vietnam on the east and south east, and Lao PDR in the north east (Figure 1).

It has a total geographic area of 181 035 sq km and has a sea coast on the Gulf of Thailand. Phnom Penh is the capital of Cambodia and is the largest city in the country. Other major cities include Battambang, Siam Reap, and Preah Sihanouk.

The country is comprised of 24 provinces, 185 districts, 1 623 communes and 13 864 villages (Figure 2). Estimated population is at 14.8 million as of 2010.

The Mekong River flows from north to south of the country up to the Mekong Delta of Vietnam. The central plain is drained by the Tonle Sap Lake (Great Lake), Mekong River and Bassac Rivers.

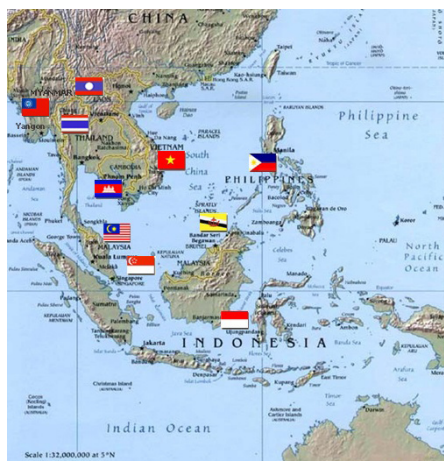


Figure 1. Cambodia with other South East Asian Countries

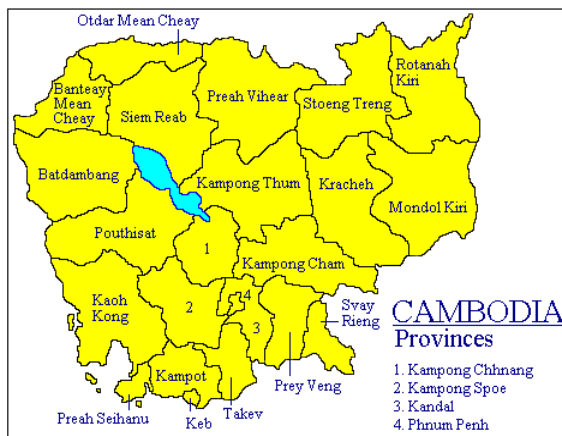


Figure 2. Country Map of Cambodia

## B. Economic Profile

In 2009, the central government budget had revenue of USD 1.38 billion (USD 1 = KHR 4 115 as of July 2011) while expenditures are at USD 1.8 billion. Foreign investments are at USD 606 million while economic aid through grants and concessional loans is at USD 989 million. Principal foreign commercial investors are from the countries such as Korea, China, Russia, Thailand, USA and Vietnam.

The service sector accounts for 38.8 percent of the gross domestic product (GDP) followed by agriculture (33.5%) and industry (21.7%). The service sector is composed of tourism, telecommunication, transportation and construction. The industrial sector, on the other hand, includes garment and shoe manufacturing, rice milling, tobacco, fisheries and fishing, wood and wood products, textiles, cement, some rubber production, paper and food processing.

Trade exports are at USD 3.9 billion while imports are at USD 5.4 billion. Exports include garments, shoes, cigarettes, natural rubber, rice, pepper, wood and fish. Products imported from other countries include fuel, cigarettes, vehicles, consumer goods and machinery.

## II. AGRICULTURE PROFILE

### A. Role of Agriculture in the Economy

Agriculture plays a crucial role in the economic growth and in addressing poverty in the country since 85 percent of the population lives in the rural areas and more than 60 percent of those are directly or indirectly dependent on the income generated from agriculture.

Agriculture contributes to 33.5 percent of the GDP. Due to its rich natural resources, Cambodia has a great potential for agriculture. About 4 848 000 hectares (12 million acres) of the country are unforested land. All are arable land with irrigation while 2.5

million hectares are cultivated. Agricultural products include rice, rubber, corn, meat, vegetables, dairy products, sugar and flour.

## B. Role of Livestock in the Total Agricultural Economy

The government considers livestock production as an important key in economic growth through increase in animal productivity, income and poverty reduction. It also plays an important role in providing nutrition and livelihood for the Cambodian people.

Livestock production accounts for 15.3 percent of the agricultural sector. Other sectors of agriculture include crop production (52.9%), fisheries (25.2%), forestry and logging (6.6%).

As of 2009 there are 3.6 million cattle; 20.18 million poultry; 2.12 million pigs and 740 000 buffaloes (Table 1).

**Table 1. Animal Population (2001-2009)**

Year	Cattle	Buffalo	Pig	Poultry
2001	2 868 727	625 907	2 118 273	15 251 574
2002	2 924 457	625 912	2 704 435	16 677 864
2003	2 985 416	660 493	2 304 248	16 013 713
2004	3 039 945	650 572	2 428 566	13 990 592
2005	3 184 146	676 646	2 688 612	15 085 547
2006	3 344 712	724 378	2 740 815	15 136 065
2007	3 368 449	772 780	2 389 389	15 825 314
2008	3 457 787	746 207	2 215 641	16 928 075
2009	3 579 882	739 646	2 126 304	20 192 811

Source: Department of Animal Health and Production

## C. Role of the Swine Sector in the Total Livestock Economy

Swine raising is a source of income for farmers through selling of pigs, meat and meat products while pork provides a good source of protein. Pigs are mainly for home consumption and smallholder farmers also see swine raising as an easy source of cash in come by selling their pigs to traders when they need money. Swine population has a 48 percent share of the total livestock production.

For the whole country, daily demand of pigs for meat consumption is at 8 200 heads. Around 88 percent (7 200 heads) of the supply is sourced domestically while 12 percent (1 000 heads) is imported from neighbouring countries.

In 2008, total meat consumption per capita is 32.85 kg. Pork meat had the highest meat consumption per capita at 14.6 kg followed by beef (10.95 kg) and poultry meat (7.3 kg).

### **III. SWINE SECTOR**

#### **A. Swine Industry Players**

The swine industry players for Cambodia are the private sector and the government. The private sector includes suppliers of livestock inputs that sell feed, equipment, veterinary drugs to the farm owners (commercial and smallholder).

The government stakeholders are composed of district veterinarians and village animal health workers who provide technical support to farmers. The Department of Animal Health and Production (DAHP) under the Ministry of Agriculture, Forestry and Fisheries (MAFF) is the lead government agency responsible for the livestock sector.

DAHP provides technical support to Provincial Animal Health and Production Office (PAHPO). At the district level, the district offices have one to two veterinarians who report to the provincial office. The village animal health workers (VAHWs) are private citizens that provide basic animal health services at the village level.

International agencies are involved (ACIAR, FAO, JICA, Institut Pasteur de Cambodge, OIE, SLPP, USAID, USDA, World Bank) in providing financial and technical support in the development of the swine industry.

#### **B. Swine Marketing and Trade**

The country does not export swine, pork and meat products to other countries. On the other hand, it is estimated that about 1 000 heads of pigs are imported from other countries for meat consumption daily.

#### **C. Swine Production Systems**

There are three types of swine production in Cambodia: smallholder (traditional/backyard) farms, semi-commercial farms and commercial farms. Farms that belong to the smallholder sector have 10-50 heads of pigs and have low farm biosecurity (Figure 3). Farms in the semi-commercial sector have 50-200 heads (Figure 4) while commercial farms have 200 or more heads of pigs and implement good biosecurity in the farm.



Figure 3. Typical smallholder farm



Figure 4. Semi-commercial farm

It is estimated that 90 percent of the farms are smallholders while the rest are semi-commercial (9%) and commercial farms (1%).

In 2008, there are a total of 1 814 pig farms and 2 215 641 heads in the country. Most of the farms were distributed in the following provinces:

**Table 2. Swine Farms in the Different Provinces**

Province	Number of Farms
Banteay Meanchey	1 391
Takeo	227
Koah Kong	66
Siem Reap	25
Battambang	16
Kampong Cham	14
Kandal	11
Kampong Speu	6
Kampong Chhnang	5
Pursat	3

Banteay Meanchey (1 391 farms) had the most number of farms followed by Koah Kong (227 farms) and Siam Reap (66 farms). Kampong Speu (6 farms), Kampong Chhnang (5 farms) and Pursat (3 farms), on the other hand, had the least number of farms (Table 2). Below is the map of the swine density population for the entire country in 2008 (Figure 5).

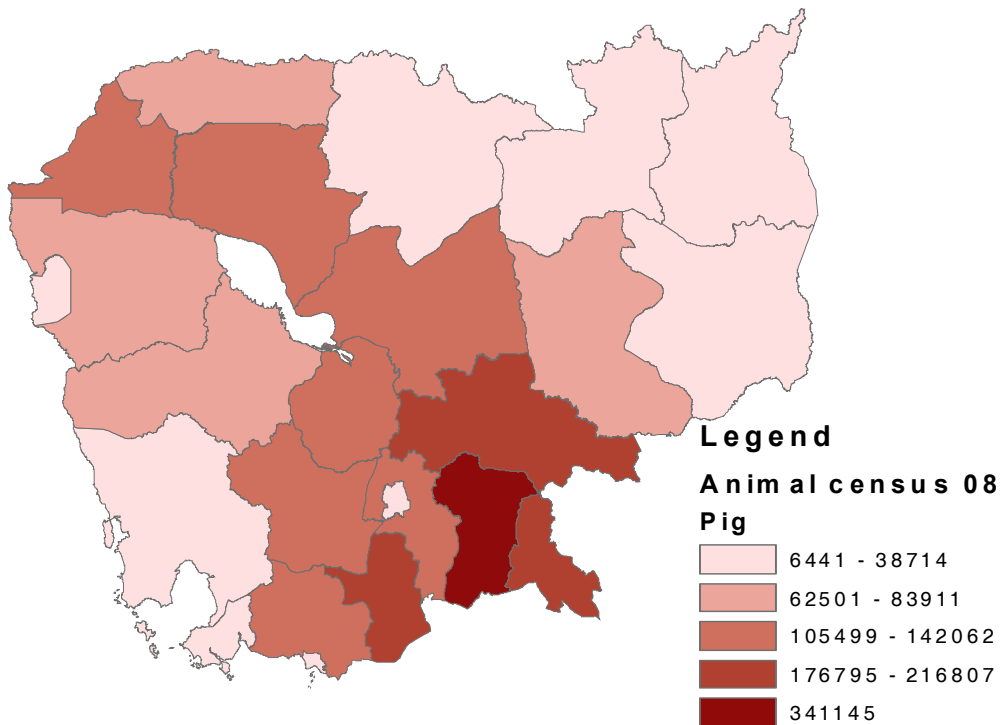


Figure 5. Swine Density Population in 2008

In 2009, the provinces with the most number of pigs include Prey Veng (375 061 pigs), Takeo (194 486 pigs), Kampong Cham (182 9156 pigs), Kampong Chhnang (146 497 pigs) and Siam Reap (135 000 pigs). Minimal number of pigs are raised in Phnom Penh (12 410), Preh Sihanouk (11 981 pigs), Kep (10 780), Koh Kong (10 429), Mondulkir (7 709) and Pailin (6 441) (Figure 6).

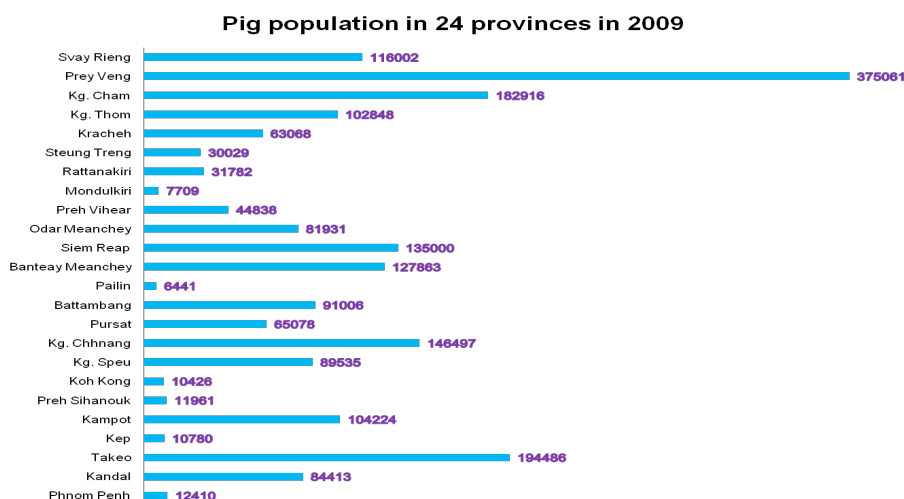


Figure 6. Swine Population per Province in 2009

CP Pig Farm, Mong Rithy Pig Farm and Cambodian-Chinese Indicator Pig Breeding Station are some of the known commercial farms in Cambodia. Most of the commercial farms are located in Battambang (11 farms) and Takeo (3 farms). In terms of number of animals at the commercial level, Takeo has more pigs compared to Battambang (2 447pigs). The following are the provinces with commercial farm operations (Table 3):

**Table 3. Province with Commercial Farm Operations**

Province	District	Number of Farms	Number of Heads
Battambang		11	2 447
	Battambang	6	1 160
	Ek Phnom	3	187
	Samlot	1	400
	Thmar Koal	1	700
Takeo		3	2 876
	Bati	2	2 176
	Samrong	1	700
Banteay Meanchey		1	2 090
Kampong Thom		1	1 000

Smallholder farms are distributed in the provinces of Takeo, Kep, Koah Kong, Rotanakiri, Udormeanchey and Banteay Meanchey (Table 4).

**Table 4. Provinces with Smallholder Farms**

Province	District	Number of Farms	Number of Heads
Takeo			
	Koah Andeat	172	8 751
	Treang	137	1 567
	Kirivong	75	1 125
	Tramkak	65	5 120
Kep			
	Damnak Changuer	17	238
	Kep	8	261
Koah Kong			
	Sre Ambel	12	150
	Botum Sakor	5	60
	Krong Khemarakphumen	4	120
Kamphong Thom		5	100
Rotanakiri			
	Balong	3	80
	Borkeo	1	15
Udormeanchey		2	190
Banteay Meanchey	Sereisorphorn	1	580
	Mongkol Borei	1	330

There was a significant decrease (11%) in population from 2007 to 2009 due to the importation of pigs from neighbouring countries. From 2 389 389 pigs in 2007, the swine population decreased to 2 126 304 in 2009 (Figure 7). The number of smallholder farms also decreased from 1 814 farms in 2008 to only 1 367 farms in 2009 (Figure 8).



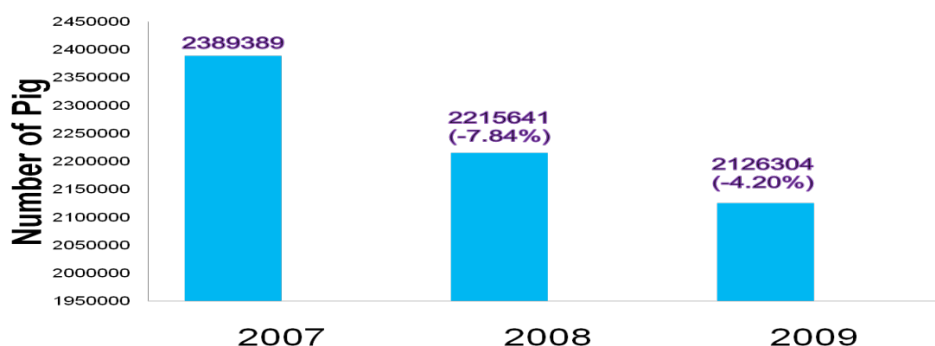


Figure 7. Swine Population from 2007-2009

Table 5. Number of Smallholder Farms (2007-2009)

Year	Smallholder Farms
2007	287
2008	1 814
2009	1 367

Source: Department of Animal Health and Production

## D. Swine Production and Health

### Production Parameters

The farmgate price in Cambodia has been stable at 7 200 KHR/kg of body weight. Pigs are slaughtered at an average age of 5-6 months with an average weight of 80-90 kgs. The average cost to produce a kilo of meat is estimated at KHR 6 500.

For raising pigs, the cost of gilts for breeding is KHR 2 469 000 for a 70 kg to 80 kg pig. For meat purposes, a gilt is purchased at 7 400 KHR/kg while weanlings is at 226 325 KHR/head.

Smallholder farmers utilize local materials and left-over food (swill) as feeds while semi-commercial farms buy feeds from feed companies (Green Feed Company, CP Group) or imported feeds. The high expenses of feeds contribute 75 to 80 percent of the total production cost for raising pigs. Other inputs such as medicines and vaccines are supplied by private companies which are expensive.

### Common Health Problems

Common swine diseases include classical swine fever (CSF), erysipelas, pasteurellosis, salmonellosis and foot and mouth disease (FMD). Porcine reproductive and respiratory syndrome (PRRS) and swine influenza virus (SIV) are also present in the country.

Parasitic and infectious diseases are more commonly experienced by the smallholder sector since biosecurity is very low and feed is sourced by scavenging or swill feeding. Semi-commercial and the commercial sector implement stricter biosecurity measures and follow a vaccination program making the swine raised in this sector less prone to the said diseases. Vaccines are available for the following diseases: CSF, FMD, salmonellosis and pasteurellosis.

### Animal Disease Diagnostic Facility

The National Veterinary Research Institute (NaVRI) is the national laboratory tasked to diagnose animal diseases in the country (Figure 8). NaVRI is under the arm of the Department of Animal Health and Production (DAHP) of the Ministry of Agriculture and Fisheries (MAFF).

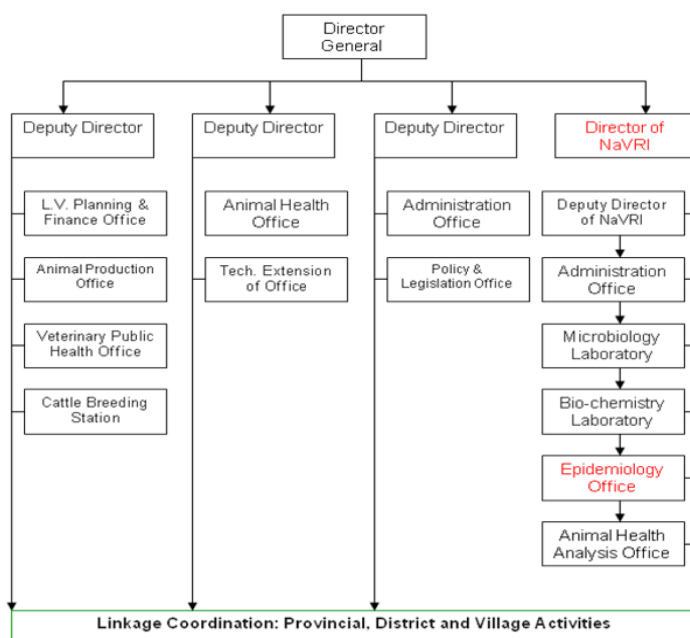


Figure 8. Structure of DAHP, MAFF

The laboratory has the capacity to diagnose diseases such as CSF, FMD, PRRS, colibacillosis, pasteurellosis and salmonellosis. Both PRRS (antibody detection) and CSF (antibody and antigen detection) can be diagnosed through serological test (ELISA).

Although the laboratory has sufficient equipment and staff to conduct animal disease diagnosis, there is limited supply of reagents because most of the reagents are sourced from other countries.

## Surveillance Programme

Animal health surveillance is conducted either through active or passive surveillance. Post-vaccination surveillance is an example of active surveillance (Figure 9).

Diseases are also detected through reports that come from the regular meetings of the district veterinarians with the VAHW and from grass roots network at the village level (passive surveillance).

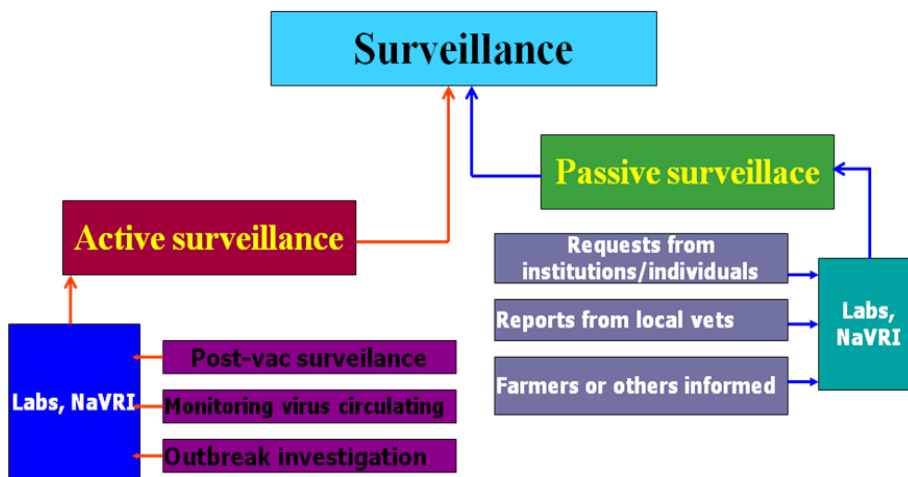


Figure 9. Animal Health Surveillance Structure in Cambodia

The suspect cases in a village and commercial farms are investigated immediately by the village animal health workers (VAHWs) (Figure 10). A standard questionnaire is used for the recording of pig mortality in the village. Reports are forwarded to the district, provincial and national level.

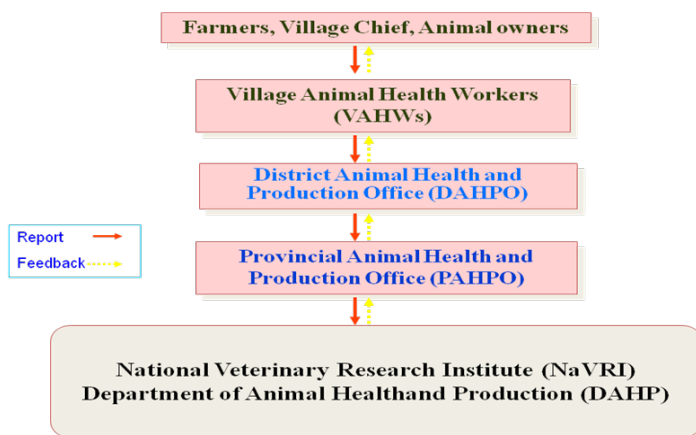


Figure 10. Routine Disease Reporting System

## **E. Constraints to Swine Production and Health**

The absence of a veterinary law and the illegal movement of animals from neighbouring countries are the main problems in having a more robust swine production. The presence of animal diseases is also a problem. Thus, there is also a need to improve surveillance and immediate reporting of suspected outbreaks. The lack of reagents for disease diagnosis and insufficient vaccines are some of the other impediments in swine production in Cambodia.

## **IV. SECTORAL POLICY AND LEGISLATION**

Realizing the importance of a policy to improve animal health and production in the country, DAHP-MAFF is currently drafting a national strategy for animal production and health. The plan aims to improve swine production as a whole so that there will be sufficient supply of pork in the market to meet the high demand.

On 8 August 2010, a Prime Minister Ordinance was released to empower MAFF to strengthen and control the movement of animals to prevent incursion of infectious animal diseases from other countries.

# LAO PEOPLE'S DEMOCRATIC REPUBLIC (LAO PDR)

## Swine Industry Profile

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## INTRODUCTION

### I. COUNTRY PROFILE

#### A. Geographic Profile

Lao PDR is a landlocked country in South East Asia situated at the north west portion of the Indochinese peninsula and surrounded by the countries of Cambodia, China, Myanmar, Thailand and Vietnam (Figure 1).

The country is mostly mountainous with mountain peaks at 9 000 feet in the north. Dense forests, on the other hand, cover the northern and eastern areas. Mekong River flows through the country for 1 500 km of its course and forms the boundary with Myanmar and Thailand.

At least 5 million hectares of Lao PDR's total land are suitable for cultivation although, just 17 percent of the land area (between 850 000 and 900 000 hectares) is cultivated. Rice accounts for about 80 percent of cultivated land use including 422 000 hectares of lowland wet rice and 223 000 hectares of upland rice.

Vientiane is the capital of Lao PDR and considered as the largest city in the country. Total land area is 230 800 sq. km. while the total area is 236 800 sq. km. Population for the whole country as of 2010 is at 6 230 200.



Figure 1. Country Map

## B. Economic Profile

Agriculture remains the basic foundation of the country's economy and more importantly provides food security for the ethnic upland people. Over 80 percent of the population of Lao PDR inhabit the rural and mountainous areas and rely on subsistence farming.

The country is listed as one of the poorest countries in the world. Foreign aid accounts for 70 to 80 percent of the country's annual budget.

## II. AGRICULTURE PROFILE

### C. Role of Agriculture in the Economy

The Government considers agriculture as the basis of economic growth to reduce poverty and ensure food security. It is seeking to diversify traditional farming practices to adopt more stable production systems and identify alternative methods in upland areas that will maintain and improve household income levels.

### D. Role of Livestock in the Total Agricultural Economy

It is estimated that 90 percent of the livestock farmers are smallholders. The government's vision is to increase domestic production of livestock for meat consumption to 22-50 kg in rural areas and 33-70 kg in urban areas by 2020.

### E. Role of the Swine Sector in the Total Livestock Economy

Pig production in highland areas plays an important role as a major source of income and seen as a "savings bank". It accounts for 2.5 percent of the national gross domestic product (GDP) and 10.36 percent of the total livestock production. In the north, 70 percent of the households raise pigs wherein more than 50 percent of the said households rely on pig raising as their main source of income.

Meat consumption has been increasing at 2.9 percent per year. There is even an increase in the demand for pork at 20 percent in 3 years in certain parts of the country such as Vientiane and Luang Prabang. In Vientiane alone, 500-800 pigs need to be supplied per day.

To meet the demand, majority of the supply are sourced from other countries such as Thailand wherein it is estimated that 65 percent of the pig stocks are sourced. Meat importation of pigs amounted to USD 321 000 in 2002 (USD 1 = LAK 8 002).

## III. SWINE SECTOR

### F. Swine Industry Players

Stakeholders in the swine industry of the country include farmers' group, farm owners and allied industries such as feed millers. The majority of commercial pig farms in Lao PDR are located in central and southern regions. The Varnit farm operates the biggest pig enterprise and produces most of the slaughter pigs for Vientiane Capital market.

The swine sector is mainly supervised by the Department of Livestock and Fisheries of the Ministry of Agriculture and Forestry (DoLF-MAF) (Figure 2). The provincial and livestock section is responsible for livestock at the provincial level while it is the responsibility of the district livestock and fisheries office at the district level. There are also village veterinary workers and development coordinators at the village commune level.

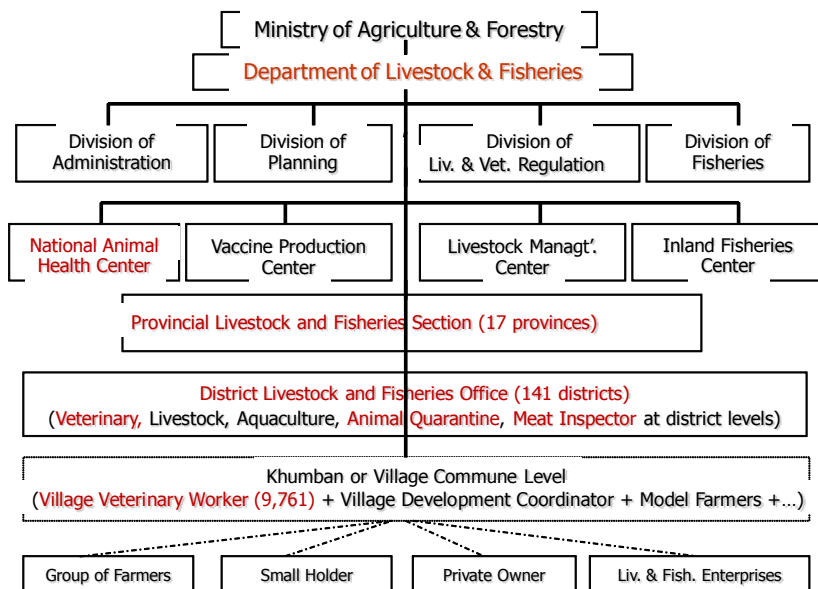


Figure 2. Swine Industry Players

The National Animal Health Center (NAHC) is the main government office tasked in the monitoring and surveillance of animal diseases; laboratory diagnosis; information dissemination and product quality control (Figure 3).

