

# Smallholder pig value chain development in Vietnam: Situation analysis and trends



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# Smallholder pig value chain development in Vietnam: Situation analysis and trends

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# Acronyms, abbreviations, and initialisms

AC-FTA	ASEAN–China Free Trade Area
AFTA	ASEAN Free Trade Area
AI	Artificial insemination
AK-FTA	ASEAN– Korea Free Trade Area
ASF	Animal source food
AVSF	Agronomes and Veterinaires Sans Frontieres
CAP–IPSARD	Center for Agricultural Policy–Institute of Policy and Strategy for Agriculture and Rural Development
CCF	Central Credit Fund
CH	Central Highlands
CIRAD	French Agricultural Research Centre for International Development
CP	Charoen Pokphand Group
CPC	Commune Peoples’ Committee
CPI	Consumer price index
CSF	Classical swine fever
DAFE	Department of Agriculture and Forestry Extension
DAH	Department of Animal Health
DVS	District Veterinary Station
FAO	Food and Agriculture Organization
FMD	Foot and mouth disease
GMP	Good manufacturing practice
GSO	General Statistics Office
HACCP	Hazard Analysis and Critical Control Point
H1N1	Swine influenza
HPAI	Highly pathenogenic avian influenza
IAS	Institute of Animal Science
IUCN	International Union for the Conservation of Nature
JSCB	Joint Stock Commercial Boards
MARD	Ministry of Agriculture and Rural Development
NAED	National Agriculture and Forestry Extension Department
NIAS	National Institute of Animal Science
NCAE	National Centre for Agricultural Extension
NCAFE	National Centre for Agriculture and Fishery Extension
NCC	North Central Coast
NIVR	National Institute of Veterinary Research

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OIE	World Organisation for Animal Health (aka Office International des Epizooties)
PCF	People's Credit Fund
PDARD	Provincial Department of Agriculture and Rural Development
PHFD	Porcine High Fever Disease
PRRS	Porcine reproductive and respiratory syndrome
PSDAH	Provincial Sub-departments of Animal Health
PTD	Participatory technology development
R&D	Research and development
RAHC	Regional Animal Health Centre
RCF	Regional Credit Fund
RRD	Red River Delta
RSHB	Rural Shareholding Bank
SBV	State Bank of Vietnam
SCC	South Central Coast
SDC	Sweden Development Cooperation
SNV	Netherlands Development Organization
SOCB	State-owned commercial banks
SOE	State-owned enterprise
ToT	Training of trainers
UNDP	United Nations Development Programme
VBARD	Vietnam Bank for Agriculture and Rural Development
VBP	Vietnam Bank for the Poor
VBSP	Vietnam Bank for Social Policy
VFU	Vietnam Farmers' Union
VietGAP	Vietnam Good Agriculture Practice
VLSS	Vietnam Living Standard Survey
VWU	Vietnam Women's Union
VYU	Vietnam Youth Union
WTO	World Trade Organisation
WWF	World Wildlife Fund

## Executive summary

Rising incomes and a changing consumer diet have led to increased meat consumption in Vietnam. The diet is changing from predominantly starch-based to a high proportion of animal protein. Pork is ranked as the most important meat, and consumption is increasing, with estimates of average per capita consumption ranging from 14 kg (based on General Statistics Office [GSO] data in 2010) to 22 kg (based on household surveys by ILRI). These estimates do not include pork consumed outside of the home. Per capita pork consumption in urban areas is higher than in rural areas, but the former experienced a lower growth rate during 2002–2010.

Vietnamese consumers generally prefer lean rather than high-fat pork and are willing to pay a premium for meat with guaranteed quality. Consumers also prefer fresh to frozen or chilled pork, and prefer buying pork in open or wet markets for convenience and freshness, but this behaviour may change in the future due to the changing lifestyles of a new generation, as well as expansion of modern retail outlets. Pork accounts for about 57% of total meat consumed in the household, a share that has declined over time, but at a very slow rate. In the future, rising incomes and changing lifestyles may increase consumer consumption of other meats and animal-source foods (ASF), while pork will likely remain the dominant meat in ASF consumption. Future demand will still be driven by population growth and rising consumer incomes.

Pig production systems are broadly categorized by scale and type. Smallholder pig producers are estimated to supply at least 80% of total pork production. The total number of pig producers slowly declined over the years as production has gradually shifted to larger producers. However, in 2011, more than one-half of producers kept only one or two pigs. They are raised across the country, but are mostly concentrated in the Red River Delta and the Northeast. The pig population has been quite stable recently, largely due to unfavourable changes in output and input prices and disease outbreaks. However, the pig sector constantly supplies 74–80% of total meat in Vietnam, and provides about 14% of farm household income. MARD has implemented a number of policies to promote pig production for both smallholders and commercial farms, with priorities for larger-scale producers, with less focus on marketing.

Recently, Vietnam had a negative trade balance in pork due to a shortfall in the domestic supply and cheaper imports. The country mainly exports suckling pigs to Hong Kong and Malaysia, live pigs to China, and imports both pork and edible pig offal for food, which come mainly from the U.S., Canada, Poland, and Denmark. Pork imports exhibit an unstable pattern because they depend largely on the gap between domestic and import prices, which in turn depend on domestic production and demand, especially demand from the meat processing sector. Integration with the regional and world economies and the accompanying significant reduction in pork tariffs, especially in AFTA and ACFTA, may likely affect pig production in Vietnam. The direction and overall effects will need to be rigorously assessed for implications on the viability of smallholder pig production. Strict quality control of pork imports may be considered as a non-tariff barrier to protect both domestic producers and consumers. From a broader sector perspective, the Vietnam Government will need to consider how recent trade policies on tariffs for meat and meat products will likely affect domestic supply and prices. There is a concern that application of some non-tariff measures to protect domestic producers is an appropriate strategy to shield Vietnamese consumers from a proliferation of cheap but low-quality meat imports. In the absence of strong and compelling evidence, this will need further investigation to ensure policy recommendations are based on a rational examination of facts.

The production, distribution, and application of veterinary practices, medicines and other veterinary inputs are not properly regulated. Nor are the markets for veterinary services and products adequately monitored for compliance with appropriate standards. This subsequently leads to a proliferation of low-quality veterinary drugs and often ineffective treatment, resulting in higher risks to pig production and to veterinary and human health in general. There are a number of common diseases affecting pig production in Vietnam such as foot and mouth disease (FMD), porcine reproductive and respiratory syndrome (PRRS), classical swine fever (CSF), porcine high fever disease (PHFD), and swine influenza (H1N1). These diseases predominantly occur among small-scale farmers in middle and mountainous areas that are less well served and difficult to reach by public veterinary services. Moreover, in case of disease outbreaks, the Ministry of Agriculture and Rural Development (MARD) has always been prepared with emergency solutions to manage the situation, but implementation at a local level has been less than desirable and not effective at controlling diseases nor curtailing transmission and accompanying economic losses. However, few studies examine economic losses due to animal health problems in Vietnam.

With rapid changes in economic development and consumer preferences (e.g. higher percentage of lean, higher-quality pork), many exotic pig breeds (e.g. Landrace, Yorkshire, Duroc etc.) have been introduced to improve productivity and quality. These breeds enrich genetic resources, improve animal production, and diversify animal products. There has been no conservation strategy during the past decades due to a lack of effective breeding management. Import of new exotic breeds also led to the extinction of many indigenous breeds, and numbers of many others are decreasing rapidly. Their performance, feed conversion efficiency, or lean meat percentage are much lower than that of imported breeds and hence are less attractive from a purely commercial perspective. Nonetheless, indigenous pig breeds such as Mong Cai and Ban remain popular, with the Mong Cai particularly used as sows for crossbreeding to produce F1 pigs (crosses of Mong Cai and an exotic breed such as Duroc, for example), in smallholder pig systems.

The Vietnam Government is now paying more attention to genetic conservation. The quality of pig breeds has improved over time, which could be attributed to the 'leanization program'. Along with growth of the livestock sector in recent years, the use of artificial insemination (AI) has been increasing and the process is quite well-developed. However, there are still some constraints to improving composition of the national pig herd. Although farmers have been more active in supplying piglets for themselves, the majority still depend on outside sourcing, especially for good quality stock and during or after disease outbreaks. Farmers are generally unable to test or check the quality of piglets sourced from markets or traders that may be sources of diseases. Hence, better state control and management of piglets for sale in markets is necessary to better manage risks of disease transmission in the piglet trade. There is currently limited information about the contribution of the private sector to the development and improvement of pig genetics in Vietnam.

The feed sector is characterized by a small number of large manufacturers that have captured a large market share (most are foreign owned such as Cargill and C.P.). This market structure limits small farmers' ability to significantly affect feed markets. The high dependence of the domestic feed industry on imported feed ingredients such as maize, soybean meal, and pre-mixes also creates volatility in feed markets and exposes farmers to market risks. After officially joining the WTO in 2012, the government set tariffs for feed ingredients to zero, thereby allowing a free flow of imported feed ingredients, anticipating lower feed prices. However, domestic feed manufacturers and feed markets are not effectively organized to allow appropriate supply responses to these new trade policies, thus feed prices in Vietnam are much higher compared to other countries in the region. Expensive feed has led to expensive domestic pig production that compromises Vietnam's competitiveness in international pork markets. There is a need for a long-term strategy to develop a feed industry with less dependence on imports and more effective and transparent management of government trade policies on feeds. Research and development (R&D) on feed technologies that will enable cost-effective feed rations will enhance feed-cost efficiency across all types and scale of pig production.

Extension services are provided to farmers through short training courses, technology transfer by demonstration models, and organizing science and technology forums, specific festivals and exhibitions. However, the agricultural extension services provided to farmers mainly focus on promotion of crop production rather than livestock production. Although Vietnam's knowledge system has improved and expanded over time, it still faces constraints to the development process. Such constraints include (i) lack of human resources in both quantity and quality; (ii)

specialization of extension workers not yet meeting the actual requirements of farming activities; (iii) lack of capacity to support processing and marketing of products; and (iv) extension methods that do not yet satisfy the diverse demands of different farming systems. There is limited information available on the role of the private sector in Vietnam's knowledge system, including an assessment of the scope and impact of extension activities so that further studies should be considered.

The key source of credit for farmers is provided by the Vietnamese banking system through a diversified system of specific banks and credit institutions such as the VBARD, VBP, PCF, Joint-Stock Commercial Banks (JSCB), and State-Owned Commercial Banks (SOCB). However, only a limited number of smallholder livestock farmers are able to access these state-owned credit facilities. Access to informal credit is likewise limited or loan amounts are insufficient. Smallholders still face many difficulties in obtaining state-owned loans because they may lack land title, assets, a feasible production plan, or ability to generate income. The non-secured or non-guaranteed loan that is now widely available due to credit policy changes has met only a part of smallholder capital requirements, but unfortunately the credit institutions are often not satisfied.

Farmer capital needs are relatively high in general, particularly in rainfed regions of the country. Because of weather conditions that directly affect cropping patterns and animal husbandry practices, farmers are able to produce only one crop during the rainy season, even though they have enough labour and arable land for more than one crop. This subsequently limits opportunities to generate additional income. The ability to obtain credit to smooth cash flow throughout the cropping cycle has enabled some farmers to invest in productivity-enhancing technologies and subsequently improve their income. Conversely, the current lack of access by many farmers to credit has prevented them from realizing additional income by investing in improved technologies, which suggests that policies that help ease this credit constraint will be useful. There is a need to pay attention to rural women, who often play an important role in managing family capital as well as crop and animal production, particularly small livestock. Lending directly to women is considered an important motivation, which helps increase their confidence, offers a chance to earn more income, eliminates economic dependency, and increases autonomy. Requirements and procedures for loans need to be simplified. One important aspect is to minimize transaction costs for both creditors and debtors.

Rapid urbanization and rising incomes might encourage establishment of longer and more complex livestock value chains, but also increase concerns for food safety. These food safety issues are likely to pose new constraints on smallholder participation and their ability to compete in modern markets. There are food safety issues at all stages of the pork value chain, from pig producers to pork consumers. Developing a credible and transparent food safety system is especially critical in meat and meat products where quality and safety attributes are not usually visual. There is a need to generate robust empirical evidence to inform the debate on food safety and accompanying issues of health risks and quality problems, especially in meat production. There is limited updated information about the causes of food safety problems on human health, especially some diseases that are associated with consuming pork. More research should assess the effects of low and uncertain levels of food safety in livestock in general, and pork in particular, on human health. The government's role in managing food safety is important. However, this is a problem in Vietnam where agencies involved in this task are not well-coordinated and cooperation among these agencies is weak. The recently established Food Safety Law has not been effectively implemented due to weak coordination among responsible agencies, as well as a lack of capacity for risk assessment in institutions tasked to perform these functions.

Both smallholders and commercial pig farms have a comparative advantage in supplying the pork that the Vietnamese consumers demand. Some studies suggest that the commercial farms achieve higher returns than smallholders, which could be explained through the greater efficiency of labour and capital in commercial farms from economies of scale. Within household-based pig production systems, however, economies of scale have not been empirically supported by survey data. Also, despite falling output prices and rising input prices experienced in recent years, domestic pig production can still sustainably maintain its dominant market share by enhancing production efficiency. There are identified areas in feed and breed use that could potentially enable pig producers, particularly smallholders, to achieve efficiency gains through application of appropriate technologies with the right policies and institutions to support their uptake.

Under the existing production and market situation in Vietnam, all pig farms, on average, are protected through some implicit output price subsidies, with commercial farms relatively more protected compared with smallholder farms ( $NPC > 1$ ). Comparison across regions, however, shows that smallholder pig farms in the North and Central regions are less protected from market conditions (i.e.  $NPC < 1$ ), suggesting that they are effectively taxed as a result of government price policies. Negative incentive effects on smallholder farms are also implied ( $EPC < 1$ ), while commercial farms effectively receive a subsidy ( $EPC > 1$ ). This trend holds across regions, too. Based on estimates of a domestic resource cost ratio, it could be concluded that pig production generally has a comparative advantage ( $DRC < 1$ ). These further suggest that smallholders are able to remain as competitive as commercial farms, despite the latter continuing to benefit from implied subsidies from targeted government policies that support the development of large farms in Vietnam. The comparative advantage of smallholder pig producers is perhaps underpinned by their ability to generate efficiency gains from technology choices, specifically, use of crossbreeds that are locally adapted and can thrive under low-input systems through feeding strategies based on low-cost, locally available feed resources. With strong demand for fresh, unchilled pork by Vietnamese consumers, smallholder pig producers can supply local markets as effectively as commercial farms in the absence of a market failure.

Animal manure can provide nutrients for crop and fish production and input for biogas production, but if managed inappropriately, can also have a negative effect on the environment. In Vietnam, methane emissions from pig manure are about 85% of total methane emissions from livestock manure management. Pollution caused by pig production is also engendering environmental and public health concerns in rural areas and more seriously in suburban areas, where population density is high and the number of pig raisers has not significantly declined as desired by the government. This has two-fold implications—increasing risks in both animal health and human health, and aggravating social issues (conflict) in the community. There is a need to explore technical solutions to environmental issues from waste and odour generated from pig production. Research on technologies that reduce environmental pollution caused by animal production will help generate knowledge and evidence that will guide development of feasible and viable approaches. To reduce overall methane emission from livestock production in Vietnam, reducing methane emissions from manure should be given priority.

There are government and non-government institutions involved in R&D in the livestock/pig sector in Vietnam. The government focuses more on research on breeds and animal health, which is more likely to benefit large numbers of small farmers. Research on feed by government agencies has not been so successful according to industry experts. Technology in feed production is largely developed by the private sector or imported, which contributed to the dependence of Vietnam on imported ingredients. There is limited research on food/pork processing technology that is largely developed by the private sector at present. Public–private cooperation in livestock R&D is quite limited.

Vietnam's Ministry of Agriculture and Rural Development (MARD) has played a key role in designing pro-poor policies in agriculture and rural poverty alleviation. MARD has implemented a number of policies to support, invest in, and promote the development of the livestock industry and the pig value chain. However, there are still gaps that need to be considered, especially because MARD strongly emphasises the production side with little attention paid to product marketing and the accompanying issues of supply vs. demand, distribution, and prices. Therefore, smallholders might still face the risk of not being able to efficiently market their products or be able to secure markets for their produce.

One of the most important policies recently issued by MARD to support the livestock industry is the Livestock Development Strategy to 2020 that has recently been updated to reflect the government's policy directions to 2030. The main challenge faced in livestock sector development has been the weak policies (not strongly grounded on relevance and context of the country and its systems) as well as in the implementation of these policies (mismatch between targets and resources). A number of issues that pose significant constraints to the development of a pro-poor and well-functioning pig value chain can be identified—breed, animal health, feed prices, market and output prices, food safety, and waste and environmental pollution.

# Introduction

## Context

A rapid increase in per capita income in Vietnam during the last two decades has accelerated household expenditures, which increased from USD 214 to USD 512<sup>1</sup> during 1994–2011 (World Bank 2013). Food, the basic commodity in a household basket, is given more priority in the context of a transition period in the country like Vietnam. In the total expenditures of a Vietnamese household, food and drinks accounted for about 53% in 2012 (GSO 2012a). Among food items, animal-source food (ASF) is the main protein for Vietnamese consumers<sup>2</sup> (CIEM 2013), and the demand for ASF is rising due to population growth as well as consumer income. Pork is 73% of total meat consumption in the Vietnamese diet (Nguyen et al. 2006). ASF expenditures were about 30% of total household expenditures for foods and drinks in 2010 (GSO 2012a).

The livestock and fishery sectors are important in Vietnam, not only for supplying ASF for its growing population, but also for their significant contributions to the country's economy. Agriculture remains an important sector for providing a livelihood for more than 60% of the population and contributing about 20% of GDP in 2012 (GSO 2012b). Recently, Vietnam's Government has focused more on improving the competitiveness of the agriculture sector for both export-oriented products (such as rice, coffee, fish) and the domestic market (such as meat). Rising competition in both world and domestic markets for agricultural products, disease outbreaks, increasing input prices, and food safety and quality issues are just some of the obstacles to development of Vietnam's food and agriculture sector.

## Livestock production

Livestock production in Vietnam focuses mainly on pigs, poultry, beef cattle, dairy cows, and fishery products. Animals that provide food for human consumption in Vietnam are mostly pigs, poultry, cattle, and buffalo. Pigs are raised all over the country and contribute nearly three-fourths of total meat production. Beef cattle and buffalo are raised in the Red River and Mekong deltas, the Central Highlands, and mountainous areas. Poultry, including chickens, ducks, swans, and geese are also raised in households across the country for meat and eggs. Goats, sheep, and rabbits also supply meat for human consumption, but much less than pigs and beef cattle, and are not commonly available in markets but are mostly served in restaurants or food shops.

Dairy animals that provide milk for human consumption are mostly cows and in some cases goats. Rearing dairy cattle is quite new to Vietnamese farmers compared with other activities in the livestock sector. While it began in the early 1920s, this sector has just developed since 1990 and mostly at a small scale. The development of the milk industry, especially the emergence of milk processing companies, has recently stimulated milk consumption in the country.

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1. Constant 2000 USD.

2. The list of protein items includes meat/poultry/offal, eggs, fish and seafood, pulses/legumes/nuts, milk and milk products.



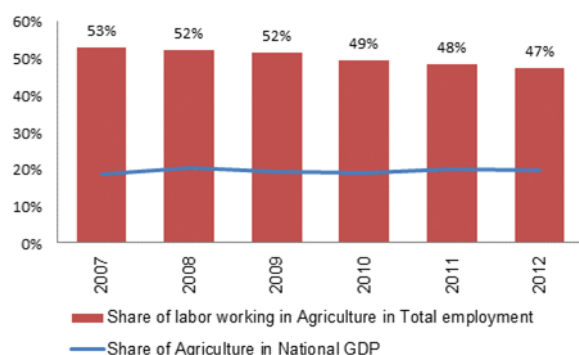
## Fish production

Vietnam, with a long coastline, huge tidal areas, and large areas of both fresh and brackish water, produces a number of fishery products. The main products include shrimp, fish, molluscs, and other processed products. There are both fresh water and marine shrimp in Vietnam. The primary species are black tiger shrimp (*P. monodon*), Pacific white shrimp, and white shrimp (*P. vannamei*). Fresh water and marine fish are marketed as both fresh and frozen products, although Vietnamese consumers prefer to buy live fish in markets. There are many varieties of fish in Vietnam. According to VTPA (2007), fresh water fish include 544 orders, 57 families, and 228 varieties. Other primary processed fish products include fish meal, dried fish, and fish sauce. Primary mollusc products are clams, squid, and octopods, one of the most important fishery export products. The fishery sector produces products by both catching and farming. Catching has shifted from small-scale manual fisheries operating in in-shore areas to a more modernized sub-sector with motorized equipment for offshore fishing, targeting high-value and export species. Catching activities contributed almost 80% of total fishery output during the 1990s, but this figure has recently dropped to 50% (GSO data, various years).

## Importance of livestock and fish in Vietnam

Agriculture contributed about 40% to total GDP and provided jobs for more than 60% of the labour force during the 1990s. These figures have decreased over time but at a different pace. While the agriculture sector has contributed about 20% of total GDP recently, labour working in this sector still remains high, accounting for about 50% of the total labour force (Figure 1).

Figure 1. Contributions of the agriculture sector to GDP and the labour force (%).



Source: GSO data.

The overall agriculture–forestry–fishery sector includes crop production, livestock, agriculture services, forestry, and fishery. Agriculture (crops, livestock, and agriculture services) contributed (72%) of total overall agriculture–forestry–fishery output value in 2012 (Table 1). The livestock and fishery sectors generated about 16 and 25% of total output value in 2012, respectively, and these figures are increasing over time. This is aligned with the MARD development strategy.

Table 1. Agriculture, forestry, and fishery gross output value in Vietnam, 2008–2012 (%)

Year	Agriculture, forestry and fishery (total)	Crops, livestock, and agricultural services	Livestock	Fishery
2008	100.0	73.2	14.8	23.6
2009	100.0	72.8	15.7	24.0
2010	100.0	72.4	15.8	24.5
2011	100.0	72.2	15.8	24.6
2012	100.0	71.9	n.a.	24.8

Source: Computed from various reports of GSO, various years.

There are no accurate data on employment in livestock and fishery production. However, according to GSO (2011), the total number of farm households was 9.58 million in 2011, of which 6.5 million were involved in livestock production (63% of total farming households) and 42% of total rural households. Livestock production may generate employment for a large number of rural households. Lapar et al. (2012) estimated that smallholder pig production generates huge employment nationwide, valued at approximately USD 3.3 billion or approximately 5.5% of Vietnam's GDP in 2007, and the pork value chain provides jobs to some 4 million people. ILRI (2011) also emphasises that household labour provides the main labour input for household-based pig production, and that female labour accounts for 1.5 times the labour use in household-based pig production. For example, if men spend an average of 1 hour per week in pig raising activities, then women spend 1.5 hours per week in pig raising. Tisdell (2010) found that household pig producers mostly rely on family labour, especially small-scale production. Gender issues in pig production are different among regions and scale of production. Women contribute more labour hours to tending pigs than men and the relative dependence on female labour tends to increase as holdings become smaller. Normally, men are involved more in the economic activity of the family that provides highest income. When pig production is small, unemployed rural women are often involved mainly with other duties such as taking care of children (Tisdell 2010).

CARD (2010) found that in Thua Thien Hue province, the majority of pig farms selected for upgrade were run by women, whereas in QuangTri, the gender ratio was skewed toward men. In large commercial pig farms, however, men often ran the operation (Hung 2011). Hired labour is found mainly on commercial farms but is not popular, and many are hired for daily wages and seasonally instead of as permanent employees.

In 2011, there were about 716,282 fishery households that accounted for about 7% of total farm households in the country (GSO 2011). Normally, fishery products are valued higher than crop production and livestock. Fisheries are larger scale compared to crop and livestock farms, occupying 21.7% of total agricultural land.

In Vietnam, agriculture, forestry, and fisheries still remain key income sources for rural households, with an average of about one-third of total household income during the last decade (Annex 1). Crop and livestock production contributed about 29% to total rural household income in 2010, compared to 36% in 2002 (Annex 1).

## Objectives of the study

This study provides an overview of past trends, the current status, and likely future directions of the livestock and fish sectors in Vietnam, with particular focus on the pig value chain. Pork is the dominant meat produced and consumed in the country. Key issues and gaps in development of the pig value chain are also identified.

Improving welfare for a large number of farmers, especially poor small farmers, is considered one target of the government policy on 'restructuring [the] agricultural sector towards greater added value and sustainable development' (MARD 2012). The value chain framework is identified as one of the approaches for livestock development. This approach requires understanding the broader national context and sectoral issues to complement value-chain assessments and analyses of the links from farm to fork, including proper disposal after use.



# The product

## Pigs

Pork is the most common meat in Vietnam and widely consumed by almost all Vietnamese. Along the value chain, pigs are produced as piglets, weaner/growers, fatteners, slaughter pigs, pig meat/pork (all types), offal, and processed pork products.

Piglets/suckling pigs are inputs for pig production. Farmers either produce the piglets on farm or buy from various sources, such as small farmers, who keep only a few piglets to raise from litters they produce. Piglets normally weigh from 10–15 kg at 40–45 days old. Piglets are also supplied by large commercial farms, state breeding centres, and nucleus farms of animal feed/food companies such as C.P., DABACO, and ANCO. A suckling pig is the new-born offspring of a sow that suckles its mother for milk for the first two to four weeks. Suckling pigs are normally processed to make ready-to-eat food. In the pig value chain in Vietnam, processed suckling pigs are not a common product produced at the household level, partly because of complicated cooking procedures that are not easily done by household consumers on a regular basis (i.e. roasting). Suckling pigs are mainly targeted for export to other locations such as Hong Kong.

Growers usually weigh from 20–35 kg at 70–80 days old. Growers are not as widely used by pig farmers because today not many farmers practise a grow-to-finish (fattening) pig production system. In some regions where demand for meat is low, growers weighing 30–35 kg might be slaughtered before they reach slaughter weight (usually from 80–100 kg liveweight) for meat and then marketed because retailer-cum-slaughter operators are generally able to sell all of the pork within a day. Such a practice is commonly found in middle and mountainous areas in Nghe An province, for example, where demand for pork is more localized and population density is lower compared to more urban areas (RIA 2013).

Finished pigs (or slaughter pigs) normally undergo four to five months of fattening, and weight varies greatly depending on breed and market demand. The volume of retail market demand for pork shapes the marketing behaviour of pig traders and farmers. For example, a finished exotic pig weighs 80–130 kg, while an indigenous pig weighs 10–40 kg. Finished pigs or slaughter pigs are the final product from the farm and are the type of pigs that usually move from farmers to collector, slaughterhouse, trader, or even individual consumers.

## Pig meat

Pigs are transformed into meat during the slaughtering process. Both pig meat and offal are edible products for human consumption. Vietnam's Ministry of Science and Technology defines meat as 'all edible parts of slaughtered animals, including edible offal' (TCVN 6162–1996) (Annex 2). The pig carcass rate in Vietnam normally varies from 65–75%, depending on breed and feeding practises. Exotic pigs produce higher carcass rates than local ones.

## Fresh meat and offal

The classification of pork meat cuts varies among countries. In Vietnam, where consumers mostly buy meat in open/wet markets, they often differentiate these meat cuts: head meat, shoulder meat, loin, bacon, leg, and ham. Bones (with meat) are generally identified as head bones, ribs, and hocks (Annex 3).

Among the meat cuts classified above, loin is the tenderest and usually the most expensive. Fresh loin is usually prepared at home for children, old people, and people on a special diet. Shoulder butt, ham, ribs, and belly are common meat cuts for daily home meals.

Blood is also sold fresh in markets or slaughterhouses, either separately or combined with the intestinal tract to make blood sausage.

Organ meat can be used for food as well, including the liver, gall bladder, stomach, and large and small intestines. Among these, stomach is the most expensive. Other organs such as the heart, kidneys, and lungs are also sold fresh in the market. Among these organs, heart is more expensive, even more so than loin.

## Frozen meat

Frozen meat is not preferred by Vietnamese consumers. In Vietnam, frozen meat is usually sold in grocery shops, convenience stores, supermarkets, or outlets of meat processing companies. Frozen meat is usually sold as meat cuts or ground meat, packed and labelled. During times of excess demand for meat and a shortfall in the domestic supply, meat imported to Vietnam is largely frozen, which accounted for approximately 0.2 and 0.1% of total pork supply in Vietnam in 2011 and 2012, respectively.<sup>3</sup>

## Processed pork products

Processed pork products in Vietnam take numerous forms, ranging from very simple, traditional products to the more sophisticated. Pork as processed commodities is driven by consumer demand for traditional processed products, especially during festivals and other traditional events.

Some simple and traditional processed products in Vietnam include:

- Steamed meat (head meat), tail, leg (trotter), and intestinal tracts (small and large intestines), blood sausage, liver, lungs, gall bladder, and stomach. These are prepared by small processors, and mostly sold on the open market.
- Ear meat is steamed, sliced, and mixed with special rice powder to make 'nem tai'.
- Pork loaf is made from lean meat (gio lua) and other variations of pork loaf depending on added materials (e.g. lean pork loaf with ear meat). Head cheese includes the ears, snout, cheek, tongue, and ham hocks (because they contain mostly skin and a small bit of pork meat). This is combined with black fungus, fish sauce, garlic and shallots, and black pepper corns and congealed to a chewy and crunchy goodness.
- Salted shredded meat (pork floss) is a common product, made from loin.
- Vietnamese/Chinese pork sausage is made from intestinal tract, lean meat, fat meat, pepper, and other spices.
- Roasted pork is made largely from belly/shoulder butt, or ham, suckling pig, or whole young pigs.
- Other products include salted ham, rump, roasted pork loaf, and fermented pork.

<sup>3</sup>. Assuming all frozen pork is from imports, estimated based on GSO and Vietnam Customs data, 2011 and 2012

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More sophisticated forms of processed pork products are produced by food and meat processing companies in Vietnam, which include sausage, pate, ham, canned meat, salted pork, pork loaf, fermented pork products, meat balls, and others. With the development of a meat processing industry in Vietnam through investments by large companies (e.g. Vissan, C.P), the expansion of modern retail distributors (e.g. Big C, Coop Mart, Hapro Mart), and a gradually changing life style of Vietnamese consumers, processed pork products have been appearing more often in daily meals, especially in urban settings.

## Summary

In Vietnam, live pigs for meat weigh from 10 kg to more than 100 kg, depending on final products, breed, and slaughtering patterns in specific areas of the country. Broadly speaking, pork is generally available as unprocessed and processed products, of which the former is more popular in the market. Unprocessed pork products are generally available as meat cuts and edible offal, and frozen cuts. Cuts sold in markets are generally meat and bones. Processed pork products can be categorized as traditional and modern products, the former are mostly produced by small processors, while the latter are mostly produced by large processors and marketed in modern retail distribution outlets.





# Consumption and expenditures

Livestock and fishery production provide animal source food (ASF) and are the main protein for humans. GSO Vietnam defines five protein sources: meat/poultry/offal, eggs, fish and seafood, pulses/legumes/nuts, and milk and milk products. A typical family meal for Vietnamese consumers (lunch or dinner) includes steamed rice, fish sauce/soybean sauce to eat with rice, a meat or fish dish, and a vegetable dish (Dung 2005). This chapter focuses on consumption and expenditures on pork and pork products by Vietnamese consumers.

## Consumption growth trends

### Consumption<sup>4</sup> of food from animals in Vietnam

Meat consumption in Vietnam increased significantly during 2002–2010. In 2002, an individual consumed 15.6 kg of meat per year (including all types, but mainly pork, chicken, and beef). In 2010, per capita consumption of meat was estimated at 21.6 kg, about 40% higher than during 2002 (Annex 4). Significant increase in consumption of other ASF was also observed, with per capita consumption of fishery products (mainly fish and shrimp) estimated at 16.8 kg/year during 2010. These consumption trends can be attributed largely to higher supply capacity from local production and improved household income, which allow consumers to buy more and diverse types of food. According to GSO data, per capita income during 2010 was equivalent to 2.9 times that during 2004, while the price index of agricultural products during 2010 was 2.1 (2005 as base), which stimulated domestic food consumption.