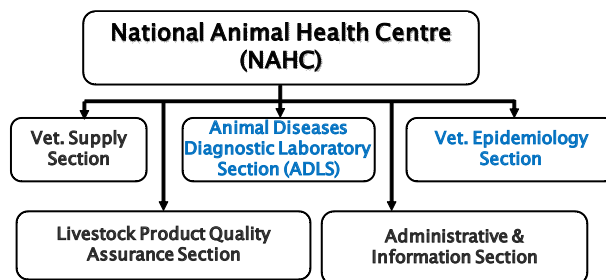


Figure 3. Organizational Chart of the National Animal Health Center, Dept. of Livestock and Fisheries

## G. Swine Marketing and Trade

Smallholders usually sell their pigs to traders. The prices of the pigs sold are unstable because there are no organized markets and auction system. There is also a lack of information on the prevailing market prices. Inadequate supply and low quality of pigs are the other major market constraints.

Large Asian integrators have established pig farms in Lao PDR including Thailand's Charoen Pokphand Foods Plc (CPF). The farm even has training farms where local pig farmers are taught modern production techniques.

Imported pigs are sold at a higher rate in the cities wherein the local pigs sold at slaughterhouses are priced LAK 1 000 per kg less than the imported pigs.

## H. Swine Production Systems

Poultry accounts for 80 percent (22 521 032) of the animals raised by farmers followed by pigs at 10 percent (2 947 288). Pig population increased at 26.4 percent for the past 3 years. Buffalo, cattle, sheep and goats are the other farm animals raised (Table 1).

**Table 1. Livestock Population (2004-2009)**

Year	Buffalo	Cattle	Pig	Goat Sheep	Poultry
2004	1 101 700	1 266 100	1 727 300	140 600	19 590 600
2005	1 080 730	1 269 606	1 886 243	187 688	22 129 399
2006	1 110 838	1 300 169	2 035 137	216 607	20 427 252
2007	1 122 858	1 353 013	2 186 208	268 292	20 452 946
2008	1 171 746	1 499 522	2 460 828	303 384	24 370 043
2009	1 177 545	1 425 681	2 947 288	367 450	22 521 032

The swine production system is divided into three main sectors based on the number of animals in the farm, which are the following: small scale; medium scale; and large scale. Majority (70%) of the farms are considered as small scale wherein less than 20 pigs are raised.

Medium scale farms account for 18 percent of the swine production and has more than 20 pigs or 10-15 sow level. Large scale production has a 12 percent share of the total swine production. The commercial farms have more than 15 sow level and produce most of the pigs for slaughter for commercial purposes.

It is estimated that there are about 7 000 breeding sows in the entire country. The largest pig farm is located in Vientiane, which has 600 sows and produces around 138 600 piglets per year.



Swine raising can be also categorized based on the swine raising system which are the following:

**Table 2. Different Swine Raising Systems**

Raising System	Description	Disadvantage
Free Range	-Local breed pigs are free to scavenge anywhere -Low cost of inputs and minimal labor required	-Production output is low -High disease incidence and mortality -Difficult to control animals and destroy other cash crops
Semi-intensive	-Local breeds feed on forest/crop by-products and kitchen waste -Pigs are confined in a simple shelter	-Still difficult to control -Prone to diseases
Intensive	-May be integrated with fish farming -Pigs are confined in a cleaner environment -Less prone to diseases -Effluent utilized effectively	-More labor intensive -Higher cost of inputs for feed and building materials
Commercial	-Pigs produced are of high quality -Supplies the urban market in big cities (Bolikhamxay, Khammuane, Savannaket, Vientiane Capital, Luangnamtha and Oudomxay) -Breeds raised are Large White, Duroc, Landrace and Chinese Jin Chi	-High cost of farm inputs

## I. Swine Production and Health

### Source of Feeds

Animal feeds are commonly imported from Thailand even though Lao PDR provides raw materials (corn) for feed to neighbouring countries such as Thailand, China and Vietnam. Despite the high cost of imported feeds, the animal feed industry continues to expand but new feed mills, abattoirs and processing facilities are still needed.

### Common Health Problems

The major swine diseases are classical swine fever (CSF), foot and mouth disease (FMD) and porcine reproductive and respiratory syndrome (PRRS).

#### 1. CSF

ACIAR supported CSF surveillance in the country in 1998 to 2003 as well as surveillance on swine zoonotic diseases and parasites in 2006 to 2010.

Based on the surveillance conducted in 2009 to 2010, there were 2 provinces that tested positive for CSF (Table 3).

**Table 3. CSF Cases (2009-2010)**

Province	No. of Samples	No. Of Samples Tested Positive	Percentage
Vientiane Capital	70	3	4.3
Savannakhet	14	0	0
Xiengkhouang	9	0	0
Xayabury	9	4	44.4
Oudomxay	7	0	0
Luangprabang	5	0	0
Phongsaly	3	0	0
Champasak	2	0	0
	119	7	5.9

## 2. FMD

FMD surveillance in July-December 2008 showed that 58 villages from 10 provinces had outbreaks. Of the 4 646 animals affected, majority were cattle (86%; 3 987) and only 2 percent (86) were pigs (Table 4).

**Table 4. Provinces and Number of Villages Affected by FMD in 2008**

Provinces	Number of Villages Affected
Bokeo	1
Bolikhamxay	1
Capital	1
Champasak	2
Louangnamtha	1
Luang	1
Namtha	1
Vientiane	1
Vientiane Capital	45
Xayabouly	4

### 3. PRRS

On 6 July 2010, the country reported to the World Organisation for Animal Health (OIE) an outbreak of PRRS in Vientiane Capital. As of 15 July 2010, there were 22 pig farms and 27 704 pigs that were affected with PRRS.

Control measures implemented to prevent the spread of the disease include the following: enforcement of outbreak and active surveillance zones; separation of sick and healthy animals; cleaning and disinfection of affected premises; animal movement control; and vaccination. Other swine diseases are the following (Table 5):

**Table 5. Other Swine Diseases**

Cause	Disease
Virus	swine influenza Nipah virus Japanese encephalitis hepatitis E
Bacteria	pasteurellosis salmonellosis erysipelas <i>Streptococcus suis</i> infection
Parasite	taeniasis (cysticercosis) trichinellosis cryptosporidiosis toxoplasmosis

#### Surveillance Programmes

The government supports the control of transboundary animal diseases (TADs) to increase the productivity of the swine sector. There is already a national strategy for the control and prevention of CSF and FMD. An existing network is already in place for the control of the said diseases.

Public awareness on swine diseases (CSF, FMD, PRRS and SI) is also given importance to involve the stakeholders in control and prevention. International organizations also support the implementation of the animal disease control programmes down to the grassroots level.

#### Animal Disease Diagnostic Facility

Presently, the government has an animal disease diagnostic laboratory which can diagnose CSF through ELISA and PCR. Laboratory staff need further training on the diagnosis of other swine diseases aside from CSF and they also need reagents to be able to diagnose other diseases.

## **J. Constraints to Swine Production and Health**

Animal diseases and parasites are the major constraints in pig production. CSF and PRRS are swine diseases that have been reported but farmers do not usually report animal diseases to the government veterinarians. CSF is endemic in the country and the most prevalent disease in swine. The occurrence of PRRS in 2010 had a great detrimental effect in the swine industry specifically in Vientiane.

Swine disease control activities are affected by the following: lack of available qualified and trained personnel to conduct disease investigations; weak surveillance system; and lack of financial support to implement disease control programmes.

The existing practices at the smallholder level with low level of biosecurity measures make the farms prone to animal diseases. Inbreeding is also a problem as well as inadequate nutrition. Thus, farmers need to be trained on farm management, biosecurity and nutrition.

Due to the increasing demand for livestock and livestock products, there is a surge in the illegal movement of animal products. Food safety is also an issue since selling and slaughtering of sick animals is a common practice.

## **IV. SECTORAL POLICY AND LEGISLATION**

The government continues to focus on coordinating with neighbouring countries through bilateral meetings on sharing information regarding animal diseases. Collaboration with international agencies (FAO, OIE, ACIAR, USAID) is continuous to request for technical assistance and reagents support.

# MYANMAR

## Swine Industry Profile

**Sein Win**

Livestock Breeding and Veterinary Department (LBVD), Yangon, Myanmar

## INTRODUCTION

### I. COUNTRY PROFILE

#### A. Geographic Profile

The Union of Myanmar covers a total area of 676 577 sq km and shares borders with Bangladesh, India, People's Republic of China, Lao PDR, and Thailand (Figure 1). A coastline of 1 900 km extends along the Bay of Bengal and the Andaman Sea which borders an estimated 500 000 ha of coastal mangrove swamp and an extensive delta region fed by the Ayeyarwady and Sittoung Rivers.

The southern extension of the country is composed of a narrow coastal strip backed by mountains. The central region of the country is known as the 'dry zone'. It is characterized by a semi-arid climate with a lengthy dry season and is enclosed to the north, east and west by highlands and mountains towards the Indochinese border in the north.

These surrounding mountains and upland areas receive higher precipitation levels than the central lowlands and are still largely covered with teak and hardwood forest. Shan State, a major plateau region in the east of the country offers suitable conditions for agriculture and has been more extensively cleared for that purpose (Figure 2).

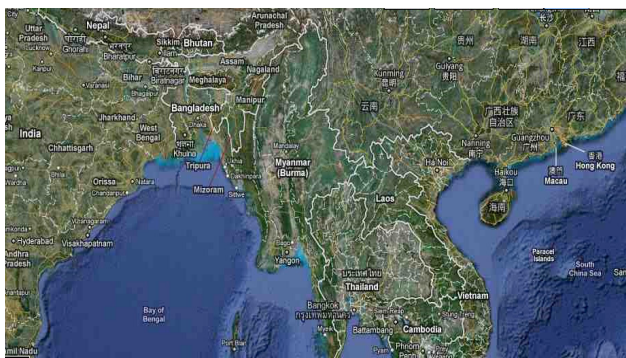


Figure 1. Location Map of Myanmar

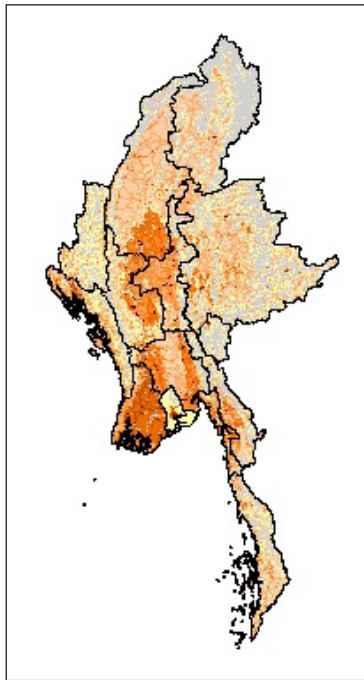


Figure 2. States and Regions



Figure 3. Population Density

## B. Economic Profile

Myanmar is endowed with natural resources supporting a relatively small population base (57 million in 2007-2008) in comparison with many other countries in South East and South Asia (Figure 3). Agriculture which is comprised of crop production, livestock, fisheries and forestry is the most important sector of the economy. It is the main source of livelihood for about 68 percent of the population and it accounts for about 64 percent of the employment of the labour force.

In addition, food security for the people and raw material production for domestic agro-based industries are heavily dependent on the agricultural sector. Annual gross domestic product (GDP) growth per capita was estimated at 13.6 percent in 2005 to 2006, 12.7 percent in 2006 to 2007, and 12.2 percent in 2007 to 2008 (Table 1).

**Table 1: Key Economic Indicators (2000 to 2008)**

	2000/ 01	2001/ 02	2002/ 03	2003/ 04	2004/ 05	2005/ 06	2006/ 07	2007/ 08
GDP growth rate (%)	13.7	11.3	12.0	13.8	13.6	13.6	12.7	12.2
Consumer price inflation (year to year)	21	57	37	5	9	20	35	22.8
Consumer price inflation	121	190	260	272	297	356	481	591
Exchange rate	620	970	960	910	1 095	1 280	1 290	1 205
Export (USD million)	2 522	2 421	2 710	2 927	3 753	4 555	6 170	5 731
Import (USD million)	2 444	2 022	1 912	1 999	1 744	2 343	2 964	3 447
Current-account balance (USD million)	-154	96.6	-19.4	112	570	759	1453	485
Rural population (% of total population)	71	71	70	70	69	69	68	68
Population (million)	50.13	51.14	52.17	53.22	54.30	55.40	56.51	57.66

Source: Statistical Yearbook 2008; Note: 1 USD=6.41 MMK as of July 2011

## II. AGRICULTURE PROFILE

### C. Role of Agriculture in the Economy

Myanmar is an agro-based country wherein the agriculture sector forms the backbone of the economy contributing 43.69 percent of the GDP in 2007 to 2008 (Table 2). Aside from agriculture being the main source of livelihood for the majority of the people, it also provides a growing market for domestic manufacturing. Thus, the government has given high priority to agriculture development since it is the main driver of economic development in the country.

**Table 2: Contribution of GDP by Economic Sector (percent)**

Year	Agriculture	Service	Industry	Trade
1995/96	45.06	17.94	15.48	21.52
2000/01	57.23	9.03	9.69	24.05
2001/02	55.87	9.63	10.61	23.89
2002/03	52.89	10.77	12.78	23.56
2003/04	51.90	11.10	13.55	23.45
2004/05	50.72	11.51	10.66	23.29
2005/06	46.68	14.09	17.52	21.71
2006/07	45.28	14.48	18.58	21.66
2007/08	43.69	14.84	19.86	21.61

Source: Central Statistical Organization, various years

At present, the net crop coverage is 11.67 million hectares, accounting for 18 percent of the total land mass and approximately 5.7 million hectares (8.4 % of total area) is still available for expansion. More than 60 kinds of crops are grown in Myanmar, most of them food crops. Among the food crops, rice comprises the major share of the land. In 2007-2008, the rice fields were approximately 8.1 million hectares accounting for some 41 percent of the total area (Table 3).

**Table 3: Distribution (%) in Production by Crop (2007-2008)**

Crop or Crop-group	Percent
Rice	41
Other Cereals	3
Oilseeds	19
Pulses and beans	5
Industrial Crops	15
Horticulture Crops	16

Source: Settlement and Land Records Department

During the last decade, the government prioritized the extension of cultivated land and promotion of yield and the production of crops by constructing water resources development projects (large, medium-sized and small-scale). In addition, the government provided the following: assistance in upgrading the living standard of the rural people to increase their incomes; ensure regional self-sufficiency in rice; adequate supply of water for domestic use; and protect the environment.

#### Poverty Profile

It is estimated that 70 percent of the country's poor live in rural areas, majority of which live in Sagaing, Bago, Magway, Ayeyarwaddy and Mandalay divisions. The said areas cover the country's most populated rice-growing region and the dry zone region. The Central Statistical Organization estimates at least 22.4 percent of the rural people and 23.9 percent of the urban people live below the poverty line.

Rural poverty rates vary considerably by region (Table 4). Chin State has the highest rural poverty rate with 47 percent of the state's rural households being classified as poor which is more than double the national average of 22.4 percent.

Kayah State and Magway Division also have very high rate of rural poverty with over 36 percent of rural households being classified as poor (1.5 times more that the national average). Sagaing, Bago and Mandalay Division also have rural poverty rates above the national average. Poverty eradication is the first priority of the economic policy agenda.



**Table 4: Estimated Poverty Rates by State and Division (%)**

Location	Urban (%)	Rural (%)	Total (%)
Union	23.9	22.4	22.9
Kachin State Kayah State Kayin State	4.6	11.9	10.1
Chin State	30.8	37.4	35.4
Sagaing Division Tanintharyi Division	11.8	12.8	12.7
Bago Division	19.8	47.1	42.1
Magway Division Mandalay Division	27.6	24.3	24.9
Mon State	9.8	7.4	8.1
Rakhine State Yangon Division Shan State	26.6	25.4	24.7
Ayeyarwaddy Division	44.9	36.3	37.9
	18.8	23.9	22.3
	27.1	16.1	19.9
	34.5	19.2	22.0
	16.6	16.7	16.7
	7.1	13.4	12.0
	47.0	17.3	21.9

Source: Central Statistical Organization

To alleviate poverty, the government has rural development programmes on the following: health and education; water and sanitation; transportation and communication; and economic development. The education and health departments support schools and health centers. The Executive Officer of the Development Affairs Department and the Township Officer of the General Administration Department implement the rural road and water supply projects.

The rural development programme of border areas is coordinated by the Ministry of Progress of Border Areas and National Races and Development Affairs. The Ministry has several subcommittees for various social and productive sectors headed by respective Deputy Ministers of line departments, Regional Work Committees headed by Military Commanders and Township Committees.

There are two principal national agencies responsible for the agriculture sector in Myanmar: the Ministry of Agriculture and Irrigation (MoAI) and the Ministry of Livestock and Fisheries (MoLF). The Ministry of Agriculture and Irrigation provides limited inputs, irrigation, farm machinery and extension service to upgrade rice and crop production.

The Ministry of Livestock and Fisheries on the other hand, has seven organizational units, including the Myanmar Livestock and Fisheries Development Bank (MLFD), the University of Veterinary Science (UVS), and the Livestock Feedstuff and Milk Products Enterprise (LFME). There are also four line divisions or departments comprised of the Directorate of Livestock and Fisheries, the Livestock Breeding and Veterinary Department (LBVD), the Department of Fisheries and the Beekeeping Division.

LBVD is mainly responsible for the animal health services and the promotion of animal products in Myanmar. Within the LBVD, there are 17 state and regional veterinary offices; 76 district veterinary offices; 281 township veterinary offices; 8 regional veterinary research and

diagnostic centers that provide outbreak investigations and commercial-scale vaccine production in Yangon Region.

As of 2010, LBVD has staff of 724 veterinarians and 364 veterinary assistants. Apart from the permanent staff, the LBVD also trains village key persons to carry out routine vaccination and to detect and notify any outbreaks of contagious diseases.

Millennium Development Goals

It is apparent that poverty and social deprivation are widespread in rural Myanmar. The Government of Union of Myanmar (GOM) is a signatory to the Global Summit on Millennium Declaration and World Food Summit. This is a tremendous opportunity to meet the commitment to reduce rural poverty and food insecurity. Agriculturally-related objectives are largely covered in the first millennium development goal (MDG-1) which stipulates that poverty will decrease in half by 2015.

Myanmar had a moderate level of undernourishment in 2005-07 (16%) which is similar to the percentage of undernourished in the entire Asia and the Pacific. The proportion of undernourished decreased compared to 1990-1992 (Figure 4).

Food consumption per person also increased in 2005-2007 (2 440 kcal/person/day) compared to 2000-2002 (2 160 kcal/person/day) (Figure 5) (Table 5).

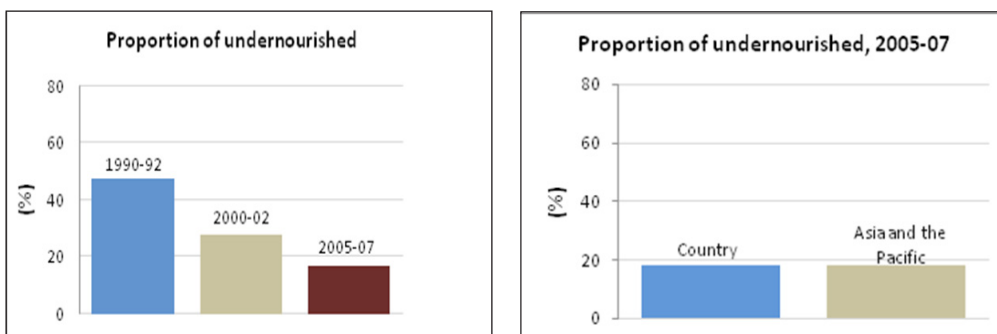


Figure 4. Proportion of Undernourished

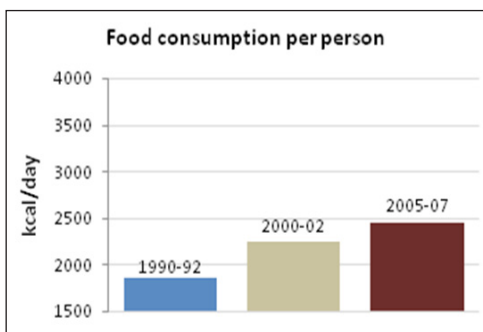


Figure 5. Food Consumption per Person

**Table 5. Food Consumption and Undernourishment Statistics**

Parameters		1990-92	2000-02	2005-07
1.	Population (million)	41.5	47.0	48.7
2.	Food consumption(kcal/person/day)	1 840	2 160	2 440
3.	Number of undernourished (million) – WFS indicator	19.6	13.5	7.8
4.	Prevalence of undernourishment(%) – MDG indicator			
	Myanmar	47	29	16
	Asia and the Pacific	20	16	16

#### D. Role of Livestock in the Total Agricultural Economy

Livestock contributed 2.87 percent to the national GDP in 2009-2010 (Table 6). The livestock sector in Myanmar is dominated by indigenous breeds kept primarily under traditional production and management systems. The majority of large livestock (cattle and buffalo) in Myanmar are for draft and for milk purposes.

**Table 6. Contribution (%) of Different Sectors to the GDP**

Year	Crops	Livestock	Fishery	Forestry	Total
2005-2006	38	3.20	4.80	0.6	47
2006-2007	37	3.20	4.80	0.6	45
2007-2008	36	3.20	4.80	0.5	44
2008-2009	34	2.80	4.20	0.4	42
2009-2010	31	2.87	4.13	0.4	39

Source: Statistical Yearbook (2008) and Ministry of Livestock and Fisheries.

There is limited commercial livestock activity in Myanmar. It is primarily located in peri-urban areas focusing on dairy cattle, broiler and laying poultry with limited commercial pig production. Production of pigs, sheep and goats and poultry occurs on a small scale. The livestock sector is estimated to contribute one tenth of the total agricultural GDP.

There are 50-100 individual large holdings of improved dairy-type cattle around Yangon and Mandalay and some smaller towns which are permanently housed and fed on a combination of gathered forages and concentrates.

There are few medium scale (100 breeding sow) commercial piggeries producing and raising high quality pigs. Some small-scale pig breeders and fatteners are in operation as well. These are commonly village rice millers who have access to cheap sources of rice by-products.

Large private sector companies are the main producers of improved feed and breeding stock for local producers and growers. The pigs as well as layer/broiler day-old chicks (DOC) produced and the feeds consumed constitute the main production base for the commercial poultry and pig industry. These companies will determine the rate and extent of commercial livestock production in future.

### III. Role of the Swine Sector in the Total Livestock Economy

In Myanmar, pork is the second most important source of meat accounting for approximately 30 percent of the total meat output. However, more than 90 percent of the total pig production is small in scale and their productivity is often far below potential levels.

Depending on the scale of production, farmers recognize the importance of swine as a major source of family income; as a supplementary source of funds for particular purposes; or as a 'savings bank'. In the rural communities, women and children continue to play an active role in pig production.

Generally from the late 2001 to present, pig production has been in equilibrium with demand for pork and pork products (Table 7). The production and consumption of pork has risen significantly from 2001 to 2009.

**Table 7. Production and Consumption of Pork (2001-2009)**

Year	Production (1000 MT)	Consumption (1000 MT)	Net Trade (1000 MT)	Self-sufficiency ratio %
2001	137	137	0.0	100.0
2005	331	331	0.0	100.0
2009	534	534	0.0	100.0

Source: Livestock Breeding and Veterinary Department

There is no pork consumption data for the whole country. Pork consumption of Yangon where 10 percent of Myanmar people live (6 million) reflects the total pork consumption of Myanmar. The following table shows the average daily pork consumption of Yangon City from 2006 to 2010 (Table 8).

**Table 8. Pork Consumption of Yangon City (heads/day)**

Year	2006	2007	2008	2009	2010
Avg Wt Consumption/day 1 000kg	106.3	106.4	109.8	113.8	112.2
Head/Day	1 854	1 579	1 431	1 315	1 250
Avg. Wt (kg)in Slaughter(East)	57	67	76	86	89
No. Pork Producer	34	34	34	34	32
No. Pork Producer(Hybrid)	6	6	4	7	5

Source: Yangon City Development Committee

As of 2009, total meat production was 1 782.9 metric tons wherein 51 percent was poultry meat, 30 percent was pork and the rest was beef and other types of meat (Table 9). The level of per capita meat consumption was 30 kg consisting of poultry (15 kg) and pork (9kg). Gross output value (GOV) of animal and animal products was 963 billion kyats including 37 billion kyats in poultry and 168 billion kyats pork.

**Table 9: Meat Production (1 000 Metric Tons)**

Product	Year				Annual growth rate (%)	
	2001	2005	2006	2009	2001-05	2006-09
Meat, total	501.4	1 100.2	1 260.8	1 782.9	21.8	12.8
Beef and buffalo	75.1	129.1	146.3	207.6	14.6	12.6
Mutton and goat	11.9	19.7	24.0	36.1	15.9	14.1
Pig	134.3	327.2	369.2	529.7	25.0	12.8
Poultry	247.2	559.6	648.4	915.7	22.7	13.1
Duck/Turkey/Geese	32.7	64.6	72.8	93.7	18.6	9.9
Milk, total	761.1	982.2	1 081.5	1 464.6	6.6	10.5
Eggs, total	118.4	216.5	243.5	357.0	16.3	13.3

Source: Livestock Breeding and Veterinary Department

According to the official statistics in 2009, Myanmar had an estimated 135 million poultry, 16 million cattle and buffaloes, 8 million pigs and 3.5 million sheep and goats (Table 10). Livestock population between 2006 and 2009 increased at an average rate of 13 percent in poultry, 10 percent in pigs, 10 percent in sheep and goats, and 2 percent per year in cattle and buffaloes.

**Table 10: Livestock Population and Annual Growth Rate (Values expressed in 1 000)**

Species	Year				Annual growth rate (%)	
	2001	2005	2006	2009	2001-05	2006-09
Cattle & Buffalo	13 718	14 828	15 134	16 019	1.9	1.9
Sheep & Goats	1 842	2 363	2 591	3 508	6.4	10.4
Pigs	4 139	5 677	6 293	8 316	8.2	10.0
Poultry	48 269	81 517	93 736	135 233	14.0	13.5
Duck/Turkey/Geese	7 739	10 121	11 154	13 803	7.2	8.1
Total LUs*	8 431	9 702	10 133	11 513		

\*LU: Livestock unit; conversion factors: cattle and buffalo (1.0), sheep and goats (0.10), Pigs (0.20) and poultry (0.01)  
Source: Livestock Breeding and Veterinary Department

## IV. SWINE SECTOR

### E. Swine Industry Players

The market-oriented economy started in 1988. In the past, enterprises were operated by the state or cooperatives. Pig farming is mostly small scale farming (80%) while medium scale pig farming is operated by people engaged with rice-milling business, food industry and beverage distillery. For the past decade, the livestock industry has significantly developed due to the improved breeding program initiated by farmers and use of artificial insemination techniques.

Significant investment in the livestock industry started in 1996 with the participation of foreign investors including CP Livestock Company of Thailand. Due to the religious reasons and health concerns, demand for pork is only secondary to chickens. Thus, the company initially focused on contract-growing schemes for broiler farms.

The farming practice involves a contract system in which the broiler companies and contract farmers agreed on production standards, sharing of profit and penalty. High supply of broiler chickens in the market and unreliable purchasing power of consumers contributed to a low profit margin for the broiler business.

In 2006 to 2009, the country encountered 4 waves of highly pathogenic avian influenza outbreaks which had a devastating effect in the poultry industry. The situation forced some of the poultry farmers to shift to pig farming business. At present, pig farming is affected by high price of feed, unstable market price of pork, limited utilization of improved technology in pig farming and lack of investment on contract farming.

The middle men serve as the link between the producer and the consumer. The market price of pork is unstable since the middle man dictates the buying and retailing price of pork. There is no incentive in the price for pork with better quality since middle men usually buy pigs from the smallholder and commercial farms at the same price.

The Ministry of Livestock and Fisheries (MoLF) is the main government agency with the direct supervision over the livestock industry. Livestock Breeding and Veterinary Department (LBVD) is responsible for all aspects related to animal health, disease control and breeding, including artificial insemination and livestock extension services in general. It is headed by the Director General.