Meat consumption trended upward in both rural and urban areas. However, rural consumption of meat and other ASF products is lower than urban consumption in terms of quantity. In 2010, an urban consumer used 25.2 kg of meat while this figure was 20.4 kg in rural areas (Annex 4). For all ASF products, the consumption growth rate was higher in rural areas compared to urban areas. For example, the average annual growth rate of per capita meat consumption in rural areas was estimated at 6.8% during the 2002–2010, while this figure is about 2.1% during the same period for urban areas (computed from Annex 4). This is largely due to are relatively lower base of rural meat consumption and a higher growth rate of household income in rural areas (Annex 5).

Meat and fish consumption experienced negative growth during 2008, largely due to high inflation and high meat prices from a shortfall in the domestic meat supply and outbreaks of foot and mouth disease (FMD) and blue ear, which discouraged consumers from buying meat. Fish and seafood consumption are not much different among rural and urban areas as shown by GSO (2012a); per capita consumption of fish and seafood was 13.2 kg and 14.4 kg during 2002, respectively, and 16.8 kg (combined fish and seafood) during 2010.

Meat consumption patterns vary across different regions in Vietnam. Households in the Red River Delta (RRD) and the North East (NE) are top meat consumers, with per capita consumption of 29.7 kg and 28.9 kg, respectively, during

4. There are several sources of data for human consumption of ASF in Vietnam. FAO provides per capita consumption estimates based on total supply, and GSO provides per capita consumption estimates based on replicated surveys of about 46,000 households. Agromonitor (a Vietnamese joint stock company for market analysis and forecasting) provides reports on meat consumption based on its surveys. USDA also provides estimates for meat consumption.



2010 (Annex 6). Lower meat consumption and/or a lower growth rate in meat consumption are likely connected with regions having relatively more abundant sources of other types of ASF. For example, those regions having a long coastline or a river basin for aquaculture have more options for ASF other than meat.

Among types of meat consumed by Vietnamese consumers, pork takes the largest share, followed by poultry and beef. GSO (2012a) reports that chicken (including broilers) consumption was estimated at 5.8 kg/capita/year during 2010, and consumption of beef and buffalo meat was quite limited at only 2/kg/capita on average during the same year).

## Pork consumption

USDA (2011) data show that the trend for pork consumption was quite stable during 2007–2011 at about 21 kg/capita/year (Annex 7), compared with poultry (broilers) at about 6–7/kg/capita/year during the same period. Meanwhile, consumption estimates from VHLSS data are relatively lower. During 2010, per capita consumption of pork was estimated at 13.7 kg (Table 2). Using the same VHLSS data, pork consumption by an urban consumer during 2010 was about 14.8 kg/year compared to about 13.2 kg/year by a rural consumer (Table 2). The same pattern is observed for chicken and other poultry meat and beef. Recent trends show that rural consumption is catching up with urban consumption of pork in terms of quantity per person, with urban pork consumption growth slowing relative to that of rural pork consumption over the last decade. If this trend continues, the meat consumption gap, including pork, between the two areas will likely narrow and possibly converge over time.

Table 2. Per capita consumption of pork in Vietnam, selected years (kg)

Region	2002	2004	2006	2008	2010	Average annual growth rate (2002–2010) (%)
Country						4.5
Urban	13.5	15	16.4	14.4	14.8	1.2
Rural	9.1	10.7	12.1	10.2	13.2	5.6

Source: Calculated from VHLSS data, various years.

Although pork is the most important and popular meat in the Vietnamese diet, the share of total meat consumption has dropped from 62% in 2002 to 57% in 2010 (Table 3). Note that these figures might actually be considerably higher because out-of-home consumption of pork and processed pork products are not captured in these estimates. Pork accounts for about two-thirds of meat production (Figure 5), and the volume of pork imports is greater than exports. Shares of beef and chicken meat, on the other hand, have been increasing during the same period, although they are still relatively lower (and significantly smaller in the case of beef), in absolute terms, than that of pork (Table 3).

Table 3. Per capita meat composition in Vietnam, selected years (%)

Meat	2002	2004	2006	2008	2010
Pork	62.3	65.9	68.9	60.6	57.1
Beef, buffaloes	5.6	5.0	5.7	8.0	8.3
Chicken	21.6	19.6	17.6	21.8	24.2
Other poultry meat	10.5	9.5	7.8	9.6	10.4
Meat total	100.0	100.0	100.0	100.0	100.0

Source: Calculated from VHLSS data, various years.

Pork consumption was highest in the North East (NE) at 18.3 kg/capita during 2010, followed by the Red River Delta (RRD) and the North West (NW) (Table 4). Per capita consumption of pork was lowest in the South Central Coast (SCC), at only 9.7 kg during 2010 and equivalent to about one-half of that in the NW. Growth in pork consumption is highest in the NW, North Central Coast (NCC), and the Central Highland (CH), with per capita pork consumption during 2010 increasing by 50% compared to 2002 in these regions (Table 4).

Table 4. Regional per capita pork consumption in Vietnam, selected years (kg)

Region	Quantity (kg)			Comparison
	2002	2008	2010	2010/1002
Red River Delta	12.8	14.3	17.1	1.3
North East	13.1	13.2	18.3	1.4
North West	9.1	9.6	13.5	1.5
North Central Coast	8.3	9.0	12.6	1.5
South Central Coast	6.8	8.1	9.7	1.4
Central Highland	7.8	9.0	11.4	1.5
South East	10.5	12.9	12.2	1.2
Mekong River Delta	8.3	9.3	11.1	1.3

Source: Calculated from VHLSS data, various years.

## Expenditures for pork and other meats

Vietnamese consumers spend the largest share of their meat budget for pork, 34 and 38% in urban and rural areas, respectively (Table 5). Consumers in both areas also rank pork as the most important meat in the meat basket. While beef and carabeef are 28% of total meat spending for urban consumption, this figure is very low in rural areas, at 7%.

Table 5. Percentage of household meat budget spent on different types of meat and sea food

Type of meat and seafood	Urban households		Rural households	
	%	Rank	%	Rank
Pork	34	1	38	1
Beef and carabeef	28	2	7	2
Fish and seafood	20	3	27	3
Poultry	18	4	27	4
Total	100		100	

Note: Total figures may not equal 100% due to rounding

Source: ILRI (2010).

Among food and drink expenditures by Vietnamese consumers, spending on ASF is highest. During 2010, the monthly per capita expenditure for food and drink was estimated at VND 556,000, of which spending on ASF was about one-third (VND 180,500) (GSO 2012a). The share of food in total household expenditures was about 50% (Table 6) and accounted for at least 80% of total household expenditures for protein-source food (Annex 8). The proportion spent for meat is quite stable, 21–22% during 2002–2008 (Table 6).

Table 6. Per capita monthly spending for food and meat in Vietnam, selected years

Spending category	2002	2004	2006	2008	2010
Per capita monthly food and drinks ('000VND)	140.9	182.5	229.3	353.1	555.9
Food in total household expenditure (%)	52.0	48.6	47.6	47.1	49.7
ASF in total food and drink expenditure (%)	33.1	34.5	35.6	35.1	32.5
Meat in total food and drinks (%)	20.2	20.5	22.0	21.6	21.2
Meat in total ASF (%)	61.2	59.5	61.7	61.6	65.4
Pork in total meat (%)	63.1	65.1	63.5	59.4	53.9
Pork in total food expenditure (%)	12.76	13.33	13.96	12.86	11.45

Source: Computed from VHLSS data.

The growth rate of spending for meat in rural areas surpassed that in urban areas during 2008–2010, at 31% compared to 20% (Annex 9). This is largely due to a higher growth rate of meat consumption in rural areas compared to urban areas during the same period. The higher growth rate of meat consumption as compared to food consumption in rural areas (about 21 versus 19%, respectively) likely suggests the increasing importance of meat for rural consumers, but the trend is opposite for urban consumers. However, these numbers should be interpreted with care because meat expenditures might be underestimated in urban areas because expenditures for food eaten away from home are excluded. According to GSO (2012a), out-of-home food consumption is more predominant among

urban consumers than rural consumers (the former were about five times the latter during 2010), though expenditure growth is higher in rural areas. On average, out-of-home consumption per capita during 2010 was equivalent to about six times that during 2002 (GSO 2012a). Lachat et al. (2009) show that the consumption of out-of-home foods was also positively associated with the consumption of sugar, sweets, fruit, meat, and offal, especially in rural areas. Their study found that about 88–99% of those who eat out consume meat, poultry, and offal, and 43–48% consume fish and seafood. On average, pork accounted for 63% of total spending for meat during 2002, but this figure decreased to 54% during 2010 (Table 6), which is a little bit higher than those inferred from Table 5 provided by ILRI. Consumers also allocated about 12% of their total food expenditure for pork during the same period (Table 6).

According to Lapar et al. (2010), dietary patterns are increasingly shifting from a predominantly starch-based diet to one with a relatively high proportion of animal-sourced proteins, fruits, and vegetables. Vietnamese consumers tend to diversify their diet towards higher shares of seafood, poultry, eggs, and beef as their incomes rise, but pork remains the dominant meat in the diet (Lapar et al. 2012). The projections according to this study indicate that the proportion of pork in meat consumption will change minimally, with incremental changes in total meat expenditure. This suggests that demand for pork by Vietnamese consumers will keep growing, albeit at a slower rate, as their incomes increase.

## Demand for pork attributes

Most Vietnamese consumers prefer lean pork (Lapar et al. 2011). With rising awareness of food safety, especially toxic residues in pork, consumers are willing to pay a premium for improved meat quality. Consumers can assess lean meat in the market, but other attributes cannot be directly observed; hence, information about meat quality is asymmetric. Some quality information (e.g. carcass weight and liveweight, lean meat ratio) pertaining to buyer preference also filters down to the farm via traders, and pig farmers reported that traders prefer pigs with high lean meat ratio. Pigs fed with non-industrial processed feed are not preferred by traders and usually get lower prices because of low lean meat ratio and lower carcass rate. Meanwhile, a group of consumers who perceived that pork from these pigs tastes better and is safe, is willing to pay a premium.

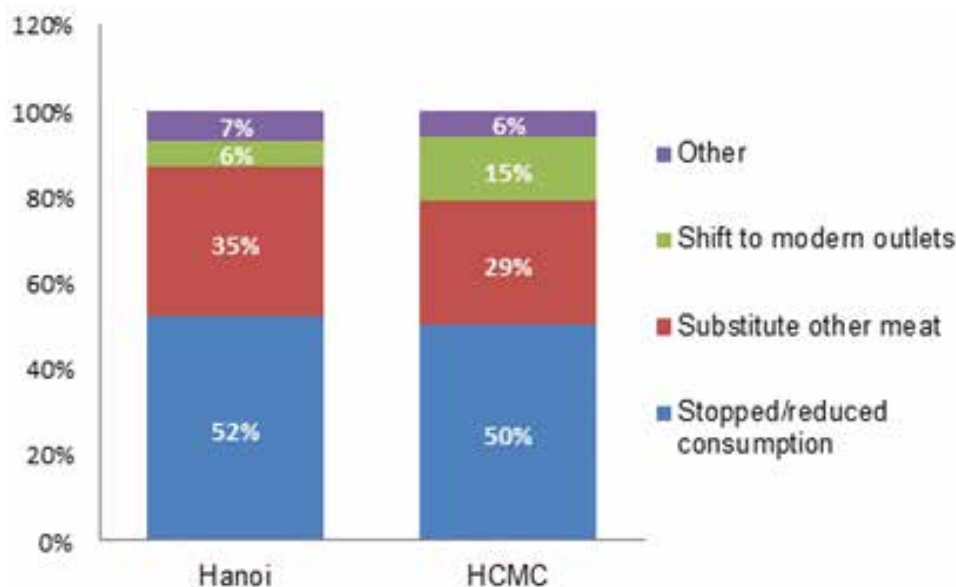
In addition to a high lean meat ratio, Vietnamese consumers prefer other attributes such as light colour, good smell and consistency, and freshness (Lapar 2010). Pork from black/indigenous pigs that are often perceived to have better taste and quality is also preferred. In addition, Vietnamese consumers have strong preferences for fresh meat over chilled/frozen meat because the cooking quality is better. Wet/open markets are the first choice of consumers to buy fresh meat, rather than modern retail outlets such as supermarkets and other food stores (Lapar 2010).

In addition to their strong preference for fresh, unchilled pork and lean meat cuts, Vietnamese consumers are also concerned about meat quality, especially in urban areas. More than one-half of surveyed consumers were willing to pay more for fresh pork with guaranteed improved hygiene, more than one-third (36%) of respondents were willing to pay more for pork with good colour, 30% for pork with less extra-muscular fat, 26% for pork from pigs not raised on manufactured feed, and 25% for pork with less intra-muscular fat (Pedregal et al. 2010). The premium for better quality meat depends largely on income and location. Vietnamese consumers were willing to pay up to VND 1800 (or 4.3% above average price) more per kg of pork with good colour or less extra-muscular fat (Lapar et al. 2010). Willingness to pay for pork from pigs not raised on manufactured feed was VND 1700 (or 4% above average price) more per kg. Consumers were willing to pay twice that amount for pork with improved hygiene, nicer colour, and less extra-muscular fat.

Meat safety is currently a top concern for consumers, especially after toxic residues were recently found in meat (clenbuterol, salbutamol, or the lean-meat additives). For example, Radio Vietnam (2013) reported that some pork samples in Binh Duong province were positive for toxic substances and Hanoi DARD found pork samples positive for Beta-Agonists (Giaoducvietnam 2012). Consumers are willing to buy safe pork at a higher price. Vietnamese consumers were willing to pay a premium of up to VND 2000 more per kg of fresh pork with better hygiene (5% above the average price) (Lapar et al. 2010). Certifying safe pork and gaining consumer trust are critical for the meat industry in Vietnam. RUDEC (2010) reports that about 36% of interviewed consumers were confident about the

quality of pork sold in the market, and fewer than one-third of respondents could easily find food of the same quality as before. According to the report, consumer trust in labelling is low, with nearly 56% of consumers agreeing that certification by veterinary authorities is not important when choosing meat. During a time of disease outbreaks, about half of consumers either stop or reduce pork consumption, while about one-third substitute other meats (Figure 2). More consumers in Ho Chi Minh City (HCMC) than in Hanoi have shifted to modern outlets for pork. Consumers also limited eating out to avoid low quality food (RUDEC 2010).

Figure 2. Consumer response to pig disease outbreaks.



Source: Lapar et al.(2011).

Vietnamese consumers prioritise convenience as one important criterion when selecting market outlets for meat. Two of the most preferred meat retailers are permanent markets and temporary neighbourhood markets (Table 7) (Lapar et al. 2010). Modern retail outlets are ranked lower by consumers in general. In terms of location, consumers in Ho Chi Minh City gave higher ranking scores for modern meat outlets than Hanoi consumers. Mobile meat vendors, a type of traditional temporary outlet for meat, were ranked lower in both places.

Table 7. Average rank score of market outlet preference, by location

Types of market outlets	Hanoi	HCM	Overall
Mobile vendors	2.83	2.61	2.74
Meat retailers in temporary neighbourhood market	1.29	1.67	1.43
Meat retailers in permanent open market	1.36	1.25	1.29
Meat retailers of branded meat	2.80	2.14	2.27
Grocery shops/convenience stores	3.42	2.95	3.13
Supermarkets	3.02	2.69	2.79

Note: Ordinal ranking was used with 1 as most preferred; hence, average rank with lowest value would indicate highest preference among respondents.

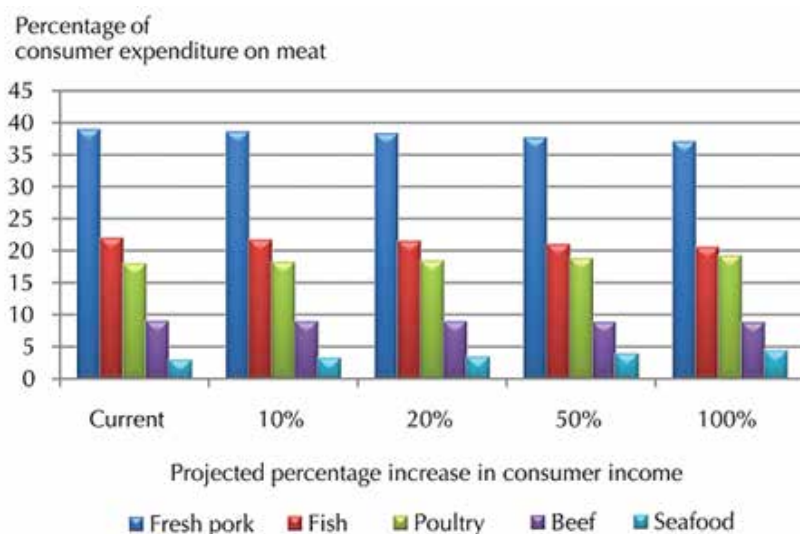
Source: Lapar et al.(2010).

Vietnamese consumers appreciate the quality and shopping experience of supermarkets, but low- and middle-income households generally buy food at traditional markets and small-scale shops because of better prices and more convenience (Figuíé and Moustier 2009).

## Likely market growth scenarios for pork

ILRI (2010) estimates expenditure elasticity for several types of ASF. Fish, fresh pork, and beef have elasticity of less than one, while seafood is quite elastic to expenditure. The study also projects that future increases in consumer income are expected to lead to a significant rise in consumer demand for pork and diversification of meat consumption to include seafood and poultry (Figure 3).

Figure 3. Projected expenditures for meat products based on scenarios of percentage increases in consumer income.



Source: ILRI (2010).

Minot et al. (2010) generated several projections for pork demand in Vietnam under different scenarios using the Vietnam Livestock Sector Model (VLSM).<sup>5</sup> The model estimates suggest that if Vietnamese per capita income growth over a 10-year period is 10%, consumption of traditional pork products (fresh, unprocessed pork) will grow at about 9% per year, and consumption of modern pork products (chilled, frozen, and processed pork products) will increase at 19% per year. Consumers will more likely shift towards consumption of modern pork products due to higher income elasticity, and partly because it is a tradable commodity. Under another scenario where there is no technological growth in the traditional pig sector (small-scale producers characterized by minimal use of hired labour, on-farm production of feeds, and use of local and hybrid breeds), consumption of traditional pork grows at close to 5% per year, while the consumption of modern pork products grows at about 14% per year (Minot et al. 2010). Nonetheless, the share of modern pork products will likely remain small, and only grow from 2% of total pork consumption to 4% over the 10-year projection period.

Overall, model projections show that Vietnam will remain self-sufficient in pork in the next 10–20 years. Rapid growth in domestic demand will likely absorb domestic production, leaving very little or none for exports. Indeed, VLSM model estimates suggest that pork product exports will likely phase out within 10 years in most simulated scenarios because of the rapid growth in domestic demand. The only exception is when there is a high rate of technological change within the sector that will significantly boost productivity, leading to a higher domestic supply.

## Summary

Meat consumption has been increasing in Vietnam as a result of rising income and changing consumer dietary patterns, from predominantly starch-based to a high proportion of animal source protein. Pork is ranked as the most important meat, and consumption has increased over the years—per capita pork consumption estimates range from 14 kg (based on GSO data in 2010) to 22 kg (based on household surveys by ILRI), on average. These estimates do not include away-from-home pork consumption. Per capita pork consumption in urban areas is higher than in rural areas, but the former experienced a lower growth rate during the 2002–2010 period. Vietnamese consumers generally prefer lean to high fat pork and are willing to pay a premium for meat with guaranteed quality. Consumers also prefer fresh to frozen/chilled pork, and prefer buying at open/wet markets for convenience and freshness, but this behaviour may change in future due to changing lifestyles of a new generation as well as expansion of modern retail outlets.

5. This pig sector partial equilibrium model was developed as a component of the project on Improving Competitiveness of Smallholder Pig Producers in an Adjusting Vietnam Market, with funding from the Australian Centre for International Agricultural Research (ACIAR).

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Pork accounts for about 57% of total meat consumed in households, a share which has declined over time, but at a very slow rate. In future, rising income and changing lifestyles may divert consumers to other meat and ASF products, while pork will likely remain the dominant meat in ASF consumption. Future demand will still be driven by population growth and rising consumer income.

## Information gap

Little is known about the away-from-home consumption behaviour of consumers in both rural and urban areas, which affects estimates of pork demand because these expenditures are growing. Also, consumption of processed products is still narrowly studied, especially the conversion of processed products to meat. Though pork demand is projected to increase, an updated study should be conducted considering emerging food safety issues that are an increasingly concern of consumers.



# Production

## Production systems and scale

Pig production is usually a component of mixed farming systems in Vietnam. Traditionally, rearing pigs has been a common activity in farm households, where use of leftover food to feed pigs is a usual practice and pigs are considered a form of savings (Kinh and Hai 2008).

There are four types of pig production in Vietnam— smallholder or backyard with 1–10 pigs, small-medium with 5–20 sows or 30–100 fattening, medium with 20–500 sows or 100–4000 fattening, and large with more than 500 sows or 4000 fattening pigs (Table 8). In 2000, commercial farms were classified as production units that produce more than 100 pigs/year or generate products with a value of at least VND 40–50 million. From 2011, a commercial farm is one sells VND1 billion, equivalent to pig herd of more than 200 sold in a year.

Table 8. Pig production holdings in Vietnam, classified by scale of production

Holding type	Herd size	% of national herd (1999)	% of national herd (2006)	Breed
Smallholders or backyard	1–10 pigs	80	64	North: mostly local South: mostly cross with exotic
Small-medium	5–20 sows or 30–100 fattening	10	20	Cross and exotic
Medium	20–500 sows or 100–4000 fattening	5	10	Exotic
Large	>500 sows or >4000 fattening	5	6	Exotic

Source: Kinh and Hai (2008).

Farms with more than six pigs accounted for only 2% of the total of pig farms in 1994 (Tunget al.2005). According to Vietnam's Agricultural Censuses for 2001 and 2006, the percentage of pig-raising households with at least 21 pigs rose from 0.3% in 2001 to almost 2% in 2006. At present, small-scale production predominates. There are more than 4 million pig-raising smallholders in the country, of which 52% are raising 1–2 pigs (Table 9) (GSO 2011). Household pig production supplies at least 80% of Vietnam's pork (Lapar et al. 2011).

Table 9. Scale of household pig holdings, 2011

Number of pigs	Share of pig-rearing households (%)
1–2	51.9
3–5	25.7
6–9	8.9
10–49	12.8
>50	0.8

Source: GSO(2011).



Many small mixed-production households that produced several different crops and raised pigs that consume by-products or excess crop production have become large farrow-to-finish production units. There is significant growth in the number of commercial pig farms in all regions in the country. In 2011, the total number of commercial livestock farms were 6202, or 31% of the total commercial farms in the country, of which commercial pig farms were 23% (Table 10).<sup>6</sup>

Table 10. Types of commercial farms in Vietnam, 2011

Type of farm	Total units	Share of total (%)
Cultivation	8642	43.1
Livestock	6202	30.9
Beef cattle	29	0.1
Pigs	4676	23.3
Chicken	1497	7.5
Forestry	51	0.3
Fishery	4433	22.1
Fish	455	2.3
Shrimp	3,399	16.9
Mixed	737	3.7
Total	20,065	100.0

Source: GSO (2011).

Among the seven regions in the country, commercial livestock farms are mostly concentrated in the Red River Delta and the South East, which account for 39 and 30%, respectively, of the total (Annex 10). In the South East, pigs are mostly raised on large commercial farms.

Ton (2010) provides another classification of pig production systems related to bio-security level, with characteristics of breeds, level of investment, and epidemic prevention practices of farmers. According to that classification, pig production systems are classified with either low, minimal, moderate, or high bio-security level (Annex 11).

Three feeding strategies are employed in pig production. Traditional pig producers use mainly leftover food and feed produced on their farms, without concentrated/compound feed. Semi-industrial pig production uses leftover food, feed produced on the farm, and compound/concentrated feed. The third group—industrial pig producers—uses almost all concentrated/compound feed. Normally, traditional producers are smallholders (fewer than five pigs), while semi-industrial and industrial categories apply to medium and commercial farms, respectively.

## Trends in pig production

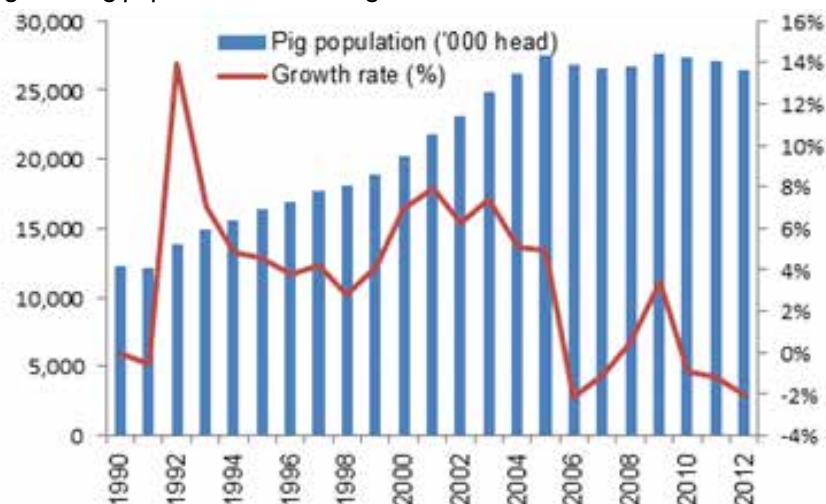
Pig population numbers exhibited a persistent upward trend during 1990–2012, although at a slowly declining growth rate (Annex 12). In 2006, an FMD outbreak reduced the total pig population, and Porcine Reproductive and Respiratory Syndrome (PRRS) occurred in 2008. The Department of Livestock Production in MARD has acknowledged that 2009–2010 was one of the toughest periods for livestock production in general and pig production in particular, due to widespread disease outbreaks, especially PRRS and FMD. Rising input costs (16% increase in electricity rate, 43% increase in the price of coal, 12–14% increase in feed prices, 20% increase in transportation costs, and 9% increase in interest rates) have also discouraged pig producers from expanding production. Problems in the marketing of pigs and pork, among other factors, might have caused a zero growth rate of pig production in 2010. There were issues along the supply chain in marketing of pig and pork from stable to table, where there exists a big gap between farm gate price and retail price, and between regions (MARD 2011). MARD also suspected that there

<sup>6</sup> The lower number is due to a change in criteria for commercial pig farms, set by MARD in 2011.

was speculation of live pig prices in some areas. Rising feed prices vis-a-vis relatively lower pig liveweight prices also discouraged farmers from expanding pig production (Annexes 13 and 14), especially in the latter half of 2012.

The growth rate of meat production, including pig production, is slowing for several reasons (Figure 4). The number of farm households engaged in livestock production has decreased over the years because of unfavourable movement of relative input–output prices, urbanization that draws land and labour out of the agricultural sector, environmental problems, and especially disease outbreaks. As long as the growth rate of meat production is greater than growth in demand (which depends on population growth and growth in per capita meat consumption), meat imports will largely depend on price gap (between domestic and import prices) and quality (mainly based on demand for high quality meat).

Figure 4. Pig population and annual growth rate, Vietnam, 1990–2012.

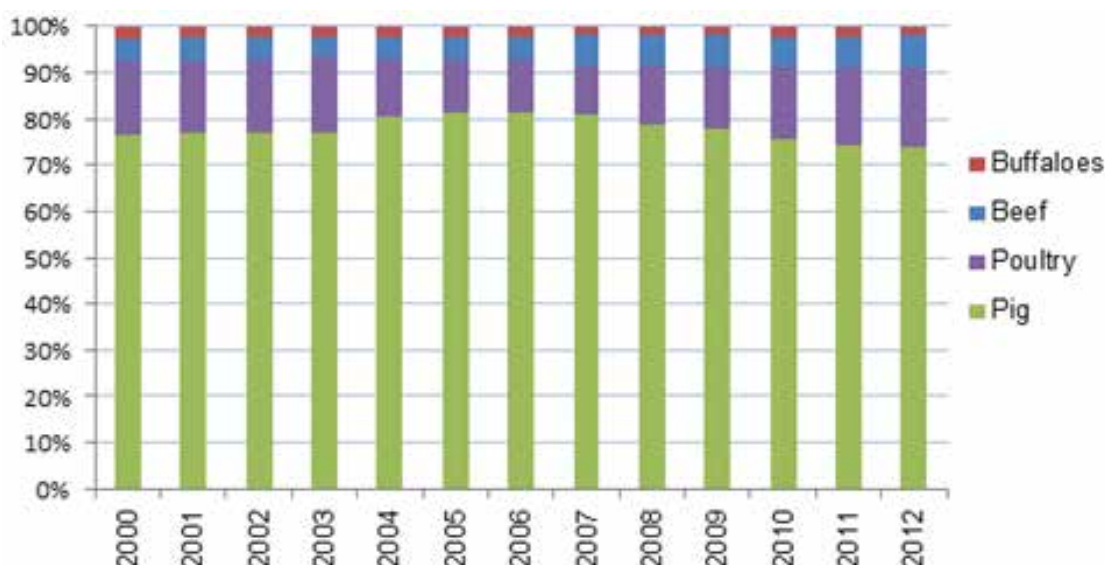


Source: GSO data.

Among livestock animals, pigs produce the highest volume of meat for human consumption, with total live weight estimated at 3.16 million tonnes in 2012, followed by poultry and beef (Annex 15).

The pig sector consistently contributed about 74–80% of total meat production in Vietnam during 2000–2012 (Figure 5), and pigs and poultry consistently make up about 90% of total meat production. The trends of their contributions are opposite, suggesting that these two products might be substitutes.

Figure 5. Share of major types of livestock products, 2000–2012.

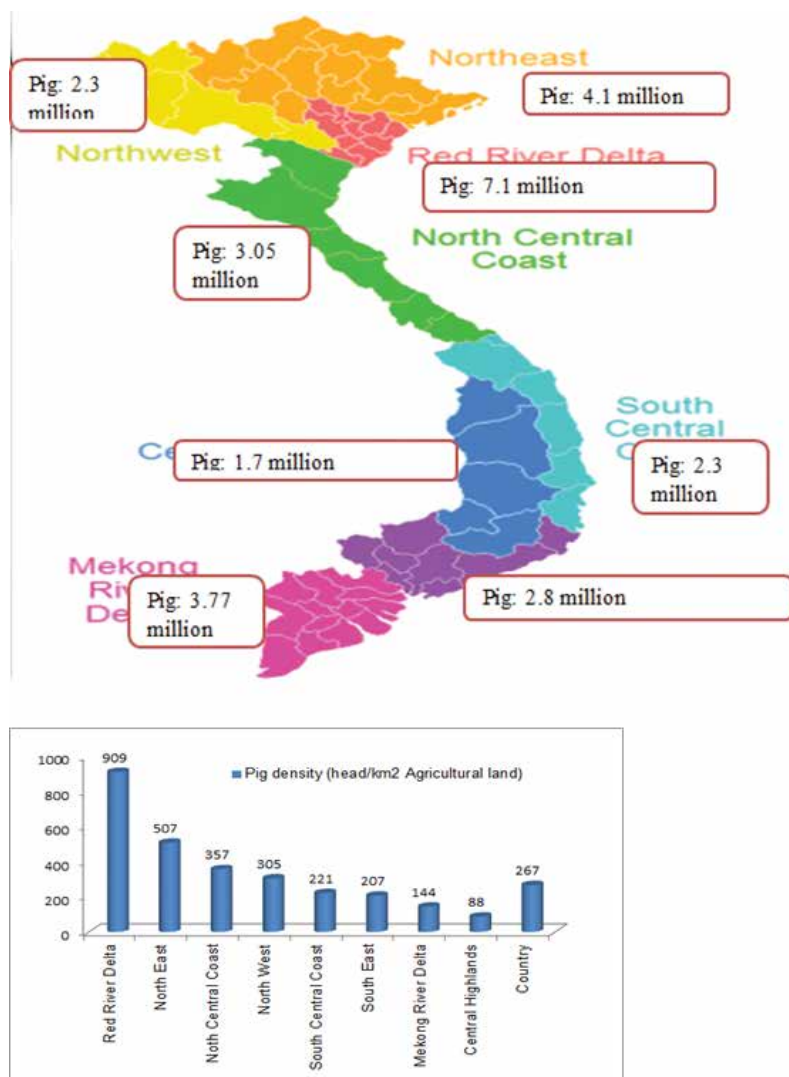


Source: GSO data.