There are two technical divisions which are the Research and Disease Control (RDC) and Animal Health and Development (AHD). All the state/region and field offices are headed by veterinary officers.

The University of Veterinary Science (UVS) is the only university that produces veterinarians and post-graduate technicians. The graduates from the university are key players in the development of animal health and animal production sector for Myanmar.

The Livestock Feedstuff and Milk Products Enterprise (LFME) is mandated to produce feed/feed supplements and the production/distribution of high quality breeding animals throughout the country. It has livestock farms and feed mills throughout Myanmar. LFMPE has six feed mills in Yangon, Mandalay and Shan state which produce feeds for fish, pig and poultry.

The Livestock and Fisheries Development Bank (LFDB) was established under MoLF in 1999 to finance investment in the livestock sector. It provides livestock production credit to larger scale livestock and fishery enterprises. The LFDB created a Livestock Bank System for small scale farmers for the production of native chicken and pig in rural areas. These programmes aim to improve livelihood of rural people and develop livestock resources of Myanmar.

The livestock organizations founded in the country are Myanmar Livestock Federation, Myanmar Veterinary Council, Academy for Livestock and Fisheries, Myanmar Livestock and Fishery Bank, and Myanmar Veterinary Association. Based on the Myanmar Livestock Federation, different federations were formed at different states, divisions and townships.

## **F. Swine Marketing and Trade**

The marketing system for pigs has four components namely, traders, wholesalers, slaughterers and consumers. Village pig farmers sell their pigs either to traders, slaughterers, or directly to consumers. Smallholders usually sell their pigs in other villages or districts.

### Local Market

Since majority of pig farmers in Myanmar raise few pigs, the marketing system is composed of various channels which causes high transaction costs. Market pigs are either sold to assemblers/traders, which is most common or sold to abattoirs. Assemblers/traders are individuals involved in the collection of fattened pigs from farmers and then sell it to larger assemblers/traders or abattoirs.

Slaughterhouses in Myanmar have three categories: abattoirs selling both wholesale and retail; abattoirs selling only wholesale; and abattoirs only for retail. Most abattoirs are privately owned and use simple equipment.

Generally, pig products thus pass through many intermediaries prior to reaching the consumer. The large number of intermediaries negatively affects both producers and consumers. Due to the poor infrastructure and long marketing channels with many middlemen, the difference between farm-gate prices of pig meat is quite high. Due to these high marketing costs, farmers do not get an adequate price for their pigs while consumers have to pay a high price for pork.

Supermarkets have grown increasingly in the past years. Supermarkets provide regular supply of premium grade, quality meat in attractive packaging with proper brand labeling and sorted according to quality grade.

Suppliers for the supermarket usually source pork from farmers or through wholesale markets. In terms of pricing, the suppliers will add a margin of between 10 to 20 percent above that paid by the collectors. For premium quality products, the price will be between 10 to 30 percent higher than the wholesale price. The high quality products target expatriates or well-to-do locals.

#### Export and Import Market

The export and import of pigs and pig products is not yet fully developed (Table 11). Pure breed animals are imported for government and private farms. In order to meet the export market demand, LFME produces and exports pigs of various sizes from Hton Bo Pig Production Farms which is located near Mandalay.

**Table 11: Export Volume of Swine**

Year	Large	Medium	Small	Total	Weight (Ton)
2006-07	6 640	2 235	6 446	15 321	366
2007-08	957	381	2 079	3 417	120
2008-09	3 401	566	6 760	10 727	392
2009-10	8 045	15	10 491	18 551	829
2010-11 (Nov)	2 991	114	11 495	14 600	389

Source: Livestock Feedstuff and Dairy Products Enterprise

Live animals are exported from Rihkhawdar, Chin State to neighbouring Mizoram State, India (Figure 6). The state is far away from mainland India and transportation is difficult. Thus, traders from India import piglets and fatteners from Myanmar.

Pig dealers collect pigs from Kalay Township, Sagaing Division and send to Rihkhawdar, Chin State by car. Indian dealers from Mizoram State, India then come to Rihkhawdar and carry pigs through the border by car. Some small scale dealers from Chin State transport pigs through a back pack to Zotland (nearest town of India border) by walking.

Dealers from Meikhtila, Mandalay Division transport pigs to Namkhan, Northern Shan State by car and export to Jiegao, China through inland border. Some consumers of China buy native pigs from Monogla, Eastern Shan State as they like the taste of native breed (Lauk Phyin Kyon). Below are the trading patterns and supply chain for export to China, Thailand and India (Figures 7-10).



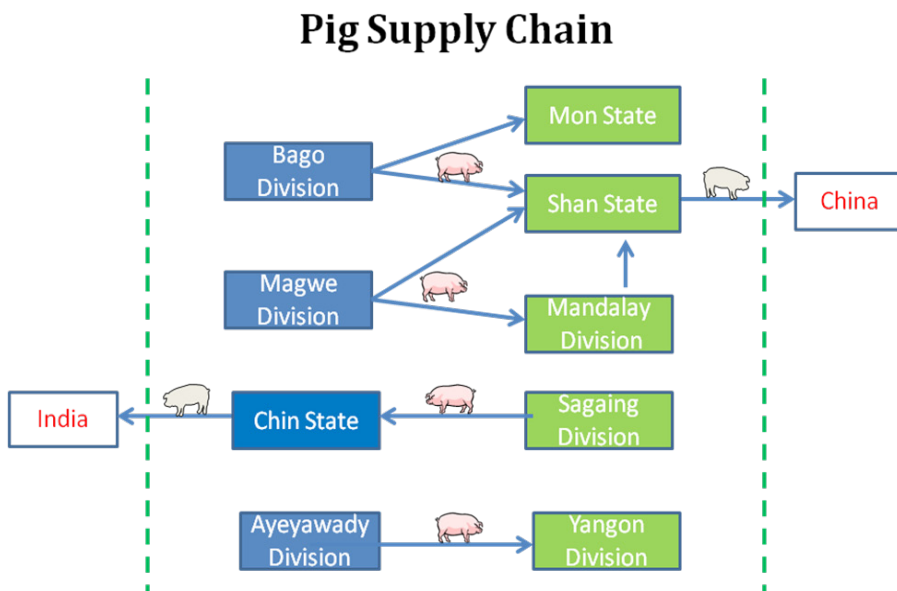


Figure 6. Pig Export to India and China

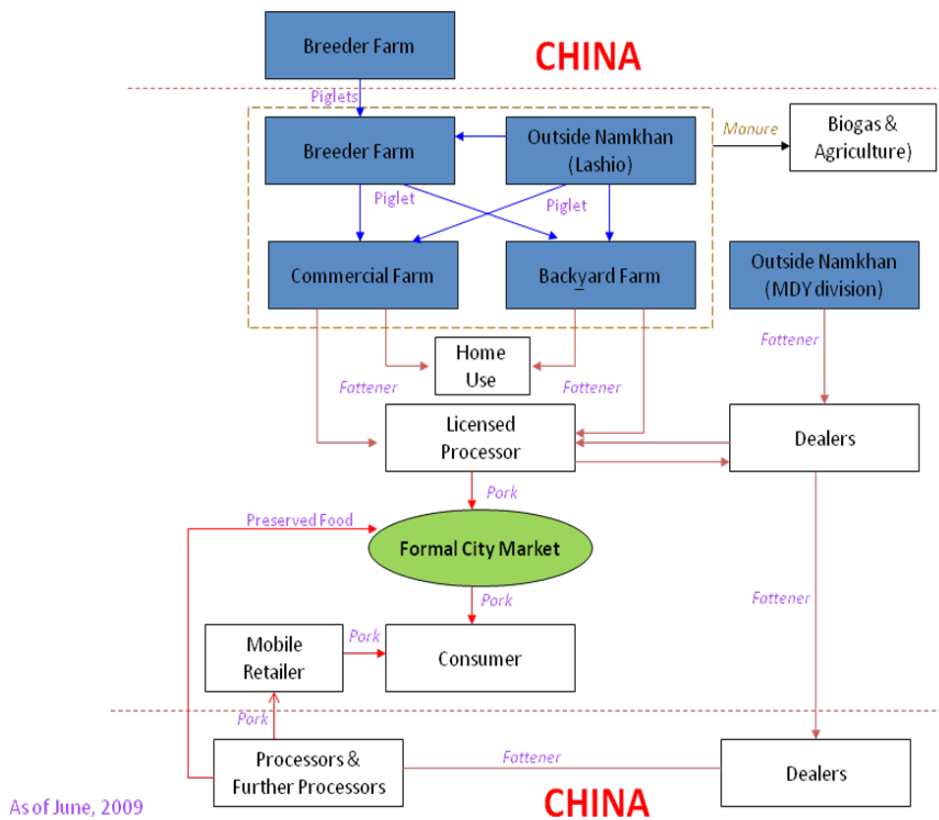


Figure 7. Cross Border Pig Supply Chain in China (Namkham)

**Cross Border Pig Supply Chain: Relationship b/t Actors, Monglah**

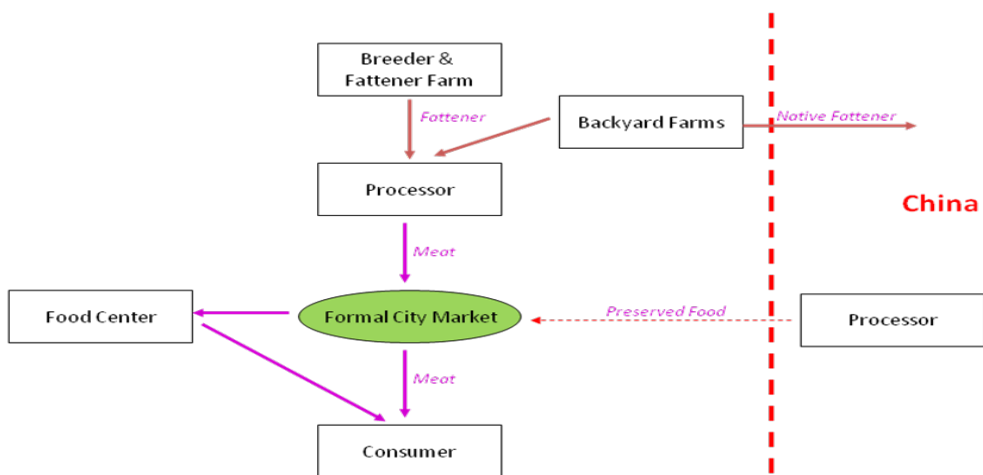


Figure 8. Cross Border Pig Supply Chain in China (Manoglah)

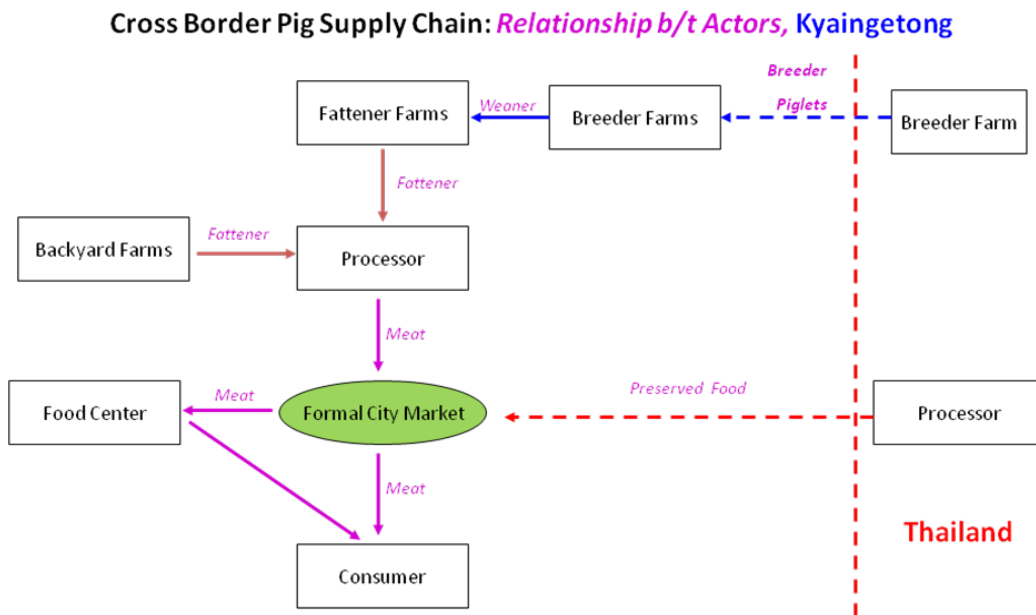


Figure 9. Cross Border Pig Supply Chain (Thailand)

### Cross Border Pig Value Chain: Rihkawdar

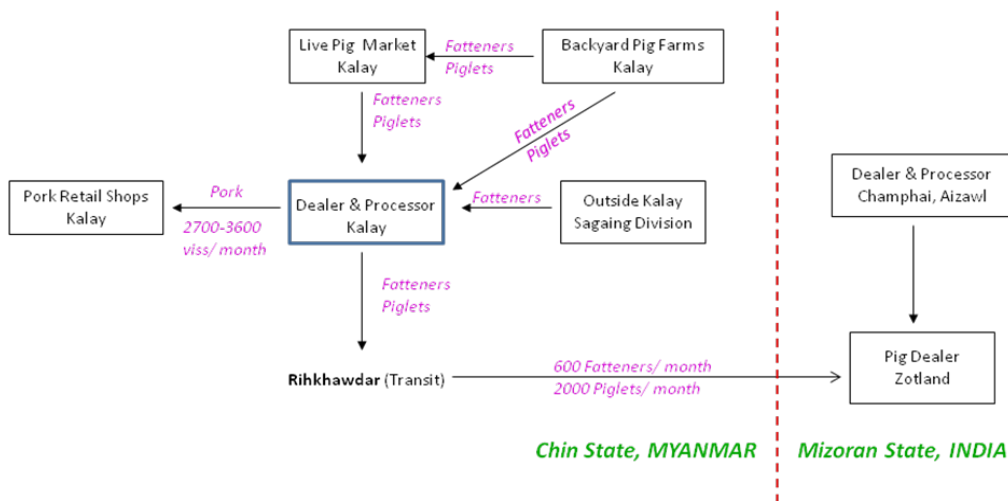


Figure 10. Cross Border Pig Supply Chain in India (Rihkawdar)

## G. Swine Production Systems

### Population

Myanmar is composed of 14 states and regions wherein 5 states and regions have high pig production (Figure 11). Commercial pig farms are mostly located in the vicinity of Yangon Region.

Highest consumption of pork is seen in Yangon and Mandalay Region. Thus, majority of pigs supplied to Yangon market are sourced from Ayeyarwaddy Region (Figure 12). There is a stiff competition between commercial farms located in the outskirts of Yangon to supply the said areas.

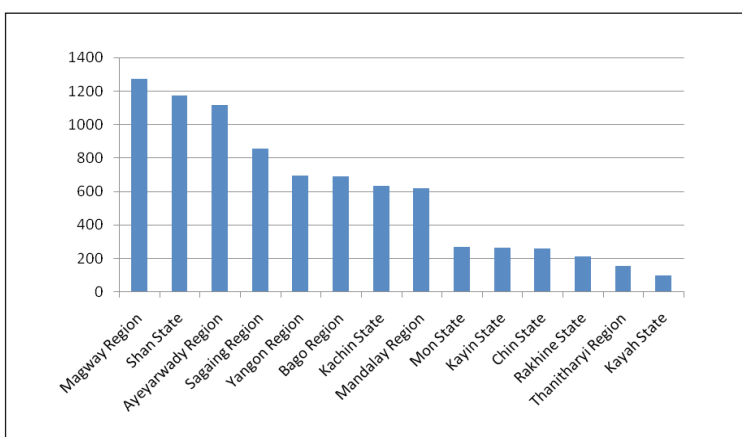


Figure 11. Distribution of Pigs ('000) State and Region (2009)

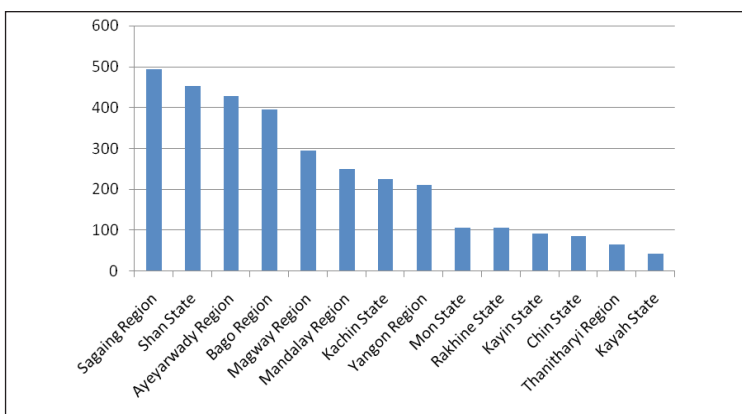


Figure 12. Pork production (1 000 Metric Tons) by State and Region (2009)

The country's livestock data is based on the information collected and provided by administrative authorities of states and regions. There is difficulty in getting the actual data regarding livestock population since it is hampered by lack of funding support, field staff and communication network.

Based on the 2009 data, areas with the most number of pigs include Magway, Ayeyarwaddy, Sagaing, Yangon and Kachin (Table 12). Ayeyarwaddy, Sagaing, Magway and Kachin had the most number of farms.

**Table 12. Pig Population Growth in State and Regions (Values expressed in 1 000)**

State / Division	2006		2009		Average Growth Rate (2006-2009)	
	Holdings	Swine	Holdings	Swine	Holdings	Swine
Kachin	92	477	93	634	0.3	10.0
Kayah	13	83	22	97	13.9	5.6
Kayin	44	209	45	265	1.0	8.3
Kayin	47	207	47	260	0.2	7.8
Chin Sagaing	122	714	132	857	2.1	6.1
Thanintharyi	20	128	20	155	0.3	6.5
Bago (E)	64	331	64	425	0.1	8.7
Bago (N)	50	207	50	263	0.1	8.4
Magway	89	746	95	1 271	1.7	20.2
Mandalay	109	487	109	619	0.1	8.2
Mon	25	198	29	268	5.1	10.5
Rakhine	30	168	31	213	0.8	7.9
Yangon	57	491	57	695	0.1	12.4
Shan (S)	29	310	30	380	1.2	6.9
Shan (E)	26	179	28	218	2.4	6.5
Shan (W)	34	357	37	574	2.7	17.7
Ayeyarwady	170	998	147	1 118	-3.3	5.8
<b>Union</b>	<b>1 022</b>	<b>6 293</b>	<b>1 038</b>	<b>8 316</b>	<b>0.5</b>	<b>10.0</b>

Source: Livestock Breeding and Veterinary Department

In 2010, LBVD with the assistance of the Food and Agriculture Organization of the United Nations (FAO) conducted a livestock data enumeration in all states and regions randomly. Farms chosen were those that had 10 or more animals. However, the information collected is not an actual representation of the livestock situation of the country as a whole but only a partial estimation of the current status of commercial farming in Myanmar.

Yangon and Shah had the most number of farms with more than 500 pigs while Magway and Mandalay had the most number of farms with 10-50 pigs. Yangon also had the most number of farms with 50-99 pigs and 100-499 pigs (Table 13) (Figure 13).

**Table 13. Number of Medium and Large Scale Pig Farms in States and Regions**

States/ Division	10-19		20-49		50-99		100-499		500 above	
	Holdings	Swine	Holdings	Swine	Holdings	Swine	Holdings	Swine	Holdings	Swine
Kachin	2	25	29	694	1	80	1	300	0	0
Kayah	4	64	4	106	0	0	2	220	0	0
Kayin	1	15	12	368	0	0	1	109	0	0
Chin	0	0	2	56	0	0	0	0	0	0
Sagaing	0	0	17	470	5	0	0	0	0	0
Tanintharyi	12	158	30	841	2	335	2	277	0	0
Bago	0	0	29	905	9	116	5	1 251	1	615
Magway	19	253	35	897	4	571	1	146	0	0
Mandalay	16	228	39	1 096	10	248	6	799	1	3 493
Mon	4	45	35	1 066	6	696	4	552	0	0
Rakhine	1	19	17	569	0	405	0	0	0	0
Yangon	9	135	59	1 732	23	0	9	1 728	9	7 189
Shan	3	47	104	2 748	12	1 488	8	1 732	4	20 928
Ayeyarwady	4	51	30	876	3	813	1	150	1	500
<b>Total</b>	<b>75</b>	<b>1 040</b>	<b>442</b>	<b>12 424</b>	<b>75</b>	<b>4 939</b>	<b>40</b>	<b>7 264</b>	<b>16</b>	<b>32 725</b>

Source: Livestock Breeding and Veterinary Department

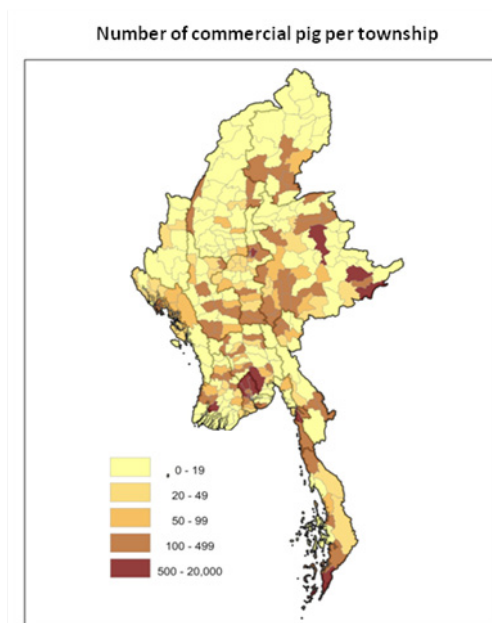


Figure 13: Distribution of Medium and Large Scale Pig Farms

## Categories of Pig Farms

Pig farming in Myanmar is divided into three categories based on the number of pigs raised in the farm.

### *a. Large Scale Pig Farm*

The farms usually have more than 500 pigs in the farm and produce faster-growing, leaner pigs. Currently, there are very few commercial pig farms in Myanmar. They are mainly located near Yangon Northern District, which supply almost all the breeding sows and piglets.

These farms are well-equipped, well-managed and have high productivity level. Breeds such as Large White, Landrace and Duroc Jersey are kept in this system. Rising cost of feeds is one of the major problems of the large-scale farms.

One major company involved in commercial pig farming is the Myanmar CP Livestock which is part of the Thai-based CP group. It is considered as the biggest player in intensive pig farming and supplies various inputs such as breeders, feeds, veterinary products and technical services. It is also involved in meat processing and trading.

LFME under MoLF is a state-owned enterprise that imports pure breed pigs from abroad. It usually distributes breeders and commercial piglets from Daik U, Lashio and Htonebo pig breeder farms. As of October 2010, the livestock inventory under LFME has 3 200 sows and 34 900 total heads. The enterprise is expected to supply 60 000 suckling pigs and 4 000t of pork annually for the domestic market.

Among the farms under LFME, Daik-U Pig Farm and Feed mill is situated in Pago Region, 120 km away from Yangon City. It was established in 1975 with the machinery equipment and services by GIZA, Italy. The first commercial run started in 1985 to 1986 covering around 44 ha with 25 000 pigs. The farm is expected to supply 12 000 suckling pigs and 2 060t of pork annually for the domestic market.

### *b. Medium Scale Pig Farm*

Medium-scale farms house a range of 10 to 500 fatteners and/or 5 to 50 sows. Pigs are kept in pens, given commercial feed, regularly vaccinated and biosecurity measures are applied to some extent.

In the cities of Yangon, Bago, Ayeyarwady and Mandalay Divisions, a medium pig farm keeps 10-30 crossbreds and exotic breeds. The pigs are raised as piglets and fatteners. Feed can be home-made concentrates or commercial feed. However, because of price competition, only very efficient farms can survive this scale of production on a long term.

### C. Small Scale Pig Raising

In Myanmar, small-scale pig production system may be categorized into three types, namely: free-range scavenging, semi-intensive (confined within a large area) and intensive (confined to a pig pen). The small-scale swine raising remains as the main source of meat supply for local consumption. Nearly 95 percent of all pigs are raised in small-scale farm.

Generally in small-scale farm, two to four pigs are fattened during a period of 8 to 12 months to reach the marketable weight. Local breeds are used and sometimes even crossbreed, depending on the breeds accessible to the hog raisers.

The low quality results to poor growth rate of pigs in this system. Nevertheless, small-scale pig raisers keep pigs as a 'savings bank'. It may be for very specific purposes such as food for special occasions; emergency needs and travels; or as a secondary source of income. The use of 'boars-for-hire' within the community is also a common practice.

This traditional system of farming has little room for development. The local breed grows more slowly than the improved pig breeds but manages to grow and adapt despite poorer feed quality and quantity and low standards of housing and husbandry. There is also no price difference between the selling of local pigs and improved breeds.

Room for improvement is seen only in the fertility of native pigs which has a smaller litter size and substantially less than half of the improved pigs (10–12 piglets). Better and more balanced rations could also be fed but the strength of this system is its low production cost. The system does not depend on purchased feed which insulates them from commercial pressures.

## H. Swine Production and Health

### Farmgate Prices and Production Parameters

Compared to the 2008 prices, there is a decrease in the farmgate price and retail price of pork in 2009 (Table 14). The large discrepancy between prices is a disincentive for small farmers involved in pork production.

**Table 14. 2002-2009 Pork Prices in Yangon (Kyat)**

Year	Farmgate Price	Wholesale Price	Retail Price
2002	507	834	1 589
2003	597	1 010	1 650
2004	700	1 116	2 112
2005	868	1 875	2 539
2006	1 027	2 750	2 800
2007	1 633	2 218	4 038
2008	2 005	2 700	5 043
2009	1 047	2 700	4 645

Source: Myanmar Livestock Federation



Compared to 2005, there is a significant increase in the percentage of pigs slaughtered in 2009 (Table 15). The carcass weight remained unchanged for pigs from 2001-2009 (57 kg/animal).

**Table 15. Carcass Weight and Percentage Slaughtered by Species**

Species/year	Carcass weight (kg/animal)			Percentage slaughtered/year		
	2001	2005	2009	2001	2005	2009
Cattle & Buffaloes	147	147	147	3.6	5.7	8.0
Sheep & Goat	10	10	10	61.2	90.0	95.4
Pigs	57	57	57	61.2	87.0	95.0
Poultry	1	1	1	473.4	596.0	574.0

Source: Livestock Feedstuff and Dairy Products Enterprise

The following table shows the total production cost, farm gate price and profit margin (Tables 16-17), pig production performance (Table 18) and pork cuts (Table 19).