## Distribution of pig production in regions

In 2011, the Red River Delta had the largest pig population in the country with about 7.1 million, and the Central Highland recorded the lowest number with 1.7 million (Figure 6). RRD had the highest pig density of 909 pigs/km<sup>2</sup> of agricultural land, followed by the North East and North Central Coast.

Figure 6. Pig population distribution and density in regions of Vietnam.

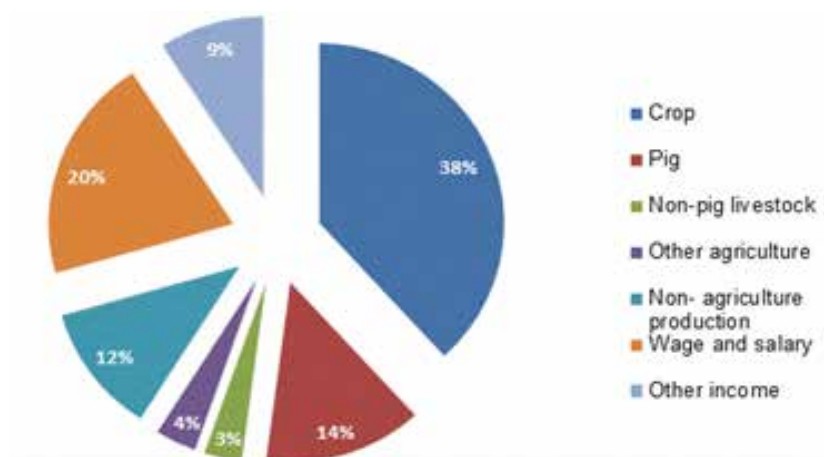


Source: GSO data.

## Contributions of pig production to the livelihood of smallholders

An ACIAR–ILRI–CAP (2008) study provides a comprehensive assessment of the state of pig production in farm households, as well as their contribution to livelihoods. Pig production generates about 14% of household income and one-fourth of total household income from agriculture (Figure 7). This source of income is important because it provides a source of quick cash in times of emergency or a shortfall in household cash requirement due to a crop failure, medical emergencies, a family death, natural disasters, or other reasons. Having access to assets that can be easily converted to cash allows households to smooth their consumption and also enables them to be more resilient against systemic shocks. This is particularly important for poor households that usually don't have access to financial institutions.

Figure 7. Pig income as a share of total household income.



Source: ACIAR–ILRI–CAP pig competitiveness project survey in 2008.

Pig-raising is and will continue to be part of farming systems in rural areas for its role as supplier of manure for crop production, biogas for cooking, and feeding fish in ponds. Even during times when pig raisers experience losses from pig raising for a number of reasons, some farmers still keep pigs because they are able to recoup the loss from other farm activities that are integrated with pig production, especially aquaculture (RIA 2013).

## Policies and programs supporting pig production

The Livestock Development Strategy to 2020 maps out the livestock sector development pathway as envisioned by the government. The strategy explicitly defines targets and directions and the accompanying policies that support them. The vision for the pig sector in this strategy is that of a modern sector that will see increasing shares of exotics *vis-à-vis* local pig breeds, increasing the share of closed production units with enhanced bio-security features, and establishment of modern slaughtering, processing, and market facilities that will service the needs of the sector. Not explicit in the strategy is the direction of development for small and household-based pig production, although later amendments to the strategy explicitly acknowledged the importance to the sector of these small yet dominant production units in Vietnam. A number of policies and programs that directly or indirectly support pig production in general are discussed below.

MARD implemented programs to develop crop seed and seedlings, animal breeds, and forestry seed during 2000–2010, to be continued in 2010–2015. The program to enhance the capacity to produce good quality seeds, animal breeds, fishery stock, and pigs is one focus. Under this program, organizations and individuals investing in production of foundation seeds and great grandparent breeds would be entitled to borrow development investment credit capital from the state and enjoy the highest tax incentives. National and local assistance funds for scientific and technological development will finance experimental projects on crop varieties or breed production and processing.

MARD gives priority focus for pig production in the RRD, North Central Coast, and the South East, where local government and line agencies are required to have incentives for pig production. The strategy for development of market-oriented pig production covers feed production, breeds, veterinary services, and marketing.

The Livestock Competitiveness and Food Safety Project (LIFSAP) is being implemented over five years in 12 provinces and cities in Vietnam. The project's development objective is 'to improve the competitiveness of household-based livestock producers by addressing production, food safety, and environmental risks in livestock product supply chains in the selected provinces'. LIFSAP includes three components—upgrading Household-based Livestock Production and Market Integration, Strengthening Central Level Livestock Production and Veterinary Services, and Project Management and Monitoring and Evaluation.

MARD (DLPand NIAS) joined SNV (Netherlands development organization) to implement the Biogas Programme for the Animal Husbandry Sector of Vietnam in 2003. This project continued to gain success and enjoyed high acceptance among provincial authorities and animal breeders. Since its implementation in 2005, the biogas program expanded from 12 to 46 provinces by 2010 (Dung 2011). MARD then approved the extended project for 2007–2012, implemented by NIAS.

MARD also prepares national programs in the field of agriculture and rural development, for example, the National Target Programme on New Rural Development and the National Food Security Program. Four other prioritized programs for 2011–2015 include: Improving the Competitiveness of the Livestock Sub-sector; Encouraging the Development of Livestock in Farmhouse, Industry and Slaughtering and Concentrated Processing; Developing Animal Feeds; and Control of Disease in Livestock.

A pilot insurance program for agriculture for 2011–2013, under which insurance for livestock production (buffalo, cow, pig, and poultry) was applied in nine provinces, and the poor enjoy special treatment, i.e. 100% of the insurance cost is paid by government.

To help reduce production risks and improve food security in pig production, MARD approved the Good Animal Husbandry Practises (GAHP) for pigs in households in 2011. MARD also introduced requirements for organizations qualified to issue VietGAHP certificates in pig, cattle, poultry, and bee production.

MARD signed an agreement with Sweden to implement the project Poverty Alleviation through Livestock Development for Northern Provinces in Vietnam, Phase 3 (2011–2014). The project was implemented during 2005–2010 by Sweden Development Cooperation (SDC), MARD, and Agronomes and Veterinaires Sans Frontieres VSF–CICDA (or AVSF).

Agriculture investors enjoy preferences and support from government in two main areas. They are charged lower rent or zero rent on land owned by the government, and receive support to rent land from individuals/private organizations (up to 50% in the first five years). Government provides other support for selected investors in:

- Labour training costs (up to 100% for very small enterprises investing in special areas),
- Market development support can be up to 70% of total cost of advertising,
- Consultant services support up to 50% of in areas of investment, law consultant, R&D, and others,
- R&D support up to 50% of the cost of research projects that aim to invent new technology, and
- Transportation support could be up to 50% of the cost of actual transportation, under certain conditions.

In emergency cases, MARD has implemented actions to solve problems in livestock production and food markets. For example, in September 2011, Vietnam experienced high meat prices and a shortage of meat in domestic markets due to disease outbreaks during 2010–2011 and high input prices. MARD proposed some emergency solutions to support livestock production to increase food supply and stabilise food prices, effective in the last quarter of 2011. Commercial livestock farms<sup>7</sup> enjoyed credit incentives (50% interest discounted) when buying/producing animal breeds to expand livestock production, and both large and small livestock producers were subsidized for vaccinations for PRRS and classical swine fever. Import tariffs for maize and wheat were reduced from 5 to 2% for maize and 5 to 0% for wheat. MARD proposed to cover more beneficiaries to include livestock producers, and also proposed to support individuals or organizations that establish livestock production facilities with modern equipment to reduce diseases and improve food safety.

7. Commercial farms are considered to make more efficient use of resources (land, labour), create employment, are likely to be new champions in agricultural production, and stimulate commercial production instead of self-sufficiency.

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## Summary

Pig production systems in Vietnam are broadly categorized by production scale—small, small-medium, medium, and large, but referring to pig producers either as smallholders and commercial farms makes it easier to identify them. Pig smallholders are estimated to supply at least 80% of total pork production in the country. The total number of pig rearers declined over the years and farmers have gradually shifted to larger scale production. In 2011, however, more than one-half keep one or two pigs. Pigs are raised across the country but are mostly concentrated in the Red River Delta and North East. The pig population has been quite stable recently, largely due to unfavourable changes in output/input prices and disease outbreaks. However, the pig sector consistently supplies 74–80% of total meat in Vietnam, and provides about 14% of rural farm household income. MARD has implemented a number of policies to promote pig production for both smallholders and commercial farms, with more priorities for the larger scale, and less focused on product marketing.

## Information gap

There is a lack of updated information on economic performance of pig production using different systems, scales, and breeds. The relationship between output/input prices and pig population has not been studied, nor has the supply response of pig production in Vietnam, including estimates of supply elasticity, particularly in smallholder systems. This is important in order to see producer behaviour to forecast the future.





# Trade in pigs and pig meat

## Importance of the meat trade in Vietnam

The meat trade is important in Vietnam for economic growth and also because it's critical in the country's economy. More than 4 million households kept pigs during 2011 (43% of total agriculture households), which contributed significantly to farm income and rural livelihood. Pork accounts for the largest share in the Vietnamese consumer's meat budget, so the price of pork may have significant influence on the food price index. In meat market disequilibrium, one policy intervention available to the government is through trade. Traditionally, Vietnam is not a net meat exporter, although this might no longer hold in the future when Vietnam further integrates into the world economy and if production efficiency improves.

Vietnam joined WTO in 2006, and as a member country it has to align with trade commitments to other members. Since 2006, Vietnam has had to comply with a schedule of tariff reductions for meat. The pork import tariff declined from about 30% (at WTO entry in 2006) to 15% by 2012.

## Exports

Export of livestock products from Vietnam is very limited. The export value of meat is quite low and has fluctuated over the years, from USD 59 million in 2008 to about USD 40 million in 2010 (Table 11). While other ASF exports recovered in 2010 after the economic crisis of 2008 and 2009, meat exports slowed in 2010. Generally, pork exports make an insignificant contribution to total exports from Vietnam, with the share decreasing from 0.1% in 2007 to 0.06% in 2010 (Table 11).

Table 11. Export of meat and other ASF from Vietnam, 2006–2010

Indicators	2007	2008	2009	2010
Export value (mil. USD)				
Frozen and processed meat	48.4	58.9	45.1	40.1
Fishery	3763.4	4510.1	4255.3	5016.9
Other ASF	65.6	129.2	101.1	131.7
Share of total agricultural exports (%)				
Frozen and processed meat	1.2	1.3	1.0	0.8
Fishery	50.6	46.5	48.3	43.8
Meat as a share of total exports (%)	0.10	0.09	0.08	0.06

Source: GSO Vietnam.

Traditionally, Vietnam had exported meat to a number of countries in Western Europe and Asia, but its export market has recently narrowed. Meat exports fluctuated widely during 2007–2012 (Figure 8), largely due to disease outbreaks and higher production costs. In 2009 and 2010, export values dropped sharply as a result of a shortfall in the meat supply for the domestic market, and disease outbreaks that caused many farmers to quit production.



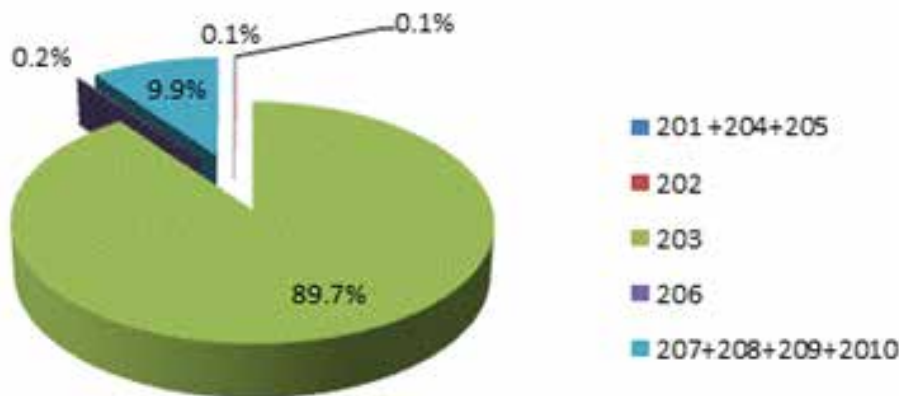
Figure 8. Trends in export of meat and edible offal from Vietnam, 2007–2012.



Source: Data from Vietnam General Custom Office.

Among livestock commodities exported from Vietnam, swine meat—fresh, chilled, or frozen —dominated with a share of about 90% during 2007–2012 (Figure 9), including carcasses and half-carcasses, hams, shoulders and cuts thereof with bone in for fresh, chilled, or frozen products. Export of other meat products is very limited.

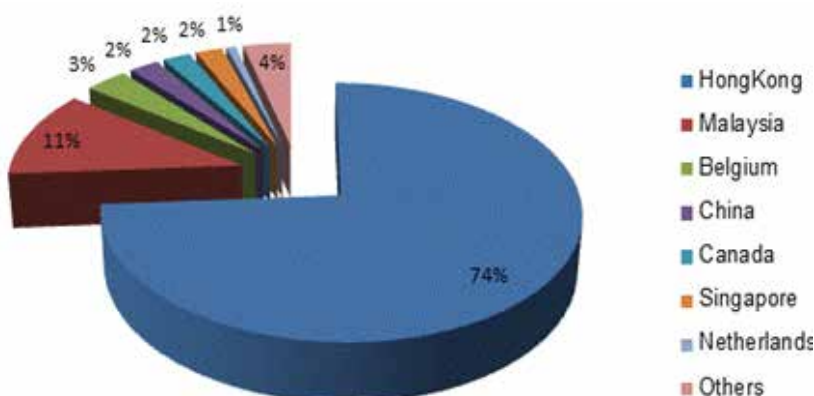
Figure 9. Value of meat exported from Vietnam, 2007–2012 (%).



Source: Data from Vietnam General Customs Office.

During 2007–2012, Hong Kong and Malaysia were the top importers of meat from Vietnam, with a share in export value estimated to be 74 and 11%, respectively (Figure 10). Vietnam exports mainly suckling pigs, and in the past it exported carcasses of pigs and suckling pigs (frozen) to Western countries. At present, most pork exports are live pigs to China (Minh Tam 2012).

Figure 10. Top importers of meat from Vietnam (% of value), 2007–2012.

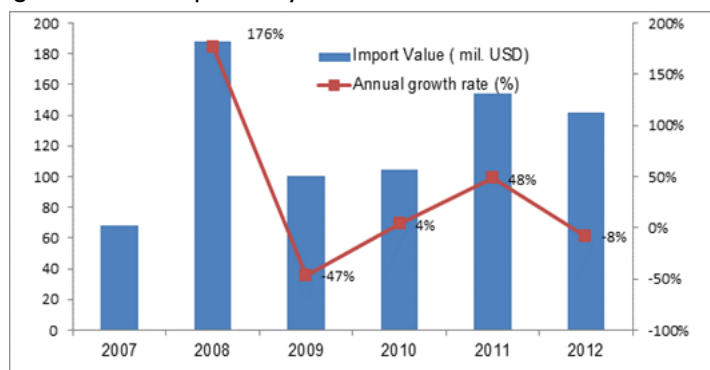


Source: Data from Vietnam General Customs.

## Imports

Meat imports climbed to over USD 180 million in 2008 as a result of a severe shortfall in the domestic supply. Demand for imported meat declined in 2009 because of a recovery and a decision specifying maximum residue levels for meat products. In 2012, total value of meat imports was about USD 142 million, down about 8% compared to the previous year (Figure 11).

Figure 11. Meat imported by Vietnam, 2007–2012.



Source: Data from Vietnam General Customs.

Edible offal was the largest share at 64.3% of total meat import value during 2007–2012, followed by other categories (Table 12).

Table 12. Breakdown of import values of meat and meat products in Vietnam, 2007–2012

Code HS	Description	Share (%)
201	Meat of bovine animals, fresh or chilled	3.1
202	Meat of bovine animals, frozen.	19.0
203	Meat of swine, fresh, chilled, or frozen	6.8
204	Meat of sheep or goats, fresh, chilled, or frozen.	2.6
205	Meat of horses, asses, mules or hinnies, fresh, chilled, or frozen	2.4
206	Edible offal of bovine animals, swine, sheep, goats, horses, asses, mules or hinnies, fresh, chilled, or frozen.	64.3
207	Meat and edible offal of the poultry of heading 01.05, fresh, chilled, or frozen.—Of fowls of the species Gallus	0.2
208	Other meat and edible meat offal, fresh, chilled, or frozen	0.2
209	Pig fat, free of lean meat, and poultry fat, not rendered or otherwise extracted, fresh, chilled, frozen, salted, in brine, dried or smoked	1.5
210	Meat and edible meat offal, salted, in brine, dried or smoked; edible flours and meals of meat or meat offal	0.0
	All	100

Source: Calculated from data of Vietnam Department of Custom (2007–2012).

In 2012, Vietnam imported 91,832 t of meat and offal, down slightly compared to the previous year (Table 13), mainly because of an abundant domestic meat supply and relatively lower prices in 2012. Poultry and offal are still the largest share of total meat imports.

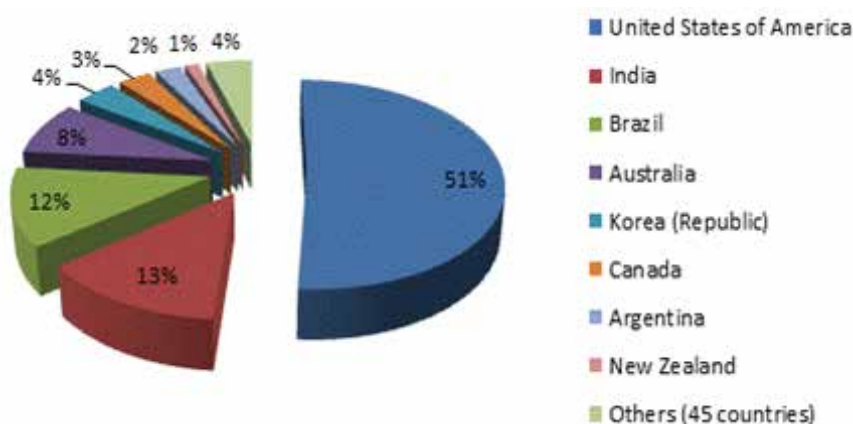
Table 13. Meat and offal imported by Vietnam, 2011–2012 (t)

Types of meat	2011	2012
Meat and offal of buffalo, goat, sheep	19,651	13,211
Pork and pig offal	6002	3287
Poultry and offal	76,521	74,196
Heart, liver, kidney of bovine animals	727	0
Heart, liver, kidney of poultry	4528	1138
Total	107,429	91,832

Source: Vietnam Department of Customs (2007–2012).

The U.S. is the leading meat exporter to Vietnam, about 51% of total meat import value during 2007–2012 (Figure 12). The U.S. and Canada are key suppliers of frozen pork. For frozen pig offal, Hong Kong, the U.S., Poland, Denmark, and Canada are the main suppliers. The U.S., Turkey, Hong Kong, and Brazil are the main exporters of chicken parts and offal to Vietnam. Vietnam imports beef mostly from the U.S. and Australia (fresh/chilled beef), and India (frozen beef) (Stanton and Sia 2009).

Figure 12. Value of meat imported by Vietnam, by exporter, 2007–2012.



Source: Data from Vietnam General Customs.

## Policies affecting the meat trade

MARD encouraged pig production for export during 2001–2010. The Ministry of Industry and Trade is responsible for exporting agencies and finding markets for pork. Vietnam is officially a member of WTO, AFTA, AC–FTA, and AK–FTA, and as such must comply with tariff reduction schedules.<sup>8</sup> Tariffs applied to chilled pork products were lower for AFTA, AC–AFTA, and AK–AFTA in 2012 or earlier, with 5, 0, and 20%, respectively (Table 14), except for meat products.

Table 14. WTO tariff reduction schedule for selected livestock and feed products, Vietnam

HS	Description	Current (2007)	WTO commitment			AFTA		AC–FTA		AK–FTA	
			At date accession	Destination	Implementation	2006	2010	2008	2010	2008	2010
0203	Chilled pork	30	30	25	2012	5	5	0	0	25	20
	Frozen pork	30	30	15	2012	5	5	0	0	25	20
0206	Edible Offal	15	15	8	2011	5	5	0	0	15	10
1601	Meat products	40	40	22	2012	50	30	30	30	35	35
2301–230	Bran	10	10	7	2010	5	5	10	10	10	8
	Soybean meal	0	5			0	0	0	0	0	0
	Feed	10	10	7	2010	5	5	10	10	10	8

Source: Vietnam Chamber of Commerce and Industry, VCCI (2007).

According to the schedule committed to WTO, tariffs for chilled pork were to be reduced from 30% in 2007 to 25% in 2012, and tariffs for frozen pork were to be reduced from 30% in 2007 to 15% in 2012. However, in late 2007 Vietnam experienced high inflation, with the consumer price index (CPI) increasing by almost 13% compared with the previous year. High inflation in the country, coupled with a 2008 shortfall in the meat supply<sup>9</sup> during celebration of the Tet holiday (the New Year in Vietnam), demanded quick measures to address the fiscal problems. The Ministry of Finance (MOF) reduced pork tariffs from 30 to 25%, earlier than the schedule committed. This, coupled with high input prices (feed), had seriously affected pig farmers.

8. AFTA: Commitments on “Free trade ASEAN” with tariff applied for agricultural products imported from ASEAN countries to Vietnam.

AC-FTA: Commitments on “Free trade ASEAN- China” with tariff applied for agricultural products imported from ASEAN countries and China to Vietnam. AK-FTA: Commitments on “Free trade ASEAN- Korean” with tariff applied for agricultural products imported from ASEAN countries and Korea to Vietnam.

9. As a result of disease outbreaks that killed about 500,000 animals (buffaloes, cows, pigs) and high feed and piglet prices (i.e. feed stuff prices increased by 60–100% compared to 2007, piglet prices increased by 106% (Agroviet 2008)

According to MARD statistics (Agro Viet 2008), frozen meat imported during the first eight months of 2008 tripled compared to the previous year when imported pork and offal was recorded at 8618 t. This contributed to a drop in pig prices and discouraged pig farmers. Agro Viet (2008) reported that the live pig price in the Northern provinces was down from VND 32,000-36,000/kg in early 2008 to about VND 26,000-30,000/kg in September 2008, and dropped even further to VND 25,000/kg in some places such as Thai Nguyen province. According to the Vietnam Feed Association, about 30% of commercial pig farms stopped raising pigs in August and September 2008 (Hong Van 2008). MOF then adjusted tariffs for selected commodities.

Pig and pork imports usually occur only when there are shortfalls due to disease outbreaks or a large gap between domestic and import prices, as recently experienced. Exports are still limited to historical destinations for specific pork products (suckling pigs) or those with historical bilateral ties that allow special treatment concerning SPS requirements (i.e. Russia). With WTO, Vietnam is committed to phase out tariffs on imports and exports. Reduced import tariffs on pork may stimulate growth of the pork processing industry, especially if domestic production costs remain higher than import prices. However, cheaper imported pigs and pork may again dampen domestic prices and hurt pig farmers. After joining AC-FTA, tariffs on unprocessed meat (including offal) were reduced to zero and this has created a flow of live pigs as well as pork between Vietnam and China during the past years. Some low-quality meat from China was exported to Vietnam, and the inspection and management of imported meat still remains a problem. For example, 550 kg of deteriorated pork was found in Lang Son port and was believed to have been brought from China with a destination of Hanoi in late 2012 (Xaluan 2013). In such cases, non-tariff barriers may be implemented if there is a perceived threat to the stability of domestic prices and the viability of domestic production (especially by those with strong lobby powers with the ruling party).

Domestic production will continue to be a viable source of pork to meet domestic demand because Vietnamese consumers strongly prefer fresh, unchilled pork. But increasingly, imports will sustain demand from the processing industry, especially if there is a big gap between domestic and import meat prices, and if demand for processed pork products continues to expand with increasing consumer purchasing power, demand for convenience, and variety.

## Summary

The pork trade is important in Vietnam because pig production provides about 14% of total farm household income and pork accounts for about 12% of total household food expenditures. Generally, the country has maintained a negative trade balance in pork recently due to a shortfall in the domestic supply and cheaper import prices. Vietnam exports mainly suckling pigs to Hong Kong and Malaysia, and live pigs to China. Vietnam imports both pork and edible pig offal for food, which comes mainly from the U.S., Canada, Poland, and Denmark. Pork imports show unstable patterns and depend largely on the gap between domestic and import prices, which in turn depend on domestic production and demand, especially demand from the meat processing sector. Integration with the regional and world economies may have an adverse effect on pig production in Vietnam, particularly with significant reductions in pork tariffs, especially in AFTA and AC-FTA. The overall effect will thus need to be rigorously assessed. Strict quality control for pork imports may be considered as a non-tariff barrier to protect both domestic producers and consumers.

## Information gap

Little is known about the economic performance of pork and pig exports, especially live pig exports to China, which can drive up domestic pig prices because trading capacity may be large because the two countries are geographically close. There has yet to be a study about the flow of imported pork from border to consumers, looking at quantity, price, and quality.



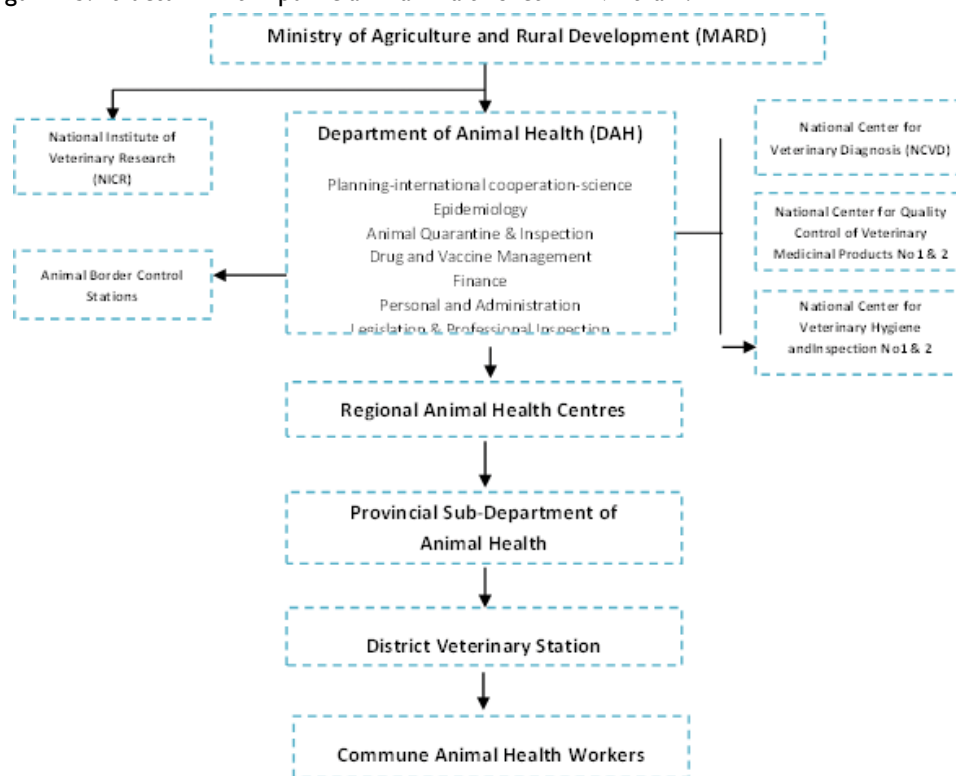


# Inputs and services—Animal health

## Structure of the animal health system

The animal health system in Vietnam includes both the public and private sectors, but is predominantly led by the public sector, which is systematically organized from the national to the commune level (Figure 13). The private animal health sector also plays an important role in providing animal health services, and is regulated and monitored by the public sector.

Figure 13. Structure of the public animal health sector in Vietnam.



Source: Fermet-Quinet et al. (2010).

## Public animal health sector

The Department of Animal Health (DAH) is part of the Ministry of Agriculture and Rural Development (MARD) and has seven functional divisions (Administration and Personnel, Financial, Epidemiology, Legislation and Inspection, Inspection and Quarantine, Drug Management, Planning-International Cooperation-Science) located at the head office in Hanoi, with another office in Ho Chi Minh City. DAH also has responsibility for the National Centre for

Veterinary Diagnosis, the two Centres for Quality Control of Drug and Bio-products, the two Centres for Veterinary Sanitary and Hygiene, and seven Regional Animal Health Centres. DAH also manages Airport, Harbour and Border Inspection Stations. The National Institute of Veterinary Research is directly under MARD. DAH does not have direct line management of the 63 Provincial Veterinary Sub-departments of Animal Health (PSDAH). The Provincial Sub-departments of Animal Health manage Inland Inspection Stations and District Veterinary Stations, which in turn have links with commune and village veterinary and veterinary para-professional teams (Fermet-Quinet et al. 2007, 2010).

There are seven Regional Animal Health Centres (RAHC) throughout Vietnam, each covering up to nine provinces. There is evidence of a breakdown in communication between RAHCs and the provinces. Although most staff in these centres are well trained, there is a need for more and better focussed training. Each RAHC has a very well equipped animal health laboratory mainly focussed on HPAI and FMD, but with the capability to carry out much more work on other diseases. Apart from the laboratories, the centres have three different sections—Administration and Information, Animal Quarantine and Inspection, and Epidemiology. Duties include surveillance, collaboration with, and assistance to provinces, supervision of disease prevention activities, evaluation and establishment of disease free zones, management of border crossings and highway check points, meat and veterinary hygiene inspection, and communication, extension and training (Fermet-Quinet et al. 2007, 2010).

Vietnam has a decentralized system of 63 autonomous provinces, each governed by a local Peoples' Committee. Animal health activities in the provinces are funded from the provincial budget, although funds for HPAI and FMD are received from the central government. Some provinces appear to be better resourced than others. Provincial Veterinary Sub-departments of Animal Health (PSDAH) employ graduate veterinarians and diploma veterinary para-professionals and seem to be adequately staffed. Training on epidemiology and GIS in particular have been undertaken in many provinces. Most of the provincial offices include a laboratory with variable levels of equipment for disease diagnosis and facilities for vaccine storage. The provinces are responsible for field animal health activities, abattoir and slaughter house inspection, checkpoints, and drug retail outlets/pharmacies. While regulations and procedures are provided by DAH, it does not have any direct control over provincial animal health activities except HPAI and FMD. Too many provincial Sub-DAHs are involved in the provision of clinical and pharmaceutical services to the public, even for pets (Fermet-Quinet et al. 2007, 2010).