**Table 16. Piglet Production Cost**

No	Particular	Cost/Sow/ Yr (Kyats)	Piglet Cost/Head(Kyats)				
			16	17	18	19	20
1	Housing Cost	90 000	5 625	5 294	5 000	4 737	4 500
2	Boar Cost	8 500	531	500	472	447	425
3	Sow Cost	25 833	1 615	1 520	1 435	1 360	1 292
4	Boar Feed Cost	32 267	2 017	1 898	1 793	1 698	1 613
5	Sow Feed Cost(Gestation)	221 800	13 900	13 000	12 300	11 700	11 100
6	Sow Feed Cost(Lactation)	193 500	12 094	11 382	10 750	10 184	9 675
7	Piglet Feed	40 500.15	3 700	3 700	3 700	3 700	3 700
8	Feed Until Production	60 000	7 594	7 147	6 750	6 395	6 075
9	Labour	7 600	3 750	3 529	3 333	3 158	3 000
10	Vaccine & Medicine(Boar)	3 350	475	447	422	400	380
11	Vaccine & Medicine(Sow)	650	209	197	186	176	167.5
12	Vaccine & Medicine(Piglet)		41	38	36	34	33
<b>Total</b>		<b>684 000</b>	<b>42 750</b>	<b>40 235</b>	<b>38 000</b>	<b>36 000</b>	<b>34 200</b>

Source: Myanmar CP Livestock

**Table17. Swine Fattening Cost Raised on Concentrate Feed (November 2010)**

Condition		
Started Piglet Weight	10	Kg.
% Depletion	5	%
Market Weight(Kg.)	100	Kg.
B.W. Increase (Kg.)	90	Kg.
Raising Period	147	Days
FCR.	3.5	
ADG. (B.W. Increase(gm.)/ Raising Period)	612	gm.
Breed Cost (Piglet)		
Piglet Price (10 Kg.)	60 000	Kyats
Breed Cost/ Head	60 000	Kyats

Feed Cost			
Products	Price(Kg.)	Feed Use(Kg.)	Kyats
C.P. 751(1)	378	65	24 570
C.P. 751(2)	330	120	39 600
C.P. 751(3)	285	130	37 050
Total Feed Consumption		315	
Total Feed Cost/ Head			101 220

Other Cost		
Medicine & Vaccine/ Head	1 500	Kyats

Total Cost Commercial Swine		
Cost Per Head on	31-7-2010	162 720
Cost Per Kg. on		1 627
End Product Price (Kyats/ Kg.)		2 030
Profit (Kyats/ Kg.)		403
Profit (Kyats/ Head)		40 280

Source: Myanmar CP Livestock

**Table18. Pig Production Performance**

Growing- Finishing	Breeding
ADG	Number of litters per year :2- 2.2
FCR	Number of piglets/sow/year: 18
Market Weight	Number of parturitions allowed: 6- 7

Source: Livestock Feedstuff and Dairy Products Enterprise

**Table 19. Pork Cuts**

Description	Hybrid	Local Breed
Front leg	2.5%	1.9%
Back leg	3.0%	2.4%
Ham	24.8%	10.7%
Bacon	6.3%	9.7%
Tenderloin	1.3%	0.2%
Sirloin	28.7%	13.2%
Fat	2.0%	11.8%
Rib bone	12.2%	9.7%
Head	5.1%	3.5%

Source: Livestock Feedstuff and Dairy Products Enterprise

### Sources of Feed

Feeds are derived from two sources, which are agriculture and fisheries. Agricultural by-products such as broken rice, rice bran and corn are used as feed. Ground nut and sesame cakes are commonly used as sources of protein. These products come from the middle and upper parts of the country where oil crops are extensively grown.

Fish and prawn meals are derived from the fisheries sector. Fish resources are divided into fresh water and marine. Untradeable fish and fish wastes are used as feed for animals. Fish wastes are dried artificially to be used as animal feed. A certain proportion is used for human consumption by preserving it as fish paste which is an essential food for the rural population.

There are 12 feed mills in Yangon with an average production capacity of 60 tons per day. A number of small scale feed mills that can produce 1-2 tons per day have been set up in areas where livestock populations are high.

In Mandalay, there are 5 feed mills with a capacity of 50 tons per day and 3 similar mills in other regions. The total production from these feed mills accounts to about 2.6 Mt per year.

About 70 percent of the feeds produced from Yangon City are for fish and the rest is for pig and poultry. Most of the small scale farmers give their animals home mixed feed or feed compound produced at the feed mill in accordance with their own preferred ration formula (Table 16).

Livestock production is greatly affected by fluctuations in the price of feeds. In order to boost livestock production in Myanmar, quality feed must be available in sufficient quantities at reasonable prices (Table 20).

It is expected that the production of feed from agriculture and fisheries will rise as a result of increase in production from these sectors. To gain maximum utilization of locally

available feed, it is necessary to identify its potential as a resource and its utilization. Alternative feed resources should be encouraged as well.

**Table 20. Animal Feed Requirement (1 000 Metric Tons)**

Particular	2001	2005	2009	Annual Growth Rate (%)	
				2001-2005	2005-2009
Broken rice	576	4 470	7 516	89.44	14.27
Rice bran	256	1 088	1 364	44.84	139.38
Coarse bran	1 165	1 792	2 542	9.15	9.16
Fish meal	235	476	931	15.67	18.54
Maize	113	168	249	8.44	10.41
Oil cake	155	1 009	1 773	74.43	15.97
Gram and Pigeon pea	14	70	104	39.07	10.41
Salt	80	262	313	32.26	4.61

Source: Livestock Breeding and Veterinary Department

**Table 21. Wholesale Price of Animal Feed at the Yangon market**

Feed	Feed Cost (Kyats/ Kg.)			
	2007	2008	2009	2010
Broken Rice	201	145	203	227
Rice Bran	203	151	148	221
Wheat Bran	198	180	164	224
Groundnut Cake	447	432	397	573
Sesame Cake	413	551	445	518
Maze	226	192	202	235
Fish Meal	401	507	461	460

### Common Production and Animal Health Problems

#### *a. Environmental Problems*

Livestock farming causes environmental pollution through waste water, odor and pests (flies). It has been identified as one of the main cause of serious environmental problems.

To confront the odor problem, large swine farms are often located away from residential areas. Conflict usually arises in small scale farms since majority are usually located within the community.

LBVD is tasked to enforce the rules and regulations for environmental pollution although the main thrust of the office is on the extension programme. Thus, better environmental management can be achieved by cooperation between LBVD and other responsible agencies.

#### *b. Food Safety Problem*

In the past, Myanmar lacked strong consumer protection system resulting to poor product quality control. The government is making headway in strictly monitoring and enforcing food safety regulations. The food safety concerns in the domestic market include the use of banned drugs and other chemicals; sanitation during slaughtering; and use of dead animals in some processed food products.

To minimize cost of producing processed meat, some producers use carcasses from dead animals that did not die of any illness. Usually the cause of death of the animals is due to stress, dehydration, biting, accident and other natural causes. The processed meat is usually sold without any brand to low-income markets in the rural areas. The practice is considered illegal and needs to be addressed with stringent regulations.

#### *c. Animal Health Problem*

Animal diseases have great detrimental effect not only to farmers but to the entire livestock industry including the consumers. It also affects the access or competitiveness of Myanmar animal products to the international market.

Controlling animal diseases has been a constant challenge to the country's veterinary service. The government provides support for vaccine research and development. Collaborations are also made with international organizations such as the World Organisation for Animal Health (OIE) and Food and Agriculture Organization (FAO) and other countries in the region to control animal diseases.

Many farmers give more priority in controlling animal diseases that cause high mortality and not those that have high morbidity such as FMD. In commercial and semi-commercial pig production system, there are existing biosecurity measures and herd health programme to prevent animal diseases. Smallholder farms on the other hand, are the most prone to diseases.

The common diseases in pigs are the following:

- classical swine fever
- foot and mouth disease type O
- swine plague
- porcine pleuropneumonia
- lung worm
- round worm
- oesophagostomiasis
- piglet diarrhoea (pig scour)

Hog cholera vaccine has been produced since 1954 by LBVD. The vaccine uses freeze dried tissue culture produced from guinea pig kidney primary cells. The vaccine is available in 10 doses or 20 doses per vial. Based on field practice and experience, it has been proven to be very effective for pigs.

FMD is endemic in cattle and in pigs. In 2011, only type O has been detected in Myanmar. Control of FMD is usually through ring vaccination only. At present, the National FMD Laboratory can produce annually about 50 000 doses of FMD type O vaccine for pigs. Small-scale farmers do not regularly vaccinate their pigs with FMD since outbreaks only occur every four or five years. The incidence of FMD in the pig population has reduced gradually every year as a result of the vaccination programme.

Myanmar together with other South East Asian countries is actively pursuing the control of FMD. The Ministry of Livestock and Fisheries already agreed in 2007 to the SEAFMD Roadmap for freedom from FMD with vaccination by 2020 in Myanmar.

Emerging infectious diseases (EIDs) are not significantly found and there have been no laboratory confirmation for porcine reproductive and respiratory syndrome (PRRS) and Japanese encephalitis (JE).

#### Animal Disease Diagnostic Facility

To provide services for pig farmers throughout Myanmar, LBVD has established national, regional and animal quarantine laboratories. The list of laboratories is as follows:

1. National Reference Veterinary Diagnostic Laboratory (Yangon)
2. Mandalay Regional Veterinary Diagnostic Laboratory
3. Patheingyi Regional Veterinary Diagnostic Laboratory
4. Taunggyi Regional Veterinary Diagnostic Laboratory
5. Muse Animal Quarantine Laboratory
6. Kyaing Tong Animal Quarantine Laboratory
7. Lashio Animal Quarantine Laboratory
8. Myitkyinar Animal Quarantine Laboratory
9. Monywa Veterinary Diagnostic Laboratory

The animal diagnostic laboratories have contributed to the improvement of the pig industry by confirmation of infectious and common diseases of pigs and sharing of information through the laboratory network.

Mandalay Regional Veterinary Diagnostic Laboratory has more facilities for disease diagnosis than any other laboratories while the National Reference Veterinary Diagnostic Laboratory in Yangon gives the final and official confirmation of pig diseases in the country. Pig diseases that can be diagnosed include classical swine fever, *E. coli*, brucellosis and other bacterial diseases, FMD, rabies, PRRS and some parasitic diseases.

Through the support of the FAO project “Avian Influenza Integrated Programme”, a biological safety level 2+ laboratory (BSL 2+) was established at Yangon in 2008. The laboratory handles dangerous and infectious materials such as avian influenza virus, rabies, hog cholera, PRRS, etc. Tests are done in the negative pressure room of the laboratory.

Pig viral disease can be diagnosed by using PCR techniques. The laboratory already has equipment for reverse transcriptase polymerase chain reaction (RT PCR) and real time RT PCR. Serological testing such as ELISA is available for the antigen and antibody detection of animal diseases. Other laboratory equipment installed are CO<sub>2</sub> incubator for tissue culture and FAT microscope.

The JICA Animal Disease Control (ADC) project, on the other hand, provided training for the Serology and Virology Section staff of Mandalay Veterinary Diagnostic Laboratory regarding the laboratory diagnosis of CSF. A sero-surveillance of CSF in Mandalay was also undertaken. One staff from Mandalay regional laboratory was trained on CSF diagnosis in NIAH Thailand. A technical expert from JICA provided training support in 2005-2006.

All the veterinary laboratories of Myanmar have the capability to diagnose brucellosis in swine by rose bengal precipitation test (RBPT) and tube agglutination test. In 2010, laboratory staff of Yangon, Mandalay and staff at township level of Amarapura and Pyin Oo Lwin were trained on Brucella diagnosis under the activities of the JICA ADC Phase II project.

Serology and virology staff of the FMD Laboratory have been trained on the diagnosis of FMD (antigen and antibody detection by ELISA, liquid phase blocking ELISA and non structural protein ELISA) at the FMD Regional Reference Laboratory for FMD in South East Asia in Pakchong, Thailand.

A training on the laboratory diagnosis of PRRS was attended by 2 Yangon laboratory staff in Vietnam on September 2010.

The veterinary diagnostic laboratories can perform the differential diagnosis of pig diseases through the following methods:

- history of clinical symptoms
- post-mortem findings (PM)
- bacterial culture and isolation
- serology by ELISA
- biochemistry and hematology testing
- histopathological findings
- parasitology
- haemagglutination and haemagglutination inhibition tests.
- RT PCR, real time RT PCR

Laboratory confirmation of a disease is dependent on post-mortem findings, differential diagnosis and results of the confirmatory tests.

### Disease Surveillance System

Passive surveillance is the main method used in Myanmar to collect information on livestock diseases. Active surveillance is conducted for highly pathogenic avian influenza for poultry sector and FMD, brucellosis and tuberculosis in cattle, sheep and goats. There is no regular specific surveillance for swine diseases.

Surveillance on swine vesicular disease (SVD) was conducted in 2003 to 2004. All the 791 samples collected from 5 divisions tested negative using cELISA provided by IAEA.

In 2006, a sero-surveillance for CSF was conducted in Mandalay Township with the use of NPLA method in Mandalay Veterinary Diagnostic Laboratory under the JICA ADC project. A total of 1 000 sera were tested and 106 samples had antibodies against CSF. For swine vesicular disease, 791 sera were collected from 5 regions and diagnosed by ELISA. All using samples tested negative.

For PRRS, 6 suspected cases were received from Muse (China border) and all tested negative based on the RT-PCR result. So far, no PRRS cases have been reported in Myanmar. For swine brucellosis, a total of 469 swine sera from Mandalay region were tested and 2 sera tested positive.

The LBVD/FAO Animal Influenza Surveillance Programme started in December 2010. The surveillance includes monthly visits to pig farms; collection of sera and nasal swabs by field staff; and laboratory diagnosis carried out at Yangon National Laboratory and the regional laboratories. The activity aims to determine the presence and prevalence of influenza A H1N1, FMD, brucellosis, and hog cholera in pigs. Clinical examination of PRRS will be carried out as well during the farm visit.

The constraints to disease diagnosis are the following:

- Need to be updated on disease diagnostic methods for swine diseases including molecular techniques.
- Lack of equipment and reagents for regular diagnostic tests.
- Human resources development regarding laboratory diagnostic techniques.
- Lack of facilities for effective and regular surveillance system.

## **I. Constraints to Swine Production and Health**

Several factors have been identified that continue to limit pig production in the country:

### Nutrition

Providing adequate nutrition for livestock is one of the major problems. Feed accounts for almost 70 percent of the production cost. Some smallholders overcome the prohibitive costs



of feeds by adding supplements such as locally available cheap by-products. Among the more common additives used are: cassava leaves, water hyacinth, water spinach, banana tree, fish meal, rice meal, and oyster shells. Only commercial farms use concentrates solely to feed their pigs. The following are the other constraints in the efficient use of feed resources:

- Quality of feeds is often low and there are also problems related to seasonality, processing and storage facilities.
- Handling and collection costs of feeds are high.
- The cost of feeds is high.
- There is lack of managerial and technical skills to utilize the feeds in situ.
- Use of locally available by-products can be a source of toxins.

#### Low Inputs

Due to lack of capital, there is limited access to quality feeds, breeding stocks and access to veterinary services. Labor is generally not considered as a scarce resource in the small scale farms since unpaid family labour is available.

#### Climatic Factors

Majority of the country has hot humid climate. The combination of high humidity and high temperature greatly affects pig raising.

#### Swine Diseases

Failure to completely monitor infectious diseases is a major limiting factor for pig production in the country. With more than 80 percent of pig producers as smallholders, a major problem is the low level of knowledge and understanding regarding the benefits of disease control. Commercial pig raisers, on the other hand, are aware of the benefits of disease control but apprehensive in reporting disease occurrence to the government.

Medium and small-scale pig farmers are prone to diseases because of the following practices:

- Traditionally, have farrow-to-finish systems with mixed age groups.
- Replacement stocks usually comes from various sources with unknown health status and quarantine of new stocks is not enforced.
- Biosecurity is usually very poor or does not exist at all.

Disease control is normally done through vaccination. Low vaccination coverage in the pig population is one of the constraints in achieving a disease free status in Myanmar. The use of high levels of antibiotics and other antibacterial agents without adequate supervision of veterinarians is very common and leads to drug resistance cases in smallholder farms.

### Animal Productivity / Genetic Development

Genetic development of pigs is not a priority for smallholder farmers. Improvements in production traits only become important once certain conditions in health and nutrition are met and certain production levels are reached.

### Marketing

Trading constraints that prevent remote smallholders from getting a fair market price for their pigs include the following: restricted movement due to disease control; high transportation fare; lots of paperwork (license, animal health certificates) in trading animals to other areas; inaccessible market information; and the absence of refrigerated trucks. The states and regions have no organized market or auctioning system for smallholders who want to sell pigs or pig products.

The traders and not the pig farmers dictate the market price of pigs. Insufficient marketing outlets, limited market information coupled with the lack of guaranteed prices are the other problems identified.

### Urbanization

Urbanization involves the migration of people from rural areas to cities and the urban periphery. One consequence of this trend is that many small farms are being abandoned due to inadequate labor supply; ageing small-scale farmers; and the younger generation pursuing non-agricultural vocations in the cities.

The causes of urbanization are many but can be linked to poverty, low income, and increased hardship in the rural areas. Since this is an increasing trend, farming activities must be restructured in a manner that would offer better prospects, higher income and living standard to prevent an exodus from rural areas to the cities.

## **V. SECTORAL POLICY AND LEGISLATION**

### Government's General Policy

The livestock sector in Myanmar is focused on the following priorities:

1. Integrated development in livestock sector
2. Self-sufficiency in livestock products and production of exports for surplus
3. Intensification of research and development activities
4. Socio-economic development of households in the livestock sector

Policies are intended to improve the economic status of livestock and fishery producers by providing support for the production of quality breeds of livestock; promotion of integrated livestock and fisheries development; and the development of both to meet local demand. At the same time, a primary objective is the development of an exportable surplus. Policy initiatives also call for livestock research and development to be expanded and encourage investment by both local and foreign sources.

There are several laws which impinge on the development of the pig sector including the Essential Supplies Act (ESA) which has provisions relating to cattle exports and slaughter and the Myanmar Investments Law which provides tax concessions as incentive for foreign investment in the livestock sector.

The most important law with specific reference to the livestock sector is the Animal Health and Development Law (AHDL) in 1993. It provides the legal basis for animal disease prevention and reporting; animal health and development; and meat inspection at township level slaughter facilities.

The specific orders issued by the Office of the Minister in respect of this law constitute the primary regulatory environment for livestock production. In particular, they provide for the control and prevention of contagious animal diseases (including zoonotic disease) through vaccination, inspection and control of livestock movement.

Several key aspects of animal production are not adequately addressed by legislation which include: (a) animal feeds standards; (b) food safety; (c) import and export regulations for both livestock and livestock products, and; (d) the location, establishment and functioning of quarantine operations and facilities. These are under the mandate of the MoLF.

The policies and objectives of MoLF are the following:

- To produce quality breeds of livestock and fish
- To promote integrated development of livestock and fisheries
- To produce meat and fish sufficiently enough to meet the local demand and to export the surplus
- To promote investment in livestock and fishery sector
- To maintain, promote and conserve breeds of fresh water and marine resources
- To promote socio-economic status of population involved in livestock and fisheries

#### National Medium Term Priority Plan

The national medium term priority framework has four main objectives:

- To increase the production of draught animals together with agricultural expansion
- To expand dairy production and facilitate import substitution
- To increase meat production and per capita meat consumption, and thereby enhance the nutritional status of the population
- To increase the income of farmers

Improved disease control constitutes one of the major means for the objectives of the plan to be met. It is expected that with better disease control there will be an improvement in the productivity and lesser risks in livestock production encouraging farmers to invest more in livestock.

Disease control is the core competency of the LBVD, and is the first priority of the AH-NMTPP. The AH-NMTPP also seeks to expand the capacity of the LBVD to study and understand livestock commodity supply chains. This will enable the LBVD to see how improved policies and actions (such as governance or technical services) can improve the livestock sector's performance. The study of supply chains is also essential in order to design effective disease control programmes.

Many domestic disease control programmes need to be linked to regional initiatives due to diseases cross border issues and because technical support can be accessed regionally. Human resources for the livestock sector are also critical inputs and providing capacity building will contribute greatly to all the four main objectives.

The specific goal of the AH-NMTPP is to assist the LBVD to support the objectives for the livestock sector through the delivery of a set of outputs related to its animal health mandate and its institutional arrangements, which are the following:

- Improvement of livestock services to smallholders
- Progressive strengthening of livestock disease control
- Better understanding and management of commodity supply chains
- Productive engagement in regional programmes and initiatives
- Development of human resources for the livestock sector

#### Animal Health and Development Law

The Animal Health and Development Law was also enacted in 1993 and 1999 to establish strategies, regulation and activities to support the FMD control programme. Strategies include the use of progressive zoning and surveillance approach; public awareness programme; and vaccination.

# PHILIPPINES

## Swine Industry Profile

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## INTRODUCTION

### I. COUNTRY PROFILE

#### A. Geographic Profile

The Philippine archipelago is bounded by the South China Sea on the west and north, Pacific Ocean on the east, and on the south by the Celebes Sea and coastal waters of Borneo. Manila is the capital of the Philippines.

The country is composed of 7 107 islands divided into three major groups of islands namely: Luzon, Visayas and Mindanao. It is further divided into 17 administrative regions (Figure 1) which are: Region I (Ilocos), Region II (Cagayan Valley), Cordillera Administrative Region (CAR), Region III (Central Luzon), National Capital Region (NCR), Region IVA (Southern Tagalog-mainland), Region IVB (Southern Tagalog-island provinces), Region V (Bicol), Region VI (Western Visayas), Region VII (Central Visayas), Region VIII (Eastern Visayas), Region IX (Zamboanga Peninsula), Region X (Northern Mindanao), Region XI (Davao), Region XII (SOCCSKSARGEN), Region XIII (CARAGA), and the Autonomous Region of Muslim Mindanao (ARMM).

There are 80 provinces that have 138 cities and municipalities, which are classified as local government units (LGUs) with relative administrative autonomy from the national government. In addition, a city or municipality is comprised of several barangays or villages.

The barangay is the smallest administrative unit headed by a chairman and as of June 2010 the country has a total of 42 025 barangays. Local chief executives such as governors at provincial levels and mayors at city/municipal level and a local council dispose both administrative and local legislative authorities.

The country has a total land area of 299 404 sq km or approximately 30 million hectares with a total agricultural land area constituting 47 percent of the country's total land area. It has 4.8 million agricultural farms covering 9.7 million hectares.

Land resources in the country are generally classified into forest lands and alienable and disposable lands. A total of 15.8 million hectares were classified into forest lands, and 14.2 million hectares are alienable and disposable lands. Out of the 14.2 million hectares alienable and disposable lands, 93 percent or 13 million hectares are classified as agricultural lands.

The total population of the country stands at around 94 million as per projection of the National Statistics Office (NSO) for the year 2010.

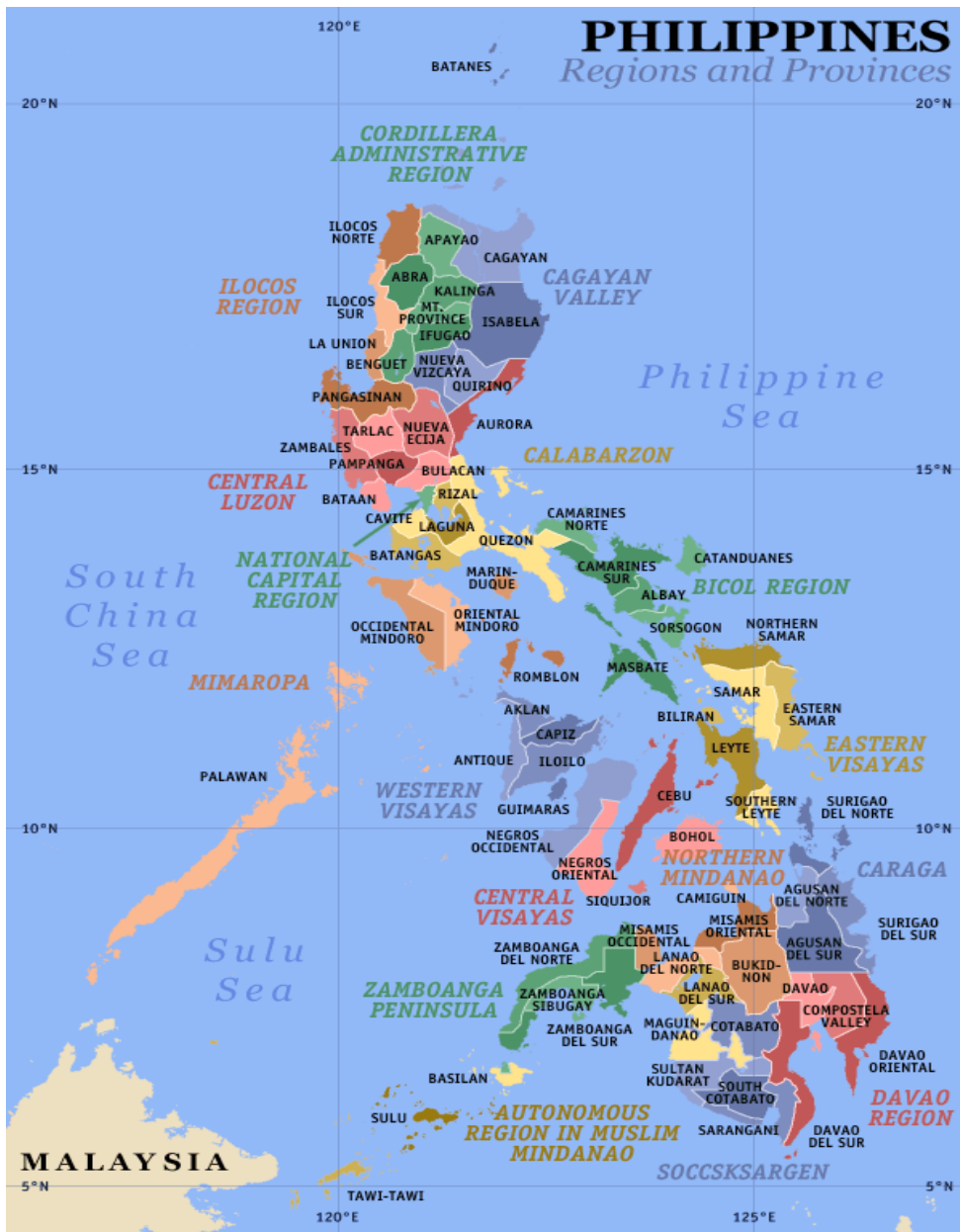


Figure 1. Map of the Philippines

## B. Economic Profile

The service sector contributes more than half of the overall Philippine economic output, followed by industry (about a third), and agriculture (less than 20%). Important industries

include food processing; textiles and garments; electronics and automobile parts; and business process outsourcing (BPO).

Most industries are concentrated in the urban areas around metropolitan Manila. Mining also has great potential in the Philippines since the country possesses significant reserves of chromate, nickel, and copper. Significant natural gas finds off the islands of Palawan have added to the country's substantial geothermal, hydro, and coal energy reserves.

**Table 1. Gross National Product and Gross Domestic Product (2008-2009)**

**GROSS NATIONAL PRODUCT AND GROSS DOMESTIC PRODUCT  
BY INDUSTRIAL ORIGIN:  
Annual 2008 and 2009  
AT CURRENT AND CONSTANT 1985 PRICES, IN MILLION PESOS**

INDUSTRY/INDUSTRY GROUP	At Current Prices			At Constant Prices		
	2008	2009	Growth Rate (%)	2008	2009	Growth Rate (%)
Agri. Fishery, Forestry	1 102 465	1 138 334	3.3	259 410	259 424	0.0
Industry Sector	2 347 803	2 318 882	-1.2	464 502	460 205	-0.9
Service Sector	3 959 102	4 221 702	6.6	693 176	712 486	2.8
<b>GROSS DOMESTIC PRODUCT</b>	7 409 371	7 678 917	3.6	1 417 087	1 432 115	1.1
Net factor income from the rest of the world	852 121	1 131 067		174 022	222 821	
<b>GROSS NATIONAL PRODUCT</b>	8 261 492	8 809 984	6.6	1 591 109	1 654 936	4.0

Source: National Statistical Coordination Board (NSCB) – 26 August 2010

## II. AGRICULTURE PROFILE

### C. Role of Agriculture in the Economy

Agriculture plays a dominant role in the Philippine economy (Table 1). It accounts for 15 percent of the country's gross domestic product (GDP) in 2007. In 2009, agriculture grossed at Philippine Peso (PHP) 1.2 trillion, representing a 2.18 percent increase from the 2008 level (USD 1= PHP 42.83 as of July 2011).

Agriculture is an important sector since the country's population is predominantly rural (70% of the total) and two-thirds of this population depends on farming for their livelihood. Production activities for agriculture include rice, corn, coconut, sugar, banana, livestock, poultry, other crops and fisheries.

In terms of employment, about half of the labour force is engaged in agricultural activities. As of July 2006, almost 35.6 percent of the labour force or an estimated 12 million people is employed in the agriculture industry which includes the hunting and forestry sectors.

The Department of Agriculture (DA) is the principal agency of the Philippine Government responsible for the promotion of agricultural development growth. It believes that sustained expansion of the national economy requires sustained growth in the agricultural sector.

DA provides the policy framework and helps direct public investments. In partnership with local government units (LGUs), it provides the support services necessary to make agriculture and agri-based enterprises profitable and help spread the benefits of development to the poor particularly those in rural areas.

The government's vision is to modernize smallholder agriculture and fisheries to a diversified rural economy that is dynamic, technologically advanced and internationally competitive. It aims for food security, sustainability of the natural resource base, social equity and global competitiveness.

Specific measures to achieve these goals include the following: protection and development of watersheds; proper management of agricultural land and water resources; establishment and rehabilitation of irrigation systems; providing marginalized sectors preferential access to productive assets; and providing other essential measures and support services.