The District Veterinary Stations (DVS) employ some veterinarians and veterinary para-professionals for designated veterinary activities (animal health, surveillance, and food safety). Some staff are under contract, others are civil servants. There are great variations between DVS in the country. In the largest districts, DVS is a strong structure involved in many activities linked to food safety, movement control, and animal health. In some places they sometimes seem to play a merely administrative role, organizing and controlling veterinary activities, and employing veterinary para-professionals on an *ad-hoc* basis. In other districts they are fully involved in vaccination campaigns and clinical activities. The links between district and commune levels are not clear, and differ from place to place. They implement activities in the field with the help of field commune veterinary teams that are accountable to and administered by the communes. Moreover, the DVS are sometimes more or less mixed with other agricultural services (plant protection and phytosanitary, extension services, animal production) (Fermet-Quinet et al. 2007, 2010).

Commune animal health workers usually include one or two veterinary para-professionals appointed by the Commune Peoples' Committee (CPC). There are wide variations in the competencies (from a few days to several years of training), duties, and rights of these staff. They are employed and paid either monthly or daily during vaccination campaigns, and are supposed to report any disease to DVS, but involvement of the CPC is not always clear. Supervision is lacking. In many cases this supervision is monthly and only due to the intervention of external programs supported by foreign aid agencies or NGOs. Some staff have not been supervised for years. The cost of such supervision would be sizeable, especially for local budgets. The additional cost of hiring supervisors for public vet staff would probably be beyond the budgetary possibilities of the Vietnamese authorities. Incidental or monthly supervision would not be considered as effective enough by many importing countries. This insufficient level of supervision could harm the veterinary service in the future if it were to be entrenched as an institutional duty. As the backbone of the veterinary services at the field level, they cannot be regarded as reliable, although they are obviously a much-needed workforce for the implementation of clearly determined tasks in the field under supervision of veterinarians or to act as the local farmers' voice for surveillance and alerting the veterinary services (Fermet-Quinet et al. 2007, 2010).

## Private animal health sector

Private veterinary practice and private veterinary medicine sales are regulated in Vietnam. Except for veterinary drug imports and production, there is no national database of private veterinary activities. Thus planning to support and control the private veterinary network is impossible. Each province usually has a list of licensed drug shops, and sometimes of veterinary practitioners. If drug shops seem to be regularly registered (easy to see and locate), it seems that an important number of veterinary practitioners are not registered (perhaps half of the para-professionals and a third of the veterinarians). Private veterinarians could number around 1 600 and private veterinary para-professionals around 30,000. The number of veterinary pharmacies and drug shops might be as high as 20 per district, but usually only one in remote areas. They could number several thousands (estimated at 3000) (Fernet-Quinet et al. 2007).

Private clinics are in most big cities and some provinces for pets and for animal production (mainly in the lowlands for poultry and pigs). They are usually owned by veterinarians who work with veterinary para-professionals. Their facilities are rather good (computers, diagnostic table, small equipment, and the usual drugs). These veterinarians and their staff are registered with local governments (Fernet-Quinet et al. 2007).

It is almost only in the big cities that drug shops are owned by private graduate veterinarians, many of whom also run a small animal clinic from the same premises. The huge majority of drug shops are held by veterinary para-professionals of non-specific qualification levels. Very often the seller is not a qualified person. Apart from merchandizing to farmers they seem to have little direct contact with farm livestock due to limited time to practise because selling brings higher returns (Fernet-Quinet et al. 2007).

## Major disease constraints and trends

### Foot and mouth disease (FMD)

FMD occurred sporadically between 2001 and 2005 in Vietnam. In 2001 and 2003, there were no FMD outbreaks in pigs. However, FMD outbreaks were numerous in early 2006 (46 out of 64 provinces were affected by FMD, with 2579 pigs infected from January to June). FMD was continuous from 2007 to 2012 with a high number of affected provinces as well as a high number of infected pigs in 2007 and 2011 (Table 15).

Table 15. Foot and mouth disease in pigs, 2007–2012

Year	Number of affected provinces	Number of affected districts	Number of affected sub-districts	Number of infected pigs	Number of culled pigs
2007	24	71	172	10,851	10,763
2008	5	9	12	67	39
2009	16	23	35	499	429
2010	14	30	39	1670	836
2011	35	239	1809	42,134	31,993
2012	12	29	59	2979	1222

Source: DAH (2010, 2011).

There were three serotypes of FMD, including O, A, and Asia I (O is the most common type). During late 2005 and most of 2006, Vietnam experienced an FMD epidemic with more than 800 outbreaks all over the country. FMD serotype Asia I has been reported in Vietnam, but the strain affected cattle rather than pigs, and the virus lineage is different from the Asia I virus lineage reported in China. The FMD serotype Asia I was found in the north near the China border, and in one province in the south bordering Cambodia. The outbreaks were suspected to have originated from unregulated movement of cattle and buffaloes from China and Cambodia (FAO 2007).



In 2012, FMD appeared in 59 communes of 29 districts. The infected animals included 226 buffalo, 112 cattle, and 2979 pigs, of which 12 cattle and 1222 pigs were destroyed. Compared to 2011, all numbers of provinces/districts/communes, outbreaks, and infected animals decreased significantly (MARD 2012).

## FMD surveillance system

In Vietnam, an FMD surveillance system has been established with assistance from FAO and OIE. In cooperation with OIE, the National FMD Control Plan was created for 2005–2010. FMD is considered one of the most important diseases and its occurrence must be reported on an emergency basis. Animal disease information and a disease reporting system has been established to report from the communal level up to the national level.

Regional Animal Health Centres immediately send staff members to the site for further investigation and sample collection for laboratory confirmation. Measures for control of outbreaks have been stipulated in the prevailing Veterinary Ordinance. FMD vaccination campaigns have been carried out regularly in provinces at high risk that share international borders, have intensive livestock production, and have had previous outbreaks.

## Porcine Reproductive and Respiratory Syndrome (PRRS)

This disease was initially detected in the northern part of Hai Duong in 2007, but some evidence of PRRS was found in Vietnam in 2000. Vietnam veterinary authorities immediately notified OIE that six outbreaks existed in North Vietnam. There were 372 susceptible animals, 133 pigs showed clinical signs of PRRS, 87 died, and 105 were disposed of (ProMED, 12 May 2007). OIE identified seven additional PRRS outbreaks in five other northern provinces. There were 2452 susceptible pigs, 1140 pigs with clinical signs, 580 deaths, and 184 pigs destroyed. Urgent measures were immediately carried out. The source of infection of all outbreaks was tracked (OIE, 19 April 2007).

In 2008, PRRS occurred twice in 953 communes/wards/towns of 99 districts of 25/63 provinces/cities. Total number of affected pigs was 308,901, and total deaths and culled pigs was 299,988 (Table 16). The first PRRS outbreak occurred mainly in the provinces of the northern central region. However, the outbreak of PRRS was fast due to slow detection, uncontrolled animal transportation, and late report by local veterinarians to higher levels, thus leading to high pig losses in a short time. The second PRRS outbreak was scattered in all three regions (North, South, and Central) but was controlled within a small area more efficiently due to the simultaneous application of many methods (e.g. culling with compensation from local governments, movement restrictions etc.).

Table 16. PRRS in pigs in Vietnam, 2008–2012

Year	Number of affected provinces	Number of affected districts	Number of affected sub-districts	Number of infected pigs	Number of culled pigs
2008	25	99	953	308,901	299,988
2009	N/A				
2010	N/A				
2011	15	49	264	42,317	26,519
2012	28	95	453	90,688	51,761

Source: MARD annual reports(2008–2012).

There were no reported PRRS outbreaks in Vietnam in 2009 and 2010. But PRRS occurred again in 2011, with 42,317 affected pigs and 26,519 culled pigs. In 2012, PRRS first occurred in January and 90,688 pigs were affected, 14,065 died, and 51,761 were culled. PRRS occurred sporadically from January to March, and then from April to July during the year.

In Vietnam, PRRS outbreaks are characterized as:

- Usually occurring sporadically throughout the year.
- An outbreak can last up to three or four months. An outbreak is normally contained within one month in some provinces.
- The mortality rate varies widely depending on the prevalence and vaccination rate.
- The virus isolated from PRRS outbreaks in 2012 was closely identified with the virus circulating in China, group SX-2009, which entered Vietnam in 2010 with a fairly wide distribution in most provinces.

The 2010 surveillance data collected from North Vietnam presented a new 2010 PRRS variant, while the mix of new and older variants was detected in other parts of the country. A large quantity of pig production in the north was produced in the Red River Delta, so this appears to be an optimal location for swine diseases. Most piglets originate from this area. The movement of pigs and pig production are the sources that cause the rapid spread of PRRSV. The sources of PRRS transmission into Hanoi and Hai Phong are local movement and regional export between northern and south Vietnam and export to Hong Kong (FAO 2008).

## Vaccine

Currently there are many vaccines that can be used to prevent PRRS. However, some vaccines from China are better at preventing spread of the disease. In 2012, the national government granted 800,000 doses of vaccine strain JXA1-R from China to pig farmers. This reduced damage to livestock, limited spread of outbreaks, and reduced the time to contain the outbreak.

## Classical swine fever (CSF)

CSF is a serious pig disease that causes huge economic losses for pig farmers (Kamakawa et al. 2003). In Vietnam, approximately 18,000 CSF-infected pigs are reported annually (Handistatus, OIE 2000). In the Mekong Delta, veterinarians usually diagnose pig diseases based on some clinical signs. There are fewer CSF cases compared to the other common diseases such as Salmonellosis and haemorrhagic septicaemia. It is easy to misdiagnose and confuse the symptoms of CSF with other common pig diseases (Kamakawa et al. 2003).

In 2012, CSF infected 4375 pigs, of which 1843 died or were culled. More than 8.31 million doses of vaccine were used. In 2011, the disease infected 1613 pigs, of which 1218 died or were culled (DAH 2012).

## Porcine high fever disease (PHFD)

Data from DAH show that more than 300,000 animal carcasses in 26 of 63 provinces/cities were disposed of during 2008 (DAH 2009). The pathogenesis of PHFD is unknown. Some research indicated a link between PHFD and PRRS virus (Tong et al. 1995). In general, the PHFD epidemic caused huge economic losses, however, no studies have yet assessed economic losses due to PHFD.

## Swine influenza (H1N1)

H1N1 is the first human influenza epidemic of the 21<sup>st</sup> century. This pathogenic agent can be transmitted between humans and swine and cause infection. H1N1 virus can interact with other viruses to become new viruses that threaten human health. Thus, it is essential to improve the surveillance of influenza viruses of pigs.

## Factors affecting the quality of pig health services

Very large investments in veterinary services have been made by both the Vietnamese Government and international donors, particularly in response to ongoing outbreaks of HPAI H5N1 in poultry. Such funding has flowed from national and international political pressure and improved planning output of the government, including the generation of medium- to long-term planning. It also has created significant improvements with physical resources and some aspects of technical capacity building at the central level, including much improved laboratory diagnosis and risk analysis capacity. At the field level, resources have poured into building offices and quarantine stations, purchasing vaccine (for FMD and especially HPAI), and creating an entirely new level of veterinary services with funding from the government, and the network of commune veterinary para-professionals at the field level. These steps obviously had some positive impact on veterinary services field coverage and activity (Fermet-Quinet et al. 2010).

However, some basic aspects of efficient veterinary services are less reliant on resources and training. Structural and organizational aspects of decision making and national coordination are seemingly blocking further progress, including in the ongoing battle with HPAI H5N1 in poultry. HPAI H5N1 has been endemic in Vietnam since 2004, generally occurring in annual 'waves'. Despite large injections of national and donor funding, outbreaks continue sporadically to this day. In 2010, Vietnam was one of only four countries globally with an ongoing endemic H5N1 situation in domestic poultry (the others were Indonesia, Bangladesh, and Egypt). Other countries in the Greater Mekong sub-region such as Thailand, Cambodia, and Myanmar have had occasional outbreaks over recent years, but these have been contained and eradicated relatively quickly, with improved capacity as experience is gained over time with additional outbreaks (Fermet-Quinet et al. 2010).

The most significant limitation within the Vietnamese Veterinary Services is the ongoing lack of effective national coordination that links central veterinary services with the field. Two related efforts are needed to generate such links throughout the different veterinary services levels to stakeholders: (i) an effective chain of command; and (ii) communications and consultation approaches. Having links between the central veterinary services and lower level veterinary services/stakeholders is of vital importance to efficiently functioning veterinary services. Unfortunately, Vietnam does not have sufficient mechanisms for an effective chain of command, nor regular, formal consultation, and therefore cannot effectively link central to field. Therefore, irrespective of funding levels and resources available, these inadequate links will continue to limit progress (Fermet-Quinet et al. 2010).

In terms of impacts, the relative separation of central from field negatively affected capabilities relating to surveillance and reporting up the line, as well as the ability of policies to be implemented to field level down the line. This was most clearly demonstrated by difficulties in rapidly and efficiently responding to outbreaks, and ultimately their persistence as endemic diseases.

In addition, a lack of standardized knowledge and skills from field veterinarians and veterinary para-professional staff and issues with stakeholder compliance (particularly farmers) also hinders progress. These may be current gaps more easily amenable to targeted funding and dedicated projects, such as those to improve initial and continuing veterinary and para-veterinary education, the establishment of a Veterinary Statutory Body and delivery of more effective animal health communications to stakeholders (Fermet-Quinet et al. 2010).

## Policies related to animal health

Policies supporting animal health services in Vietnam cover a wide range of regulations about (i) the procedures for veterinary medicine testing and experimenting; (ii) inspecting veterinary medicine quality; (iii) inspection and certification for production and trading of veterinary drugs, biologicals, microorganisms, or chemicals used in veterinary medicine and aquatic animal health protection; and (iv) the national technical standards of veterinary hygiene conditions. These policies have significant contributions to the development of the animal health services in Vietnam (see Annex 17.1 for more detail of each policy).

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## Summary

In Vietnam, the production, distribution, and application of veterinary practises, medicine, and other veterinary inputs are not properly regulated nor are the markets for veterinary services and products adequately monitored for compliance with appropriate standards. This subsequently leads to a proliferation of low quality veterinary drugs and low treatment effectiveness, resulting in higher risks in pig production and the public veterinary and human health in general. There are a number of common diseases affecting pig production in Vietnam such as foot and mouth disease(FMD), porcine reproductive and respiratory syndrome (PRRS), classical swine fever (CSF), porcine high fever disease (PHFD), and swine influenza (H1N1). These diseases predominantly occur on small-scale farms in middle and mountainous areas that are less served and difficult to reach by public veterinary services. Moreover, in the case of disease outbreaks, MARD always has been prepared with emergency solutions to manage the situation, but the implementation of these programs at the local level has been less than desirable and has not been effective in controlling disease spread nor curtailing transmission and accompanying economic losses. There is a lack of studies that examine the economic losses due to animal health problems in Vietnam.



# Inputs and services—Pig genetics

## Structure of the animal genetics sector

A number of organizations are involved in pig genetics, including the national government, research organizations, training institutions, and NGOs. These organizations play different roles in livestock breeding and genetics. In addition, the private sector (feed companies) also contributes to the development of livestock breeding and genetic conservation.

### National government

The Ministry of Environment and Resources, along with other ministries, is responsible for implementing and managing the Convention on Biodiversity and general government policies on animal genetic resources.

The departments of Agriculture and Extension of MARD are responsible for sector policy and planning. These departments are also responsible for directing and coordinating technology transfer, production, and marketing. The Agriculture Forestry Extension network reaches to the commune level, and makes significant contributions to livestock production, including breeding programs (FAO 2003).

### Research organizations

The National Institute of Animal Sciences (NIAS) and the National Institute of Veterinary Research (NIVR) carry out more than 80% of research activities on animal and veterinary science all over the country. The balance is undertaken by the Institute of Agricultural Science (IAS) in the South and the other six agricultural universities (Hanoi University of Agriculture, Thai Nguyen University of Agriculture and Forestry, Hue University of Agriculture and Forestry, Taynguyen University, Ho Chi Minh University of Agriculture and Forestry, and Cantho University) (FAO 2003).

NIAS is responsible for research on all aspects of livestock production and for implementation of research results to production. The main subjects of NIAS include biochemistry, biophysiology, genetics, nutrition, reproduction and artificial insemination, embryo transfer, rare animals and biodiversity, poultry, cattle, and pig production. Research is carried out in 10 research departments, 12 animal research centres from north to south, and also in small households and state farms. Most of the farm animal conservation activities are carried out by NIAS researchers. NIAS has 1174 staff, including 62 PhDs, 84 MScs, and 346 engineers or bachelor's degree holders (NIAS 2010).

With the investment of the Vietnam Government and international support through research projects, the current research facilities of the institutes are comparable to others in the ASEAN region. Nevertheless, these institutes need more investments in research facilities and staff training. Human resources at these institutes are inadequate. The major constraints to attracting well-educated personnel for research activities are low salaries and inadequate mechanisms to recruit permanent staff (FAO 2003).

## Training institutions

The formation and training system in Vietnam includes six agricultural universities under the direction of the Ministry of Education and Training. MARD is also responsible for training farmers and staff, and operates some secondary schools of agricultural technology (FAO 2003).

The universities offer training at the BSc, MSc, and PhD levels. The BSc training program can be completed in four or five years. Training focuses on theory, and there are few chances for practical applications. Postgraduate training is also offered at some institutes (NIAS, NIVR, IAS). There are more opportunities to study abroad funded by international projects and support from both the Vietnamese government and bilateral cooperation.

## Non-governmental organizations (NGOs)

Non-governmental organizations include national and international NGOs, such as the Women's Union and Elderly Club, also play an important role in collection and conservation of farm animal breeds. The native breeds are conserved more successfully if they are kept closely linked to cultural activities.

NGOs and international organizations take part in agriculture activities, and environment and natural resources protection, especially forest, marine, and salt-marsh forest ecological systems. Those organizations take part in consultative activities and technical assistance concerning exploitation and conservation of natural resources, especially biodiversity. These organizations include UNDP, FAO, IUCN, WWF, Birdlife International, Fauna and Flora International, and CIRAD. CIRAD has cooperated with NIAS since 1999 to study farming deer biodiversity and will have further projects on biodiversity conservation and animal characterization.

## Composition and trends of the national pig herd

Until the 1970s, most pig breeds were indigenous with low performance. The indigenous pig breeds include I, Mongcai, Baxuyen, Thuocnhieu, Meo, Tay Nguyen Soc, Muongkuong, QuangTriMini, SonVi, Ban, Langhong, Co, and H'mong. The currently popular native pig breeds are Mongcai and Ba Xuyen. They are being raised in small households or in remote areas where the low input-low output system is predominant. The Mongcai breed is kept mainly in the Northern Mountains and Midlands, the Red River Delta, and North Central Coast. The Muongkuong, Meo, Co, and Soc breeds are only kept in some limited areas in the North and Central Regions of Vietnam. The Thuocnhieu, Baxuyen and Phu Khanh breeds are distributed mainly in the South; they are crossbred between exotic and local breeds that have existed for hundreds of years. They are now well adapted to local conditions and their body size is usually bigger than other local breeds in the North. Some local breeds were used as a baseline for crossing with exotic breeds, and lean meat percentage increased from 33.6% in the local breed to 42.6% in F1 (1/2) and 48–52% in F2 pig (3/4 exotic blood component) (FAO 2003).

The Vietnam pig sector includes several production systems (Table 17) (ILRI 2009). Each production system has its own importance for producers and economic development in different regions of the country. They can be classified as two main types: (i) resource-driven (scavenging and backyard fattening pig production systems); and (ii) demand-driven (small-, medium-, and large-scale pig production systems). The scavenging system is predominantly practised by the H'Mong ethnic group and the pig genotype is a Vietnamese breed called 'Ban' or 'Meo'. Sows, boars, and piglets in this system spend most of their time looking for their own food in the villages. The backyard fattening system is practised in all regions of the country, where pig genotypes are diverse, including local breeds, crossbreeds, and even exotic breeds. In this system, the pigs grow slowly with a high fat content; the main advantage is very low input requirements.



Table 17. Characteristics of pig production systems in Vietnam, 2008

	Scavenging	Backyard Fattening	Small-scale	Medium-scale	Large-scale
<b>Herd</b>	1 sow + piglets + 1-2 fatteners	1 <> 10 fatteners	1 <> 10 sows > 10 fatteners	10 <> 500 sows + fatteners	> 500 sows + fatteners
<b>Level of intensiveness</b>	Scavenging	Semi-intensive	Semi-intensive	Intensive	Intensive
<b>Location</b>	Remote districts / communes especially in northern uplands, central highlands ...	Lowland and midland areas	Lowland and midland areas	Lowland areas	Lowland areas
<b>Genotype</b>	100% indigenous	All types	All types for sows 100% indigenous for niche market. Cross-bred or 100% exotic for fatteners	100% exotic. Sometimes cross-bred sows.	100% exotic.
<b>Feed</b>	Scavenging	Kitchen wastes + ...	Agriculture by-products + kitchen wastes + factory concentrate	Factory complete feed. Sometimes agriculture by-products + factory concentrate.	Factory complete feed.
<b>Technical Services</b>	None or veterinary para-professional.	None or veterinary para-professional.	None or veterinary para-professional.	Own or veterinarian from animal feed company. Veterinary pharmacist.	Employ own veterinarian (s).
<b>End products and destination.</b>	Piglets for neighbors Fatteners for local market & family events	Fatteners for local market & family events	Piglets for neighbors and for traders (supply of upland areas) Fatteners for rural markets. Fatteners of indigenous breed for niche urban market.	Fatteners for urban markets	Fatteners for urban markets
<b>Ownership</b>	Rural family	Rural family	Rural family	Rural family or investor	Family enterprises; State farms; Foreign enterprises.

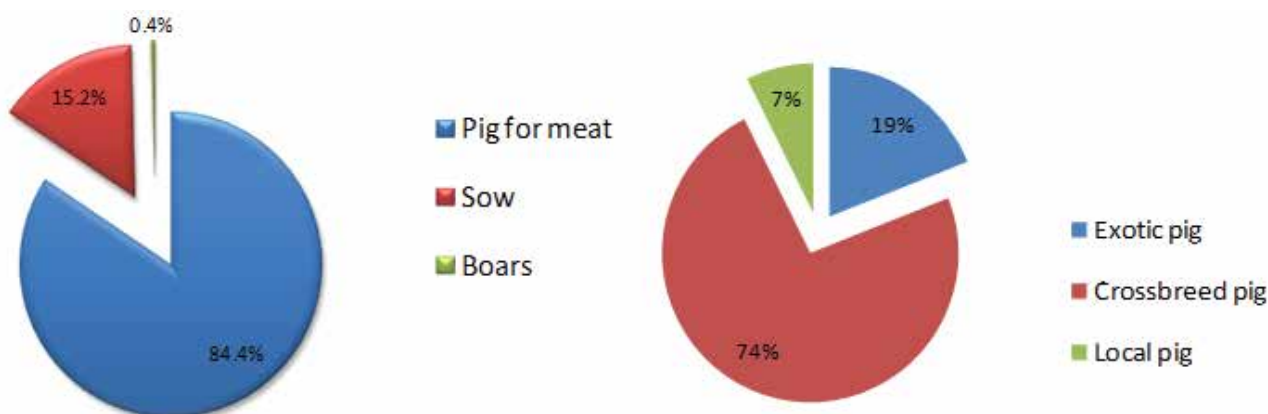
Source: ILRI (2009).

The small-scale pig production system could be classified into two subsystems—small-scale fatteners and small-scale semi-intensive sow rearing. The small-scale fatteners normally are raised from two-month-old white piglets (usually the result of crossing a Mong Cai sow and an exotic boar) bought from traders and fed in a semi-intensive way for at least four months. The small-scale semi-intensive sow rearing system, on the other hand, produces cross-bred piglets and fatteners. It normally has one or two sows (Ban or cross-bred) and either uses a white cross-bred boar or artificial insemination of purchased exotic boar semen from neighbouring districts. For medium-scale pig production systems, most of the sows and all terminal boars are 100% western genotypes except for some small farms where cross-bred sows (indigenous x exotic) are still used. The large-scale piglet and fattener production system is mainly located in southern Vietnam where the genotypes come from suppliers of high-quality exotic gilts and boars (ILRI 2009).

With rapid changes in economic development and consumer preferences (high percentage of lean, high quality pork), many exotic pig breeds (e.g. Landrace, Yorkshire, Duroc etc.) have been introduced to Vietnam to improve pig productivity and quality. The total number of pigs in 2010 was about 27.4 million (GSO 2011), of which about 84% were raised for meat production, 15% were sows, and less than 1% were boars. In past decades, the government implemented some policies and programs to improve the efficiency of the livestock sector, especially pig production, such as a 'leanization program' by importing good exotic breeds to cross with local pig breeds. As a result of this program, the national pig herd in 2010 included 74% crossbreeds, 19% exotic breeds, and only 7% local pigs (Thanh 2011) (Figure 14). About 140 pig breeding units and enterprises are keeping the grand grandparent pig (GGP) and grandparent pig (GP), with about 321,000 pigs, of which 8000 are GGP exotic sows (Thanh 2011). There are nine pig breeding units under management of MARD (1600 GGP sows and 1770 GP sows, which accounted for 20% and 0.6% of GGP and GP sows in the entire country).



Figure 14. Composition of the national pig herd by type and breed, Vietnam 2010.



Source: Department of livestock production, MARD.

The number of some exotic breeds has decreased, such as large white, Hampshire, Berkshire, and DE due to degradation of genetic breeding over many years of imports and/or not meeting the target of leanization. Hence, these exotic breeds are used less by pig producers.

## Breeding programs and breeding strategies

In Vietnam, systematic breeding is carried out only in nucleus herds and breeding farms. Straight breeding is used for purebreds, keeping in grand grandparent (GGP) and grandparent (GP) herds and is employed mainly for exotic breeds. The breeding objective in that system is referred to as 'leanization' to improve product quality. On the other hand, unstructured breeding is commonly used in households and extensive systems. In both production systems, the breeding objective is to increase the proportion of lean meat in the pigs. Quality and quantity traits are of main interest in all breeding systems, while disease resistance and lifetime productivity traits are not yet considered. There are 10 breeding centres with nucleus herds, mainly exotic herds. The breeding programs use artificial insemination (AI). There are 100 breeding farms which serve as multiplication herds, with an average of 200 sows and 10 breeding boars. Ten percent of exotic sows are used for pure breeding, and 90% are used for crossing. There are four boar-testing stations, two in the North and two in the South, however, only 30% of the current testing capacity is used. The majority of boars used on small farms for either AI or natural service were purebred indigenous or exotic breeds. Up to 60% of the national pig herd used AI. In each province there is one or more AI stations (FAO 2003).

MARD and NIAS have put a lot of effort into pig breeding. During 1995–2000, an ACIAR project, Pig Breeding and Feeding in Australia and Vietnam, was implemented with participation by the Institute of Agricultural Science of South Vietnam (IAS), the Animal Research Institute of the Department of Primary Industry–Queensland (ARI), key agricultural universities, and NAEC. The improved pig breeds, which were imported from Australia, were evaluated for adaptation to Vietnamese conditions. It was evaluated as a successful project targeting enhanced benefits to the poor in Vietnam.

NIAS has carried out research projects funded by ACIAR, FAO, BADC, and others for livestock production, such as the project on Control of Pasteurellosis in Pigs and Poultry; Breeding and Feeding Pigs in Australia and Vietnam: Phase II; Animal Husbandry Development to Fight Against Rural Poverty; CD-ROM Development: Efficient Pig Management in Tropical Asia; Use of the On-Site Materials for Animal Feed, and Analysis of Sustainable Livestock Farming Systems (with SAREC/SIDA), among others.

## Genetic conservation

For agricultural and economic development, the need for animal production and consumption of higher quality products is increasing, which requires better and more productive animals. Numerous commercial animal breeds have been introduced into Vietnam during the last few decades. These breeds enriched genetic resources, improved animal production, and diversified animal products.

There was no conservation strategy in the last decades due to lack of management in breeding. The import of new exotic breeds also led to the extinction of many indigenous breeds, and many others are decreasing rapidly since their performance, food conversion efficiency, or lean meat percentage are much lower than that of imported breeds (FAO 2003).

The Vietnam Government is now paying more attention to genetic conservation; therefore the budget for genetic conservation is regularly increasing. There are six ministries responsible for genetic conservation under the regulation of the Ministry of Science and Technology. For conservation of agricultural genetic resources there are nine focal institutions and a network for genetic conservation. Genetic conservation activities have been conducted in Vietnam since 1987, and while the number of well-trained personnel working in this field is limited, they have obtained much experience from conservation activities during the last decades. A number of young scientists have been trained overseas and will contribute to conservation and sustainable use of animal genetic resources (FAO 2003).

## Artificial insemination in pig production

Along with the growth of the livestock sector in recent years, use of artificial insemination (AI) has been increasing. In 2008, there were 549 facilities breeding boars and carrying out artificial insemination, with 456,000 male pigs and production capacity of about 5.77 million doses of semen per year. There were 105 facilities belonging to state-owned and share holding companies with 205,000 boars and the ability to produce about 3.48 million doses of semen per year. There are 444 privately owned farms with about 25,000 boars and the ability to produce 2.3 million doses of semen per year. About 4.56 million doses of semen were used, which inseminated approximately 30% of the sow herd in the country (DLP 2009).

The number of AI swine facilities increased from 282 in 2000 to 549 in 2008, with an average growth rate of 10% per year. A boar can breed an average of 325–400 sows/year using AI, while it can only directly breed for 30–32 sows/year. Thus, the AI method made significant contributions to quality improvement of the national pig herd, pig productivity, and efficiency of the pig sector. Understanding the important role of AI, there are many provinces that have preferential policies to support and encourage the development of the AI method in pig production (Hang 2008).

## Factors affecting trends in pig genetics

### Composition of the pig herd

There are a number of factors that affect trends in composition of the pig herd, including (i) high demand for lean and good quality pork in the domestic market; (ii) high investment in pig genetics from the government and other organizations; and (3) high support from government policies to develop the pig sector toward high quality products for export.

### Use of artificial insemination

There are still some constraints in the application of AI in pig production: (i) although the number of AI facilities is increasing, the number of boars in these facilities is still small (about 5% of the total national boar herd) and can support only 29% of sows in the country; (ii) total annual through put of semen at the AI facilities is 4.55 million out

of 5.77 million doses of total production (only 79% of the total semen production) limits accessibility to pig producers who may lack knowledge about AI and its efficiency; and (iii) the percentage of pregnant sows inseminated using AI is still low due to the low level of skills and capacity of AI technicians and veterinarians (Hang 2008).

## Policies related to pig genetics

To support management and promote the development of animal production, the Vietnam government has issued a number of policies and decisions related to pig genetics. These policies regulate different aspects of livestock genetics in general, and pig genetics in particular, such as (i) a subsidy fund for maintaining and improving livestock and poultry breeding herds; (ii) animal breeding management; (iii) trading animal breeds; (iv) a standard for animal breed quality characterization; and (v) developing pig breeds for export. The government also determined preferential breeds and species that will contribute to national economic development. The details of these policies are provided in Annex 17.2.

## Summary

Several organizations and institutions participate in the development of pig genetics. The quality of pig breeds has improved over time, which could be attributed to the 'leanization program'. Along with the growth of the livestock sector in recent years, the use of AI has been increasing and the process is quite well developed, however, there are still constraints to improving the national pig herd with AI. Although farmers have been more active in supplying piglets for themselves, the majority still depend on outside sources, especially good varieties and during/after disease outbreaks. Farmers are unable to ascertain the quality of piglets sourced from markets or traders, which are also a source of diseases. Hence, better state management of piglets for sale in markets is necessary to better manage the risk of disease transmission from the piglet trade.

## Information gap

There is currently limited information on the contribution of the private sector to the development and improvement of pig genetics in Vietnam.





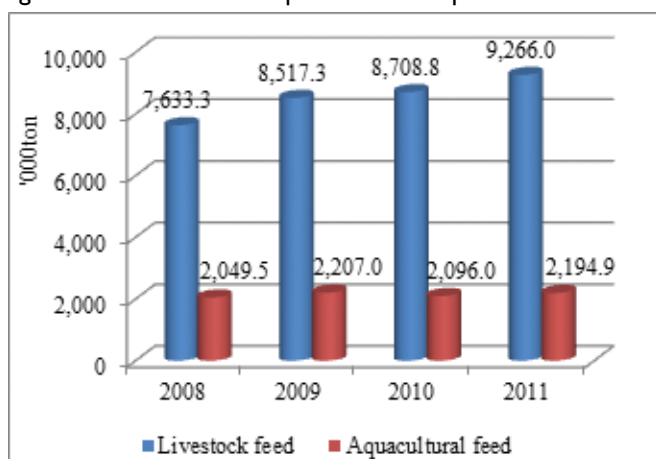
## Inputs and services—Feed

### Structure and development of the feed sector

The feed industry plays an important role in improving productivity, efficiency, and food safety of the livestock and fishery sectors. In recent years, the livestock and fishery sectors have been faced with quickly increasing industrial feed prices because a high percentage (20–30%) of raw material for feed is imported from other countries. With high potential profit from feed production, an increasing number of foreign and domestic companies are entering Vietnam. In addition, multinational feed companies such as Cargill, C.P., Proconco, and Japfa have established feed production facilities in Vietnam as a result of government reform policies as well as foreign and domestic investment.

The livestock feed processing industry in Vietnam has developed rapidly since the 1990s with the growth of the livestock and fishery sectors. According to GSO, total industrial feed for livestock production was estimated at around 9.3 million tonnes in 2011 and approximately 2.2 million tonnes of aquaculture feed was produced in the same year. The average annual growth rate of total industrial feed production for livestock and fishery during 2008–2011 reached almost 7% and more than 2%, respectively (Figure 15).

Figure 15. Livestock and aquaculture feed production in Vietnam, 2008–2011.



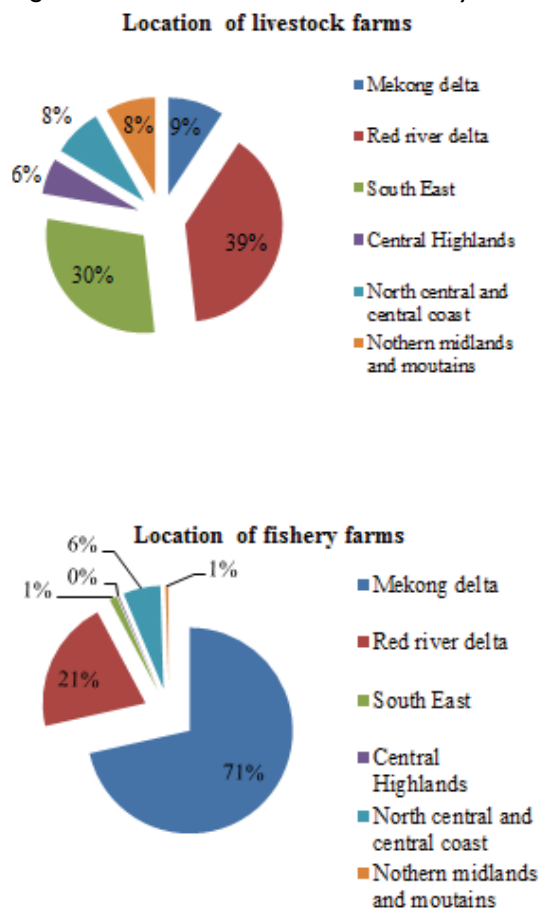
Source: GSO (2012d).

According to MARD data, there were 225 registered livestock feed mills (42 foreign, 12 joint ventures, and 171 domestic) and 89 aquaculture feed mills in Vietnam in 2010. All of the biggest feed manufacturing corporations in the world have established businesses in Vietnam. Currently, foreign feed companies hold a market share of 65–70%. There are a number of domestic feed enterprises that have been successfully developed such as Golden Pig. However, the feed technologies used by domestic feed companies are not as modern compared to the foreign ones. Although there was high investment and support from the government, state-owned feed enterprises cannot compete with private and foreign feed companies. The big challenge for domestic feed enterprises is a lack of premix technology, which is owned by the foreign companies. The foreign companies have no competitors in producing premix feed in Vietnam, hence they can sell their products to Vietnamese feed companies at a very high price.



To reduce transportation and transaction costs, the feed industry located in eight regions of Vietnam. Industrial feed mills are located mainly in the Red River Delta, South East, and Mekong River Delta, where livestock and fishery farms are highly concentrated. The smallest feed producing region is the Central Highlands, where the livestock and fishery sectors are less developed due to unfavourable natural conditions (Figure 16).

Figure 16. Location of livestock and fishery farms in Vietnam, 2011.



Source: GSO (2012d).

The feed industry is classified as large-, medium-, and small-scale (CAP-IPSARD 2011). There are different strategies used to buy raw materials and sell products among the feed companies. In general, the larger the scale of feed production, the higher the percentage sold to wholesalers and traders, with a smaller share sold to small household livestock producers. The larger the feed business, a higher percentage of raw materials is bought from private processing businesses/state-owned enterprises and traders, with a lower share coming from farmers.

Table 18. Characteristics of small- and medium-scale feed enterprises

Scale of feed business	Sources of raw materials	Type of customers
Large	Private processing business	Wholesale agents/traders
	State-owned enterprises	
Medium	Private processing business	Wholesale agents/traders
	Traders	Retail agents
	Farmers	Commercial farms and small households
Small	Farmers	Retail agents
	Traders	Wholesale agents/traders
	Private processing business	Commercial farms and small households

Source: CAP-IPSARD (2011).

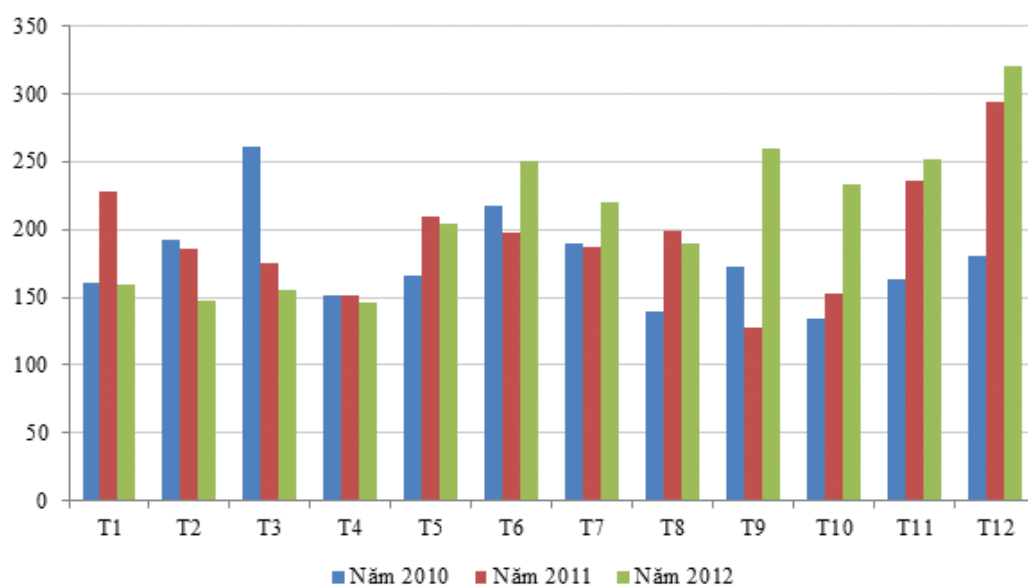
In summary, the fast growth of the livestock and fishery industries in Vietnam during the last decade has significantly contributed to development of the feed sector. However, there are still constraints and challenges, including: (i) lack of long-term development of raw materials for the feed processing industry (making it highly dependent on imported raw materials); (ii) high unit costs of feed production and low feed quality due to the current use of low-tech feed production technologies; (iii) lack of capital to develop raw material areas and develop modern feed production technologies; and (iv) limited successful research on the feed sector due to low levels of investment and funding from the government.

## Trends in feed crop production

To achieve the goal of the 2020 livestock development strategy, the government launched a number of policies and provided support to develop major crops used as inputs for industrial animal feed. Major crops planted in Vietnam used as raw materials for animal feed include paddy, maize, soybean, and cassava. Data from the General Statistics Office show that there was an upward trend in domestic production of these four crops, both in area planted and yield, during 2001–2012. Area planted and production of soybean in 2012 slightly decreased compared to previous years due to unfavourable weather (Table 20). A high percentage of maize production in Vietnam is located in the mountainous regions and is used mostly for animal feed. Total area planted and maize production rapidly increased during 2001–2012, with annual growth rates of almost 4 and 8%, respectively. Some paddy, soybean, and cassava are also used for animal feed. The fast growth in production of these crops has made significant contributions to the feed sector and livestock industry in Vietnam.

The availability of local inputs for feed, particularly protein-rich ingredients, is limited compared to local demand for feed. Vietnam is an agricultural country, but the industry does not have enough raw materials for feed production because there is a shortage of good hectareage to grow these crops, as well as limited processing capability. This imbalance of supply and demand increases feed prices in domestic markets. Every year the feed processing industry in Vietnam produces nearly 6 million tonnes of feed for livestock and poultry and 2.4 million tonnes for aquaculture. Of the estimated 8.5 million tonnes of feed, processing factories have to import 3.7 million tonnes of raw materials each year. Although Vietnam is one of the largest exporters of agricultural products in the world, there is still a high percentage of raw materials imported for domestic feed production. This is a major constraint for development of the domestic feed industry. Prices of commercial animal feed produced domestically are 15–20% higher than commercial feed produced in neighbouring countries in the region based on recent statistics (MARD, 3/2010).

Figure 17. Feed imports, 2010–2012 (million USD).



Source: GDVC, Dec: estimate.



## Feeding practises, feed sources, and key feed constraints

### Feeding practises and feed sources

Feeding practises in the livestock sector in general, and pig production in particular, are diverse and likely associated with different production systems. For example, pigs raised in the scavenging system by ethnic groups spend most of their time looking for their own food in the villages. The backyard fatteners are fed with kitchen waste and other agricultural by-products. In small-scale pig production systems, pigs are raised in semi-intensive ways using mainly agricultural by-products, kitchen waste, and a small percentage of feed concentrate. In medium-scale production systems, the feeding practice depends more on concentrate feeds, and in some regions pig raisers use both agricultural by-products and concentrate feeds. In large-scale pig production systems where exotic pig breeds are predominantly raised, the feeding practise is highly intensive using 100% concentrate feeds (ILRI 2009). Industrial feeds coming from big foreign feed enterprises has gradually changed the traditional patterns of livestock and fishery production. More livestock producers are using industrial feeds instead of home-produced feeds to improve productivity and income (increased use of industrial feed in the Southern provinces, or mixed use of industrial and raw feeds in the North) (CAP-IPSARD 2011).

### Key feed constraints

The price of animal feed in Vietnam is always 8–12% higher than that in other countries in the region due to dependence on international markets, small ports, slow clearance at ports, large costs of advertising and service, and heterogeneous livestock farming production scales (Giao,2009).Data from Vietnam's General Customs showed that the total volume of imported raw materials for livestock and fishery feed production increased over time during 2010–2012 (777,000t in 2010 and 887,000t in 2012, with an average annual growth rate of almost 7% during this period). The imported value of these raw materials also increased at an average annual growth rate of 22% during the same period (Table 19). A high percentage of imported raw materials is rich protein ingredients due to a domestic shortage. The prices of imported raw materials are higher compared to domestic raw materials, leading to high feed production costs per unit. Given the increasing price of industrial animal feed, smallholder producers often feed their pigs with unprocessed raw materials or feed that they produce themselves, and locally available crops.

Table 19. Imports of raw materials for livestock and fishery industrial feeds in Vietnam, 2010–2012

Type of ingredient	2010		2011		2012		Average growth rate (%)	
	Volume ('000 t)	Value (billion USD )	Volume ('000 t)	Value (billion USD )	Volume ('000 t)	Value (billion USD )	Volume	Value
Total	7.77	2.68	8.91	3.68	8.87	3.99	6.84	22.02
Rich energy ingredients <sup>a</sup>	3.15	0.75	3.86	1.24	4.35	1.32	17.51	32.66
Rich protein ingredients <sup>a</sup>	4.41	1.84	4.8	2.34	4.29	2.01	-1.37	4.52
Minerals and vitamins	0.21	0.1	0.25	0.11	0.23	0.65	4.65	154.95

a. A partial amount of this volume (wheat, maize, and soybean) is used as seed.

Source: Vietnam General Customs (2013).

According to GDVC, feed and feed ingredient imports from 1 January 2012 to 15 December 2012 reached USD 2,303.8 billion, an annual growth rate of almost 5%. Based on data from MARD, feed and feed ingredient imports in 2012 reached USD 2.542 billion, an annual growth rate of almost 9%. Among the main imports during the first 11 months of 2012, soybean meal had the highest value at USD 1,092.6 million, making up 49% of total feed imports (Agrolnfor 2013).

Table 20. Total area and yield of main crops used for livestock feed

Crop	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Average growth rate (%)
Paddy													
Area ('000 ha)	7,49	7,50	7,45	7,44	7,33	7,32	7,21	7,42	7,44	7,49	7,65	7,75	0.31
Quantity ('000 t)	32,1	34,4	34,5	36,1	35,8	35,8	35,9	38,7	39,0	40,0	42,3	43,7	2.83
Maize													
Area ('000 ha)	730	816	913	991	1,05	1,03	1,10	1,14	1,09	1,13	1,12	1,12	3.95
Quantity ('000 t)	2,16	2,51	3,14	3,43	3,79	3,86	4,30	4,57	4,37	4,63	4,80	4,80	7.53
Soybean													
Area ('000 ha)	140	159	166	184	204	186	187	192	147	198	182	121	-1.33
Quantity ('000 t)	174	206	220	246	293	258	275	268	215	299	266	175	0.06
Cassava													
Area ('000 ha)	292	337	372	389	426	475	496	554	508	498	560	551	5.94
Quantity ('000 t)	3,51	4,44	5,31	5,82	6,72	7,78	8,19	9,31	8,53	8,60	9,88	9,75	9.73

Source: GSO (2013).

## Policies supporting development of the feed sector

Animal feed policies include (i) a ban on the production, import, and use of some specific chemicals in commercial feed production; (ii) national technical standards for the feed sector; (iii) management of the livestock feed industry; and (iv) administrative sanctions for violations in animal feed production, among others. A detailed list of these policies is presented in Annex 17.3. These policies play an important role in developing the feed sector for livestock production in Vietnam. However, there are still some constraints to implementation of these policies, particularly quality issues.

## Summary

In Vietnam, the feed sector is characterized by a concentration of a small number of large manufacturers capturing large market shares (most of them are FDIs). This market structure limits small farmers' ability to significantly affect feed markets, particularly prices. The high dependence of the domestic feed industry on imports such as maize, soybean meal, and premixes also creates volatility in feed markets and exposes farmers, particularly, small-scale producers, to market risks. After joining the WTO, the government set tariffs for feed ingredients to zero, thereby allowing the market to accommodate a free flow of imported feed ingredients with the anticipated desired price effects in the feed sector. However, the domestic feed manufacturing sector and feed markets are not effectively organized in a structure that allows appropriate supply responses to these new trade policies that will likely benefit a majority of stakeholders. Feed prices in Vietnam, therefore, are much higher compared to other countries in the region, leading to high pig production costs and reduced competitiveness. This suggests the need for a long-term strategy to develop the feed industry towards less dependence on imports (maize, soybean meal, and other feed ingredients) and more effective and transparent management of government trade policies on feeds. R&D on feed technologies that will enable cost-effective rations will enhance feed-cost efficiency across all types of pig production.



# Inputs and services—Knowledge system

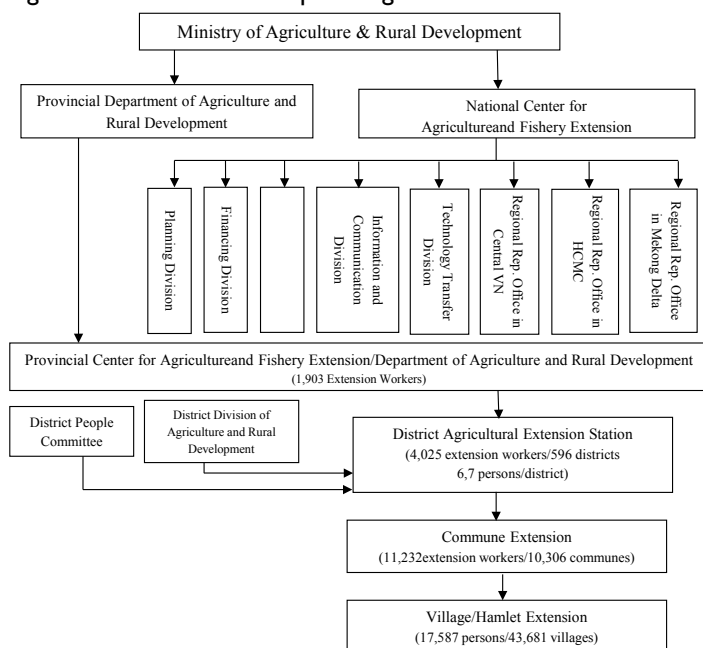
## Structure of the knowledge system

Agricultural research and extension each have knowledge systems, but the link is weak, with no coordination to avoid overlapping functions. The research system includes research institutes and research centres/stations that belong to MARD or provinces. The results of research experiments are transferred to farmers through the agricultural extension system after they are approved by a group of specialized scientists of the Scientific Council. Coordination between these two systems is weak and as a result research outputs do not address the actual needs of farmers. Cooperation among extension workers and researchers needs to be improved for the extension system to become an effective bridge between farmers and researchers. Currently, the field research approach and participatory technology development (PTD) are promoted to create good platforms for researchers, extension workers, and farmers to work together (Van 2010).

These actors have extension duties under the current system: (i) government extension system (extension centres); (ii) research institutions; (iii) universities; (iv) enterprises; (v) NGOs; and (vi) volunteer extension organizations (associations, local common interest groups). Research institutions, universities, and enterprises are mainly transferring their own technologies and products.

The agricultural extension system in Vietnam is mainly based on a top-down approach. It is a step-by-step approach developed from central to local levels associated with the agriculture sector, farmers, and rural development (Figure 18).

Figure 18. Structure of the public agricultural extension network in Vietnam



## Central level

The National Centre for Agricultural Extension (NCAE) was formed under the management of MARD. The roles of the agricultural extension agencies at the central level are to: (i) act as a focal point for agricultural extension in the entire country; (ii) synthesise extension demands from extension agencies and farmers; (iii) provide guidelines on extension messages, methods, monitoring and evaluation of extension activities, and make a yearly report to the Ministry; (iv) directly carry out extension communications at the central level and cooperate with related organizations for training activities; (v) organize and participate in competition festivals, workshops, exhibitions, and fairs relating to extension activities in seven ecological zones; and (vi) cooperate with other departments of science and technology to identify advancements that are relevant to extension audiences.

## Local level

Agricultural and fishery extension organizations at the local level are developed step-by-step from provincial to village levels. The roles of agricultural extension agencies at the local level also vary. For example, the provincial agricultural extension agencies: (i) propose extension projects that suit provincial conditions; (ii) provide extension guidelines at the district level and cooperate with districts to carry out extension activities; and (iii) directly implement extension communication and training for district extension staff and key farmers in the province. At the district level, agricultural extension agencies play important roles in directly carrying out extension activities, providing training courses for commune/village extension staff, and also providing training to farmers. However, the roles of the commune/village agricultural extension are to encourage farmers to participate in extension activities, reflect farmer needs to higher levels, and directly implement extension activities at the village level.

Currently, all 63 provinces/cities have provincial centres for agricultural extension (or provincial centres for agricultural and fishery extension) under management of the provincial departments of agriculture and rural development. At the district level, there are 596 districts/towns with agricultural activities (accounting for about 96% of total districts/towns in the whole country) and established agricultural extension stations (or agricultural and fishery extension stations). At the commune and village level, there are 51 provinces/cities with a local agricultural extension network, in which there are one or two professional extensionists per commune, and one agricultural extension collaborator working part-time at the village level. In addition, there are 10,000 extension clubs operating at the commune level with participation by 300,000 farmers (MARD 2013).

## Historical development of the agricultural extension system

The National Agricultural and Forestry Extension Department (NAED) was established in 1993. The Department of Agriculture and Forestry Extension (DAFE) belongs to the Ministry of Agriculture and Rural Development (MARD). In the Ministry of Fishery, fishery extension activities were assigned to the Department of Aquaculture Management. Those departments function as a state governing organization (managing production) as well as technology transfer bodies. In line with this degree, 64 provincial agricultural and forestry extension centres were set up in 64 provinces and cities of Vietnam (now only 63 provincial centres). These centres belong to the provincial Department of Agriculture and Rural Development (PDARD).

However, serving two assignments at the same time—governance and providing public services—created many problems for NAED. In 2003, NAED divided into two units as the National Centre for Agricultural Extension (NCAE) and the Department of Agriculture, both still under MARD. In the same year, the National Fishery Extension Centre was founded within the Ministry of Fishery. In 2008 when the Ministry of Fishery was integrated into MARD, the Fishery Extension Centre was also integrated into NAEC to form the National Centre for Agriculture and Fishery Extension (NCAFE).

## Agricultural extension activities and services

### Current extension activities focus on:

(i) Models are set up to demonstrate advanced technologies and techniques for transferring to farmers. The models concentrate on introducing new varieties and techniques/technologies. Parallel to this, extension workers organize field days to train and respond to questions from farmers.

For the last 20 years (1993–2013), extension programs about livestock mainly focused on application of advanced technologies for breed improvement, and adoption of livestock breeds with high productivity and quality; moving from scattered and extensive livestock production systems to intensive medium- and large-scale livestock farms; and adoption of advanced technologies for livestock nutrition, disease prevention, and food safety. There are a number of critical extension programs such as the oxen herd improvement program, development programs on lean crossbred pigs, biosafety poultry and waterfowl livestock production, biosafety livestock breeding, and application of Vietnam Good Agriculture Practise (VietGAP).

Livestock demonstration activities and technology transfers of the Vietnam agricultural extension system in 2009 were diverse. For example, in the sustainable lean pig production program, there were 84 demonstration models established in different places with 697 farmers participating, which attracted 5518 trainee visits from different training courses and regions. There were 3761 pigs raised in the demonstration models utilizing high-quality crossbred and exotic pigs (Table 21). Conducting demonstration models is a useful way to disseminate advanced technologies in livestock in general and pig production in particular to farmers because they can show benefits and viability, as well as a step-by-step approach for adopting these technologies. These demonstrations made significant contributions to the development of livestock, especially pig production in last two decades in Vietnam.

(ii) Short training courses for local extension workers and farmers are conducted. Not all new technologies and techniques are demonstrated in the field, therefore training is a means to transfer them quickly to farmers. Training methods include face-to-face training, and training via TV, radio, brochures, CD, VCD, DVD, and via websites (e-learning). Training of trainers (ToT) is also an effective training method to expand the number of skilled extension practitioners. Additionally, the extension system also creates opportunities for some experienced farmers to use advanced technologies from overseas.

Table 21. Results of demonstration activities and technology transfers in livestock, 2009.

Type of demonstration model	Scale (no. of head/herds)	Number of demonstration models	Number of participating farmers	Number of trainees visited
Improving ox breeds towards meat production	4449	54	2424	5518
Fattening oxen herd	7821	62	2816	6324
Raising dairy cows	97	6	80	380
Developing breeding oxen	121	3	102	330
Improving the buffalo herd	713	14	512	1144
Improving the goat and sheep herds	6966	36	416	2230
Developing sustainable lean pig production	3761	84	697	6105
Biosafety poultry production	472,105	194	1942	11,346
Honey bee production with high quality	600	5	100	250
Total	496,633	458	9089	33,627

Source: NCAE (2009).

For the last two decades (1993–2013), the central agricultural extension office has offered printed reference materials and a wide range of DVDs, TV channels, and internet pages. There have been 6000 training courses conducted with 210,000 participants and many domestic and international visits for approximately 900 participants.

(iii) Science and technology forums and specific festivals and exhibitions are organized so that farmers can exchange directly with scientists and see examples of successful application of new technologies.

The advanced technologies used in demonstration models and training are products of research institutions, universities, and imports. In order to avoid risks for farmers, those technologies must be recognized/approved by the Scientific Council at the Ministry level (applied on a national scale) or at the provincial level (applied on a regional scale).

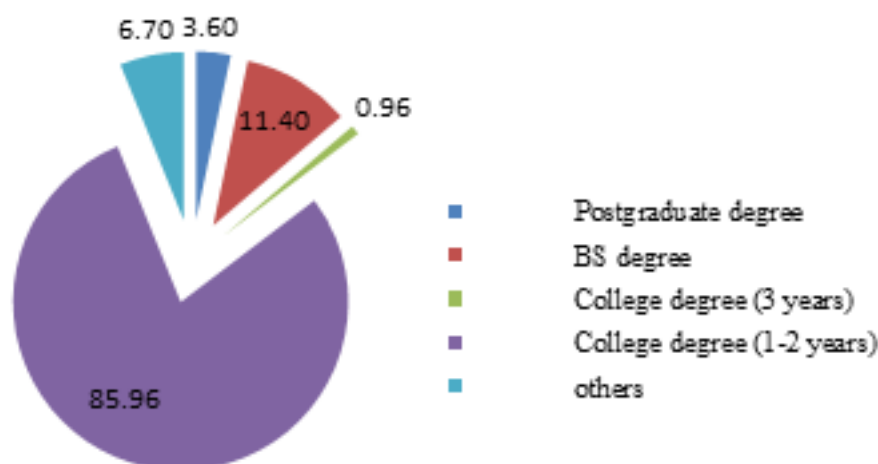
Besides the responsibility for transferring technologies and training, the extension system also takes responsibility for disseminating new policies related to agriculture, farmers, rural areas, and markets. Meanwhile, extension workers receive feedback on weaknesses and constraints of proposed new technologies or policies.

## Trends in knowledge development and provision

Development of the agricultural and fishery extension system was not only institutional, but was also designed to improve and enhance the quantity and quality of extension workers. Currently, there are 17,250 extension workers, of which 90 work at the national level, 1,903 at a provincial level, 4,025 at a district level, and 11,232 at a commune level. In addition, there are about 17,587 extension collaborators working at a village level. Most extension workers are well trained to promote agricultural extension activities and transfer new and modern technologies to farmers (MARD 2013).

The NCAE data in 2011 also show that the majority of extension workers (86%) working at local levels obtained college degrees with one or two years of training about agriculture and/or agricultural extension, and most worked at commune and village levels. Those who obtained postgraduate, BS, and college (three-year) degrees work at provincial and district levels (Figure 19). In general, there was a low educational level for extension workers at the local level, which could be a big constraint.

Figure 19. Local extensionists by educational level, 2011.



Source: Computed from NCAE data (2011).

The infrastructure of the agricultural extension system in Vietnam was gradually supported at all levels to satisfy the demand for its activities. A survey in 2012 showed that 100% of the provincial centres for agricultural extension had concrete offices, but only 68% at the district level. About 60% of the provincial centres and 40% of stations at the district level furnished the office with communication, training equipment, and transportation means to implement agricultural extension activities. The remaining offices lacked the equipment needed to support their responsibilities (MARD 2013).

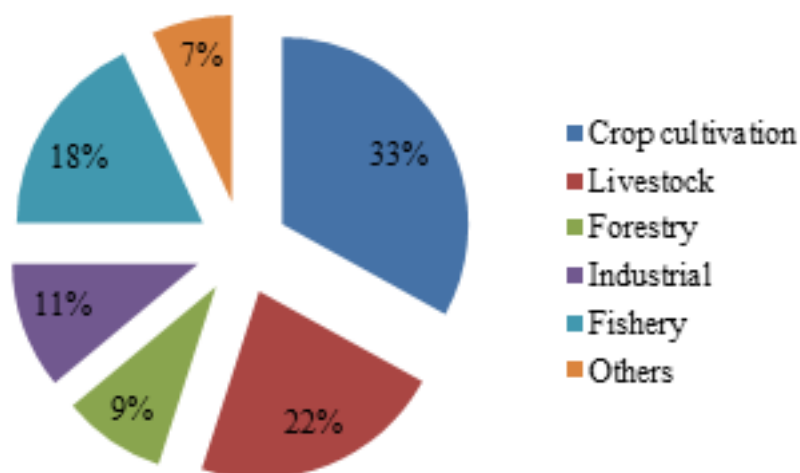
Agricultural extension activities are implemented based on government budgets and follow the financial mechanism of the state. Agriculture is moving towards production of high quality agricultural commodities that require better trained agricultural extension staff. It is still difficult to change the perception/thinking of agricultural extension staff so that they become more dynamic, knowledgeable, and responsible for their work. Payment by farmers for agricultural extension



services remains a difficult problem, especially in poor mountainous areas (Van 2010). Responsibility and working loads of extension workers, especially in remote areas, are in excess of their capacity, and their salaries are low.

At the national level, a relatively higher percentage of the budget is used for agricultural extension activities and services on crop cultivation (32%) compared to promoting livestock production (22%). Budget allocations at the local extension centres are similar (Figure 20).

Figure 20. Budget allocation for extension activities at the central level, 2011.



Source: NCAE (2012).

## Factors influencing the status of knowledge provision

Although it has important achievements, the agricultural extension system in Vietnam still has limitations:

(i) Human resources are lacking in both quantity and quality. Currently there is only one professional staff person per 280 farming households. Among extension workers, only 15% received professional training in the field of extension, and the rest have mainly shifted from other technical professions (Bo 2012). In 2011, 189 extension staff had masters and PhD degrees, and 3960 had undergraduate degrees, which is only 11% of extension workers.

(ii) The specializations of extension workers do not yet meet the requirements for helping farmers achieve potential productivity levels. Most specialize in crops and husbandry; other fields are lacking. The villages/hamlets and even communes average less than one extension worker for work related to the entire production process, including crops, livestock, fishery, forestry, irrigation, rural economy, and markets. Integrated knowledge is required for grassroots level extension, which is difficult to find.

(iii) Extension has focused mainly on hunger alleviation and poverty reduction, but has not yet really developed support for product processing and marketing. This is a reason why small and medium farm owners and agricultural enterprises have received very limited attention and services from government extension departments. These enterprises produce products for market, so they need more support for processing and marketing, unlike poor and small farmers who mainly produce products for home consumption.

(iv) Extension methods do not yet satisfy the diversified demands of farming systems with different knowledge and culture in many varied localities. In addition, the barrier of languages to communicate with ethnic groups also limits the effectiveness of extension workers. A top-down approach is still common for government extension activities.

(v) The system of monitoring and evaluation of extension activities is still lacking and not working properly. The involvement of local authorities is still very limited. Farmers are not yet involved in extension works at the planning

stage, therefore extension activities do not really meet the requirements of farmers as well as the reality of agricultural production (Bo 2012).

## Policies related to knowledge system

Agricultural extension activities fall under a national network in the agriculture sector (agriculture, forestry, and fishery). Testate encourages development of volunteer institutions for agricultural extension among Vietnamese and foreign socioeconomic organizations. Agriculture extension is defined to include: (i) dissemination of technical advances in cultivation, animal husbandry, processing technology, storage of products of agriculture, forestry, and fishery, as well as achievements by successful production units; (ii) strengthening skills and knowledge for economic management among farmers to enable increased production and improved economies; and (iii) in cooperation with other units, providing farmers with information on markets and prices for agricultural products to enable them to adjust production and achieve improved economic results.

Current extension policies and programs are mainly focused on the government extension system, and are provided for free. This does not create a motivation to expand activities beyond the reach of the public sector, and does not promote participation by other organizations. The links among extension, research, and education are not yet well developed.