#### **D. Role of Livestock in the Total Agricultural Economy**

The livestock subsector accounts for 12.47 percent of total agricultural production in 2009. The gross value of livestock production was PHP 196.0 billion at current prices, indicating a 6.5 percent increase compared to 2008.

The swine industry, along with poultry, has consistently dominated other livestock industries in terms of volume and value of production. Livestock production remains to be dominated by smallholders and is a major activity in rural areas. A large proportion of smallholder farmers consider livestock raising as their primary source of income.

#### **E. Role of the Swine Sector in the Total Livestock Economy**

As of 1 January 2010, the country's swine inventory was estimated at 13.4 million heads. The swine industry is valued at around PHP 150-200 billion (USD 3.2 – 4.2 billion), including production, processing and exports. In 2007, swine accounted for 82 percent of the total livestock production with an estimated value of the PHP 134 billion.

Filipinos are relatively large consumers of pork and are known to generally prefer pork to chicken or beef. According to the Bureau of Agricultural Statistics (BAS), Filipinos consume about 17 kg of pork per capita, equivalent to 65 percent of the total annual meat consumption.

Being the biggest and most organized industry among the local livestock industries, the swine industry provides business and employment opportunities. Moreover, the industry also sparks the development of related industries such as veterinary drugs and feed milling.



It is estimated that 77 percent of hog inventories remain in backyard production systems. In this system, swine raising is considered as an extra source of income or “piggy bank” wherein housewives are mainly responsible for raising of the pigs. As a secondary source of income, they often raise one or two head of pigs with the proceeds of the sale of pork being used for very specific purposes such as tuition fees, food for special occasions, emergency needs and travel.

The economic importance of the swine industry is also seen in the continuous commercial investment and establishment of commercial farms. Large-scale pig farms integrated with commercial feed mills are being established by foreign investors in the free port zones using their own breeder stocks, technology and other production inputs.

### III. SWINE SECTOR

#### F. Swine Industry Players

The Philippine swine industry is a relatively advanced and competitive industry led by the private sector. Cooperation among the government, private, and public sectors in harnessing the available technologies and resources is advocated to effectively address problems plaguing the swine industry and support the country’s quest for global competitiveness.

The key players of the Philippine swine industry can be grouped into swine producers and traders/processors. The government agencies (research and extension organizations), non-government associations and other organised groups provide support services to the industry. Participants in the processed meat industry range from the large meat processors carrying well-known brand names, medium scale meat processors and the small scale or home-based processors.

The Bureau of Animal Industry (BAI) is the lead agency in promoting the advancement of the country’s livestock and poultry sector in coordination with various government and private stakeholders. Its paramount objective is to formulate policies plans, programmes and projects; disseminate technological information; monitor and evaluate livestock programmes and projects.

BAI is also tasked to provide technical assistance and adequate support services to accelerate the development of the livestock, poultry and dairy industries in the following areas of concern: animal health, feed quality promotion, livestock production technology, marketing, research and development, post production technology and human resources development. The following are the stakeholders of BAI in swine production and health (Table 2) and the services available to the swine industry (Table 3):

Table 2. List of Swine Industry Stakeholders

Group Type	Name
Farmers/Swine Industry Groups	Meat Importers and Traders Association National Federation of Hog Farmers In. Philippine Association of Feed Millers Inc. Philippine Association of Hog Raisers Inc. Philippine Association of Meat Processors Inc. Philippine Swine Foundation Philippine Swine Industry Research and Development Foundation Inc. Philippine Swine Producers Association
Advisory Committee	National Advisory Committee on Animal Disease Control and Emergency (NAC-ADCE)
Veterinary Specialist Interest Groups	Philippine Veterinary Medical Association Philippine Veterinary Practitioner's Association Philippine College of Swine Practitioners Philippine Veterinary Drug Association
Consumer Organizations	Philippine Amalgamated Supermarkets Inc. Philippine Association of Supermarkets Inc. National Market Vendors Confederation of Cooperatives
Government Agencies	Department of Agriculture Livestock Development Council Department of Health Department of Finance Department of Interior and Local Government Department of Education, Culture and Sports Department of Environment and Natural Resources Philippine Information Agency
Non- Government Organizations (NGOs)	Philippine Animal Welfare Society Philippine Society for the Prevention of Cruelty to Animals
Stakeholders of National Veterinary Quarantine Service (NVQS)	National Meat Inspection Service (Department of Agriculture) Philippine Ports Authority Bureau of Customs Philippine Coast Guard Philippine National Police Department of Justice Philippine Aviation Security Command

**Table 3. Services Available to the Swine Industry**

Services	Farm Type	
	Small Holder	Commercial
Research and Development	SCUs, DOST-PCARRD, DA (i.e. BAI and RFUs), Foreign agencies	SCUs, DOST-PCARRD
Extension	SCUs, DA (i.e. BAI and RFUs), LGUs, Foreign Agencies and private drug and feed companies	Private, self
Source of Stock	Among smallholders, government AI services, commercial farms	Self, imported
Health Services	Government veterinary services	Private consultants, employment
Health products	Commercial veterinary drugs	Imported medications
Feed	Kitchen refuse, crop by-products, commercial feeds	Commercial feeds

Note: DOST= Department of Science and Technology (DOST); PCARRD= Philippine Council for Agriculture, Forestry and Natural Resources and Research and Development; DA= Department of Agriculture; SCUs= State Colleges and Universities; LGUs= Local Government Units; AI= Artificial Insemination; BAI= Bureau of Animal Industry; RFUs= Regional Field Units of DA

### G. Swine Marketing and Trade

The production to marketing channel of the swine industry in the Philippines is composed of breeders, slaughter pig growers/raisers, traders, butchers/retailers, and processors. Both breeders and growers/raisers produce and sell live pigs. The breeders produce quality pigs for breeding purposes while the slaughter pig growers/raisers raise and grow hogs for slaughter.

Hog traders and butchers/retailers, on the other hand, market and distribute pork and pork products. The butchers also convert live pigs into consumable pork cuts. The processors convert fresh pork into value-added processed pork products (Figure 2).

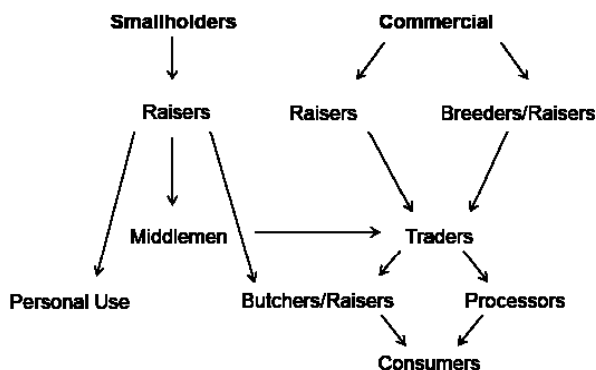


Figure 2. Swine Production and Marketing Channels

About 33 percent of the swine raisers sell market hogs to retailers. Except in certain provinces (Quezon, Leyte, and Zamboanga del Norte), hog raisers rely on middlemen/agents in the sale of hogs. Wholesalers are the major buyers (15%) of the hogs produced.

About 86 percent of the hog raisers prefer selling live pigs while the remaining 14 percent prefer selling slaughtered hogs. Age and weight are the main considerations in selling/ slaughtering but there are instances when backyard raisers are forced to sell or slaughter hogs at inappropriate times (BAS, 1999).

The smallholder sector has no specific cuts and the meat is usually sold in fresh, warm portions. The commercial sector uses commercial cuts (usually USA-style) and has rigid product specification. The table below (Table 4) summarizes the marketing system for swine in the Philippines.

**Table 4. Marketing System for Smallholder and Commercial Farm**

	<b>Smallholder Farms</b>	<b>Commercial Farms</b>
<b>Marketing System</b>	Live animal	Live animal, with vertical integration of growers, slaughter and retailers
<b>Produce</b>	Fresh warm portions, cuts	Commercial cuts, chilled
<b>Market Sector</b>	Local, some to cities and to processing companies	Local, cities and processing companies
<b>Market Signals</b>	Through middlemen	Strong product specification by middlemen/buyers

## H. Swine Production Systems

Swine farms in the Philippines are classified depending on the population of animals in the farm. The BAS considers a farm commercial if it satisfies at least one of the following conditions: a) at least 21 heads of adults and zero young b) at least 41 heads of young animals c) at least 10 heads of adults and 22 heads of young.

As of January 2010, it is estimated that there are 13 397 789 heads of swine. It was 1.46 percent lower compared to last year's inventory of 13 600 000 heads. The beginning stocks in backyard farms went down by 0.63 percent and those in commercial farms dropped by 3.46 percent against the 2009 levels. Moreover, the hog industry recorded a 1.16 percent growth in 2009. Output increment was 21.61 metric tons or from 1 855.73 thousand metric tons in 2008 to 1 877.34 thousand metric tons in 2009.

Majority (64%) of the total swine population is concentrated in Region IV-A (13.13%), Region VI (11.56%), Region III (10.66%), Region V (7.84%) and Region VIII (7.30%) (Table 5) (Figures 3 and 4).

Around 71 percent of the swine population are in backyard farms and only 29 percent are in commercial farms. Region VI had the highest inventory for backyard farms (14%) while Region IV-A (33%) ranked first in the commercial swine inventory (Table 6) (Figure 5).

**Table 5. Total Swine Inventory per Region (January 2010)**

Region	Total Farm Population	Percent
Region 3	1 428 682	10.66
Region 4A	1 759 631	13.13
Region 5	1 050 795	7.84
Region 6	1 548 714	11.56
Region 7	973 113	7.26
Region 8	978 360	7.30
Region 12	882 010	6.58
	8 621 305	64.35
Other Regions	4 776 484	35.65
	13 397 789	100.00

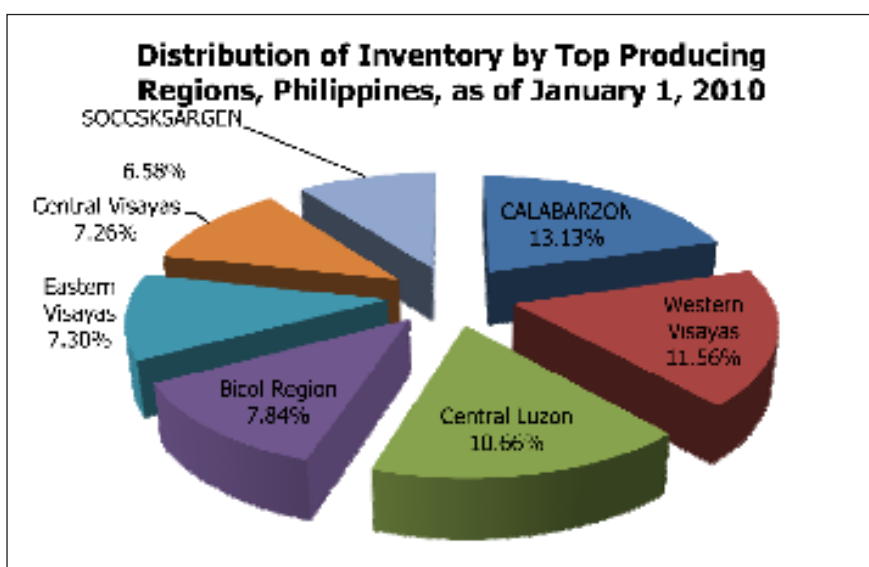


Figure 3. Distribution of Swine Inventory by Top-producing Regions (January 2010)

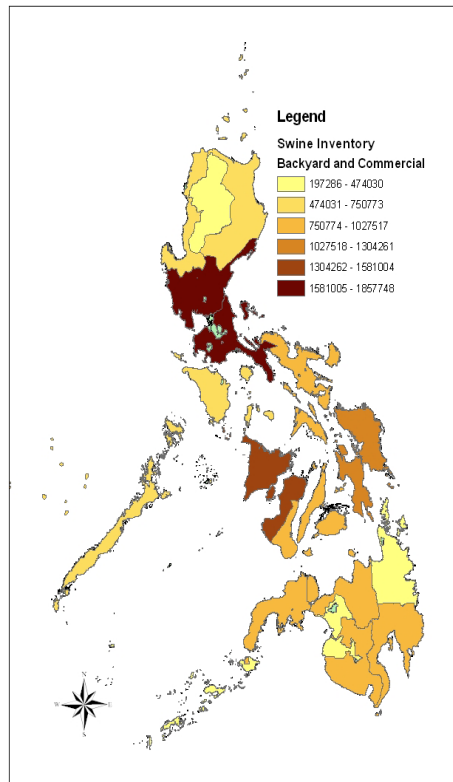


Figure 4. Swine Density Map

Table 6. Swine Inventory per Region by Farm Type in 2009

Region	Backyard Farm Population	Percent	Region	Commercial Farm Population	Percent
Region VI	1 388 725	14.03	Region IV-A	1 255 926	32.57
Region VIII	970 911	10.17	Region VI	965 227	25.03
Region IX	791 566	8.30	Region XII	349 115	9.05
Region VII	789 556	8.27	Region V	289 925	7.52
Region V	760 870	7.97	Region X	230 060	5.97
Region XI	707 588	7.42	Region VI	209 989	5.45
Region X	615 451	6.45	Region VII	183 557	4.76
<b>Sub-total</b>	<b>5 974 667</b>	<b>62.61</b>		<b>3 483 799</b>	<b>90.36</b>
Others	3 567 525	37.39		371 798	9.64
<b>Philippines</b>	<b>9 542 192</b>	<b>100.00</b>		<b>3 855 597</b>	<b>100.00</b>



Figure 5. Swine Inventory by Farm Type (2008-2010)

## I. Swine Production and Health

### Production Parameters

At the backyard and commercial farm, farrowing index is 2.2-2.25/year. Average daily gain is at 3.5 for the whole herd. Animals are usually slaughtered at an average weight of 185 kilos at 158 days of age. Gilts cost around PHP 15 000-16 000 while weanlings are sold at PHP 3 000-3 500 (average PHP 3 200 at 20 kgs). The estimated average cost of feeds is PHP 17.50/kg feeds. Medicines account for 8 percent of the total cost of production.

### Common Production Problems

One of the most common production problems is low farrowing index and low litter size which translates to low number of pigs sold per sow per year. Poor monitoring of unproductive sows is the main cause of this problem. Although available, only few farmers use computer software to monitor sow productivity. Low farrowing index can be attributed to improper breeding techniques and continuous use of unproductive sows (poor culling system).

Low litter size is another common problem observed which is due to the use of "F4" breeders instead of "F1". Persistent use of "F4" breeders also penalized the farmers in terms of feed efficiency and growth rate. Most smallholders also use "mixed breeds" wherein stocks are obtained from different sources and the main consideration for purchase is low price. Smallholder swine operations also use "boars for hire" for breeding service and the basis for selection is the recommendations from other farmers.

## Common Health Problems

Mortalities in the farm caused by infectious diseases affect considerably the cash flow with health cost taking 8 percent of the total cost of production. Below (Table 7) are the common swine diseases in the country as well as the emerging diseases.

**Table 7. Common and Emerging Diseases in the country**

Common Diseases	Emerging Diseases (diseases not previously present)
classical swine fever (CSF)	porcine reproductive and respiratory syndrome (PRRS)
<i>Actinobacillus pleuroneumoniae</i> (APP)	porcine circovirus associated diseases (PCVAD) porcine dermatitis nephropathy syndrome (PDNS)
bacterial diseases	post-weaning multisystemic wasting syndrome (PMWS)
parasitic diseases	swine influenza (SI)
	porcine epidemic diarrhea (PED)
	transmissible gastroenteritis (TGE)

## Animal Disease Diagnostic Facilities

The Philippine Animal Health Center (PAHC) of BAI provides diagnostic laboratory services and conducts animal disease researches for toxicology, virology, bacteriology and pathobiology. PAHC offers laboratory services to both commercial and backyard farms with free of charge for the latter.

Diagnostic services are also provided by the Department of Agriculture's regional animal disease diagnostic laboratories (RADDLs), regional animal feed laboratories, provincial animal diagnostic laboratories and BAI recognized feed laboratories (Figure 6).

There are 14 RADDLs around the country. Local government laboratories are located in the Provincial/City Veterinary Offices of Bulacan, Negros Occidental and Puerto Princesa City. Aside from RADDLs, rabies laboratories are also situated in Research Institute for Tropical Medicine (RITM), San Lazaro Hospital and the Province of Ilocos Norte. Influenza laboratories are present in Regions II, III, VII, IX and XII.



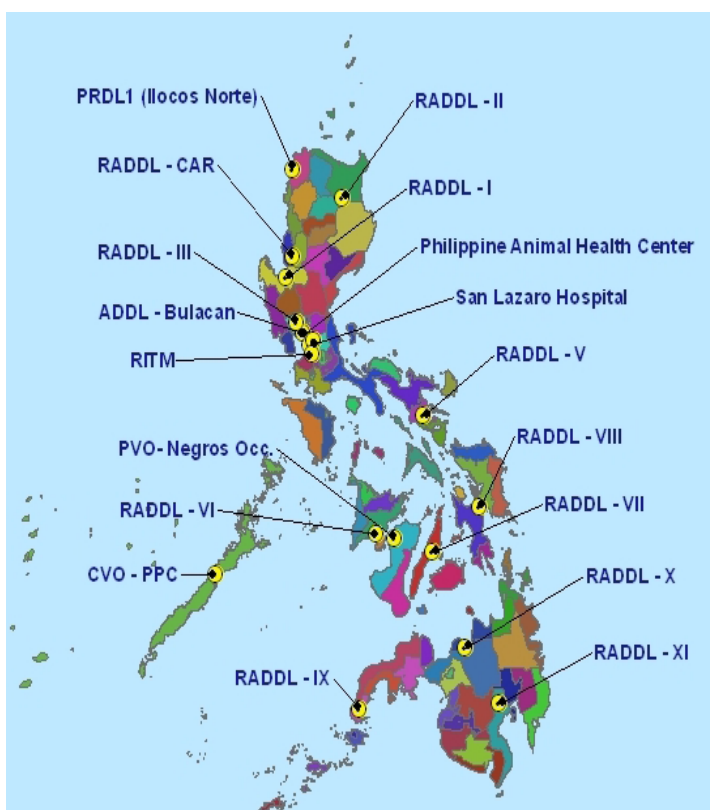


Figure 6. Locations of the Animal Disease Diagnostic Laboratories

### Surveillance Programmes

Surveillance of foot and mouth disease (FMD) through negative monitoring is still on-going despite the World Organisation for Animal Health's (OIE) recognition of Visayas, and Mindanao Zones 1 and 3 of Luzon as FMD free areas without vaccination.

BAI also implemented an FAO project, TC/PHI/3204 (E) "Emergency Assistance for the Early Detection, Response and Control of Ebola Reston Virus in Swine and Other Diseases in the Philippines" for the surveillance of different swine diseases in the Philippines.

It is expected that passive surveillance and linkage among the country's decentralized veterinary services will be strengthened through the national implementation of the Philippine Animal Health Information System (Phil-AHIS).

## J. Constraints to Swine Production and Health

### Swine Production

Major constraints in swine production include high feed of cost, use of middlemen, smuggling, non-prioritization of swine genetics and software. Most of the raw materials for feeds are expensive since they have to be imported.

An example is corn wherein local sources are far from the swine dense areas causing additional expense on freight cost. Due to rising cost of feeds, there were instances that pork prices rapidly increased from PHP 140/kg to PHP 180/kg in a week's time. As a result, many Filipinos resorted to other meat sources. Small swine raisers and employees of small commercial swine farm owners are also losing jobs and sources of income.

The use of middlemen for selling pigs is a constraint since they are the ones who get the biggest share of profit from selling the pigs and not the farmers. Smuggling, on the other hand, is detrimental to the swine industry since it causes a decrease in farm price which lessens the profit of the farmers.

Due to high cost of investment, farmers opt not to use computer software to monitor sow efficiency and productivity.

### Health

Rampant selling of pork from dead and sick pigs in the market is one of the major constraints of the industry. Additional checkpoints in strategic areas, stiffer penalty and strict monitoring of swine diseases are recommended.

An indemnification scheme for farms affected with outbreaks is recommended to assist farmers during mandatory quarantine of farms. A faster and more efficient diagnostic laboratory is also suggested as well as strict regulations to monitor sub standard vaccines and other veterinary drugs. Facilities with stable electricity are also needed to maintain the temperature of vaccines.

Swine diseases account for about 20 percent loss in the value of swine production. Small scale breeders or backyard raisers dominate the Philippine swine industry and the current pork crisis is pushing these small players to close as they lack the capability to implement reliable farm biosecurity measures.

In the past 5 years, pneumo-enteric outbreaks have affected the pig industry and took a heavy toll on the local swine and allied industries. Disease outbreaks hit the major swine production provinces which supply more than 50 percent of the pork demand in Metro Manila and nearby cities.

In 2006, the porcine epidemic diarrhea (Asian Type) caused a very high mortality in suckling pigs. Porcine respiratory disease complex which includes PRRS, swine flu, pseudorabies and hog cholera also caused major losses in the swine industry. The disease outbreaks caused a tight supply of pork meat for the first four months of the following year.

There is a need to improve surveillance of possible emerging and re-emerging diseases since animal disease outbreaks produce occasional shortage of pork supply despite improvements in the outputs of the Philippines hog industry.

#### IV. SECTORAL POLICY AND LEGISLATION

BAI as the national and lead livestock agency of DA is mandated to conduct the following:

1. Formulate long and short-term programmes for the development and expansion of the livestock, poultry and dairy industries to meet the requirements of the growing populace.
2. Recommend specific policies and procedures governing the flow of livestock products through the various stages of marketing, as well as the proper preservation and inspection of such products.
3. Coordinate and monitor the activities and projects relating to livestock and allied industries.
4. Prescribe standards for the quality of manufacture, importation, labeling, advertising, distribution and sale of livestock, poultry and allied industries.
5. For its own sector, recommend plans and programmes, policies, rules and regulations to the Secretary of Agriculture and provide technical assistance in the implementation of the same.

Specifically, the BAI through the Animal Health Division (AHD) ensures that the following tasks are realized with the ultimate aim of making livestock farmers, and the farming sector in general profitable. This is through the formulation of policies and programmes designed to accelerate the industries as well the provision of adequate technical services in animal health (including that of swine) and human resource development:

1. Formulate programmes for the prevention, control and eradication of priority animal diseases
2. Provide technical assistance in the implementation of these programmes to LGUs
3. Evaluate the effectiveness of programme implementation, strategies and activities
4. Formulate regulatory policies related to animal health
5. Plan and organize epidemiological studies as basis for sound animal health programmes
6. Recommend appropriate strategies in disease control
7. Train/re-train LGU veterinarians on how to conduct disease investigation and sample collection
8. Collate and analyze animal health data from the field for reporting to ARAHIS and WAHIS through PhilAHIS
9. Formulate rules and regulations on the movement of animals and its products

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# THAILAND

## Swine Industry Profile

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## INTRODUCTION

### I. COUNTRY PROFILE

#### A. Geographic Profile

Thailand occupies the western half of the Indochinese Peninsula and the northern two thirds of the Malay Peninsula in South East Asia. Thailand shares its borders with Myanmar on the north and west, Laos on the north and north east, Cambodia on the east and Malaysia on the south.

The country is about the size of France and has a land area of 511 771 sq km and total area of 514 000 sq km. Bangkok is the capital of Thailand and is also the largest city. Other large cities include Nonthanburi and Chiang Mai. In 2010, population is estimated at 66 404 688.



Figure 1. Map of Thailand

## B. Economic Profile

In 2009, the gross domestic product (GDP) of Thailand was at USD 538.6 billion (USD 1 = BHT 30.37 as of July 2011). The GDP per capita, on the other hand, is at USD 8 100. It is estimated that 49 percent of the labour force which has a total of 36.9 million is in agriculture while services and industry account for 37 percent and 14 percent, respectively. Unemployment rate is at 1.6 percent while inflation rate is at -0.9 percent.

Thailand is the second largest producer of tungsten and third largest producer of tin. Other industries of the country are tourism, textile and garments, agricultural processing, tobacco, cement, integrated circuits, furniture, plastics, automobiles and automotive parts. Major agricultural products include rice, cassava, rubber, sugarcane, coconuts and soybean.

The value of exports in 2009 is at USD 150.9 billion which was comprised of textiles and footwear, fishery products, rice, rubber, jewelry, automobiles, computers and electrical appliances. Imports include capital goods, intermediate goods, raw materials, consumer goods and food which have a total amount of USD 131.5 billion. US, Japan, China, Singapore Malaysia, Hong Kong and Taiwan are the major trading partners.

## II. AGRICULTURE PROFILE

### C. Role of Agriculture in the Economy

Agriculture accounts for 12 percent of the GDP in 2009 which is valued at BHT 9 047 631 billion. The value of the agriculture sector has been increasing at 5 percent annually compared to the non-agricultural sector which increased around 3 percent annually (Table 1).

**Table1. GDP of Thailand in Agriculture and Non-agriculture Sector (2005-2009)**

	Agriculture		Non-Agriculture		GDP
	Billions of Baht	% GDP	Billions of Baht	% GDP	Billions of Baht
2005	733.276	10.33	6 362.343	89.67	7 095.619
2006	835.776	10.66	7 005.521	89.34	7 841.297
2007	913.926	10.76	7 579.385	89.24	8 493.311
2008	1 056.038	11.64	8 018.655	88.36	9 057.493
2009	1 052.164	11.63	7 995.467	88.37	9 047.631

Source: NESDB

According to the Office of the National Economics and Social Development Board (NESDB), agriculture will play a major role in achieving the Goal 1 of the millennium development goals (MDGs) of Thailand which is to decrease the poor population by 2009 to 2015 as well as continuously increase the proportion of employed population and decrease the hungry population by 50 percent.

## D. Role of Livestock in the Total Agricultural Economy

In 2008, the value of gross livestock products accounts for 6.56 percent of the total agricultural sector which is worth THB 69 037 million. From 2003 to 2008, the total value of livestock production was at THB 50 000-70 000 million which is less than 10 percent of the total agricultural production (Table 2).

**Table 2. Value of Livestock Production Compared to Agricultural Production**

Year	Livestock and Livestock Product (millions of Baht)	Agriculture	Share of Livestock (%)
2003	51 380	615 854	8.34
2004	58 666	668 808	8.72
2005	71 987	733 276	9.82
2006	59 980	835 776	7.18
2007	57 254	913 926	6.26
2008	69 027	1 056 838	6.53

Source: Office of the National Economics and Social Development Board (NESDB)

## E. Role of the Swine Sector in the Total Livestock Economy

Based on the figures in 2010, there are 312 181 million heads of livestock (10.45 livestock units). Beef cattle (40%) and poultry (28%) contribute to the majority of the livestock population. Pigs account for 20 percent of the total livestock population (Table 3).

**Table 3. Livestock Population in Thailand (2010)**

Type	Livestock Unit (million)	Percentage (%)
Beef Cattle	4.18	40.03
Poultry	2.95	28.29
Pigs	2.09	20.00
Buffaloes	0.83	7.98
Dairy Cattle	0.34	3.29
Sheep and Goats	0.04	0.40
Total Livestock Units (LUS)	10,435	100.00

Source: Department of Livestock and Development

Note: Conversion factors for Livestock Unit: Cattle (0.65); Buffalo (0.70); Sheep and Goat (0.10); Pigs (0.25) and Poultry (0.01)

The swine production in 2009 was 11.756 million heads (0.940 million tons). It was a 2.75 percent decrease from the previous year due to the higher price of feed raw materials. It is expected that by 2010, swine production will increase by 2.88 percent (12.0940 million heads/0.968 million tons) due to lower cost of production and use of drugs, vaccines to reduce production loss (Table 4).

Smallholder swine farms are commonly associated with rice farming since rice bran is used as a feed supplement. Swine farming is also seen as an easy source of cash for the family.

Majority of the swine produced (95%) are allotted for domestic consumption while 5 percent are exported. Consumption of swine products in 2009 is at 0.895 million tons which was a 5.39 percent decrease compared to the previous year. It is expected that consumption per capita will decrease in 2010 from 13.38 to 13.29 due to increase in export.

**Table 4. Supply and Demand for Swine in Thailand (2007-2010)**

Description	Unit	2007	2008	2009	2010*
1. Supply <sup>1</sup>					
a. Amount	Million heads	13.545	12.088	11.756	12.094
b. Quantity	Million tons	1.084	0.967	0.940	0.968
2. Demand					
a. Export <sup>2</sup>	Million tons	0.012	0.021	0.045	0.072
b. Consumption <sup>3</sup>	Million tons	1.072	0.946	0.895	0.896
3. Consumption per Capita	kilograms	16.23	14.23	13.38	13.29
4. Ratio of Export to Livestock	%	1.13	2.20	4.76	7.44

Source: 1-Office of the Agricultural economics; 2-Thai Customs Department; 3-From calculation; \*Estimated Figure

### III. SWINE SECTOR

#### F. Swine Industry Players

Major players of the swine industry include feedmill owners, swine raisers, slaughterhouse owners, whole sale and retail market as well as the consumers. There are 61 feedmill plants wherein 32 plants adhere to good manufacturing practices (GMP) and 29 plants follow the hazard analysis and critical control points (HACCP) regulations. There are 600 abattoirs to supply the domestic market while 5 slaughterhouses are for export.

The Department of Livestock and Development (DLD) is the main government agency involved in regulating and monitoring the livestock supply chain. They are also involved in accrediting farms and slaughterhouses.

#### G. Swine Marketing and Trade

For smallholder farms, pigs are sold in the farm wherein prices are set on a per head basis. Weaners are sold at 8 weeks of age weighing around 8 to 12 kg. Pigs for slaughter are usually collected from different villages and brought to a central pooling area by traders for transport to the slaughterhouses.

For domestic consumption, majority of the pork produced is distributed to the general market (71.41%) which is comprised of the plaza and wet markets while 20 percent are



brought to supermarkets. Pork is also utilized for meat processing (2.75%), food service (4.79%) and processed meat for exports (1.04%).

The estimated 5 percent of the pork production of Thailand is exported to other countries such as Japan, Hong Kong, Lao PDR and Cambodia either as live pigs, fresh/frozen/salted pork and processed meat. As of October 2010, the total value of pig and pork exports amounted to THB 2 393.57 million (Table 5.) Majority of the exports were processed meat (6 703.20) followed by fresh/frozen pork (904 456 heads) and live pigs (399 825 heads).

**Table. 5 Quantities and Value of Swine and Swine Product Export (2007-2010)**

Year	Live Pigs		Fresh/Frozen/Salted Pork		Processed Meat		Total Value (million Baht)
	Quantity (heads)	Values (million Baht)	Quantity (heads)	Values (million Baht)	Quantity (heads)	Values (million Baht)	
2007	89 054	91.15	4 110.82	238.72	4 578.95	768.90	1 097.96
2008	283 608	1 012.43	4 613.23	404.39	5 303.69	1 440.50	2 857.32
2009	728 770	1 683.20	2 935.19	177.01	6 284.66	1 572.44	3 432.65
2010	399 825	816.48	904.456	54.773	6 703.20	1 522.22	2 393.57

Source: Thai Customs Department, January-October 2010

It is expected that export of pig and pork products will continue to rise due to free trade; focus to increase the competitiveness of the swine industry; and the plan to establish a FMD free zone in the eastern region of Thailand.

## H. Swine Production Systems

Based on the data of DLD, the total swine population as of October 2010 is 8.347 million. Fatteners account for majority of the population (5.147 million heads) followed by breeders (1.512 million heads) and local indigenous pigs (0.681 million heads).

The central region of Thailand is the most swine dense area (54.12) followed by north east (18.22) and the north (17.87). The southern region has the least dense pig population (9.79) (Table 6).

It is important to note that since 2007, swine production decreased at an average of 2.7 percent. Low market price and the high cost of feed due to the use of grains as an alternative source of fuel were the main drivers for the decrease in swine production.

**Table 6. Swine Density in the Different Regions of Thailand (2007-2010)**

Region	2007	2008 heads (%)	2009 heads (%)	2010 heads (%)	Growth Rate
Central	5 038 136 (54.17)	4 145 834 (53.56)	4 669 535 (54.69)	4 517 561 (54.12)	-2.73
Northeast	1 693 707 (18.21)	1 689 436 (21.83)	1 482 117 (17.36)	1 520 591 (18.22)	-2.70
North	1 780 029 (19.14)	1 233 716 (15.94)	1 363 970 (15.98)	1 491 595 (17.87)	-4.42
South	788 201 (8.48)	671 589 (8.68)	1 022 081 (11.97)	817 270 (9.79)	0.91
Total	9 300 073	7 740 575	8 537 703	8 347 017	-2.70

Majority of the swine population (4 564 385 heads or 55%) is located in 10 provinces of Thailand. Ratchaburi is the most swine dense province (1 572 524 heads) followed by Nakhom Pathom (579 612) and Lopburi (468 823). Below are the other provinces with high density of swine population (Table 7).

**Table 7. Provinces with High Density of Swine Population**

Province	2008	2009	2010
Ratchaburi	1 313 249	1 219 365	1 572 524
Nakhon Pathom	702 763	664 498	576 912
Lopburi	474 903	454 294	468 823
Chonburi	316 505	778 482	391 149
Nakhon Ratchasima	559 762	323 971	389 385
Chachoengsao	326 545	351 721	301 013
Lamphun	210 342	210 432	228 020
Chiang Mai	143 315	194 228	225 596
Phatthalung	159 817	171 631	200 076
Total	4 306 610	4 521 770	4 564 385

Source: Information Technology Center, DLD

The Department of Livestock and Development (DLD) categorizes swine farms into 2 types based on the number of pigs in the farm. The two types are smallholder farms and commercial farms. Smallholder farms have 1-50 swine. Commercial farms on the other hand are subdivided into the following: small scale raising (51-500 heads), medium scale raising (501-5 000 heads) and large scale raising (more than 5 000 heads).

Most of the swine farmers raise swine in a smallholder capacity (92 %) and only 8 percent are considered commercial swine farmers. But it is important to note that the number of swine in commercial farms (85%) outnumber the number of swine in smallholder farms (15%).

Majority of the commercial farms are small scale farms (79.94%). Medium scale farms account for 18.62 percent of the commercial farms and followed by the large scale farms (1.44%). The number of swine is highest in the medium scale farms. (Table 8)

**Table 8. Swine Density of Commercial Farms per Region**

Region	Small Scale Farms		Medium Scale Farms		Large Scale Farms		Total	
	Heads (%)	Farmers (%)	Heads (%)	Farmers (%)	Heads (%)	Farmers (%)	Heads (%)	Farmers (%)
Central	565 129 (33.70)	2 764 (21.67)	1 976 166 (66.89)	1 466 (49.37)	1 810 316 (74.68)	161 (70.31)	4 351 611 (61.68)	4 392 (27.53)
Northeast	393 817 (23.48)	3 073 (24.09)	316 818 (10.72)	430 (14.48)	363 870 (15.01)	43 (18.87)	1 074 505 (15.23)	3 546 (21.66)
North	407 742 (24.31)	4 580 (35.92)	455 579 (15.42)	854 (28.75)	197 898 (8.17)	19 (8.15)	1 061 319 (15.04)	5 453 (34.18)
South	310 312 (18.50)	2 336 (18.32)	205 816 (6.97)	220 (7.41)	51 803 (2.14)	6 (2.66)	567 931 (8.05)	2 563 (16.07)
Total	1 677 000 (100)	12 573 (100)	2 954 379 (100)	2 970 (100)	2 423 987 (100)	230 (100)	7 055 366	15 953

Source: Calculated from DLD Database of Registered Swine Farmers, 2007

The northern region of Thailand has the most number of commercial swine farmers (34.18%) although, the most number of swine in commercial farms is located in the central region (61.68%).

For the smallholder farms, most of the farmers are located in the central region (41.59%). Northeastern and northern regions have high population swine density in smallholder farms at 34.54 percent and 33.31 percent, respectively (Table 9).

**Table 9. Swine Density of Smallholder Farms Per Region**

Region	Small Scale Farms	
	Heads (%)	Farmers (%)
Central	565 129 (33.70)	2 764 (21.67)
Northeast	393 817 (23.48)	3 073 (24.09)
North	407 742 (24.31)	4 580 (35.92)
South	310 312 (18.50)	2 336 (18.32)
Total	1 677 000 (100)	12 573 (100)

Source: Calculated from DLD Database of Registered Swine Farmers, 2007

DLD also have an accreditation system for "standard farms". To be classified as a standard farm, the farm must observe pharmaceutical withdrawal time, appropriate waste management and adhere to national/regional disease monitoring regulations. In 2009, there were around 3 400 registered standard farms. The farms can be further categorized as large scale farm, medium scale farm and small scale farm.

Swine production can be also divided according to production cycle such as: full cycle farm (farrow to finish); breeder farm; and fattening (finisher farm). Full cycle farm can be a large scale or a smallholder farm. A full cycle smallholder farm may only have 1 to 4 sows that have a farrow to finish operations. Piglets/finishers are sold to other farmers,

village traders and meat dealers. Breeder farms are usually owned by private companies since it needs long-term investment and high capital input requirement.

## I. Swine Production and Health

### Production Parameters and Farmgate Prices

Due to the export demand of pigs, the farm gate price of weanlings increased by more than 50 percent compared to the price in 2004 (THB 1 000/head to THB 1 500/head) (Table 10).

**Table 10. Farm Gate Price of Weanlings (2004-2010)**

Year	Farm Gate Price (THB)
2004	1 000
2005	1 300
2006	1 290
2007	990
2008	1 400
2009	1 650
2010	1 870

Source: Thai Feedmill Association, Jan-Sep 2010; Note: Average weaner weight-16kg

In 2009, the average production cost per kilogram of swine is THB 49.43 which increased by 3.19 percent in comparison with 2008. The increase in production cost was due to higher value of feed crops (soybean meal, maize) which were also used as alternative fuel source.

According to the Feedmill Association, the farm gate price per kilo pork in 2010 was at THB 61.06 while the production of cost is at THB 55.10. Profit margin is about THB 6 per kilo of pork produced. It is noticeable that process of pork suffered in 2007 wherein farm gate price of kilo of pork is only at THB 42.87 (Table 11).The situation in 2007 resulted with many farmers opting not to raise pigs anymore. One of the main reasons for the decrease in profit margin was the escalating price of feeds (Table 12).

**Table 11. Production Cost and Farm Gate Price per Kilo of Pork (2004-2010)**

Year	Production Cost (Baht)	Farm Gate Price (Baht)
2004	39.13	44.74
2005	43.54	49.55
2006	45.57	47.07
2007	38.35	42.87
2008	51.06	53.32
2009	49.43	56.89
2010	55.10	61.02

Source: Office of Agricultural Economics, Jan-Sep 2010

**Table 12. Monthly Retail Price of Feeds (2008-2010)**

Type	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Weaner Feeds	2008	382	382	382	382	403	428	447	465	465	442	442	442
	2009	428	406	406	406	406	406	406	406	406	406	406	406
	2010	427	447	455	462	473	473	473	462	459	459	459	
Fattener Feeds	2008	370	370	370	370	392	416	435	453	453	430	430	426
	2009	426	400	400	400	400	400	400	400	400	400	400	400
	2010	426	447	447	447	447	447	447	459	459	459	447	

Source: Department of Internal Trade, MOC

The Swine Raisers Association of Thailand reported that the average weight of animals for slaughter is 100 kilograms. Piglets of 20 kilograms usually take 137 days to fatten. Below are the accepted production parameters for feed conversion in different stages of production (Table 13):

**Table 13. Accepted Production Parameters for Feed Conversion**

Index	Pre-starter	Starter	Grower	Finisher	Total
Body Weight (kg)	6-15	15-30	30-60	60-100	94
Feed Consumption (kg)	15	15	90	138	273
Feed Conversion Rate	1.50	2	3	3.2	2.9

Source: Animal Health Product Association

### Common Health Problems and Vaccination Programmes

Based on the Animal Epidemics Act B.E. 2499 (1956) and the Revision B.E. 2452 (1999), the notifiable endemic diseases in Thailand are foot and mouth disease (FMD), classical swine fever (CSF) and porcine reproductive and respiratory syndrome (PRRS). Notifiable exotic diseases include Nipah encephalitis, trichinosis and brucellosis. Nipah encephalitis is not currently present in the country.

Common swine health problems encountered in the farm include FMD, CSF, PRRS, circovirus, porcine epidemic diarrhea (PED), AD, *Actinobacillus pleuropneumoniae* (APP), mycoplasma, swine influenza virus (SIV), protozoa and parasite. Diagnoses of animal diseases are carried out by the laboratories of the national government, private companies and universities. The national laboratories are tasked to receive samples from all over the country and certify farms for export.

The Department of Veterinary Biologics of DLD is in-charge of producing vaccines to support animal health programmes and as a response to outbreaks. As of the moment, the department produces trivalent FMD vaccines and CSF vaccines. FMD vaccines for smallholder farmers are subsidized to support the twice a year vaccination campaign. Government-produced vaccines are sold at a lower rate.

To be able to meet the demand for vaccines, the vaccination plan is regularly monitored. The potency of the vaccines is also monitored to determine if they are within the international standard.

Depending on the type of farm, a vaccination programme is done in every stage of production. Below are the cost of vaccination per stage of production and the schedule of vaccination (Table 14) as well as individual costs of different vaccines (Table 15):

**Table 14. Vaccination per Stage of Production**

Stage of Production	Cost Baht/animal	Vaccine	Schedule
Replacement Gilt	290	PRRS (live)	1 <sup>st</sup> week as a replacement gilt (6 mos. of age)
		AD (live)	2 <sup>nd</sup> week
		CSF	3 <sup>rd</sup> week
		PRRS (live)	4 <sup>th</sup> week
		FMD type OA	5 <sup>th</sup> week
		APP 1 <sup>st</sup> shot	6 <sup>th</sup> week
		PEL 1 <sup>st</sup> shot	7 <sup>th</sup> week
		APP 2 <sup>nd</sup> shot	8 <sup>th</sup> week
		PEL 2 <sup>nd</sup> shot	9 <sup>th</sup> week
Sow	247	AD (live)	12 weeks of gestation
		CSF	13 weeks
		PRRS (killed)	14 weeks
		PED	15 weeks
		FMD	After 2 weeks
		PEL	After 3 weeks
Piglet	211	PRRS (live)	2 weeks
		Mycoplasma Circovirus	3 weeks
		CSF	5 weeks
		APP 1 <sup>st</sup> shot	7 weeks
		AD (live) 1 <sup>st</sup> shot	8 weeks
		FMD 1 <sup>st</sup> shot	9 weeks
Fattener	74	CSF 2 <sup>nd</sup> shot	11 weeks
		APP 2 <sup>nd</sup> shot	12 weeks
		AD (live)	13 weeks
		FMD 2 <sup>nd</sup> shot	14 weeks
		Slaughterhouse	24 weeks

**Table 15. Cost of Vaccines per Dose**

Vaccine	Cost per Dose (Baht)
PRRS (live)	60
PRRS (killed)	110
Mycoplasma	19
Circovirus	58
FMD (commercial)	24
FMD (DLD)	18
CSF	5
AD (live)	9.5
PEL	32.8
PED	60
APP	30

### Animal Disease Diagnostic Laboratories

The National Institute for Animal Health (NIAH) is the national reference laboratory with 7 regional diagnostic laboratories (Table 16). It is a biological safety level (BSL) 2 Laboratory which has the capability to diagnose swine diseases based on the World Organisation for Animal Health (OIE) Manual of Diagnostic Tests and Vaccines for Terrestrial Animals. The laboratory has the capacity to conduct virus isolation, serology (antibody detection) and molecular diagnosis.

**Table 16. List of Animal Disease Diagnostic Laboratories and Capabilities**

Name of Laboratory	Diagnostic Capability A-ELISA; B-RT PCR; C-PCR; D-Sequencing
National Institute of Animal Health	A B C D
Northern (Upper Region) Veterinary Research and Development Center, Lampang	A B C
Northern (Lower Region) Veterinary Research and Development Center, Pitsanulok	A B C
Northeastern (Upper Region) Veterinary Research and Development Center, Khon Kaen	A B C
Northeastern (Lower Region) Veterinary Research and Development Center, Surin	A B C
Eastern Veterinary Research and Development Center, Chonburi Province	A B C
Western Veterinary Research and Development Center, Ratchaburi Province	A B C
Southern Veterinary Research and Development Center, Chonburi Province, Nakhon Sri Thammarat	A B C
Faculty of Veterinary Medicine, Chulalongkorn University	A B C D
Faculty of Veterinary Sciences, Kasetsart University, Kampanasang	A B C D
Faculty of Veterinary Sciences, Kasetsart University	A B C
Faculty of Veterinary Sciences, Mahidol University	A B C D
Faculty of Veterinary Sciences, Chiang Mai University	A B C D
Faculty of Veterinary Sciences, Khon Kaen University	A B C D

NIAH also has the capacity and reagents to conduct differential diagnosis of swine diseases. The laboratory also has an existing collaboration with a reference laboratory for diagnosis of exotic diseases such as nipah encephalitis, west Nile virus and ebola.

Currently, there are 8 highly trained personnel involved in swine diagnosis at NIAH. The staff composed of veterinarians and animal scientists regularly attend in-country and international workshops and trainings.

NIAH have modern equipment through funding support from international organizations such as FAO, Japan International Cooperation Agency (JICA) and OIE. Below is the list of equipment at NIAH (Table 17):

**Table 17. List of Laboratory Equipment at NIAH**

Type of Diagnostic Test	Equipment	No. of Equipment
Virus isolation	Cell culture incubator 37	1
	CO <sup>2</sup> Incubator	7
	BSL 2 cabinet	7
	Liquid Nitrogen Tank	3
	-20 and -80°C Refrigerator	3
Antibody Detection	Inverted microscope	3
	ELISA reader	3
Molecular Diagnosis	PCR machine	9
	Real Time PCR machine	2
	Sequencing machine	2

Commercial laboratories such as CP or Betagro offer their services for free to both commercial and smallholder farms. University laboratories are utilized by farmers in the conduct of research and development project. Below is the list of laboratories in the country and the diagnostic capabilities.

#### Surveillance Programmes

Thailand implements both passive and active surveillance to be able to detect swine diseases. Recently, emphasis is given on case definition and syndromic surveillance for early detection of unusual clinical signs and immediate disease response.

Through the district livestock offices, swine diseases with unusual clinical signs are investigated and disease control measures are implemented immediately. Samples are collected and submitted to the provincial livestock office that forwards the samples to the national and regional diagnostic laboratory. The provincial livestock office sends an online report to the Bureau of Disease Control and Veterinary Services (DLD Central). Reports are also validated by the regional office of the DLD.



Daily reports are sent to the Director General and Ministry of Agriculture. Confirmed reports of notifiable diseases are sent to OIE by DLD.

Thailand has a national surveillance plan for swine diseases such as FMD, Nipah encephalitis, SIV, PRRS and pandemic H1N1 (pH1N1).

### *1. FMD Serosurveillance to Establish an FMD Free Zone with Vaccination in Region II*

The national surveillance for FMD is implemented to establish an OIE FMD free zone with vaccination in 8 provinces of Region II in the eastern part of Thailand. With 9 percent level of confidence, all cloven-hoofed animals in Region II are randomly selected for the surveillance. Liquid phase enzyme linked immunosorbent assay (LP-ELISA) and non-structural protein enzyme linked immunosorbent assay (NSP-ELISA) are used for laboratory diagnosis of the samples.

Based on the FMD surveillance in 2009, it was determined that 4.95 percent of the cattle and buffalo tested were NSP positive and there was a very low prevalence in swine (0.02% -0.24%). Due to the surveillance results, the animal movement management policy was changed. All cloven-hoofed animals must be certified as NSP negative before they could enter the region. Swine going to the region must be sourced only from DLD accredited FMD free farms.

A farm is considered as an FMD free accredited farm by the DLD when the following requirements are met: it is under official veterinary control; a "standard farm" with effective biosecurity; two FMD vaccinations per year is strictly followed; and based on serological survey, all pigs are NSP negative (confidence level-99%; prevalence rate-5%; 90 samples per farm). Pigs in the said farms are regularly monitored for clinical signs of FMD.

In the event of an FMD outbreak in an accredited farm, it is required that the farm be NSP negative in two consecutive testing in an interval of 2 weeks. Another test will be done 6 months after being recognized as an FMD free farm.

Animals in the region are also registered in the National Identification and Registration System (NID) to be able to identify animals individually and for easier identification of risk factors in the event of an outbreak.

### *2. National Nipah Encephalitis Surveillance Programme*

The Nipah Encephalitis Surveillance Programme was initiated in 2003 to demonstrate that the swine population of the country is negative of Nipah encephalitis. The surveillance is ongoing due to the detection of the Nipah virus in bats near swine dense areas and due to the sharing of border of Regions 8 and 9 with Malaysia.

All the samples from commercial farms and small holder farms tested from 2003 to 2009 were negative for Nipah virus. Indirect ELISA and modified direct ELISA were used for laboratory diagnosis.

A retrospective study on Nipah testing was also conducted for all samples sent to NIAH with interstitial pneumonia from 1998 to 2009. All samples tested negative for Nipah virus.

### 3. National SIV Surveillance Programme

Clinical and laboratory surveillance for SIV was established as part of the preparedness for the Influenza A/H1N1 outbreak in swine. The surveillance was conducted on April-June 2009 and focused on classical influenza H1N1. Case definition includes at least 50 percent of the observation unit with fever, sneezing, coughing, nasal and ocular discharge.

Based on the surveillance conducted in the smallholder farms and slaughterhouses, all samples were negative for SIV (confidence level-99%; prevalence rate-5%). Since SIV is present in the country, trainings on sample collection and restraint for field officers were intensified.

### 4. National pH1N1 Surveillance Programme

In September-December 2009, a surveillance programme was established for pandemic influenza A/H1N1 (pH1N1) by DLD due to increased cases in humans and swine worldwide. The intensive clinical surveillance was undertaken in small and medium-sized farms by animal health volunteers and through the assistance of the HPAI network.

Case definition include swine showing fever, sneezing, coughing, nasal and ocular discharge at least 20 percent of the observation unit within 3 days or 50 percent of the observation unit within 7 days. Target population includes commercial and smallholder farms (280 farms) in 38 provinces with reported human cases (180 households).

Based on the results of the laboratory findings, 51 out of the 20 278 samples submitted were positive for Influenza A/H1N1 using virus hemagglutination inhibition test. After confirmatory tests using virus isolation and PCR, it was determined that 1 farm in Saraburi Province was positive for pH1N1.

As a control measure, movement of animals was restricted in the farm and sick animals were quarantined in the infected premises (IP) for 30 days. Sick animals were given supportive treatment while the premises and equipment were disinfected 4 times a week. Treated animals were slaughtered for meat processing after observing the withdrawal time. An animal checkpoint was established within the 10 km radius of the IP. Further clinical and laboratory surveillance showed that pigs within 5 km radius of the IP were negative for pH1N1.

In collaboration with the Ministry of Public Health, serum samples were collected from farm workers and students who visited the farm. Based on the tests conducted by MOPH, the possible source of infection was either the university students who visited the farm or the farm workers. Thus, human to animal transmission of pH1N1 may have occurred.

### *5. National PRRS Surveillance Programme*

The program was launched in 2011 to detect atypical PRRS in swine. The district veterinary officers and animal health workers are tasked to conduct active clinical surveillance in their areas based on the PRRS case definition of DLD. Farmers also report to the provincial veterinary authorities for suspected cases.

It is expected that within 24 hours after the case has been reported, initial control measures will be implemented and laboratory samples will be sent to the regional laboratory. Confirmatory tests will be done at NIAH. The preparedness plan and SOP were already distributed to all provincial livestock offices ([www.dld.go.th/dcontrol](http://www.dld.go.th/dcontrol)).

To increase awareness of the farmers regarding PRRS, various reading materials have been distributed. The information campaign focused on the importance of immediate reporting (24 hours) of suspected cases to veterinary authorities; enforcement of strict quarantine of newly introduced pigs; cleaning and disinfection of premises and equipment; use and effectiveness of PRRS vaccine. The Pig Producers Association was also tapped to assist in the information campaign.

### **J. Constraints to Swine Production and Health**

FMD continues to be the main problem of the swine industry. The disease is still endemic in the country which curtails the opportunity to sell fresh pork to the export market. Export is limited to trading of processed meat to other countries such as Japan and Hong Kong.

The move of DLD to establish the eastern region of Thailand as an FMD Free Zone with vaccination by 2010 is seen as a way to be able to export fresh pork products to other countries. FMD freedom in certain parts of the country will also serve as an encouragement for farmers to adhere to the farm standard regulations set by the government.

The following are the major production and health problems in some of the farm production systems (Table 18):

**Table 18. Animal Production and Health Constraints**

Type of Farm	Advantages	Constraints
Medium to large scale commercial farm	<ul style="list-style-type: none"> <li>-High biosecurity</li> <li>-Private veterinarians oversee animal health management programs and monitor drug residue</li> <li>-Use commercial high quality feeds</li> <li>-Usually supply supermarkets and for export purposes</li> </ul>	<ul style="list-style-type: none"> <li>-High investment cost</li> <li>-Recurring swine diseases occur</li> <li>-Unstable market price due to less demand and over supply</li> </ul>
Small scale commercial farm	<ul style="list-style-type: none"> <li>-Low biosecurity</li> <li>-Feed and pharmaceutical sales representatives provide technical assistance on farm management and health</li> </ul>	<ul style="list-style-type: none"> <li>-PED and PRRS recur</li> <li>-Unstable cost of feeds and pharmaceuticals</li> </ul>
Smallholder farm	<ul style="list-style-type: none"> <li>-Minimal or no biosecurity</li> <li>-Technical services provided by DLD veterinary officers and volunteer animal health workers</li> <li>-FMD vaccination subsidized by the government</li> </ul>	<ul style="list-style-type: none"> <li>-prone to disease outbreaks</li> <li>-Animal health management programs may be non-existent</li> <li>-Vaccination and use of supplements are optional</li> </ul>

#### IV. SECTORAL POLICY AND LEGISLATION

In 1999, DLD implemented the accreditation of “standard farms” for swine, poultry and cattle farms. Based on the guidelines of the good agricultural practices (GAP), the goal of the standardization of farms is to increase the quality of production from the farms to the consumers as well as address environmental issues on swine farming. Slaughterhouses also implement standards to ensure safe meat for consumers.

The government also aims to eradicate FMD in certain parts of Thailand though the project, “Establishment of FMD Free Zone without Vaccination in the Eastern Region of Thailand”. The project aims to establish the free zone by 2013.

Smallholder farms and medium-sized farms are also encouraged by the government to organize cooperatives to assist the farmers in having better profit from livestock farming; better access to national/ regional support from the government; and be more stable in confronting production and market pressures.

The government also focuses in identifying the training needs and the development of training programmes for farmers.

# VIETNAM

## Swine Industry Profile

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## INTRODUCTION

### I. COUNTRY PROFILE

#### A. Geographic Profile

Vietnam is located in the southern extremity of the Indochinese peninsula. It shares borders with the Gulf of Tonkin, Gulf of Thailand, South China Sea and with other countries such as China, Lao PDR and Cambodia. China lies towards the north, Gulf of Thailand in the east and the Red River delta in the south east.

The Red River delta is a triangular region covering 3 000 sq kms which is more densely populated compared to the Mekong River delta. The entire delta region is subject to frequent flooding since it is just 3 km above sea level.

Unique to the country is the S-shaped coastline that is 3 260 km long. It has a total land area of 331 690 sq kms composed of tropical lowlands, hills, densely forested highlands and deltas.

#### B. Economic Profile

The economy of Vietnam is still developing after experiencing severe economic restrictions and the devastating effects of the Vietnam War. The annual Gross Domestic Product (GDP) based on purchasing power parity is USD 280.2 billion (USD 1 = VND 20 570 as of July 2011). Although it must be noted that from 2000 to 2004, the country recorded an average annual growth in GDP of about 7 percent and an astounding 8.4 percent in 2005 making it the second biggest growth in Asia after China.

In 2006, the industry sector remains the biggest contributor in the nation's GDP with 41.8 percent, followed by services (38.1%), and agriculture (20.1%). In terms of labor force, agriculture has the biggest number accounting to 56.8 percent, followed by industry (37%), and services (6.2%).