## Summary

Knowledge systems play an important role in agricultural development. Extension services are provided to farmers through short training courses; technology transfer by demonstration models; and organizing science and technology forums, specific festivals, and exhibitions. However, the agricultural extension services provided to farmers still mainly focus on promotion of crop production rather than including livestock production. Although knowledge systems have improved and expanded over time, they still face some constraints in the development process such as (i) human resources are lacking in both quantity and quality; (ii) the specializations of extension workers are not yet meeting actual requirements of farming activities; (iii) not really providing support for processing and marketing products; and (iv) extension methods do not yet satisfy the diverse demand of different farming systems.

## Information gaps

There is limited updated information on assessment of extension activities of the private sector and NGOs. Further studies should be considered in the future.



# Inputs and services—Credit

## Structure of the rural credit system

Rural credit is either formal, semi-formal, or informal. The formal financial sector is dominated by four groups of financial institutions operating under the permission and supervision of SBV, including state-owned commercial banks such as the Vietnam Bank for Agriculture and Rural Development (VBARD) or Vietnam Bank for Social Policy (VBSP), rural private banks, Rural Share holding Banks (RSHBs) owned mainly by private holders, and People's Credit Funds (PCFs). The semi-formal sector is characterized by those officially recognized by government agencies, but neither legally regulated nor supervised by the SBV. Informal credit providers include families, friends, traders, unregistered private moneylenders, and traditional rural credit associations.

Until 1988 the financial system in Vietnam included only the State Bank of Vietnam (SBV), which had several affiliates that distributed credit to state-owned enterprises (SOEs) and other entities (O'Connor 2000).

In 1988–1989 the government initiated banking reforms that transformed the then single-bank system into a two-tier system—SBV restricted itself to acting as the central bank, and its commercial banking activities were taken over by four sector-specialized state-owned commercial banks. In 1990 the rules on the sectoral specialization of these banks were removed (IMF 1998).

During the 1990s, the government stimulated the entry of new players into the financial sector. This policy led to a substantial increase in the number of foreign banks and the so-called joint-stock commercial banks. Joint ventures between foreign banks and state-owned commercial banks were also established, but the services they offered were strictly circumscribed. Non-bank financial institutions such as finance and insurance companies exist, but they are unimportant in terms of financing. The stock market, established in July 2001, is still in its infancy.

The outreach of formal credit providers has increased over time. The Vietnam Living Standard Survey (VLSS) of 1992–1993 found that almost three-quarters (73%) of all rural households borrowed funds from private individuals, and only 23% from government banks. In the next VLSS survey (1997–1998), government banks provided loans to about 40% of rural households. Government programs and savings and credit schemes reached about 8% of the total credit market in 1997–1998. The share of informal credit was reduced from 73% in 1992–1993 to 51% in 1997–1998. In 2002, the total number of households borrowing from VBARD reached about 7 million, about 60% of rural households.

## Development of the rural credit system

### Collapse of credit cooperatives

Credit cooperatives were set up as local financial intermediaries on behalf of the SBV, and operated in isolation from each other, without any network links (Tran 2003). Prior to 1988, the collective sector was regarded as the main economic unit in the country and most loans (more than one-half) went to this sector. Among cooperatives, agricultural cooperatives were provided with the largest reserve to lend, accounting for 54% of loans in 1976.



In the late 1980s, the agricultural cooperatives collapsed. Loans made to this sector decreased to about one-fourth of total loans in 1988. The loans from credit cooperatives became non-performing, but SBV, did not refinance credit cooperatives. As expected, rural depositors rushed to withdraw money, and many credit cooperatives collapsed with substantial deposits (reportedly VND 100 billion or USD 5 billion under current exchange rates) not reimbursed to their owners. This seriously damaged the public's faith in the formal financial system.

Demand for credit from family farms rose sharply in 1988. Farm households had land and labour, but needed capital to purchase inputs. This need, coupled with the collapse of credit cooperatives in rural areas, was the main reason behind the renovation in Vietnam's financial system, spurring the development of a robust rural credit market.

## Establishment of a new formal financial system

### Vietnam Bank for Agriculture and Rural Development

VBARD was established in 1988, under the name of Vietnam Bank for Agricultural Development. Among the credit institutions, VBARD is the leader in the rural credit market.

By December 2005, VBARD developed its network to more than 2000 branches in all provinces, more than 700 mobile banking units, and 200,000 saving and borrowing groups. With this network, VBARD is the only commercial bank that covers the entire country.

VBARD implemented a lending policy for smallholders that came into effect in 1993. The number of rural clients increased from 546,000 in 1992 to about 7,000,000 in 2002. Credit coverage was estimated at about 10% of potential farmer clients.

Starting in 1995, VBARD adopted a new credit policy and made use of joint-liability groups. For loans up to VND 1 million, no collateral is needed. The joint-liability group acts as a guarantee, i.e. these small loans were only processed via groups. For loans of VND 1–10 million (USD 50–500 under current exchange rates), a guarantee by a third party was required. Loans of more than VND 10 million (USD 500) needed collateral. In 1998, VBARD provided loans to more than 3 million households.

From 1991 to 2005, VBARD provided loans to more than 60 million households, with a total value of more than VND 200 billion. This suggests that more than 50% of households in the country have established relationships with VBARD.

To obtain such achievements in mobilizing capital and lending, VBARD used several credit methodologies:

- Individual loans directly to rural farmers and entrepreneurs, with a collateral requirement.
- Loans to individuals through joint-liability groups, which improves credit access, lowers the cost associated with making and collecting many small loans, thereby reaching a large number of small borrowers.
- Use of brokerage services of social organizations, especially the Women's Union and the Farmers' Union, to establish credit groups similar to the joint-liability group.
- Use of innovative ways to reach people at the commune or grass roots level, where it has minimal representation, for example, mobile banking.

### Vietnam Bank for Social Policy

Despite attempts to reach poor households, VBARD's outreach to poor communes in isolated and mountainous areas, where poverty is highest, has been limited. The Vietnam Bank for the Poor (VBP) was established in 1995 to serve the poor that could not be reached by VBARD. This is a non-profit branch of VBARD that distributes subsidized credit to poor households that do not qualify for individual loans because of limited ownership of potential collateral.

It mainly offers collateral-free credit services to finance productive activities (credit-worthiness is checked through 'poverty committees'). VBP was renamed as the Vietnam Bank for Social Policies (VBSP) in late 2002 to take over the poverty targeting program run by VBARD and consolidate all governmental lending to the poor and other vulnerable social groups.

One of the successful factors with lending to poor households is the close relationship with socio-political organizations (Farmers' Association, Women's Union, Veteran Association, and Youth Union). This collaboration includes 239,647 credit and savings groups at hamlets and villages all over the country. This network has helped VBSP to manage outstanding loans of VND 14,816 billion, representing about 80% of the total outstanding loans of VBSP. Furthermore, VBSP cooperates with various international organizations and development agencies such as UNICEF, OPEC, IFAD, and WB to help VBSP mobilize capital (VBSP 2007).

### People's Credit Fund (PCF)

The collapse of credit cooperatives in the late 1980s seriously damaged the public's faith in the government financial system. This, collapse, coupled with increasing credit demands in many rural areas where VBARD could not reach, again posed the issue of constructing a viable rural finance system. In 1993, the network of People's Credit Fund (PCF) was built under the supervision of SBV. One reason behind this move was to restore public confidence in the formal rural credit system. PCF also aimed to promote self-help and mutual assistance among its members (Wolz 1999)

The PCF system has three tiers—PCFs, regional credit fund (RCF), and Central Credit Fund (CCF), each an autonomous legal entity. PCFs are small-scale financial institutions, providing credit and mobilizing savings at the commune level. RCFs operate at the provincial level, providing liquidity and technical support to member PCFs. CCF was the apex organization in 1995 to ensure a relationship with the government and financial credit organizations, regulate resources within the system, and provide accounting, lending, and borrowing services to the whole system.

### Rural Shareholding Banks (RSHBs)

RSHBs also arose from the reorganization or mergers of rural credit cooperatives since the early 1990s. Like PCFs, they are very cautious about expanding their lending to the poor, and therefore very doubtful about lending to this population. Only some RSHBs have lent to the poor and these were through the Women's Unions

In 2000, there were some 19 rural share holding banks in Vietnam. Generally they have limited capital and operate through the relatives and contacts of the few who make up their shareholders. RSHBs have the advantage of simple and less time-consuming borrowing procedures.

VBARD and VBSP are key formal credit providers in the rural credit markets, with about a 90% market share among formal credit providers belonging to VBARD and VBSP.

### Semi-formal financial players

The semi-formal finance system includes various structures of decentralized financing that offer microfinance services and try to reach those populations excluded from the official banking circuits (Putzeys 2002). The semi-formal financial institutions are recognized by the government but are not under the supervision of SBV. According to VLSS, in 1997–1998, government programs and these savings and credit schemes reached about 8% of the total credit market.

### Mass/social organizations

Mass organizations are quasi-governmental bodies that are represented at four administrative levels—national, provincial, district, and commune, including the Veterans' Association, Vietnam Farmers' Union (VFU), Viet Nam Youth Union (VYU), Peasants' Union, and VWU. This structure enables the mass organizations to have direct contact with the grassroots and to establish a connection with the national level. These organizations help government to

disburse loans under specific government programs (Dao 1998). Mass organizations could reach about 1.6 million households with total credit disbursed of about USD 220.1 million by 1998 (Llanto 2000).

The Vietnam Women's Union (VWU) is the most active organization nationwide to help government grant loans to poor households, especially poor women. VWU has implemented a number of development programs financed by national or international funds. VBARD and VBSP are the main institutions providing funds for these mass organizations. VWU and VFU are also sources of credit, and VWU also received grants from various donors.

The credit service offered by mass organizations is highly appreciated because it: (i) can be channelled directly to targeted beneficiaries at the grassroots level, especially low-income households, poor women, or minority groups; (ii) has more direct and closer contact with rural customers; (iii) can offer small loans more efficiently and have higher repayment rates to mobilize local savings with flexible and simple savings schemes; and (iv) improves participation at the grassroots level (Dao 2001).

### Microfinance programs

A great number of rural households could not get access to the formal financial sector due to lack of collateral, while others have limited access to formal credit. Since the early 1990s, the mass organizations, supported by foreign NGOs such as UNICEF and SIDA, were involved in providing credit to poor households.

Since the early 1990s, more than 60 donor-supported NGO savings and credit schemes have operated in Vietnam. According to 1996 data, there were in excess of 67,000 beneficiary households with loan funds of more than USD 2.1 million. VWU was involved in most of the programs. NGO efforts were positive because they reached directly to the poor, developed innovative and practical ways to identify the poor, and encouraged them to participate in savings and credit schemes.

### Informal credit players

Between 68% and 94% of farm households received credit from informal sources (Seibel 1992). According to VLSS 1992–1993 data, 73% of rural households borrowed from informal credit suppliers, but this figure dropped significantly to 51% in 1997–1998 and about 40% in 2004 as a result of the development of the rural financial system.

### Relatives/friends/neighbours

Normally in Vietnam when people are in need of credit, the first source is their relatives, friends, and neighbours. The interest rate is based on negotiation, and sometimes it is zero for relatives or close friends. The loan is usually without collateral or any written contact. The purpose is generally for emergency needs such as illness, weddings, or for buying/constructing/repairing assets for the household such as a house or motorbike.

### Ho/Hui

These are rotating savings and credit associations (ROSCAs), which have a very long tradition in Vietnam. They are called Ho in the North, and Hui in the South. In Africa these are called *tontines*.

Ho/Hui are groups whose members are mainly in the same hamlet, or may be friends and colleagues. Group size is normally 5–20. The mechanism is that each group mobilizes a periodic saving contribution within group members, then these savings are rotated as a fund among members. The savings and credit can be made either in cash or in kind (e.g. rice). The decisions about interest rates, membership, and loans are normally made by all members. The life cycle of a savings and credit association ends when every participant has obtained a loan. RCAs have been a successful institution, where peer monitoring among members helps reduce enforcement and transaction costs.



## Phuong

Unlike Ho/Hui, Phuong does not charge interest on loans. Each member deposits a required periodic payment and is entitled to receive an interest-free loan once in a credit cycle. Group size is smaller than Ho, and usually varies from five to eight (Quach 2003). Phuong is usually practised in mountainous areas where interest-bearing loans are not considered a friendly way to help each other.

## Private moneylenders

Private moneylenders are widespread and seem to be important sources of loans for households, especially in rural areas. The presence of a private moneylender is important when access to other credit sources is limited, for example no formal credit institution exists, or even if there is one, the procedure is complicated, time-consuming, and requires collateral. In VLSS 1992–1993, about 33% of rural households borrowed from moneylenders. This figure was about 10% in 1997–1998. Among informal credit suppliers, moneylenders charge the highest interest rate, about 4.5% per month according to a VLSS 1997–1998 survey.

Moneylenders are usually rich households with surplus money and goods in rural areas that can lend money for long periods, sometimes at very high interest rates depending on the credit supply in the area. Theoretically when a moneylender is the main credit source, it has a monopoly and the interest rate is higher. Data from a World Bank report show that during 1990–1992, when lending to households from VBARD was very limited, moneylenders charged an average rate of 6–7%, and the maximum was 20%. These rates dropped to 4–5% in 1995–1996 with the maximum rate at 10% (Tran 2003). Moneylenders can give loans in cash or kind.

## Traders

Traders may offer credit in the form of inputs such as fertilizer, seeds, or animal feed provided in advance for farm production. They advance inputs to a borrower and receive the products at harvest time at a predetermined rate. As with moneylenders, interest rates charged by traders have decreased over time (Tran 2003) because the outreach of formal credit institutions is wider, and many cooperatives have taken charge of supplying inputs to their members.

# Access to credit by smallholder farmers

The major formal source of credit accessible to farmers is through the Vietnamese banking system via a diversified system of specific banks and credit institutions such as the VBARD, VBP, PCF, Joint-Stock Commercial Banks (JSCB), and State-Owned Commercial Banks (SOCB). During 2001–2010, the annual growth rate of the credit supply from VBARD, VBSP, PCFs, and microfinancial institutions was 21, 34, 23, and 45%, respectively.<sup>10</sup>

Smallholders still face many difficulties in gaining access to state-owned credit programs because of their inability to meet the screening requirements and borrowing procedures. For example, they generally do not have land titles because they do not own their land, nor do they have valuable assets to use as collateral. They do not have the capacity to develop a feasible business plan that is necessary to show their ability to generate income. The implementation of non-secured or non-guaranteed lending programs has, to some extent, helped provide smallholder farmers with an opportunity to obtain some credit to ease their liquidity constraints. Unfortunately, the aim of credit institutions that have been providing these types of loans is not consistent with the needs and requirements of farmers in terms of capital security and restoration (ILRI 2005, unpublished paper).

Chau et al. (2012) conducted a study on access to credit by animal production households in Hai Duong province (Tables 22 and 23). One hundred forty-five randomly-selected households were divided into two groups, animal-based and non-animal-based, with a high demand for credit from both groups. The animal-based group needed credit to buy feed, upgrade fish ponds, and repay old loans. The non-animal-based group, who were unskilled workers, did

<sup>10</sup>. Collected from the annual reports of VBARD, VBSP, PCFs and microfinance intuitions.

not find stable off-farm jobs and had limited income, so they wanted to borrow money for animal production. The farmers borrowed money from the formal sector or the informal sector or both at the same time. The study showed that 77% of borrowers in the animal-based group obtained credit from the formal sector, while the non-animal-based group was 51% (Table 22). For a formal credit source, the proportion of borrowers in the non-animal-based group that obtained credit from VBSP (52%) was higher than that of the animal-based group (21%).

Table 22. Financing sources of surveyed households, 2010

Indicator	Total		Animal-based group		Non animal-based group	
	No.	%	No.	%	No.	%
I. Surveyed households	145		58		87	
II. Borrowers						
1. Formal sector	81	62.8	44	77.2	37	51.4
- VBARD	45	48.4	32	60.4	13	32.5
- VBSP	32	34.4	11	20.8	21	52.5
- PCFs	16	17.2	10	18.8	6	15.0
2. Informal sector	48	37.2	13	22.8	35	48.6
- Friends and relatives	33	67.3	7	53.8	26	72.2
- Village moneylender	16	32.7	6	46.2	10	27.8
3. Both sectors	25		11		14	
III. Household without loan	41		12		29	

Source: Chau et al. (2012).

Table 23. Loan amount by credit sources in 2010 (million VND/household)

	Total		Animal-based group		Non animal-based group		F value
	Mean	Range	Mean	Range	Mean	Range	
I. Formal sector <sup>5</sup>							
1. VBARD	28.2	5.0-50	31.9	15-50	18.8	5-30	16.6***
2. VBSP	8.4	4-17.2	8.5	4-17.2	8.3	4.3-8.6	0.01
3. PCFs	25.3	10-35	25.5	20-35	24.5	10-30	0.1
II. Informal sector <sup>5</sup>							
1. Friend and relatives	5.6	1-20	10.2	2-20	4.3	1-13	13***
2. Village money lender	10	2.5-25	14.6	10-20	7.3	2.5-25	4.7*

Source: Chau et al. (2012).

## Factors affecting trends in the use of credit

The development of the rural credit system has enabled growth of household economies in Vietnam. Rapid expansion of formal and semi-formal credit has substantially increased the outreach of these formal sectors to rural people, especially the poor.

Farmers' capital needs are relatively high, particularly in the rainfed region, because weather conditions allow only one crop per year, during the rainy season, even if farmers have enough labour and arable land for multiple cropping, but water is a primary constraint. As such, the farm household's cash flow dips very low during several months before harvest. It is during this period when family expenditures generally exceed income because they lack cash from crop production, still the major source of income for farm households.

With the liquidity constraint, farmers have limited options to engage in productive activities outside of crop production because of the immediate need to provide subsistence requirements for food and health, among others. It is also during this time that external funds would be useful to smooth the cash flow of farm households. Provision of credit could help farm households overcome the cash flow problems. One of the most disastrous consequences of the lack of credit options is borrowing from moneylenders at outrageous rates of interest, which eventually leads to being buried in debt.

A farm household's decision of where to borrow depends on an array of factors, including contract terms such as duration and size of loans, household characteristics such as family size, as well as the accessibility of formal credit institutions. The same sets of variables determine the interest rates for informal loans.

## Review of credit policies

The time line of the development of credit policies is covered in Annex 18.

## Summary

The key source of credit for farmers is provided by the Vietnamese banking system through a diversified system of banks and credit institutions such as VBARD, VBP, PCF, Joint-Stock Commercial Banks (JSCB), and State-Owned Commercial Banks (SOCB). However, only a small proportion of smallholder livestock farmers are able to obtain credit from these state-owned facilities. Access to informal credit is likewise limited or loan amounts are insufficient. Smallholders still face many difficulties in obtaining a state loan because their conditions do not satisfy complete loan requirements procedures such as a land title, valuable assets, a feasible production plan, and the ability to generate income. The non-secured or non-guaranteed loan now widely available due to credit policy changes has met a part of smallholders' capital requirements. Unfortunately, the aim of credit institutions is not consistent with that of farmers in terms of capital security and restoration.

Farmers' capital needs are relatively high, particularly in the rainfed region, where weather directly affects cropping patterns and animal husbandry practises, and farmers are able to produce only one seasonal crop during the rainy season even though they have enough labour and arable land for more than one crop. This subsequently limits opportunities to generate additional income from crop and animal production. The ability to obtain credit to smooth cash flow throughout the cropping cycle has enabled farmers to invest in productivity-enhancing technologies and subsequently improved their income. Conversely, the current lack of access to credit for many farmers has prevented them from investing in improved technologies. This suggests a need for policies to help ease this credit constraint. There is a need to pay attention to rural women, who often play an important family role in capital management. Lending directly to women is considered an important motivation. This helps increase their confidence, gives them a chance to earn more income, eliminates their economic dependency, and increases their autonomy. Requirements and procedures for credit loans need to be simplified. One important aspect is to minimise transaction costs for both creditors and debtors.



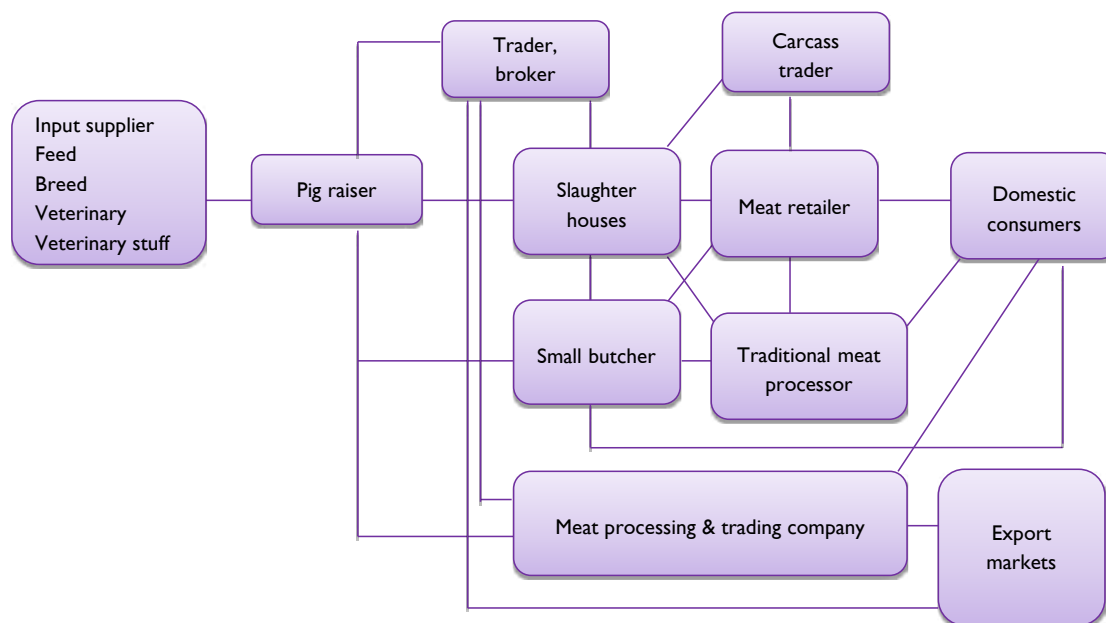
# Value addition, marketing, and value chain governance

## Chain actors and functions

### Generic value chain in Vietnam

The pig sector and value chain have changed and become more organized (Figure 21), but small scale and fragmentations are basic characteristics of pig production and marketing in Vietnam. There are two predominant types of pork value chains (ILRI 2010). The first is typical of value chains in lowland areas, generally including both lowland rural and urban and peri-urban areas. The other is typical of upland areas across the country. Pork supply chains in lowland areas are generally longer and more complex and include a range of actors. Live pigs are traded, usually within and across provinces because of an insufficient supply at the province level in lowland areas. In contrast, pork supply chains in upland areas are generally shorter and simpler. Pig trade in upland areas is usually localized, with live pigs sold where they are produced.

Figure 21. A generic pork value chain in Vietnam.



### Post-farm nodes in the chain

Finished pigs go through several nodes in the pig value chain before reaching final consumers. Depending on the value chain gradient, the number of post-farm nodes in the chain varies, but in general, post-farm nodes include:  
*Trader/broker:* Trader buys live pigs from farmers and sells to slaughterhouses or other traders. Brokers help traders



search for live pigs for sale in their areas, and obtain commissions for providing this service.

*Slaughter man:* Slaughters pigs and also sells meat carcass, offal, and blood to meat wholesaler, meat retailer, processors, and/or consumers.

*Meat wholesaler/carcass trader:* Buys meat in bulk and sells to meat retailer. Institutional meat buyers may also buy from meat wholesalers.

*Meat processor:* Undertakes processing functions to transform pork into processed pork products. This is the node where processes add more value to pig meat.

*Meat retailer:* Sells meat to consumers (individual/institutional). Meat retailer can also sell processed meat.

## Actors along the value chain

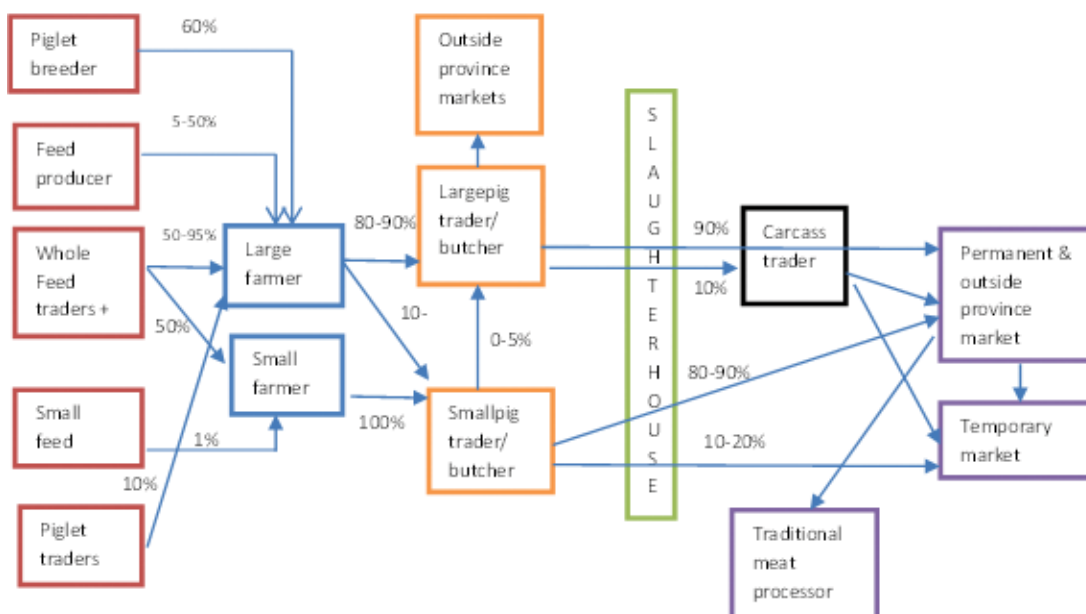
### Input suppliers

Input suppliers for feed, breed, and veterinary inputs operate at different scales and distribution across regions, and depend heavily demand from pig growers.

### Feed suppliers

Feed suppliers could be small private shops in villages/communes, feed agents, or feed producers selling directly to farmers. The feed shop is usually owned and run by both husband and wife. In regions where demand for compound/concentrate feed is low (either small-scale production or farmers can produce/procure feed on their own), there are typically few feed retail shops in the commune. Normally feed producers do not deal directly with pig producers, however, for a significantly large and regular volume as in the case for large commercial farmers, there is incentive for both to do so (Figure 22). Large pig farms and farmer groups usually purchase feed in bulk directly from feed producers or feed agent level 1,<sup>11</sup> significantly reducing the unit cost of feed. Large-scale pig farmers tend not to buy feed from small feed shops in villages/communes. For farmers contracted with feed and meat groups (such as C.P., DABACO), feed is provided directly from the contractors. In many places, feed is delivered to a farm by the feed shop owner. A feed supplier in communes may also raise pigs.

Figure 22. Typical pork supply chain in lowland areas of Vietnam



11. Feed agent level 1 is a feed trader who buys feed directly from a manufacturer, and normally sells to feed agent level 2 and big buyers (group buyer).

### Breed suppliers

Breed suppliers may be piglet traders or piglet producers. A trader buys piglets from various sources (farmers, breeding stations) and sells to farmers. The traders may source piglets from different areas, with or without quality control, and hence may be a source of diseases. In most cases, a piglet trader is male, probably due to the characteristics of the job that demand good health and time to be able to source, collect, and sell piglets in many places. Some large farms contract with feed and meat groups, such as C.P. group, and also sell piglets to farmers when there is an excess supply but at a higher price than the prevailing market because piglets from these farms are better quality. More farmers tend to raise sows and produce piglets on their farms because they perceive that their own piglets are healthier than those bought from traders (RIA 2013). After disease outbreaks, piglets are challenging to find and expensive. The number of piglet traders and their scale of operation has seemingly declined over time as farmers respond to disease outbreaks and epidemics.

### Veterinary inputs suppliers

Suppliers of veterinary products range from small shops in a commune/village to bigger shops in town/city, and trading/producing companies. This service must have permission from the government to operate. Normally the number of veterinary shops is less than the number of feed shops in a commune. In some communes where pig density is low and small-scale production is dominant, there are no veterinary facilities and farmers have to go to the nearby communes/towns to obtain their veterinary supplies. In some cases, feed retailers in the commune also sell veterinary supplies. Another supplier is para-vets in the commune/village. They treat livestock on farms as well. Small-scale farmers usually buy veterinary inputs in shops, but large farms are more connected with big traders or veterinary manufacturing companies. For contracted farmers, the contractors might provide veterinary inputs directly.

Note: Percentages are shares of products/services from an upstream actor to a downstream actor.

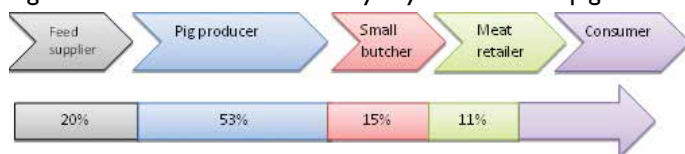
Source: Lapar et al. (2011)

### Pig raiser

Pig farmers produce finished pigs, piglets, and in some rare cases, suckling pigs. The scale of pig production strongly shapes its relationships with other actors in the chain. Small-scale farmers have quite a loose relationship with upstream and downstream actors due to their low demand for inputs as well as low sale volume. For example, many smallholders produce piglets themselves and use less manufactured feed, especially in the central and mountainous areas (RIA 2013). They also believe that pigs fed with feed they produce are healthier and less susceptible to diseases than those fed with manufactured feed. Smallholder pig farmers are usually women, while on large farms, men are more engaged in production functions, especially treating sick animals, artificial insemination, and making decisions about their livestock business.

Along the typical pig value chain, farmers generate the highest share of value added, accounting for 53% total value added in the entire value chain, followed by feed suppliers at 20%, meat retailers at 11%, and small butchers at 15% (Figure 23). Note that it takes a farmer 4–5 months to produce a finished pig, while other actors have more frequent, or even daily, transactions.

Figure 23. Share of value added by key actors in the pig value chain in Vietnam.



Source: Adapted from Lapar et al. (2011).

Another study by Huong et al. (2009) found that farmers generate the highest value added in the indigenous pig value chain. The indigenous pig (I and Mong Cai) value chain in upland areas includes farmers, collectors, traders/



slaughterers, and retailers. A different feature of indigenous pig production in upland areas is that the major source of animal feed is home production. In this chain, the farmer creates about 59% of total value added, followed by the trader at 21%, meat retailer at 16%, and a collector at 4%.

### Pig traders and brokers

A pig trader buys live pigs from farmers and sells them to other actors such as slaughter men, small butchers, meat processing and trading companies, or other pig traders. Pig traders normally operate across provinces and regions, especially if trading volume is significantly large. The main function of this trader is to move live pigs among regions from surplus areas to deficit areas. Where there is excess demand in the final destination, price gaps between producing regions and demand regions can generate profits. For example, pig traders collect pigs from rural areas (e.g. Central region) and transport them to urban areas (Hanoi), or sell to China. There are no data available on live pigs exported to China, but according to DLP (2011), there were two cases during 2006–2011 when export of live pigs to China was significant. Export volume could reach 300–350 t liveweight per day during November 2007–February 2008, and export volume could reach 500–600 t of liveweight per day during November 2010–January 2011. Recently, Thang and Anh (2013) reported that China traders collected fat pigs in Vietnam (heavier than 100 kg) in July–August 2013, and exported volume could reach 200 t/day. DLP also emphasised that live pig exports across the border with China was not a regular occurrence and was influenced by the price gap between the two countries. During time of excess demand and reasonable price gap among regions or demand from China, pig trading is quite intensive, and vice versa. However, traders may be perceived as a source of risk for disease outbreaks when moving sick pigs between places. Almost 100% of pig traders are male, probably due to job characteristics.

For indigenous pigs, traders normally handle a small volume (1–3 pigs per day) while Mong Cai traders mostly trade 4–8 per day (Huong et al. 2009). Indigenous pig traders may operate quite far away from production areas to big cities where there may be high demand for indigenous pork. The number of pig traders has grown in line with rising pork demand (Lapar et al. 2011).