Vietnam's main industries include food processing, garments, shoes, machine building, cement mining, glass tires, oil, chemical fertilizer, coal, steel and paper. Currently, it is the biggest producer of cashew nuts and second largest exporter of rice next to Thailand. Its main export partners are Japan, Germany, Singapore, Taiwan, Hong Kong, France, South Korea, and China. Tourism also plays a vital role in the country's services sector. In 2004, Vietnam welcomed almost 3 million foreign visitors.

A very important milestone for the economy of Vietnam is the signing of the bilateral trade agreement (BTA) with the United States in 13 July 2000 which paved the way for the normal trade relations (NTR) status of Vietnamese products in the US market. On 7 November 2006 the country became the 150th member of the World Trade Organization (WTO).

## II. AGRICULTURE PROFILE

### C. Role of Agriculture in the Economy

Economic reforms were made in early period of the 1980s such as the transition from a central control-based economy to socialist-oriented mixed market economy. Foreign investments, access of farmers to arable land and ownership of productive assets were encouraged and infrastructures were improved.

After 20 years, Vietnam has achieved the aim of ensuring food self-sufficiency becoming a leading rice exporter and the world's second exporter of agricultural products such as coffee, rubber, pepper, etc. It is estimated that in 2009, 43 million tons of food were exported.

In 2009, agriculture contributed around 20.91 percent to the GDP which is lower compared in 1990 (38.74%) (Table1). Due to the stable source of food, the country was not directly affected by the 2007-2008 food crises and the economic crisis that started in 2008 (Vu Dinh Sun et al. 2010). The average rate of annual growth in agricultural value was 4.6 percent from 1990-2009.

The food industry developed very slowly since majority of the exported goods is raw and unprocessed, which has a very low turn-over. Only 5 percent of meat and 1 percent of fruits are processed. There are also significant post harvest losses which affected the export potential of cereals (25% loss) and other agricultural products (70%) (Phan Xuan Dung, 2005). Agricultural production is also affected greatly by outdated farming systems, competition from imported goods, food safety issues and diseases.

With a population of 86.2 million in 2009, the country has a very high population density of 260 persons per square kilometer, especially in the red river delta and central coast regions. Average income per capita is USD 1 000. It is estimated that 70 percent of the total population is in the rural areas wherein 63 percent belongs to the agriculture sector (13 million farmers).

Access to land for production is a key issue in agriculture. An average agricultural worker has access only to less than 0.1 ha of arable land and each household has less than 0.5 ha of arable land. This equates to 8 million hectares of agricultural land being further divided into 75 million plots. Thus, the average annual income per farmer is only USD 300 per year and a hectare of agricultural land only has an income from USD 1 000 to 1 100 (Phan Xuan Dung, 2005).

Table 1. Contribution of Agriculture in GDP at Current Prices (1990-2009)

Year	Gross domestic product (GDP) Unit: billion VND			Growth rate (%)		GDP of agriculture and livestock (%)		
	Total GDP	GDP from agriculture	GDP from livestock	Total GDP	Agricultural GDP	The structure of agriculture in GDP	Structure of livestock in agriculture	Pork industry structure in GDP
1990	41 955	1 6252	3 701.0	5.09	1.6	38.74	17.9	6.0
1991	76 707	3 1058	7 500.3	5.81	2.7	40.49	17.9	6.6
1992	110 532	3 7513	10 152.4	8.70	8.4	33.94	20.7	6.2
1993	140 258	4 1895	11 553.2	8.08	6.6	29.87	21.4	5.6
1994	178 534	48 968	13 112.9	8.83	4.9	27.43	20.2	5.0
1995	228 892	62 219	16 168.2	9.54	6.9	27.18	18.9	4.8
1996	272 036	75 514	17 791.8	9.34	6.5	27.76	19.3	4.4
1997	313 623	80 826	19 287.0	8.15	7.0	25.77	19.4	4.2
1998	361 017	93 073	20 365.2	5.76	5.7	25.78	17.8	3.8
1999	399 942	101 723	23 773.2	4.77	7.3	25.43	18.5	4.0
2000	441 646	108 356	24 960.2	6.79	5.4	24.53	19.3	3.8
2001	481 295	111 858	25 510.4	6.84	2.6	23.24	19.6	3.6
2002	535 762	123 383	30 574.8	7.04	6.2	23.03	21.1	3.9
2003	613 443	138 285	34 456.6	7.24	4.5	22.54	22.4	3.8
2004	715 307	155 992	37 343.6	7.79	4.1	21.81	21.6	3.6
2005	839 211	175 984	45 225.6	8.44	3.2	20.97	24.7	3.7
2006	974 266	198 798	48 487.4	8.23	4.1	20.40	24.5	3.4
2007	1 143 715	232 586	57 803.0	8.46	3.6	20.34	24.4	3.4
2008	1 485 038	329 886	102 200.9	6.31	6.9	22.21	27.1	4.7
2009	1 658 389	346 786	110 311.6	5.32	22	20.91	26.9	4.5

Source: General Statistics Office, 1990 – 2009; Note: USD 1=VND 20 570

#### D. Role of Livestock in the Total Agricultural Economy

Livestock production is important in the implementation of poverty reduction strategies and improvement of nutritional levels in rural areas throughout the country. It plays a significant role in providing protein and other nutrients.

Livestock products such as meat, eggs, milk also contribute in reducing the rate of child malnutrition in rural areas. Cattle and poultry are used to improve the fertility of the land, protection from soil erosion and alternate energy source for the household (biogas).

The total value of livestock industry in 2008 reached VND 97.9 trillion accounting for 27 percent of the GDP for the agricultural sector which is higher compared to 2005 wherein the value is at VND 45.2 trillion, which is only 24.7 percent of the GDP for the agricultural sector (GSO, 2009).

The growth rate of livestock products averaged at 10 percent for the period 2000 to 2007 (Table 2). In particular, meat production increased by 11 percent, beef by 9.5 percent, and milk production increased by 32 percent a year. Before HPAI, poultry meat production increases by 8.5 percent annually.

**Table 2. Number of Livestock and Poultry (1999 to 2009)**

Year	Buffalo (million)	Beef (million)	Dairy Cattle (million)	Pigs (million)	Chicken (million)	Ducks, geese (million)	Goats and sheep (1 000 heads)	Horse (1 000 heads)
1999	2.95	4.06	29.40	18.88	153.76	43.56	516.00	149.6
2000	2.90	4.13	35.00	20.19	147.10	51.00	543.90	126.5
2001	2.82	3.90	41.20	21.76	158.00	57.97	569.00	113.4
2002	2.82	4.06	55.85	23.17	159.45	73.84	621.90	110.9
2003	2.84	4.39	80.00	25.46	185.20	68.84	780.40	112.5
2004	2.87	4.91	95.80	26.14	159.20	58.92	1 022.00	110.8
2005	2.92	5.54	104.10	27.43	220.00	60.10	1 314.00	110.5
2006	2.92	6.51	113.20	26.90	214.60	62.60	1 525.00	87.3
2007	2.99	6.72	98.60	26.50	157.90	68.00	1 777.00	103.5
2008	2.90	6.34	107.89	26.70	176.04	71.18	1 483.50	121.0
2009	2.89	6.10	115.52	27.63	199.99	80.18	1 375.13	102.21

Source: General Statistics Office, 2000 - 2009

The rapid development of the livestock industry has led to the development of other industries such as manufacturing of animal feeds. In 2006, feed production reached 6.2 million tons which is a 16 percent increase compared to 2005 and accounts for 43 percent of total demand in livestock feed.

#### **D. Role of the Swine Sector in the Total Livestock Economy**

Growing rice and pig raising is still considered as a household-based agricultural production. Except for the mekong delta, rice is mainly cultivated to meet subsistence needs of the family while breeding and non-agricultural activities are done to meet the demand for additional cash income (Thang Phan Dang et al, 2008).

An average household raises 10 pigs a year. From the period of 2000 to 2009, the average growth of the swine industry reached 4.3 percent. In 2009, total national pig herd is 27.6 million which is a 3.5 percent increase compared with 2008. Meat per capita in 2009 is 35 kg/year which is higher to the 27.4 kg/year in 2008. In breeding farms, raising pigs accounted for 68 percent of the income followed by poultry (19%) and other livestock (13%) (Department of Livestock Production, 2008).

Sixty percent of households in Vietnam or a total of 7.9 million small household farms are into raising pigs. These farms are usually into subsistence farming with low productivity and high production costs. Weight of the average production per sow is only at 589 kg a year which is



far from the ideal production of 1 900 kg per sow per year (Department of Livestock Production, 2008). The farms also have low biosecurity and prone to diseases since most farms are located at residential areas (Phan Dang Thang et al, 2010).

Traditionally, raising pigs is considered only as a source of organic fertilizer mainly for farming. Currently, the number of farmers has decreased due to the high labor cost; development of organic fertilizer manufacturing industry; and high cost of farm inputs (feeds).

#### Pork Demand vs. Supply

In recent years, pig production has gradually shifted towards producing goods to meet the demand of the domestic and export markets. The lack of application of new technology on swine husbandry has led to the production of meat and meat products that are not within export standard. Farm size is highly dependent on the current market prices which are an unstable basis for supply of pigs and pork products.

Based on the forecast of production and supply for the period of 2010 to 2015, supply and demand of pork is not dependent on income level while meat consumption is dependent on population growth (Table 3). It is also noticeable that in some years, pork production does not meet the demand.

The forecast have also shown that even though Vietnam ranks 5th worldwide with the most number of pigs, it is only sufficient to meet the demand of the local market with only 5 percent surplus. An example is the 2015 figures wherein it is estimated that pork production is equivalent to 3 895 thousand tons of steam and pork consumption forecast is 3 717 thousand tons of steam. Thus, the amount of surplus production will be only 5 percent. The figures have also shown that there is a great export potential and there is a need to reduce production costs.

Table 3. Estimated Amount of Supply and Demand for Pigs (1996-2015)

Year	Population (1 000 people)	Income (1 000 VND)	Pigs (1 000 heads)	Supply (1 000 tons of steam)	Bridge (1 000 ton steam)	Difference in supply / demand (%)
<i>Supply and demand for pork consumption period 1996 - 2009</i>						
1996	73 157	1 620	16 922	1 080	1 007	7
1997	74 307	1 800	17 636	1 154	1 134	2
1998	75 456	2 100	18 132	1 228	1 202	2
1999	76 597	2 220	18 886	1 318	1 282	3
2000	77 631	2 400	20 194	1 418	1 383	2
2001	78 621	3 048	21 800	1 515	1 560	-3
2002	79 539	4 272	23 170	1 654	1 804	-9
2003	80 468	4 824	24 885	1 795	1 901	-6
2004	81 438	5 808	26 144	2 012	2 056	-2
2005	82 394	6 480	27 435	2 288	2 269	1
2006	83 313	7 632	26 855	2 505	2 564	-2
2007	84 221	9 000	26 561	2 663	2 672	0
2008	85 122	11 940	26 702	2 783	2 718	2
2009	86 025	13 380	27 628	2 909	2 855	2
<i>Results of running the forecast supply and demand functions for pork period 2010 - 2015</i>						
2010	86 945	14 611	27 836	3 062	2 995	2
2011	87 876	16 056	29 445	3 239	3 136	3
2012	88 816	17 674	31 009	3 411	3 279	4
2013	89 766	19 497	32 526	3 578	3 423	4
2014	90 727	21 271	33 990	3 739	3 569	5
2015	91 698	23 338	35 405	3 895	3 717	5

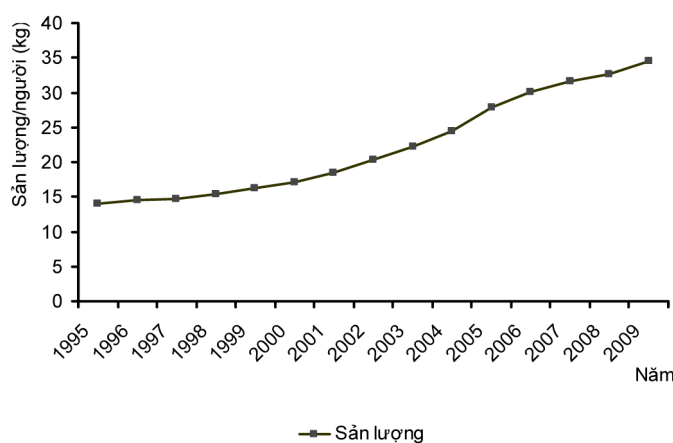
Supply of pork production can be interpreted as pork production capacity in a unit time. Bridge pork consumption was interpreted as the amount of pork that consumers can afford and are willing to buy at the different prices within a certain time. Calculations based on data from the General Statistics Office, the research data on food consumption of the Information Center (MARD) and the Interdisciplinary Research Center for Rural Development (HUA).

#### Pork Consumption

It is estimated that 98 percent of households in Vietnam consume pork which is based on the survey results on household living standards of the General Statistics Office (VLSS, 2000-2008). Other food products consumed are fish and shrimp (97%), chicken (82%) beef (40%) and buffalo meat (7%).

Another study has also shown that there is a disparity between pork consumption in rural and urban areas. The average pork consumption in the rural areas is lower (15 kg/person/year) compared to the urban areas (20 kg/person/year).

There is a 60 percent increase in the volume of pork consumption per person between 1995 (14/kg/person) and 2009 (34.5/kg/person) (Figure 1). This shows that there is a constant increase in pork consumption which translates to a great potential for demand of pork in the country.



Source : General Statistics Office (1999, 2002, 2006, 2010)

Figure 1. Average Pork Consumption per Person (1995-2009)

### III. SWINE SECTOR

#### F. Swine Industry Players

The swine industry of Vietnam involves varied players in production, distribution and processing. The main players include pig farmers, middlemen, abattoir personnel, meat processing operators, distributors (wholesalers, retailers and supermarkets), and consumers. The role of each player is closely inter-related with each other. Below is the role of each player in swine production (Table 4):

Table 4. Players in the Swine Industry and their Role

Players	Role
Pig Farmers	Create products for circulation in the chain
Middlemen	Serve as the collecting agent and the link between the farmers and the abattoir operators/distributors
Abattoir	Transform products form live animals into meat. They dictate the price of the products
Meat processing operators	Convert pork products to processed meat and usually for export purposes
Distributors -wholesalers, retailers and supermarkets	Directly distribute pork products to consumers
Consumers	End receiver affected by any factor in the chain

### Distribution Channel for Production

Usually pigs are sold as piglets to other farmers or middlemen for fattening. Some are also retained in the farm for the same purpose (Figure 2). It is expected that it becomes less profitable if the pigs stay at a longer time in the channel. Contract-growing farms, on the other hand, are involved in the farrow to finish system to decrease exposure to diseases.

Another channel is where suckling pigs and growers are exported to other countries such as Hong Kong, Taiwan, Malaysia and China. Piglets are usually sourced from Thai Binh, Hai Phong, Hanoi, Hai Duong and Nam Dinh provinces.

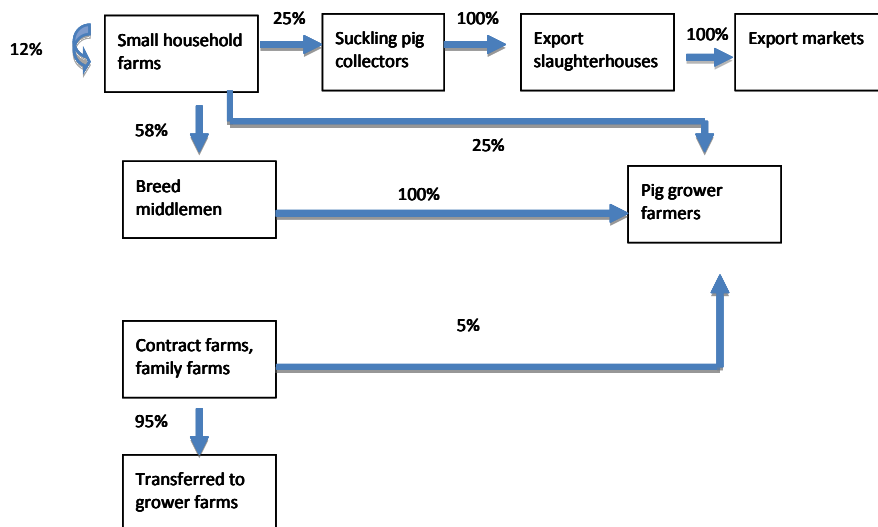


Figure 2. Linkages of Player in the Swine Industry

## Distribution Channel for Marketing

The 3 main destinations for marketing pigs are the following (Figure 3):

### 1. Rural Areas

Majority of the grower pigs are sold at the rural areas. Products are either sold to middlemen for slaughter or to small retailers.

### 2. Cities

Usually middlemen collect grower pigs and brought to intensive abattoir. Meat is then sold to retailers and distributors. Recently, there is a trend where pigs are brought to small local abattoir, collectors and dealers then buy and sell the meat products to the city.

### 3. Supermarkets

Due to the demand for pork in the urban areas, companies such as CP Group have established intensive abattoir and distribute fresh meat to the supermarkets in big cities such as Hanoi and Ho Chi Minh. It is estimated that 10 percent of the pigs produced by the big companies are for supermarkets.

Pigs are also sent to intensive abattoir for export to other countries such as China. Fierce competition from other countries, increase in production cost and the PRRS outbreak in 2007 decreased the export potential of pork. It is important to note that the demand for pork increased after the PRRS outbreaks.

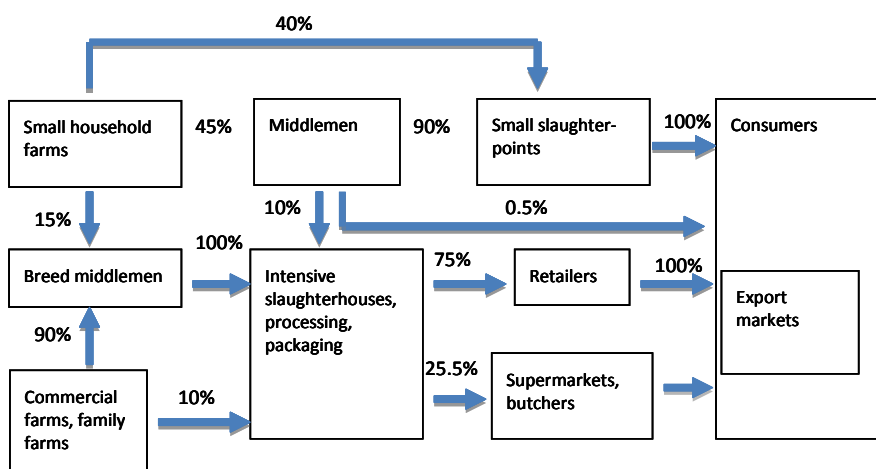


Figure 3. Pig Distribution in Vietnam

## G. Swine Marketing and Trade

### Marketing and Trading of Live Pigs

Traders serve as the link between the producers and the consumers. Usually, traders have the necessary network and market information to source pigs from different areas. Pigs are then brought to the abattoirs in Hanoi or Ho Chi Minh City. Limited amount of pigs are also sold to local abattoirs.

Slaughtering of pigs may be done in the abattoirs (fixed type) or through slaughtering within the farm (mobile type). Large abattoir facilities are usually utilized for wholesale selling to restaurants and by meat dealers from other villages.

Majority of the abattoirs and processing plants do not meet the food safety and hygiene standards. Based on the survey conducted of the Department of Livestock Production in 2008, only 45 percent of the 434 slaughterhouses are allowed by the veterinary offices to operate; only 35 percent have sanitary facilities; and only 25 percent have running water.

### Marketing and Trading of Pork Products

Processing of pork product for export to Russia and Hong Kong is still very limited. Production is unstable due to competition from other countries (China and Brazil); low capital investment; and use of outdated slaughtering and meat processing techniques.

Pork dealers distribute pork products to the consumers by wholesale, retail or through the supermarket. Dealers give more emphasis on the price of the meat sold rather than the quality. Thus, meat is prone to contamination due to lack of sanitation and storage facilities during transport.

Majority of the pork sold are through retail selling. Although retailers need minimal investment for selling pork, it is hindered by the lack storage facility to preserve the freshness of the meat. Pork meat is also sold in supermarkets in low quantity since consumers prefer fresh meat compared to frozen meat.

Consumers in the urban area are more discerning in their purchase of pork products compared to the rural consumers. Urban consumers demand products that are of high quality and within food safety standards while rural consumers are more concerned with price and freshness of the meat.

Foreign consumers also have stricter requirements on consumer products than domestic clientele. Pork products must have no antibiotic residue, absence of hormones and growth stimulants, packaging, labeling and traceability.

### Imported Pork

Vietnam has gained considerable achievements in raising the status and expansion of economic relations by joining the World Trade organization (WTO). However, small

farmers may be at a disadvantage in the process. To meet the WTO commitments, tariffs were reduced in 2007. Import duties for chicken and beef decreased from 20 to 12 percent, pork import tax reduced from 30 to 20 percent. Pork imports increased sharply since 2007 (Figure 4).

In the first 5 months of 2010, total pork imports amounted to about 52 thousand tons. PRRS in pigs in recent years has made consumers turn away from meat sold in the market and increased buying frozen meat sold in supermarkets.

It is projected that the volume of pork imported in the future will continually increase. Pork imported into Vietnam are mainly frozen meat (95%) from Europe (86%) followed by Hong Kong (13%), and U.S. (1%). The rest are from other countries such as Thailand, China, and Japan (Department of Livestock Production, 2010).

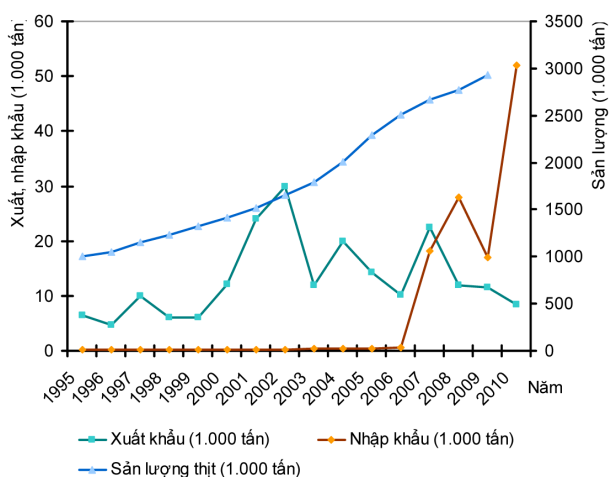


Figure 4. Volume of Swine Import, Export and Production (1995-2010)

### Export Market

Through the resolution of the Prime Minister on 02/2/2000 03/2000/NQ-CP regarding economic development and decision 166/2001/QĐ-TTg dated 26/10/2001, the government encourages the development of pig exports from 2001 to 2010. Vietnam mainly exports frozen carcasses to Russia, Hong Kong, Japan and China. Frozen suckling pigs are exported to Hong Kong while frozen pork are sent to Russia under a repayment programme.

From 2003 to date, the pork export of the country has decreased significantly due to growing competition on production cost from other countries (Brazil, European Union, and United States) (Table 5). Other factors include disease outbreaks, unstable price of food, tighter export quota from China, and stricter technical barriers set by importing countries.

While the demand for pork has been increasing domestically, the demand for pork exports has greatly decreased. The import of pork and pork products, on the other hand, is continually increasing.

**Table 5. Pork Export and Import Volume (1995-2009)**

Year	Exports (1 000 tons)	Imports (1 000 tons)
1995	6.40	0.27
1996	4.60	0.22
1997	10.00	0.15
1998	6.00	0.12
1999	6.00	0.15
2000	12.20	0.20
2001	24.00	0.20
2002	30.00	0.25
2003	12.00	0.30
2004	20.00	0.35
2005	14.20	0.41
2006	10.20	0.52
2007	22.50	18.20
2008	12.00	28.00
2009	11.50	17.00
1-5/2010	8.50	52.00

Source: Estimates made upon FAO statistical sources, the General Statistics Office, Department of Livestock Production, USDA, Agriculture Information Network Global

## H. Swine Production Systems

### Population

There is an increasing trend in the growth rate of the swine population from 1995 (16.3 million), 2000 (20.2million) and 2009 (27.6 million) (GSO, 2009). The annual growth rate is about 6.4 percent a year. Hog production has an average growth rate of 10 percent a year with 1.5 million tons in 2001, 2.3 million tons in 2005 and 2.7 million tons in 2009.

Pig density is highest in the red river delta (up 27.5%) followed by the mountainous northern provinces and central coastal provinces (20 -24%) (Table 6). Provinces with the most number of pigs (over a million pigs a year) and farms include Hanoi, Thanh Hoa, Bac Giang and Dong Nai (Table 7).



Table 6. Pig Population in Different Areas (1999 to 2009) Units: 1 000

Region Year	Mid-land and Northern Mountainous Provinces	Red River Delta	Northern Central and Central Coastal Provinces	Highlands	South East of the South	Mekong River Delta	Nation-wide
1999	4 173	5 051	4 336	1 030	1 498	2 792	18 886
2000	4 088	5 688	4 953	1 123	1 365	2 977	20 194
2001	5 745	5 072	5 279	913	1 850	2 912	21 800
2002	5 058	6 307	5 599	1 191	1 863	3 152	23 170
2003	5 335	6 758	5 941	1 330	2 073	3 449	24 885
2004	5 201	7 265	6 433	1 489	2 043	3 714	26 144
2005	5 446	7 796	6 526	1 591	2 248	3 829	27 435
2006	5 339	7 473	6 245	1 386	2 431	3 982	26 855
2007	5 559	7 248	6 149	1 451	2 369	3 785	26 561
2008	5 928	7 334	5 880	1 557	2 373	3 630	26 702
2009	6 665	7 096	5 545	1 636	2 955	3 731	27 628
Ratio%	24.12	25.68	20.07	5.92	10.69	13.50	100%

Source: General Statistics Office, 2000 - 2009

Table 7. Provinces with the Most Number of Farms

Province/ City	No. of Farms
Ho Chi Minh City	1 053
Dong Nai	967
Thai Binh	419
Hung Yen	372
Tra Vinh	348
Bac Giang	248
Hai Phong City	248
Binh Dinh	234
Binh Duong	217
Thanh Hoa	204
Lam Dong	200

Large scale farms have been established in recent year such as CP Group of Thailand, DABACO and Bac Ninh. Said farms have an average of 600 - 1 200 sows and some even have 2 400 sows. It is estimated that 20 percent of the pigs sold in the market are from large-scale farms.

## Swine Farming System

Rural households in Vietnam combine rice farming with poultry and swine raising to be self-sufficient. It is estimated that 5 percent of households in the communes have live stock farms to supplement their income. Typical scale of pig farm usually produces from 80 - 200 pigs per household per year, or 50 - 20 sows (Thang Phan Dang et al, 2009).

There are various pig farming systems categorized based on the level of biosecurity implemented in the farm as well as in the number of sows and growing pigs (Table 8).

**Table 8. Pig Farming System in Vietnam**

Farming System	Number of Sow/Pigs	Number of farms (%)	Yield (%)
Small Scale Farming with Low Biosecurity	1-2 sows, <20 pigs	80	70
Small Scale Farming with Minimum Biosecurity	50-20 sow <100 pigs	15-20	15
Cooperative Farms with Moderate Biosecurity	20-50 sow 100-200 growing pigs	ε	2
Intensive Livestock Farms with High Biosecurity	600-1200 sows 1 000-10 000 growing pigs	0.1	13

Source: Compiled from Department of Livestock Production's Report, 2008 & 2009, the General Statistics Office, 2009 and discussions with a number of experts in agriculture

### 1. Small Scale Farming with Low Biosecurity

It is estimated that small scale farms supply 75 percent of the country's pork and accounts for 70 percent of the total hog produced. Usually the farms are situated in residential areas with 1-2 pigs per household. In lowland and mid land areas, there are 2-4 farmers that are into breeding pigs with 2-3 litters/household/year.

To reduce produce cost, pigs are fed with agricultural products including vegetables, pulp beans, cassava, and wheat bran. Average profit per pig raised is at VND 100 000-160 000 with an average annual profit of VND 3 500 000-5 000 000/household/year.

This type of farm usually has low biosecurity level, no vaccination programme and do not regularly clean and disinfect the farm premises. The farms are faced with various problems such as waste management, disease outbreaks and poor quality meat.

Small scale farming is now concentrated in rural areas due to the occurrence of epidemics and unstable market prices. Thus, semi-intensive scale farming and livestock farms are given more priority for development.

## *2. Small Livestock Farms with Minimum Biosecurity*

Through the New Land Use Law, farmers have the opportunity to convert portion of their land for fish breeding, pig and poultry raising. Fish farming is the main enterprise and swine raising is only secondary. Wastes from pigs are used to increase the organic matter in the fishpond.

Number of pigs are usually 10-20 pigs/household or even 50-70 sows per household (Vu Dinh Ton et al, 2007). This type of production system constitutes 15 percent of the total number pigs in the country. Pigs are fed with both commercial feed and swill. Farms are commonly located in the provinces in Red River Delta such as Hai Duong, Thai Binh, Nam Dinh.

For a 30-sow level farm, profit is estimated at 27 million to 100 million VND/household/year. Environmental pollution is one of the main concerns of this type of farm as well as lack of investments for further expansion.

## *3. Cooperative Farms with Moderate Biosecurity*

Cooperatives are formed by a group of people through a voluntary basis. These farms are seen in the provinces of Ha Noi, Hai Duong, Hung Yen. Households that are part of the cooperative voluntarily contribute funds for farm inputs such as pig stock, feeds and medicines.

Farmers in cooperatives raise an average of 20 - 50 sows for 200 households a year. Medium-scale farmers raise 10- 20 pigs per household per year or 1-2 pigs per household at a time.

Cooperative farms have a very efficient operation. They have the capacity to market large volume of pigs and pork with uniform quality as well provide farmers with stable income. However, the development of this farming system is very minimal at the moment since it requires large capital and large area away from residential areas.

## *4. Intensive Livestock Farms with High Biosecurity*

Contract-growing farms or intensive livestock farms was on the rise since 2000. Farms are usually located in the south eastern provinces in the Red River and Mekong delta. Farms have high biosecurity level, far from residential areas (1.5 kms. away) and substantial investment is allocated for farm infrastructure. The modern design of the farm includes floor pens, barn cooling system, heating system, feeder system and automatic. Farms use only commercial feeds.

Typical contract growing farms have 600 – 2 400 sows or 1 000 – 10 000 pigs. It is estimated that this type of farm constitutes 10 percent of the total number of pigs produced in the country and contribute 20 percent to the total meat production.

There is still limited number of farms in this category due to the high cost of initial investment needed. Private companies provide almost all the farm inputs including the breeders, feed, vaccine, medicines as well as technical and marketing support. Profit per household for this farm type is estimated at 100 million VND/ household/year.

The government encourages intensive farming through policy support on land use, long-term land lease and loans. This type of farming provides a stable income for farmers and food security for consumers although, there are also concerns on waste disposal, impact of the farm to the environment, high initial investment, and unstable distribution and marketing system.

#### *Other Classifications*

Breeder farms, on the other hand, can be classified based on the number of sows in the farm (Table 9). South east region has the highest number of breeding sows (20 farms with 250-500 sows per farm; and 16 farms with the size of more than 500 heads per farm) followed by the Red River Delta Region (10 farms with the scale of 250-500 sows; and 11 farms size over 500 sows per farm); and the Mekong Delta (5 farms with scale 250-500 heads per farm) (Department of Livestock Production, 2007).

**Table 9. Classification of Farm based on Sow Level**

No. of Sows	Number of Farms	Percentage of Farms (%)
20-50	2 131	71.3
51-100	508	17.0
100-500		11.7
500		1

Table 10. Classification of Farm based on Number of Fatteners/Growers

No. of Fatteners/Growers	Number of Farms	Percentage of Farms (%)
100-200	3 388	75.5
200-300	606	13.5
2 500		0.3

A farm can be also classified based on the number of fatteners/growers in the farm (Table 10). The south east has the largest number of grower pigs (14 farms at the size from 1 500-2 500; and 14 farms having over 2 500 heads per farm) followed by Red River Delta Region (3 farms with 1 500-2 500 heads per farm; and 6 farms with a size over 2 500 heads per farm) (Department of Livestock Production, 2007).

## Swine Production Parameters

Average feed conversion rate in Vietnam is 2.9 kg feed/kg weight gain. Some companies even reach 2.13 kg feed / kg weight gain (Talk with Prof. Vu Duy Giang; Prof. Dang Vu Binh, farm management CP group, DABACO Bac Ninh).

Some farms located at Red River delta and the northern mountainous midland have feed conversion rate as high as 4.25 kg feed/kg weight gain. The average growth of grower pigs is 14.58 kg per month. It may reach up to 21.70 to 23.84 kg per month during breeding (Table 11-13).

**Table 11: Structure of the Pigs and Sows in Smallholder Farms**

Target	Households (n = 100)	Farm (n = 32)	Organizational group (n = 30)	Processing (n = 8)
Domestic sows (% households)	65	30	5	0
Hybrid sows (% households)	35	55	70	0
Foreign sows (% households)	0	15	25	100
Number of sows (piglets per household)	1.2	13.5	17.4	600
Number of pigs (animals per household per year)	12.3	185	430.5	3.400
Number of pigs (animals per household per year)	24.2	300	320	10.700

Source: Survey results of the provinces of Hai Duong, Hung Yen, Nam Dinh, Hanoi, Bac Giang, Bac Ninh, Tuyen Quang, Hoa Binh (Phan Dang Thang et al. 2008; CEIDR 2005 to 2009).

**Table 12. Productivity of Grower Pigs**

Target	Households (n = 100)	Camp (n = 32)	Organizational Group (n = 30)	Processing (n = 5)
Number of litters per year	3.40 ± 0.17	5.76 ± 0.13	6.20 ± 0.05	2.20 ± 0.03
Number of piglets per year	12.30 ± 1.10	185.30 ± 2.27	430.50 ± 2.13	3400 ± 8.12
Number transferred to growers (kg / head)	16.50 ± 0.41	18.50 ± 1.21	23.20 ± 1.26	6.20 ± 2.10
Growing period (days)	105.2 ± 1.25	85.31 ± 1.89	87.72 ± 2.27	135.21 ± 5.13
Sales volume (kg / head)	67.50 ± 0.72	86.24 ± 3.12	90.75 ± 2.88	97.20 ± 4.20
Weight gain (kg / month)	14.58 ± 0.12	23.84 ± 0.68	22.96 ± 0.70	21.70 ± 0.62
Feed conversion rate (FCR)	4.25 ± 0.14	3.10 ± 0.05	2.85 ± 0.08	2.50 ± 0.11
Survival rate (%)	100	98.01	98.20	97.05

Table 13. Productivity of Breeding Sows

Target	Households (n = 30)	Farm (n = 20)	Organizational Group (n = 25)	Processing (n = 3)
The number of offspring / litter	12.67 ± 0.27	11.52 ± 0.24	10.27 ± 0.15	10.12 ± 0.02
Number weaned / litter	11.10 ± 0.37	11.02 ± 0.19	9.87 ± 0.15	9.70 ± 0.10
TGCS (days)	45.19 ± 0.93	38.17 ± 0.90	35.41 ± 1.31	20.54 ± 0.13
TG sold (days)	75.06 ± 1.81	69.63 ± 1.18	60.09 ± 2.23	20.54 ± 0.13
Litters / sow / year (age)	1.94 ± 0.11	2.28 ± 0.13	2.35 ± 0.10	2.41 ± 0.03
Sales volume (kg / head)	14.58 ± 0.58	17.57 ± 0.28	23.11 ± 0.63	6.20 ± 2.10
Export sales volume (kg / drive)	160.06 ± 8.59	193.20 ± 3.02	214.00 ± 5.27	60.20 ± 3.16
Survival rate (%)	88.20	96.12	96.30	95.80

## I. Swine Production and Health

### Source of Stocks

It is estimated that 15.15 percent (4.17 million) of the 27.6 million pig population are sows. Majority are hybrid sows (74.4%; 3.1 million) followed by imported sows (13.2%; 550 200) and locally bred sows (12.4%; 519 000).

There are about 321 000 grand-grandparent sows (GGP) and grandparent sows (GP). Only about 8000 grand-grandparent sows (GGP) are imported (2.5%). Grand-grand parents and grandparents are located mainly in the south east and Red River Delta Region (82%). The rest are in north east, north west, south central coast and central highlands (3.2%).

There are about 140 facilities for keeping breeding herds and grand-grandparent sows wherein 9 facilities are under the management of the Ministry of Agriculture and Rural Development. Limited number of breeding sows (1 600 sows and 1 700 grand-grand parent sows) is kept in the said farms (Department of Livestock Production, 2010).

The rest of the breeding sows are owned by domestic companies and companies with foreign capital. An example is Vietnam Joint Stock which has 25 600 (3.6 thousand grandparents sows and 22 thousand sows grandparents) breeding sows and Darby-JC Co. which has 5 000 sows.

Grand-grandparents and grandparents produce around 2 500 piglets and 90 000 grandparent piglets. These can produce around 1.5 million parent pigs that fully meet the demand for domestic production. However, farmers in northern mountainous areas and mountainous central highlands prefer local pigs (Soc pigs) which have low productivity.

### Average Cost to Produce a Kilo of Meat

Cost in swine production include purchase of pigs, vaccines, drugs, electricity and water, costs for premises, equipment, employees and bank interest. Revenue is derived from the sale of meat and pork byproducts

For household farms, the cost to produce 1kg of pork is 28 780 VND/kg (Table 14). The cost to produce 1kg of pork in intensive scale and family farms are lower at 25 730-26 990 VND/kg. There will be a loss in profits for farmers if the hog prices will go down at 26 000 VND/kg.

**Table 14. Cost of Production of Grower Pigs**

Target		Households (n = 100)	Farm (n = 32)	Organizational group (n = 30)	Processing (n = 5)
Total revenues		2 890.00	2 920.00	2 920.00	3 300.00
Intermediate cost (IC)		2 838.06	2 514.99	2 622.76	2 596.53
IC	Chi breed	683.96	551.51	714.98	943.91
	Expenses for feed	2 151.69	1 955.83	1 886.22	1 589.33
	Veterinary medicine, vaccines	2.41	5.70	19.46	25.31
	Utilities	0.00	1.96	2.10	32.55
	Shipping	0.00	0.00	0.00	7.23
Depreciation (Amt)		39.96	36.70	49.58	9.39
Financial expenses		0.00	21.01	27.03	32.91
Hiring		0.00	0.00	0.00	36.17
Value Added	Increase in crude	81.94	405.01	297.24	703.47
	Net increase	41.98	368.30	247.66	694.08
	Profit	41.98	347.30	220.63	625.00
Production costs on the farm (1 000 VND / kg)		28.78	25.73	26.99	26.75

### Source of Feeds

Starting in the 1990s, the country started using industrial feed due to the development of the swine sector. Industrial feed was only 2.7 million tons in 1999 which has currently increased significantly to 9.5 million tons. It is estimated that the 47-48 percent of the value of the food industry is for animal feed production (Do Kim Tuyen, Hoang Kim Giao, 2009).

A large portion of the raw materials for animal feed production such as corn, soybean cake, wheat bran, fish meal, bone meal, various mineral and vitamin premix are imported from other countries (Table 15). Thus, feed prices in Vietnam are highly dependent on the world market.

Table 15. Composition of Feeds

Target	Households (n = 100)	Farms (n = 32)	Organizational Group (n = 30)	Processing (n = 8)
Feed (%)	0	0	0	100
Any concentrated feeding (%)	10	20	20	0
Rice bran, wheat bran (%)	25	15	15	0
Maize (%)	50	55	60	0
Paddy, rice (%)	15	10	5	0

As of 2008, there are 225 feed mills in the country (Table 16). Majority of the feed mills are concentrated in the Red River delta (45.78%) followed by the south east (28.89%), Mekong River delta (12.89%) and central highlands (1.33%).

Table 16. Distribution of Feed Mills in Vietnam

Area	No. of Feed Mills	Percentage
Red River delta	103	45.78%
south east	65	28.89%
Mekong River delta	29	12.89%
central highlands	3	1.33%

It is estimated that 76 percent of the feed mills are locally owned and has the capacity to supply 27 percent of the feed requirement. This is in comparison to feed mills with foreign capital or joint venture which are only 24 percent but produces 73 percent of the feed supply for the country.

Large livestock farms use only commercial feeds while smallholder farms use feed concentrate and supplement it with feed materials from other sources. Most factories are focused on production of feed concentrates for small farms.

Since 2007, feed prices have been increasing due to the food and energy crisis in the region and the world. Feed prices increased by 90 percent from 2007 to 2008 as compared to the previous period (Figure 5). As a consequence, farmers reduce their farm size or completely stop their farm operations.

The situation was further aggravated by the PRRS epidemic since hog prices did not increase in 2009 to 2010 because consumers were wary of buying pork and pork products (Figure 6). Thus, the local swine industry at the moment is very unstable and swine raising is considered as a very risky venture.



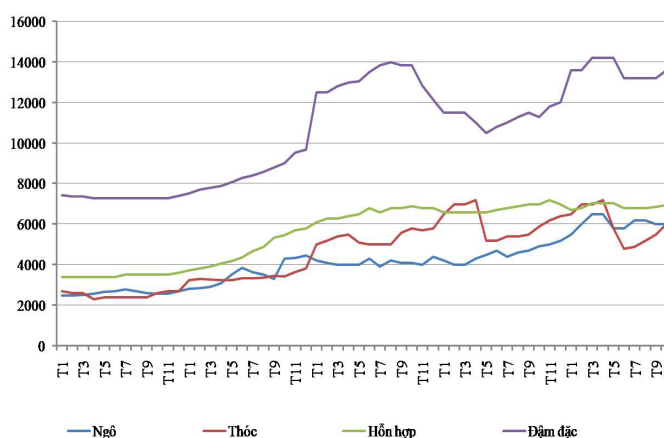


Figure 5. Fluctuations in Feed Prices (2006-2010) (per kg)

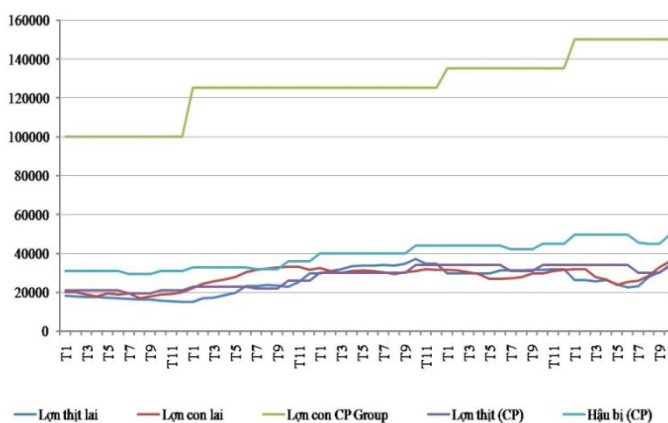


Figure 6. Fluctuations in Pork Prices (2006 - 2010) (price/ kg)

## J. Constraints to Swine Production and Health

The following are the problems affecting the swine industry of Vietnam:

### Swine Diseases

Since majority of the farms are small scale in nature, farms are prone to infectious diseases such as FMD and PRRS due to low biosecurity and low vaccination coverage. There is also lack of veterinary staff at the rural areas and the disease network at the grassroots level is undeveloped as well.

Government regulations on transport, slaughter of animals as well as on disease control and prevention have very minimal penalty. Focus is also mainly given on disease control rather than prevention.

PRRS was first detected in Vietnam from infected pigs from USA in 1997. The 2007 epidemic have severely damaged the swine industry in many provinces in northern part of the country such as Hai Duong, Hung Yen, Thai Binh, Bac Giang and the disease quickly spread in the central and southern provinces. Below is the progression of PRRS in Vietnam from 2007-2010 (Table 17):

**Table 17. PRRS Situation in Vietnam (2007-2010)**

Year	Number of Pigs Infected	Number of Pigs Culled	Number of Communes	Number of Districts	Number of Provinces
2007	66 000				
2008	390 000	300 000	953	99	25
2009	7 030	5 900	69	26	14
2010	70 000	24 000	181	34	12

Source: DAH, May 2010

Foot and mouth disease (FMD), on the other hand, have been present in the country since 1992. There is no active control programme for FMD and disease control is affected by lack of vaccines, limited veterinary staff, and farmers' lack of knowledge in the prevention and control of FMD.

In 1999, the initial outbreak was in Cao Bang and spread to 58 provinces. Below are the FMD cases in 1999, 2009-2010 (Table 18):

**Table 18. FMD Situation from 2009-2010**

Year	Number of Pigs Infected	Number of Cattle Infected	Number of Communes	Number of Districts	Number of Provinces
1999	37 000	300 000			58
2009	650 pig herds		235		30
2010	500	1 000	23	12	5

Source: DAH, May 2010

Other disease that have been reported in the country which are of great significant impact to the swine industry include porcine epidemic diarrhea (PED) and *Streptococcus suis* Type II.

#### Environmental Pollution

With majority as small holder farms and located in densely populated areas (80%), waste management is one of the main problems in swine raising. Farm animal wastes (from manure (solid waste), waste water (liquid waste) are considered as major sources of pollution. Waste gases such as CO<sub>2</sub>, NH<sub>3</sub>, H<sub>2</sub>S are the main gases causing the greenhouse effect.

Faeces and urine contain nitrogen, phosphorus, microorganisms and decompose into toxic vapors including about 40 kinds of toxic gases (Vu Dinh Ton et al, 2010). The composition of pollutants in livestock waste is classified as organic matter and inorganic with a variety of other pathogens. These wastes pollute the air, affect the ground water and leave residues in crops that will eventually affect humans. A household with 5-10 pigs situated in a residential area will affect the surrounding households.

Every year it is estimated that animal waste contribute more than 80 million tons of solid waste, several tens of billions of cubic liquid waste and waste hundreds of millions of tons of gas (Department of Livestock Production, 2008). Hanoi produces 1 million tons of solid waste from livestock which are directly released to the environment with only a small fraction used as compost fertilizer, irrigate crops or for fish pond use. Liquid wastes from urine and washing of pens are discharged directly into the sewer system (Department of Agriculture and Rural Development Hanoi, 2009).

Industrial scale farms are also sources of pollution since there are no waste treatment facilities in the farm and there is minimal awareness regarding laws on waste management.

### Food Hygiene and Safety

In recent years, problems that were encountered regarding food safety include drug residues in Sudan-4 eggs; melamine contamination in dairy industry; chickens infected with HPAI H5N1; FMD, PRRS and Streptococcus infection in swine.

Since priority of the farmers is to increase profits, most make shortcuts to minimize production time and cost. Practices such as product contamination, drug residues, selling of meat from infected carcasses occur. Even with the high demand for pork, consumers are wary regarding the issue on food safety.

Based on the inspection of DAH in 2007 of poultry meat, it was found out that 40 percent of stalls do not follow basic food hygiene standard and the origin of the meat are unknown. Up to 64 percent of the samples do not meet microbiological standards and 23 percent of samples failed to meet the standards on antibiotic residues, heavy metals, drugs and plant protection.

In particular, meat products were found to be contaminated at slaughterhouses with *E.coli*, Salmonella and *Staphylococcus aureus*. Among them, 9 percent of beef samples were with microbial contamination while 38 percent of pork samples were infected with *E. coli*, *Staphylococcus aureus* and Salmonella. Poultry meat samples were contaminated with *E. coli* and Salmonella at 46 percent and 95-100 percent, respectively. In fact, food poisoning due to infections such as cholera, Streptococcus do occur and is a proof that food hygiene is a problem. There is a constant risk of food-borne disease in different cities and provinces of Vietnam.

The export market is also affected by the food hygiene and safety issues. As part of WTO, there are stringent requirements that need to be adhered to be able to export to another country. Failure to comply with the requirements decreases the competitiveness of the country not only to supply other countries but may affect the domestic demand as well.

One of the main problems is the production of meat with veterinary drugs and antibiotics residues which is very rampant and difficult to regulate (Dau Ngoc Hao, 2008; Dinh Thien Thuat et al, 2003; La Van Kinh, 2007).

In recent years, Vietnam has been actively building the legal system, standards, procedures, analysis centers, expertise to regulate food hygiene and safety (FHS) issues. However, several issues hinder the implementation of the FHS measures such as the lack of information of stakeholders regarding FHS and overlap of jurisdiction of different government agencies.

#### Involvement of Various Government Regulatory Agencies

There are several agencies involved in the implementation of FHS from the farm to the consumers. Ministries involved include: Ministry of Health, Ministry of Agriculture and Rural Development, Ministry of Trade and Industry, Ministry of Science and Technology, Ministry of Natural Resources and Environment, General Department of Customs, Ministry of Public Security, Ministry of Defense, and local authorities. The division of tasks and responsibilities in the different stages of production between the said ministries is unclear.

Ministry of Health and the Food Safety Administration is responsible only at the consumer stage. Meanwhile, the management of livestock, water, animal feed, chemicals, and the environment is under the Ministry of Agriculture and Rural Development. There is a need to identify specific government agency involved in the monitoring between the stages of swine production until it reach the consumers.

There is limited inspection done by health inspectors (for the Ministry of Health) and veterinary hygiene inspection (for the Agriculture and Rural Development). Analysis for food safety such as on chemicals, antibiotics, hormones, toxins is also very limited. More policies are needed to develop the swine industry specifically in the different stages of production. Animal health agencies must be more visible at the local level.

#### Small Scale Farmers

Majority of swine farmers (90%) are small scale which contributes to only 20 percent of total swine production. There is a need to develop livestock farms but it is hampered by lack of capital, technical knowledge and land for expansion. Farmers are not informed also on proper animal husbandry techniques.

#### Access to Government Services and Technology

There is limited access to new technologies and government services. Majority of farmers' knowledge on swine raising is based on experience only. Limited technical information usually comes from sales agents of veterinary drugs and feeds. There are only few veterinary personnel in the rural areas which make the veterinary services and the disease networking system inefficient.

### Increasing Cost of Workers

Due to the unique living arrangement of farm workers wherein they live inside the farms as a biosecurity measure, it is becoming more difficult to acquire workers. Thus, farm workers are offered higher wages to work in the farm. Living standards inside the farms needs to be improved as well.

### Access to Bank Loans

Support of banks to agriculture-based loans is not high. Banks are not keen in giving loans for swine farm owners due to the unpredictability of the situation of the swine industry in the country.

### Lack of Electricity

There is frequent power interruption in swine farms which affects breeding farms and causes mortality in high-value breeders. Said farms are usually far from residential areas and the barn design requires uninterrupted power supply.

Some farms already shifted to alternative source of energy such as biogas but the high cost of investment is very limiting wherein a farm with 600 sows requires an investment of 300 million VND for biogas generators.

### Competitiveness in the Export Market

The livestock sector must invest on new technologies and implement strict regulation of FHS to be globally competitive. HACCP must be implemented at slaughtering and meat processing. Control of swine diseases must be a priority since it is a trade barrier in export of live animals, meat and meat products.

## **IV. SECTORAL POLICY AND LEGISLATION**

### Food Safety and Hygiene

The Ministry of Agriculture and Rural Development, Department of Animal Medicine is involved in supervising the monitoring of the production, transport, slaughter and consumption in provinces and cities. The Provincial Veterinary Bureau is tasked to supervise the region, export or import goods into the region. There is a delineation of function between agencies and policies to support the regulations. Although, it is observed that there is a weakness in the monitoring in the different stages of production.

A 7-year survey from Department of Livestock Production (MARD) released in 2009 showed that only 45 percent of abattoirs have licenses and 65 percent of facilities have no cleaning and disinfection procedure implemented even though there are existing regulations for inspection and slaughtering in abattoirs.

The National Assembly Standing Committee has the responsibility to supervise 16 512 small slaughter facilities but cannot guarantee that FSH regulations are implemented in the said facilities.

Based on the study of National Agro-Forestry-Fisheries Quality Assurance Department (NAFIQAD) in 2009, there is a significant meat product (pork, chicken, duck) with antibiotic residues that exceeds the standard level.

To control this problem, the Department of Livestock Production should focus on inspection and quality monitoring at the source inputs including seed, feed and veterinary drugs, especially the banned substance. There is a need to implement sanctions to farms that administer seed, feed or veterinary medicine to more than twice the existing policy.

The NAFIQAD proposed to reduce the overlap between ministries. On the other hand, a separate budget for the management of food safety quality, particularly for fresh produce like vegetables, fruits and meat should be allocated (Le Ngoc, 2009).

The following are the recommended solutions: delineate responsibility between different agencies; raise consumer awareness to put pressure on manufacturers; increase capacity building for inspection, supervision and quality control of raw material inputs (feed, veterinary drugs, the production stages and final product).

The following are the different policies on livestock production and animal feeds (Table 19); funding support for livestock production (Table 20); and regulations on food hygiene and safety (Table 21).

**Table 19. Policies on Development of Livestock Production and Animal Feeds**

<b>Government Policy</b>	<b>Date</b>	<b>Details of the Policy</b>
Governmental Decree No. 14/CP	19 March 1996	Management of domestic animals
Ordinance of the Standing Committee of Parliament 16/2004/PL UBTVQH11	24 March 2004	On animals
Decision 186/QD-CN-TACN Department of Livestock	31 December 2008	Issuance of general requirements for the competence of laboratory animal feed
Decision 168/QD-CN-TACN of Livestock Department	4 August 2009	Appointment of laboratory quality control of animal feed.
Decision 10/2008/QD-TTg	26 January 2008	Approval of the breeding development strategy until 2020
Animal Health Ordinance 1993, Decree No. 93/CP	27 November 1993	Enforcement of the rules on animal health -Prevention of animal diseases -Quarantine, slaughter inspection and testing. -Management of veterinary medicine -To sanction administrative violations in the veterinary
Ordinance of the Standing Committee of Parliament 18/2004/PL UBTVQH11	29 April 2004	On animal health

**Table 20. Policies on Funding Support for Livestock Production**

<b>Government Policy</b>	<b>Date</b>	<b>Details of the Policy</b>
Decree No. 67/1999/QD-TTg	30 March 1999	Prime Minister on credit policy in the Bank for Agriculture and Rural Development
Decision 02/2001/QD-TTg	2 January 2001	Prime Minister on policies to support investment from the Development Assistance Fund for projects of production, processing and export agricultural projects
Decision No. 133/2001/QD-TTg	10 September 2001	Prime Minister on credit loans from the Export Support Fund.
Decision No. 65/2001/QD-BTC	29 June 2001	Finance Ministry portfolio was awarded four export commodities including pork.

Table 21. Farm Development Policies and Food Safety Standards

Government Policy	Date	Details of the Policy
Central Resolution 4	December 1997	Identified the farm economy in many different forms of ownership
Central Resolution 6	10 January 1998	Conclusions from the farm economy in the region, the different geographical areas.
Decree No. 85/1999/ND-CP of the Prime Minister	28 August 1999	Amending and supplementing a number of provisions on the allocation of agricultural land to households and individuals for stable and long use.
Resolution 03/2000/NQ-CP by the Prime Minister	2 February 2000	On "economic farm"; Resolution is set out three views and policies to develop the farm economy: -Uniformly aware of the nature and location of the farm economy -A number of long-term policy of the State for the farm economy -Eight specific policy on the farm economy
Decision 166/2001/QD-TTg of the Prime Minister	26 October 2001	Measures and policies to develop pig raising for export in the period 2001-2010
Veterinary Ordinance	2004	
10/2008/QD-TTg Decision of the Prime Minister	16 January 2008	Approval of a livestock development strategy to 2020.
Document No. 329/CN-GSL of Department of Livestock		Implementation of urgent measures in animal husbandry to ensure growth of 8-9% in 2008
Viet GAHP standard	2008	Vietnam Good Animal Husbandry Practice
Decision No. 121 / 2008/QD-BNN the Ministry of Agriculture and Rural Development	17 December 2008	Regulation on the basis of implementing certification processes practiced good husbandry (VietGAHP) for dairy cows, pigs, poultry and bees.
Decree No. 79/2008/ND-CP	18 July 2008	Regulations organizing the management system, inspection, testing and food safety
12/2008/TTLT-BYT-BNV	30 December 2008	Circular regarding guidelines, functions, duties, powers, organizational structure, and staffing of the Food Safety Department of the provinces/cities
Food Safety Laws	2010	
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