In Northern Vietnam, probably the area with the most pig traders is An Noi wholesale pig market (Binh Luc district, Ha nam province), where pigs collected from various places are shipped to many provinces in Vietnam and China.

Pig brokers are those actors that connect pig raisers with pig traders/slaughterhouses/other meat dealers. They do not keep live pigs but earn a commission for their service. For example, in Hung Yen province, a pig broker earns VND 20,000/pig (about USD 1) for every successful sale (RIA 2013). Pig brokers mostly operate in pig production areas with a surplus where traders/slaughter men are not local people and normally collect pigs from several farmers to fill one shipping quota. All brokers are male.

### Slaughter men and butchers

Slaughter houses operate at different scales in Vietnam. Large ones are more likely located near big cities. There is one large-scale pig abattoir in Hai Phong, which was designed in the 1980s for export purposes, especially for suckling pigs to Hong Kong (FAO 2008). The second abattoir with continuous-line slaughter of cattle and pigs is the VISSAN abattoir in Ho Chi Minh City, built in 1974 by the German Government. Large abattoirs often supply meat for modern retail markets (supermarkets) as fresh/chilled and processed for export, rather than for the wet market. There were 29,281 slaughterhouses in 2011, of which about 50% were for pig (Table 24).

Table 24. Number of slaughterhouses and slaughter points, 2011

Animal	Total	Percent of total	% of slaughterhouses/ points under control	No. of slaughterhouses	No. of slaughter points
Buffalo, cows, goats, sheep	1882	6.43	2.46	121	1761
Pigs	14,537	49.65	21.16	561	13,976
Poultry	9075	30.99	3.22	173	8902
Poultry and cattle	3787	12.93	3.33	141	3646
Total	29,281	100	30.16	996	28,285

Source: DAH(2011).

Note: Most slaughterhouses are actually slaughter points, which have a capacity of fewer than 10 head of buffaloes/ cows/goats/sheep per night, fewer than 20 pigs, or fewer than 100 poultry. Only about one-third of total slaughterhouses are under the control of government line agencies.

Except large-scale pig abattoirs that are attached to processing, dealing, and exporting meat and carcasses, other large slaughterhouses buy live pigs from farmers/traders and slaughter daily. They could either (i) have labour doing the work and sell directly to other meat wholesalers, retailers, or processors; or (ii) have other butchers come, buy pigs from the slaughterhouse's stock, kill the animals, and sell meat/carcass either wholesale or retail, or both. Normally, it is difficult to trace the origin of pork in such large slaughterhouses because pigs are imported from many traders. Hence, meat quality is normally unknown.

In rural/semi-urban areas where demand for meat is lower and scattered, local butchers both kill animals and sell meat/carcass for retail or wholesale. A butcher can also sell meat to local traditional processors.

### Meat processing and trading companies

Vietnamese consumers prefer fresh meat over processed products, so the share of meat for processing is quite low. There are about 28 pork processing factories in Vietnam with products such as ham and sausage (Thanh 2011). Tung et al. (2010) also noted that processed meat accounts for less than 6% of meat sold, especially in rural areas. This figure is highest in Hanoi and Ho Chi Minh City, at just over 10%. Some trading companies process and export meat.

The key players in the meat processing industry include some of the largest multinational and joint-stock companies such as VISSAN, which is the largest company engaged in food processing in Vietnam. The major processed pork products include paté, ham, and meat loaf type products. The operation of modern market outlets such as BigC and Metro Cash and Carry has encouraged development of modern meat processing. Normally, these big companies have contracts with large pig farms.

### Traditional small meat processors

Apart from a concentrated modern meat-processing industry, local traditional processing units have existed over the years in Vietnam, and there are traditional villages that produce different traditional products such as grilled chopped pork, fermented pork, and Vietnamese meat loaf. In Northern Vietnam, there are several meat processing villages where many small meat processors operate, such as Uoc Le, Chem, and Dong Huong. Processed meat for urban/semi-urban consumers mostly comes from meat processing areas where many meat processors operate, such as in villages.

In rural areas where demand for processed pork is relatively low, normally there are few or no meat processors in a commune. The scale of operation for these processors is very small, about 3–4 kg of meat processed each day. Many of them do slaughtering, processing, and retailing, e.g. husband slaughters pig, wife does retailing, and both process the meat. For communes near traditional meat processing villages, there may be no meat processors because consumers might buy directly from the villages or through meat retailers at communes.

Processors normally buy meat directly from the slaughterhouse right after slaughtering. Some types of processed products require fresh meat, such as meat loaf. Some processors also make other ready-to-eat food from pork and sell it in the market, for example cooked blood sausages, barbeque, steamed pig's liver, lung, and intestines.

### Carcass trader/wholesaler

This actor buys carcass/meat from slaughterhouses and sells to retailers/processors/institutional consumers. This type of trader operates mostly in large-scale slaughterhouses that are more likely in big cities or close to big cities. These actors might specialize in meat carcass, meat cuts, or offal. In big cities or suburban areas of big cities there are normally wholesale food markets.

### Meat retailer

Meat is sold to consumers through various channels, including modern outlets (supermarket, trading centre, food stores), wet markets in communes/towns, temporary meat vendors in villages, or itinerant meat vendors hawking from home to home. In 2011, there were 8550 (open/wet) markets in the country, 638 supermarkets, and 116 trading centres (Table 25). However, a majority of Vietnamese consumers do not like to buy pork from supermarkets, and prefer to buy fresh pork from traditional market outlets (Lapar et al.2009), so most meat is available in traditional open/wet markets. In 2011, there was one open market for about every 39km<sup>2</sup> in the country. The density is highest in RRD (11.8 km<sup>2</sup>), followed by MRD (22.8 km<sup>2</sup>) (Table 25). In rural areas, only 58% of communes have markets (Table 26). The operation of small meat vendors is popular in rural Vietnam.

Table 25. Number of vendors and market density in Vietnam, by region, 2011

Region	No. of (wet) markets	No. of supermarkets	No. of trading centres	Area to have one market (km <sup>2</sup> )	Population supposed to be served/market (person)
Country	8550	638	116	38.7	10,274
RRD	1782	165	38	11.8	11,223
NMMA	1423	63	7	66.9	7934
NCCCA	2427	144	22	39.5	7848
CH	370	24	1	147.7	14,276
SE	766	186	44	30.8	19,440
MRD	1782	56	4	22.8	9726

Source: Computed from GSO data.

Table 26. Presence of markets in communes in Vietnam, 2011

Indicator	2006	2011
Total number of communes	9073	9071
Total number of communes having a market	5336	5239
Communes having a market as percentage of total communes	58.8	57.8

Source: GSO (2011).

Almost all meat retailers are female and operate at a range of scale, depending on demand and supply capacity in the market place. They might specialize in fresh meat, processed/cooked meat, or combine with other foods such as eggs, tofu, and vegetables. Normally meat retailers who register in markets specialize in only meat, partly because it is regulated by the market management board. Meat retailers in villages or temporary market places normally sell meat plus several other types of foods. The former might sell up to several pig carcasses per day in urban/semi-urban areas, while the latter trades a much smaller quantity, as low as 5 kg/day (RIA 2013). Many meat retailers in village or temporary markets in rural areas have multiple functions such as slaughtering and processing (traditional meat loaf and grilled chopped pork).

### Consumers

Customers who meat buy from wholesaler/retailers are either institutional buyers (restaurants, food shops, schools, hospitals, kitchen of enterprises/government offices), or households. Given the increasing trend for consumers to eat out, as well as enterprises that provide meals (often lunch) for workers, demand for meat by institutional buyers

might increase. High quality meat is demanded by high-end restaurants, and in many cases, it is imported (for example, beef from the EU and New Zealand). There is no study on institutional meat buyers. However, recent cases of food poisoning related to institutional buyers have raised much concern about food safety in Vietnam. Almost all individuals who buy are female, who also prepare food for their families.

## Value chain links and governance

### Links in the pig value chain

The pig value chain in Vietnam is not built with strong links either vertically or horizontally. Formal contract farming (production and marketing) is practised by some big feed and food companies, but in selected regions and for qualified pig farms. These formal contracts are generally farrow-to-wean and grow-to-finish operations, with a breeding component to control genetic quality, a feed milling/mixing section to control nutrition quality, and a veterinary and animal health program to control diseases (Costales et al. 2006). The formal contract farms are supervised by integrators who choose the optimal timing to sell the pigs, and are up to date with information on daily price fluctuations. As of the end of 2005, there were 34 formal contract pig farms in Northern Vietnam, which were largely concentrated in Ha Tay and Bac Giang provinces, of which six were producing piglets (farrow to wean operation) and 28 were producing slaughter pigs (grow to finish operation) (Costales et al. 2006). There are no updated figures on the current number of contracted pig farms, but C.P had more than 230 swine contract growers in Northern Vietnam in 2011 (Anh 2011).

Informal contracts (generally unwritten contracts) are set between the producer and a cooperative or the producer with an input supplier (Costales et al. 2006). RIA (2013) found that there is no formal contract for pig smallholders, all arrangements are made verbally and based on trust among actors, including input supplier-farmer, farmers-traders, and traders-slaughterhouse. Some large slaughterhouses have contracts with modern retail outlets (supermarkets) and meat processing companies. There is no comprehensive study on horizontal links in the pig value chain, however, there are some cooperatives established from pig farms, mostly to improve pork quality. For example, Tien Phong cooperative in Ho Chi Minh City with 16 members was founded in 2006 to apply good practises and produce safe pork, (Nguyen 2013). Phu Cuong cooperative in Vinh Phuc province was founded in 2006 with eight members, supplying about 150 t of pork in 2012 (Viet Son 2013). Phu Binh livestock cooperative has contracts with Vissan Company for pig production and marketing.

### Input prices and quality

Pig farmers usually buy inputs at fixed prices due to specific market structures. Feed agents sell mostly at prices fixed by manufacturers, thus farmers have no bargaining power in the feed market. Medium- to large-scale pig farmers normally have better links to feed suppliers, even if no formal contract exists. For example, they establish a more regular relationship with feed suppliers (to buy on credit) or a group of farmers will buy feed in bulk. In general, feed of unacceptable quality is rarely returnable after purchase. Feed prices have historically never decreased, only increased.

Piglets as inputs are supplied by a large number of actors (with the exception of farmers who produce piglets on their farms): smallholders, commercial farmers, piglet traders, and breeding centres. There does not appear to be a dominant actor in piglet markets. Piglet prices are determined largely by supply and demand, and prices are usually higher during and after disease outbreaks.

### Live pig prices

With millions of small-scale pig farmers who operate in quite long value chains, most pig raisers are price takers in the market. The dominant actors moving the product from farm to market (e.g. large pig traders, carcass traders) are

important sources for live pig prices and likely influence prices (Lapar et al. 2011). Medium- to large-scale pig farmers and pig traders/slaughterhouses/brokers normally have more regular contact with market transactions.

In a commune/village, a pig raiser—who is also a consumer—knows carcass or retail prices of pork (RIA 2013). Hence, local butchers/retailers have no incentive to fix their buying price for live pigs lower than the prevailing price in the market if they want a secure supply in a competitive live pig market. Local trade of pigs is mostly within smallholders because local butchers normally do not buy pigs from medium to large farms because of their limited capacity to sell meat in large quantities at the commune/village level.

For longer and more complex chains such as rural to urban/semi-urban where farmers are not well informed about the destination of their pigs (geographic area, demand, consumer preferences), prices are more influenced by the middlemen (e.g. large-scale pig and carcass traders). These actors have better access to information about pig prices (both live and carcass) and also the supply requirements from key markets such as urban cities, regional trading hubs for live pigs, or the export market. These actors also play a coordinating role in moving supply from the farm to end markets, a function that gives them relative power over other actors in the chain (Lapar et al. 2011).

## Pork prices

With rapid development of markets, retailing outlets, and transportation systems, meat is relatively available in places where demand exists. Consumers can buy meat at official markets, roadside and temporary markets, village corners, supermarkets, or even have it delivered by a meat vendor. With such large numbers of retailers and consumers, they lack significant bargaining power. However, in markets in cities where meat is distributed from just several large slaughterhouses, prices are probably regulated by the intermediate actors (slaughterhouse, carcass/pig traders).

Coordination among actors in the pork value chain, typically like other agricultural products, is quite loose and not streamlined, especially for small-scale actors. Farmers with a few pigs normally sell directly to local slaughter men or butchers without any formal or informal contract. Local butchers normally know pig farmers and contact them a few days before the transaction. Small-scale farmers, especially those who do not often use industrial or processed feed, are less dependent on feed markets and output markets.

## Degree of market concentration

### Live pig markets

A large number of small-scale farmers are selling a small volume of live pigs, and a large number of buyers of live pigs are traders, slaughter men, or small-scale butchers. These form a quite competitive live pig market in Vietnam; no individual pig supplier can influence the live pig market.

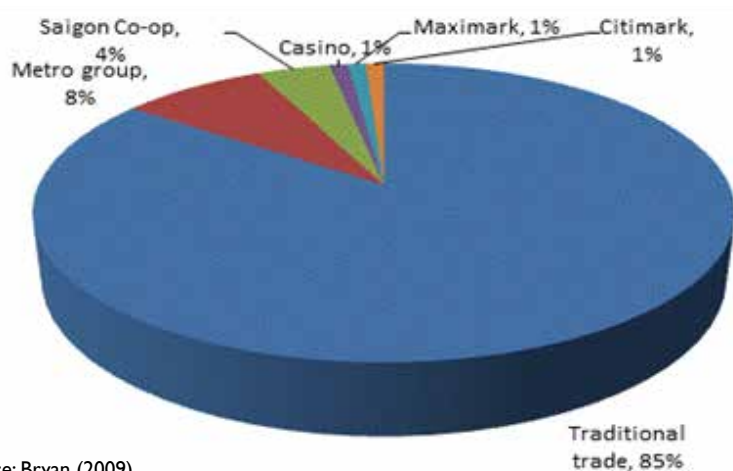
### Pork markets

Vietnamese prefer wet markets, both permanent and temporary. There are many throughout the country, and a large number of meat retailers are in wet markets. Almost all pork sold in these markets is not labelled. Therefore the perceived homogeneity is high. Pork is supplied by a number of slaughterhouses and small-scale butchers or slaughtering points.

Modern food retailing in Vietnam is in a very early stage of development, with total food retailing accounting for 15% in 2009 (Figure 24) (Bryan 2009). Retail sales indicators are very positive and grew by 19% in 2006, however, the sector is highly fragmented and there are only a few major retailers in the country such as Metro Group and Casino

(foreign retailers), and Saigon Co-op, a local operation. Pork sold through modern markets is mostly chilled and frozen.

Figure 24. Share of the retail market in Vietnam.



Source: Bryan (2009).

The food service sector in Vietnam includes hotels, restaurants, fast food outlets, airline catering, and institutional catering. Western-style fast food outlets in Vietnam include Kentucky Fried Chicken (KFC), Burger King, Lotteria, Pizza Hut, and the Philippines' favourite chain, Jollibee. A growing number of tourists in Vietnam also stimulate food sales in hotels, restaurants, and other food outlets.

## Policies related to the value chain

Policies related to production and trading were presented earlier, among which production is given more focus by MARD compared to marketing pigs and pork. Policies related to the value chain cover issues from slaughtering to marketing.

### Slaughtering

In 2006, the government encouraged the build-up and upgrading of slaughterhouses, including specific conditions (capacity, hygiene, food safety, slaughtering technology, planning, and location). Government agencies involved in the task are the Department of Livestock Production, Department of Animal Health, Department of Agro-Forestry Processing and Salt, Provincial Peoples' Committee, and DARD. GMP (*Good Manufacturing Practice*) and HACCP (*Hazard Analysis and Critical Control Point*) are encouraged to be applied to production and slaughterhouses.

### Meat processing

The MARD livestock development strategy toward year 2020 emphasises establishment of processing plants suitable to modern technology and equipment, and linked to commercial livestock production areas. GMP, HACCP procedures are applied in processing plants.

### Retailing and distribution

Hygienic conditions and food safety for raw meat and edible offal marketing are specified by the government, including packaging, conditions for preservation, quality, facilities, water, means of transportation, and waste management. These

standards are still far from the present situation of marketing in open markets. Many open markets are degraded and do not meet the requirements. LIFSAP, the World-Bank funded project currently being implemented by MARD, has supported upgrading some open markets for fresh agricultural products at project sites, which aims to meet hygiene conditions and food safety requirements.

Livestock strategy towards 2020 by MARD emphasises the re-organization of the meat marketing system to link it with slaughterhouses, storage, and processing plants to improve hygiene and food safety, and to influence consumer behaviour towards a preference for chilled/frozen and processed food, and also to discourage vendors, wet markets and temporary markets on street corners. MARD also encourages individuals and institutions to build auction markets for livestock and livestock products, and kiosks for selling livestock. Market promotion, market development, and exhibitions on livestock are also highlighted in the livestock strategy.

## Market information

Feed, pork, and live pig prices are posted on the MARD website<sup>12</sup> on a daily basis, covering selected markets in 30 provinces throughout the country, both retail and wholesale. However, it is quite difficult for farmers and other small-scale actors in the value chain to access such price information on the government website. Farmers normally depend on traders/collectors and slaughter men and do not have many choices to whom they can sell, and normally do not know where their pigs can be sold at reasonable prices other than these traditional buyers. Therefore, price information published on MARD website is likely of little or no value to smallholders.

MARD and Agromonitor also provide commodity reports that analyse meat markets, demand, supply, prices, and outlook for the coming years, but these are largely available to researchers. These reports are also more focused on country-level information, and thus of little value to local pig value chain actors, except for large-scale operators (meat processing companies, retail distribution).

## Coordination in the pig value chain

In 2002, the government encouraged marketing of agricultural products on contract (including pig and pork commodities). It encourages firms to buy agricultural products from farmers through contracts. Enterprises and agents that develop and implement marketing contracts with farmers are given some incentives from the government in terms of land, credit, technology transfer, and market promotion. Various institutions are involved in implementing this policy, including MARD, MOIT, MOF, banks, the State Price Management Board, Vietnam Farmers' Union, and Commodity Associations. It has been informally understood as 'four-stakeholder coordination on agricultural production and marketing' or 'Lien ket bon nha'. The policy has not been effective in stimulating contract agreements in pig marketing.

With small-scale production in Vietnam, large-scale meat traders, retailers, and processors would find it very difficult and costly to buy directly from individual farmers. MARD introduced a new Cooperative Law that took effect in July 2013. In places where smaller groups of farmers want to form a production group, the government introduced a decree on the organization and operation of production groups.

## Summary

The pig value chain in Vietnam is quite complex and longer in the lowland area compared to the upland area. Actors in the chain include input suppliers, pig rearers, collectors/brokers, pig traders, slaughter men, meat wholesalers, processors, retailers, and consumers, of which collector and broker rarely appear in short value chains. The scale of operation largely influences the relationship or links among upstream and downstream actors, where small-scale

12. <http://www.agroviet.gov.vn/Pages/CSDL.aspx?ttvaxttm.aspx>



actors (farmers) usually operate independently while large-scale actors usually set up regular relationships with other actors such as input and service providers as a business strategy.

An actor may perform multiple functions,—a slaughter man can also do processing and retailing, while more specialized functions in the value chain are observed in urban areas. Pig farmers capture the highest share of value added along the chain, but are also exposed to more risk with a longer cycle for production. Except for some farms that have contracts with big feed and meat processing companies, most pig farmers operate independently or with verbal arrangements with input suppliers or pig buyers. Farmers are price takers for both input and output markets. Information on prices and quality is usually transmitted along the chain by different actors, however, the longer and more complex the chain with many nodes, the flow of information is slower and less transparent. Loose links among actors in the chain and non-traceability of products might have contributed to low responsiveness of the chain to consumer demand. Policies related to the marketing of pigs and pork in the value chain generally lack focus for small-scale farmers.

## Information gap

No updated information on contract farming in pig production or economic performance of this type of integration has been developed in the past years. Gender issues in the pig/pork value chain have not been studied intensively. Though pork processing has evolved, no information on the structure, operation, and economic performance of meat processors is available nor has been generated from studies. Economic performance and behaviour of pig slaughterhouses is also missing. While consumer behaviour for pork consumption has been studied, information on characteristics and consumption demand by institutional pork buyers is still a major gap. Market share of different types of pork retailers is not known for both unprocessed and processed products. There are emerging safe food chains for pork in big cities (Hanoi and Ho Chi Minh), especially from GAHP farmers, and these should be studied. Information on R&D for pigs and pork is limited, especially by the private sector.

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**MARPHAVET**



SDK: TCCS

## THÀNH PHẦN

Glucosate canxi  
Vitamin K  
Vitamin C  
Tolferamic acid  
Methyparacetol  
Tá dược: dung môi đặc biệt v.v

## CÔNG DỤNG

Hồi sức cho bệnh thú mag  
sinh thú suy nhược, con  
thú Vitamin C giảm  
Vitamin K ch  
trong cơ

# Food safety

## Structure of the public health sector

In Vietnam, the public health system is divided into three levels—central (Ministry of Health, MOH); provincial (provincial health departments or PHDs, sometimes referred to as provincial health offices or provincial health bureaus); and district level (district health offices, or DHOs). There are four official levels of service delivery: (i) central (central and regional hospitals) managed directly by MOH; (ii) provincial-level providers, managed by PHDs; (iii) district-level, also managed by the PHDs; and (iv) commune-level, managed by the DHOs.

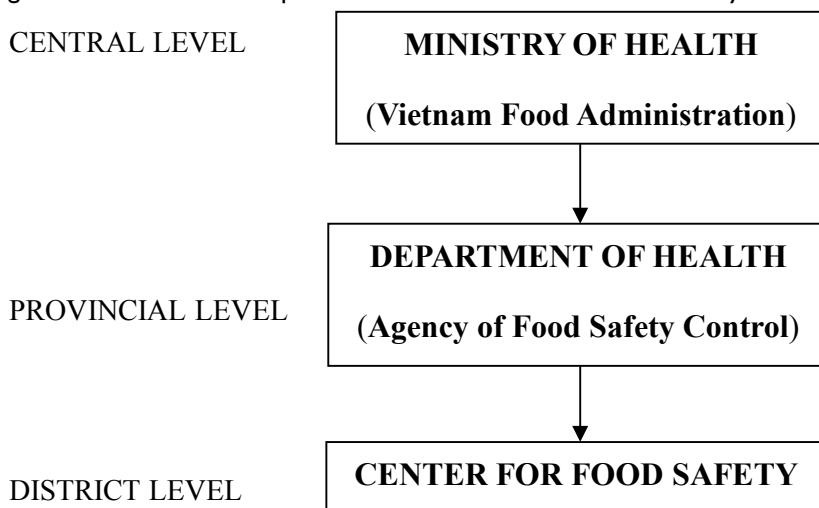
The Vietnamese food safety law mandates national assessment for high-risk products (including meat, fish, and vegetables) for both export and domestic products. In practice, however, this food safety law has not been effected in informal markets because there is insufficient capacity to enforce the law, assess risks, and manage food safety, thus enabling a climate with frequently prevalent food-borne problems as a result of viruses, parasites, mycotoxins, food additives, pesticide residues, and heavy metals (Sarter et al. 2012).

The new food safety law designates three leading bodies as responsible for food safety—the ministries of Health (MOH), Agriculture and Rural Development (MARD), and Industry and Trade (MOIT). These ministries and the subordinate departments at all levels are intended to regulate food safety, but it can be argued that MOH bears the heaviest responsibility for food safety (Figure 25) (National Assembly of Vietnam 2010; Hung 2013). This ministry is mandated to monitor food and drinking water, as well as to manage food safety for both imported and domestically distributed goods. MOH further coordinates food testing institutions, and is expected to anticipate and intercept potential food safety risks. MARD is positioned to supervise food safety and health of all agricultural, forest, and aquatic products along the chain, from input to marketing. MOIT merely monitors imported goods and the value adding processes along the chain (FAO 2009). Although MOH holds overarching responsibility for food safety, MARD and MOIT are in charge of food security, which is strongly associated with food safety (Tiên 2012). All three ministries hold very distinct mandates that might complement each other and foster collaboration, or might not converge in the desired direction. The responsibilities of these ministries to manage food safety are summarized in Annex 19.

Food safety remains a high priority in Vietnam with the growth of export markets and increasing food imports, thus the need to rapidly build capacity to reduce the threats of food borne disease becomes increasingly important. The Vietnam Food Administration (VFA) is responsible for managing food hygiene, safety, and quality and has made significant progress since its establishment in 1999 at the central level. VFA has embarked on an innovative capacity-building activity with technical assistance from the World Health Organisation (WHO).

VFA was established to advise the Ministry of Health. Under this mandate, the tasks and responsibilities of VFA are quite broad and include drafting food standards and coordinating safety regulations; information, extension, and communication (IEC) on food safety; testing food products; inspecting and licensing joint venture enterprises; investigating food poisoning outbreaks; and working with Provincial Preventive Health Centres and District Preventive Medicine Teams to achieve food safety goals.

Figure 25. Structure of the public health sector involved in food safety.



## Major meat safety problems

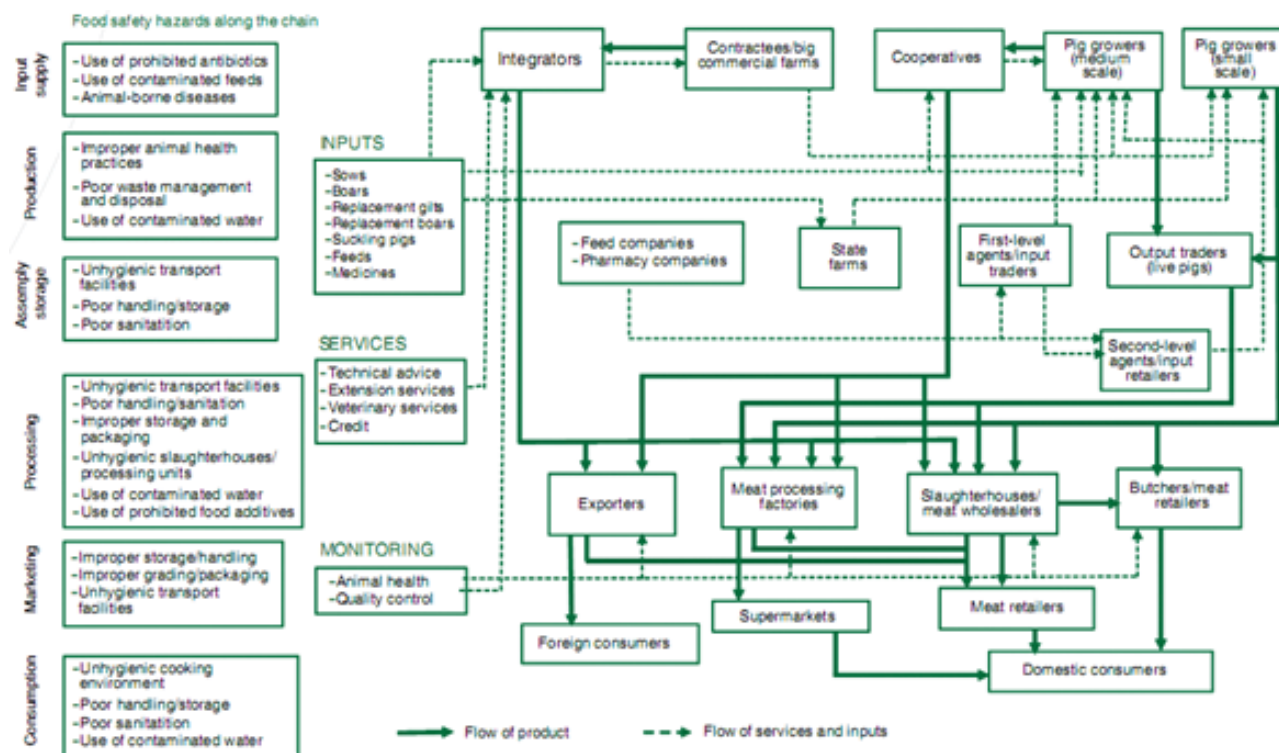
Safety concerns about pork are growing because it is a potential source of several economically important microbial pathogens, including *Clostridium perfringens*, *Staphylococcus aureus*, *Listeria monocytogenes*, and *Campylobacter jejuni* (Jensen and Unnevehr 2000). These biological hazards can occur at any point along the pork supply chain, from production through processing, and finally with the consumer, particularly for consumers who prefer to buy freshly slaughtered meat from traditional wet markets. Hazards are likely to be introduced at various points in the value chain through questionable practises from farm to consumer (Lapar and Tiongco 2011) (Figure 26).

## Food safety in feed

In recent years, public concern about the safety of food of animal origin has heightened due to problems arising from bovine spongiform encephalopathy (BSE), dioxin contamination, outbreaks of food-borne bacterial infections, as well as growing concern about veterinary drug residues and antimicrobial resistance in micro-organisms. Animal feed or forage may be the source of a number of infections for farm animals that can lead to human illness. These include *Salmonella enterica*, *Toxoplasma gondii*, and *Trichinella spiralis*, as well as mycotoxin contamination. Pesticides, agricultural and industrial chemicals, heavy metals, and radionuclides can all pollute animal feed and forage and may also contaminate food of animal origin (FAO and WHO 2007).

It is difficult to monitor feed and additives, and micro-organism contamination is high at slaughter. The level of antibiotic residue and chemicals in aquatic products is also quite high (TECHFOOD EU-ASIA 2007).

Figure 26. Potential sources of risk in the Vietnam pork supply chain.



Source: Tiongco, Catelo, and Lapar (2008).

### Hygiene and food safety in slaughterhouses

About 64% of animal slaughtering is located in residential areas and 36% in markets, and 68% of cattle slaughtering and 27% of poultry slaughtering has veterinary control. These facilities are small. The rate of microorganism pollution samples was 57% (TECHFOOD EU-ASIA 2007).

In 2009–2010, the agencies under DAH conducted hygienic veterinary and food safety surveys in several provinces. There was a decreasing trend in the number of violations among slaughtering. For example, 36% of the inspected slaughtering units did not satisfy the registered required standards in 2009, but the figure dropped to 17% in 2010 (Table 27). Hygiene and safety in slaughtering operations appear to be improving.

Table 27. Inspection of slaughtering units for hygienic conditions, 2009–2010

Type of slaughtering unit	2009			2010		
	No. of inspected units	No. of violated units	%	No. of inspected units	No. of violated units	%
Buffalo, cattle, goats, and sheep	5	5	100	7	4	57.1
Pigs	45	12	26.7	55	7	12.7
Poultry	24	10	41.7	27	4	14.8
Total	74	27	36.5	89	15	16.9

Source: DAH Report (2011).

In general, violations are: (i) unhygienic veterinary waste and water management systems; (ii) not having hygienic veterinary and environmental conditions; (iii) water stagnation on the floor, and (iv) slaughtering livestock infected with diseases. The number of violations at pig slaughtering facilities was highest compared to slaughter operations for

other livestock (Table 28). Inspection and monitoring is more efficient, and contributed to improved hygiene and food safety conditions.

Table 28. Violations of veterinary hygiene and food safety at slaughterhouses

Type of slaughtering points/houses	Total number of violated slaughtering points/houses	Primary offence	Sanction
Buffalo, beef cattle, goats, and sheep	349	Unhygienic waste and water management systems	Warning
Pigs	2015		Administrative sanction
Poultry	145		Overcoming, repairing and improving
Cattle and poultry	30	Water stagnation on the floor	Shift to other places
		Using infected cattle and poultry	Culled
<b>Total</b>	<b>2539</b>		

Source: DAH Report (2011).

In 2010, there was a worrying trend about hygiene and food safety. Surveys indicated higher percentages of meat samples that did not satisfy the required hygienic veterinary and food safety standards compared to 2009 (Table 29). The majority of meat samples that exceeded prescribed levels were in areas such as wet markets due to unsafe transportation of slaughtered meat using primitive means such as motorbikes, pedicabs, and no special equipment to ensure hygiene during transport. In addition, there was a low level of awareness about food safety (not packaging products when they are sold, not having cool storage facilities, using unhygienic veterinary and unsafe tools) which contributed to contamination.

Table 29. Inspection and monitoring of veterinary hygiene and food safety in meats, 2009–2010

Type of slaughtering unit	2009			2010		
	No. of checked samples	No. of violated samples	%	No. of checked samples	No. of violated samples	%
Buffalo meat and beef	60	33	55	51	36	70.6
Pork	503	240	47.7	462	222	48.1
Poultry meat	269	202	75.1	222	195	87.8
<b>Total</b>	<b>832</b>	<b>475</b>	<b>57.1</b>	<b>735</b>	<b>453</b>	<b>61.6</b>

Source: DAH Report (2011).

Test results for microbial contamination in 17 provinces in 2012 showed that 28 of 275 (10%) of pork samples were contaminated with *Salmonella*, and 31% of chicken samples in 2011 and 39% in 2012 were contaminated with *E. coli* (MARD). The high rate of contamination among vegetables and meat is blamed a lack of specific regulations to monitor food quality in all provinces and cities (Vietnamnet 2013).

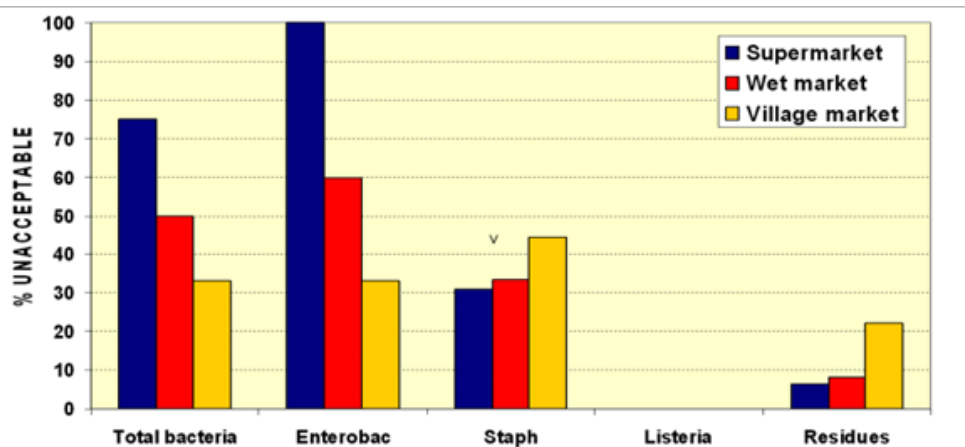
## Food safety in markets

From August 2007 until March 2008, Takeshiet al. (2009) conducted a detection and epidemiological analysis for *Salmonella* spp. in specimens collected from pork value chains to improve the quality of meat hygiene conditions in Hue City. A total of 306 specimens were examined for *Salmonella* spp., aerobic bacterial counts, and coliform. Seven serovars of *Salmonella* spp. were detected in retail pork, slaughterhouse carcasses, and environmental specimens with these detection rates: 33% of retail pork, 16% of slaughterhouse carcasses, 47% of floors, 38% of weighing bowls, 29% of cooking boards, and 17% of tank water samples. They recommended exhaustive sterilization, washing, routine bacteriological examinations, and cooling.

The proportion of pork samples from peri-urban Hanoi with an unacceptable total bacterial count was higher in supermarkets than in wet markets (Lapar et al. 2011). The incidence of staphylococcus and residues was higher in pork samples from wet markets than from supermarkets (Figure 27).



Figure 27. Pork risk assessment in peri-urban Hanoi.



Source: Lapar et al. (2011).

## Food safety in consumption

Toan et al. (2013) used the Quantitative Microbial Risk Assessment (QMRA) to assess the health risk of pork meat contaminated by *Salmonella* spp. in Hanoi. A total of 72 pork samples were collected from four formal markets in Long Bien District. *Salmonella* spp. was analysed by the Most Probable Number (MPN) method. A survey using self-administered structured questionnaires was conducted in 210 households to determine the consumption of pork and examine cooking and eating habits. A health risk assessment was performed for four scenarios of cross-contamination of *Salmonella* spp., including contamination from raw meat to cooked food via hands, knife, cutting board, and full cross-contamination. *Salmonella* spp. was detected in 25% of pork samples (18 of 72). Although this study considered only one stage of exposure in the 'farm to fork' chain, it showed that this stage is critical and represents a potential health risk for consumers.

## Trends in morbidity and human mortality

The public health significance of food safety in Vietnam is not well known, with little quantitative data on the actual incidence of food-borne diseases. The incidence of diarrhoeal disease (both food-borne and water-borne) may be considered quite high, with 984,671 cases of acute-unspecified diarrhoea reported to the National Institute of Hygiene and Epidemiology in 2000 (FAO and WHO 2002).

The Food Administration also has a passive surveillance system that captures what is considered only a small percentage of food-borne disease outbreaks. It can be assumed that most food-borne disease outbreaks are not detected, and hence not reported. In 2001, there were 245 outbreaks of food-borne disease, with 3901 cases and 63 deaths. Approximately 38% of such outbreaks are due to microbiological agents, 16% due to chemical agents, 32% are toxins naturally occurring in food, and 14% were not determined. Determination of causes is mostly based on clinical symptoms, not laboratory confirmation (FAO and WHO 2002).

Poor water quality and deficient production, processing, marketing, and retailing technologies cause high levels of food-borne diseases. Surveys of meat for domestic consumption show one-third of all samples are positive for salmonella, with particularly high figures for pork (77% positive). A recent survey showed 1.5 cases of diarrhoea per person per year, one-fifth of which require medical attention, compared with 0.3 cases of diarrhoea per person per year in developed countries (World Bank 2006).

Data from VFA showed that food poisoning outbreaks in Vietnam did not decrease during 2007–2012 (Table 30), and the number of reported food poisoning outbreaks was normally lower than the actual cases (likely underestimated).

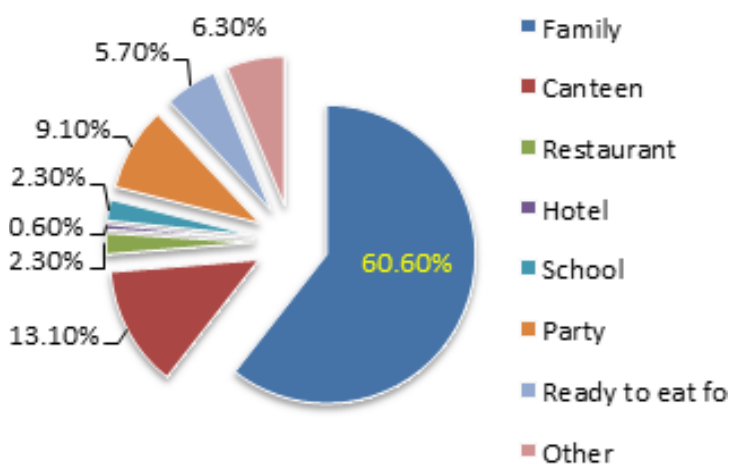
The majority of food poisoning cases happened when people consumed food at home (61%), in canteens (13%), at a party (9%), and in other places (Figure 28).

Table 30. Food poisoning outbreaks in Vietnam, 2007–2012

Year	No. of food poisoning cases	No. of infected persons	No. of deaths
2007	247	7329	55
2008	205	7829	62
2009	152	5212	35
2010	175	5664	51
2011	148	4700	27
2012	168	5541	34

Source: Vietnam Food Administration (VFA) (2013).

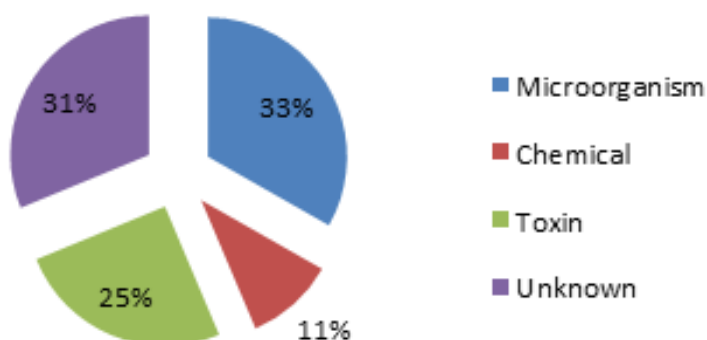
Figure 28. Reported food poisoning outbreaks, 2002–2010.



Source: VFA(2011).

Currently, there is limited quantitative information and research about the nature of food poisoning in Vietnam. Food poisoning reported from 2002–2010 included microorganisms (33%), toxins (25%), chemicals (11%), and unknown (31%) (Figure 29).

Figure 29. Contaminants related to reported food poisoning outbreaks, 2002–2010.



Source: Sarter et al.(2012).

## Factors affecting food safety control practises

A number of factors influence food safety practises: (i) poor quality infrastructure to manage food safety (laboratory equipment etc.), (ii) weaknesses in the food poisoning surveillance system, (iii) lack of resources for food safety management, (iv) low level of awareness of food safety, (v) weak capacity to assess risk, and (vi) weak coordination among actors in the food chain. For example, databases on the nature of food poisoning are limited, which hampers the state response to manage food safety.

When placing Vietnam food safety under a microscope, many hazards can be identified—increasing movement of humans, livestock, and food products; rapid urbanization; shifts in food processing; and pathogens and antibiotic resistance in pathogens are all risk factors affecting food safety in developing countries (Unnevehr and Hirschhorn 2012). In Vietnam's specific context, scant capacity to assess risks and manage food safety is considered to be a major issue associated with the current food safety situation. The present institutional structure for managing food safety should cooperate with all actors along the food chain to minimize risks and map hazards at each stage (The Nation 2012).

## Policies related to food safety

Several policies relate to food safety in Vietnam (see more detail in Annex 17.4). Food safety policies regulate: (i) procedures to control animal slaughtering; (ii) order and procedures for quarantine of animals and animal products, and veterinary hygiene inspection; (iii) regulations for inspection, sanitation surveillance, and animal slaughtering; and (iv) hygienic veterinary conditions for pig slaughterhouses.

Unfortunately, at present there is little coordination among the ministries that are involved in food safety. The legal framework is complex, overlapping, and confusing. Certain special commodities such as infant formula and nutritional supplements are subject to additional quality standards and health requirements.

Policy makers' knowledge about stakeholders seems to fall short, as demonstrated by legislation that was unrealistic to enforce in Vietnam's current situation. This may be associated with the little research that is specific and touches upon the real issues that Vietnam and its society encounter.

## Summary

Rapid urbanization and rising income might encourage longer and more complex livestock value chains and increase concerns about food safety. These food safety issues are likely to pose new constraints to smallholder participation and their ability to compete in modern markets. The government role in management of food safety is important. This is a problem in Vietnam when agencies involved in this task are not well-coordinated and cooperation among them is weak. There are food safety issues at all stages of the pork value chain from pig producers to pork consumers. The recently established Food Safety Law has not been effectively implemented due to weak coordination among responsible agencies as well as the lack of capacity to assess risk. Developing a credible and transparent food safety system is especially critical in meat and meat products where quality and safety attributes are not visual.

## Information gaps

There is still a need to generate robust empirical evidence to inform the debate on food safety and accompanying issues of health risks and quality problems, especially in meat production. There is limited updated information about food safety problems for human health, especially some diseases that are associated with consuming pork. More research should assess the effects of low and uncertain levels of food safety in livestock production (especially, pork) on human health.



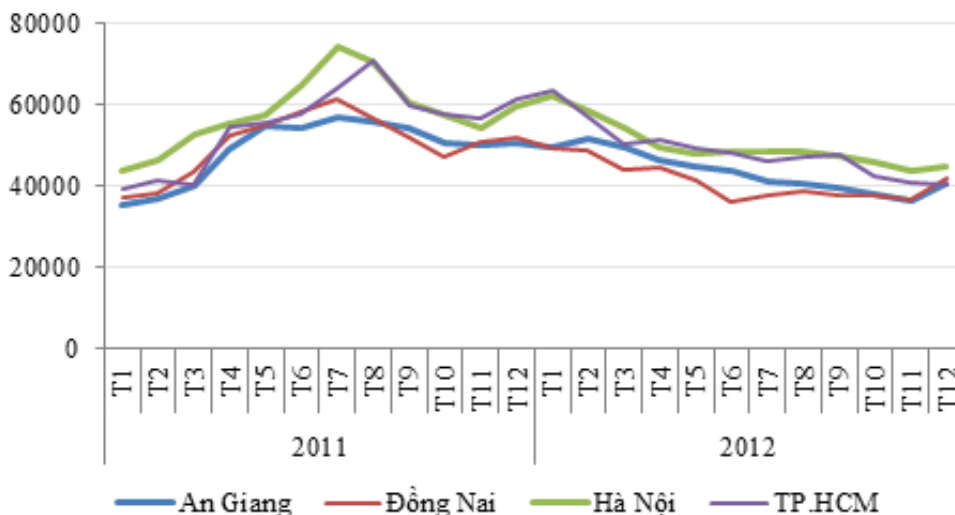
# Competitiveness

## Comparative and competitive advantages of pig production

### Domestic prices of pigs and pork

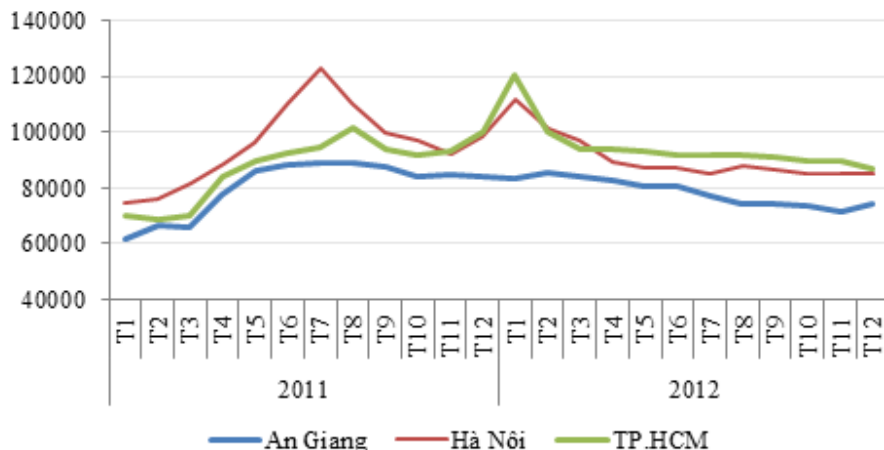
The year 2012 saw a downward trend in live pig and ham prices (Figures 30 and 31). In 2012, food prices were down but feed prices were still up due to strong effects from world input prices (Figure 32).

Figure 30. Volatility in live pig prices, 2011–2012 (VND/kg).



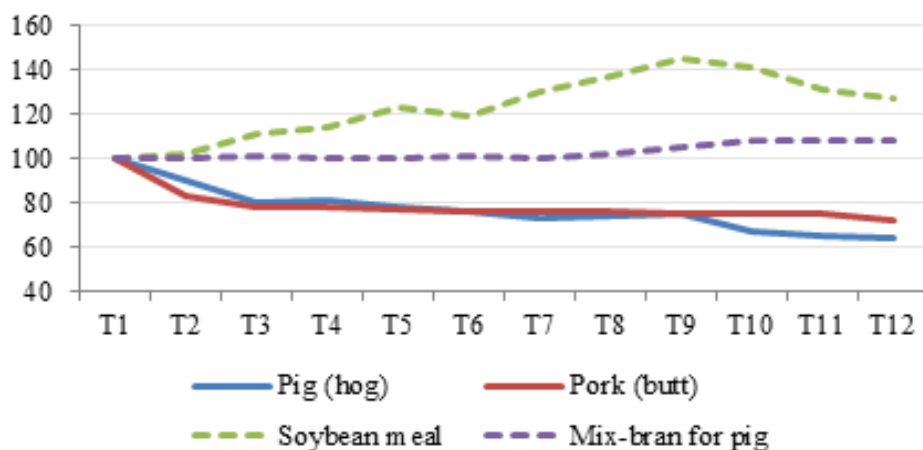
Source: AgrolInfo (2013).

Figure 31. Ham price volatility, 2011–2012 (VND/kg).



Source: AgrolInfo (2013).

Figure 32. Changes in pork and feed prices during 2012 (baseline=Jan 2012, unit %).



Source: AgrolInfo (2013).

## Comparative advantage of pig production

Tung et al. (2010) assessed the comparative advantage of pig production by production systems, regions, and breeds in Vietnam based on a sample of 825 representative farms selected randomly from 38 communes belonging to 18 districts of eight provinces in the North, Central, and Southern regions. Economic analysis and policy analysis matrix were applied to measure the level of comparative advantage in pig production. Production cost per unit live weight of fattening pigs ranged from VND 29,000/kg for smallholders to VND 26,000/kg for commercial pig farms. Under the existing production and market situation in Vietnam, all pig farms, on average, are protected through some implicit output price subsidies, with commercial farms relatively more protected compared with smallholder farms based on the NPC values in Table 31 (NPC > 1).

Table 31. Comparative advantage of pig production in Vietnam, 2009

Indicator	Average		North Region		Central Region		South Region	
	Small-holder farm	Commercial farm	Small-holder farm	Commercial farm	Small-holder farm	Commercial farm	Smallholder farm	Commercial farm
NPC	1.02	1.16	0.93	1.15	0.99	1.10	1.12	1.14
EPC	0.82	1.42	0.77	1.61	0.82	1.41	0.96	1.28
DRC	0.69	0.52	0.71	0.64	0.65	0.41	0.72	0.51

Source: Tung et al. (2010).

Comparison across regions, however, shows that smallholders in the North and Central regions were less protected from market conditions (NPC < 1), suggesting that they are effectively taxed as a result of government price policies. In addition, this study also showed negative incentive effects on smallholder farms (EPC < 1), while commercial farms effectively receive a subsidy (EPC > 1). This trend holds across regions. Based on a calculation of domestic resources cost ratio, it could be concluded that pig production generally had comparative advantage (DRC < 1), and commercial farms had a higher comparative advantage than smallholders (Table 31 and Annex 20).

These results further suggest that smallholders are able to remain as competitive as commercial farms, despite the latter benefiting, and continuing to benefit, from implied subsidies from targeted government policies that support development of large farms in Vietnam. The comparative advantage of smallholder pig producers is thought to be underpinned by their ability to generate efficiency gains from technology choices, specifically, use of crossbreeds that are locally adapted and can thrive under low input systems through feeding strategies based on low-cost, locally available feed. With strong demand for fresh, unchilled pork by Vietnamese consumers, smallholder pig producers can supply local markets as effectively as commercial farms in the absence of a market failure.



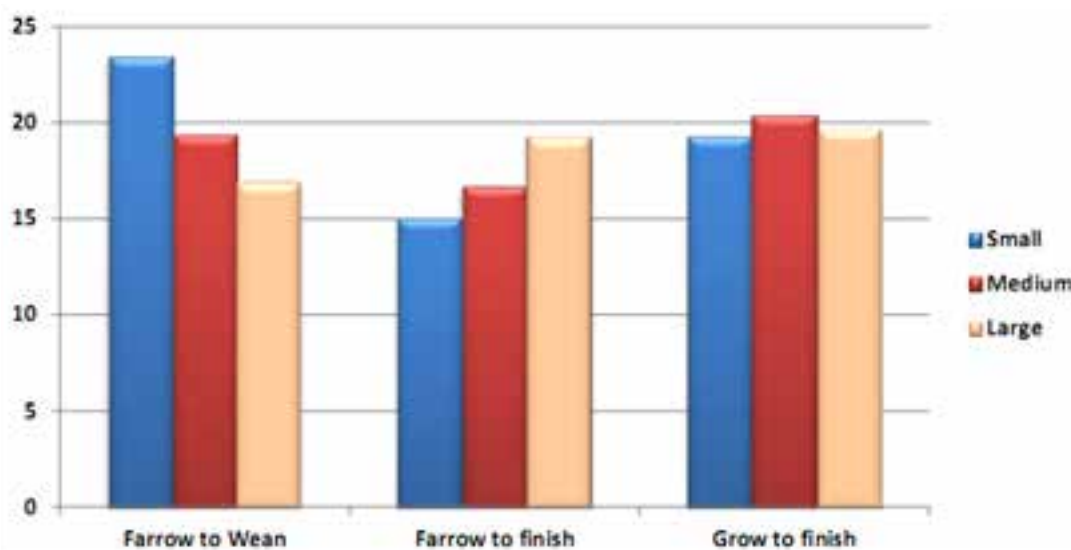
## Current structure of prices and margins in pig value chains

### Smallholder pig farms

A study conducted by Lapar et al. (2012) to evaluate competitiveness of smallholder pig farms showed that most of the variable cost is feed in all production systems (ranging from 64% to 96%). Most producers used a combination of unprocessed and industrial feed and none used only feed they produced themselves. The proportion of industrial feed tended to rise as scale increased, while smaller producers relied more on their own feed. Most industrial feeds were supplied by feed retailers rather than feed wholesalers or integrators. These retailers were also one of the principal raw feed suppliers in addition to crop farmers. Cooperatives have almost no role in the feed supply (Annex 21). An important indicator of farm performance is unit cost or cost per additional unit of weight gain.

In this study, information on various costs were collected, including feed, stock purchase, transportation, services such as veterinary, interest on loans, hired labour, and other costs (Figure 33). Family labour was not included in the cost computation because it was difficult to value family labour given that there are hardly employment alternatives for household members. Moreover, because family members can raise pigs and do other things, say, cooking or taking care of children at the same time, measuring family labour might exaggerate actual labour time. Fixed costs such as depreciation of pig pens and equipment were also excluded in this study. In the context of smallholder systems, these costs were not large and difficult to measure. Note that in farrow-to-wean and farrow-to-finish systems, sows were considered an asset (or capital) and their cost, in principle, should be depreciated along its reproduction cycles. Cost of sows was not taken into account in this study because information of their original purchase prices was not available. Thus, pig production cost was total variable cost excluding the cost of family labour (Lapar et al. 2012).

Figure 33. Cost per unit output of pig production at different scales.



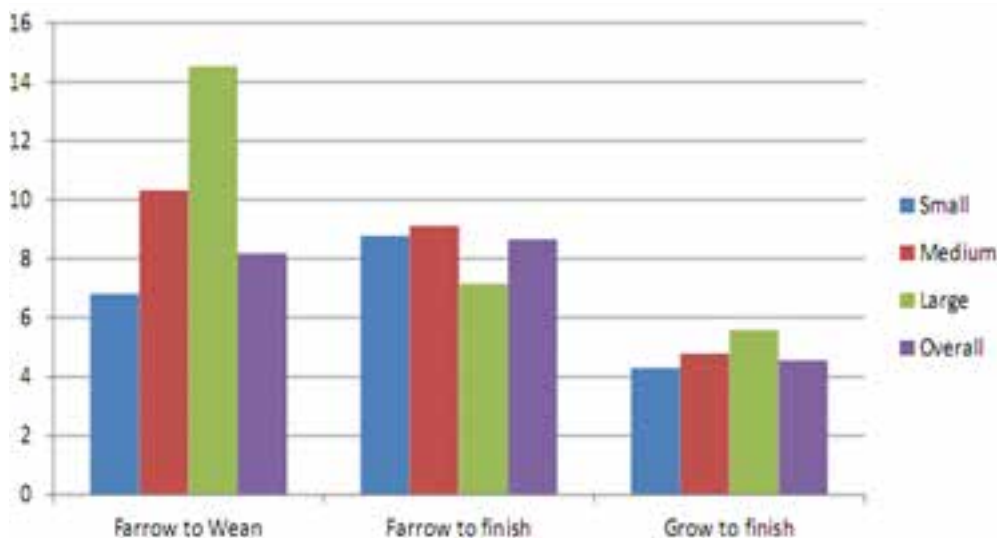
Source: Lapar et al. (2012).

The gross margin per kilogram of output was defined in this study as the difference between average selling price per unit output and per kilogram cost of production (per kilogram cost is total variable cost per kilogram of weight gain). Gross margin captures the effect of output price variation when cost per unit output is not statistically different across scales. Based on estimates from survey data, household-based pig production could generate gross margins ranging from VND 4000 to 15,000/kg live weight of pig produced (or approximately USD 0.21–0.78)<sup>13</sup> (Figure 34). These figures were good indicators of returns to household labour. Average gross margin per kilogram live weight output appeared highest in the full cycle system (VND 8700 or USD 0.46). Lowest average gross margin per kg live weight output was found in fattening systems (VND 4600 or USD 0.24) (Lapar et al. 2012).

13. At the time of the survey, USD 1 = VND 19,000. Applies to the entire paragraph.



Figure 34. Gross margin per unit of output at different scales.



Source: Lapar et al. (2012).

From gross margin estimates, economies of scale were observed in piglet production (farrow-to-wean system). In full cycle production (farrow-to-finish system), empirical evidence suggests the presence of diseconomies of scale. No clear scale effect was found in the grow-to-finish system (Lapar et al. 2012).

Examining feeding systems, the adoption of a traditional feeding seemed to be associated with lower gross margin in piglet production and higher gross margin in the fattening system. There were no statistically significant differences across scale in the full cycle system. For breeds, it was interesting to note that local breed producers were likely to enjoy a higher gross margin per kg liveweight output, compared with improved breed adopters. However, this difference was not statistically significant in piglet production (Lapar et al. 2012).

## Commercial pig farms

The accession of Vietnam to WTO will likely bring stiff competition in the domestic meat market, especially pork (Hung 2011). Commercial pig farms will be much affected due to their larger production scale. The study employed data from 77 commercial pig farms in the Red River Delta. Two groups of farms were defined in this study: (i) CA included farms that had crop cultivation and animal rearing activities, and (ii) CAF included farms that employed three activities in their farming system: crop cultivation, animal rearing, and fish ponds. The total cost for a tonne of liveweight pig was estimated at VND 30.5 million in 2010, in which the variable cost accounts for 93%. Feed cost was a dominant element of variable cost, estimated at VND 21.27 million, accounting for 70% of the total cost of production (Table 32).

Table 32. Production cost and return per tonne of pig liveweight on commercial farms (million VND)

	CA	CAF	Total	Difference (CAF-CA)	p-value
Variable cost	28.8	28.3	28.4	-0.46	.810
Fixed cost	1.3	2.3	2.1	1.09	.002
Total cost	30.1	30.6	30.5	0.5	.732
Revenues	36.4	32.5	33.4	-3.91	.059
Gross margin	7.6	4.2	4.9	-3.46	.054
Net farm income	6.4	1.8	2.8	-4.55	.014

Source: Hung (2011).

While there was no statistically significant difference in variable cost among the two types of farms, fixed cost incurred by CAF farms was statistically higher than CA farms, which could be attributed to a higher land rental and

depreciation cost. Total revenue per tonne of liveweight pigs was estimated to be VND 36.4 million for CA farms, about VND 4 million higher than that of CAF farms (Table 33), because the majority of the CA farms were fortunately not affected by PRRS outbreak in late 2009 and 2010 that were covered by the study period, while the majority of CAF farms were affected (19 farms incurred losses). CAF farms, therefore, earned a relatively lower net income at VND 1.8 million per tonne of pig liveweight, and this is statistically lower than CA farms (Hung 2011).

Table 33. Gross margin analysis, per farm (million VND)

	CA	CAF	Overall	Difference (CAF-CA)	p-value
Total revenues	958.36	1,091.84	1,062.37	133.48	.773
Total variable cost	753.05	840.44	821.15	87.39	.805
Gross margin	205.31	251.40	241.22	46.08	.727
Total fixed cost	43.35	43.40	43.39	.05	.997
Net farm income from agriculture	161.96	208.00	197.83	46.04	.704
Total farm income	206.5	238.1	231.1	31.5	.631

Source: Hung (2011).

In terms of net income per farm, a CA farm obtained VND 161.96 million in year 2010 while CAF farms earned VND 208 million during the same period. The difference in income was VND 46 million and was not statistically significant. On average, a commercial pig farm had income of about VND 198 million from agriculture in year 2010 (Table 33). Total farm income was estimated to be VND 231 million, of which pig production accounted for about 70% of total farm income.

In addition, Hung's study (2011) also showed that the farms were quite vulnerable to external conditions, of which disease outbreaks and market fluctuations were the most risky factors. Both contributed to higher costs and lower market prices for domestic pig meat, hence lower competitiveness of domestic pig producers. Advantages of rearing pigs in a VAC system could be lost due to disease outbreaks. To enhance competitiveness of commercial pig farms, disease prevention and control are emphasized; a sustainable supply of piglets should be facilitated by building breeding stations in selected areas. MARD also needs to speed up the progress of expanding maize and soybean areas. The government plays an important role in facilitating and/or securing market access for pig producers by managing the domestic meat supply including imports, building alliances among farmers and relevant actors, spending for R&D, and other macro policies.

## Likely growth areas for smallholder pig producers

If smallholder pig producers can produce at a lower per unit cost than large producers in the fresh pig meat market, then they will have a chance to remain competitive in that market. This is feasible when smallholders are more efficient users of farm resources such as using their own produced feed and household labour, thus giving them a market advantage over large producers that will be difficult to overcome. Identifying viable options for technologies, policies, and institutions that will enhance smallholder production efficiency will help ensure that smallholders sustain their comparative advantage and be competitive in supplying the fresh pork market in Vietnam.

Smallholder pig producers in Vietnam are competitive in producing pork that meets the demand requirements of the fresh meat market. High and increasing demand for pork and strong preference for fresh, unchilled meat supplied by traditional market outlets present market opportunities for smallholders. This strong preference for fresh pork also provides natural trade protection from imports. These demand drivers could underpin the competitiveness of smallholders in the fresh pork market in Vietnam, given the increasing concern about pig meat quality and food safety, particularly among increasingly urbanized and high-income consumers (Reardon et al. 2001; Humphrey 2005; King and Venturini 2005; Regmi and Gelhar 2005).

Smallholder pig producers still use a large proportion of feeds they produce themselves such as crop by-products and forages. This provides cost-effective feeding options, thereby enhancing their ability to compete with other suppliers in the same market for fresh pork (ILRI–CAP 2010). Feed costs are 64–96% of production cost in smallholder pig production (ILRI–CAP 2010). Many smallholder pig producers use a combination of purchased feed, e.g. complete, concentrate, and raw feed, and their own feed of which forages and crop by-products are the main types (ILRI–CAP 2010; Lapar et al. 2012).

Smallholder pig producers can potentially exploit their comparative advantage in supplying the market for replacement gilts for local breeding sows, given the existing gap in market requirements for these types of pigs, especially in upland areas (ILRI–CAP 2010). This is a potential for growth for smallholder producers in Vietnam. They can capture a significant market share of breeding stock for local pig breeds that are widely used for cross-breeding with exotic boars. Breeding of local cross-breeds suits the smallholder systems in terms of resource requirements for feeds, as well as the high adaptability of indigenous breeds to local conditions.

## Summary

Both smallholders and commercial pig farms have comparative advantage in supplying pork that the Vietnamese consumers demand. Some studies suggest that commercial farms achieve higher returns from pig farming than smallholder farms, which could be explained through the observed greater efficiency of labour and capital use in commercial farms from economies of scale. Within household-based pig production systems, however, economies of scale were not empirically supported by data from surveys implemented by ILRI and its collaborators in Vietnam. Also, despite falling output prices and rising input prices, domestic pig production can still sustainably maintain its dominant market share by enhancing production efficiency. There are identified areas in feed and breed use that could potentially enable pig producers, particularly smallholders, to achieve efficiency gains through application of appropriate technologies with the right policies and institutions to support their uptake.



# Externalities

## Environmental impacts of livestock production

Animal manure can provide nutrients for crop and fish production and input for biogas production, but if managed inappropriately, can also have a negative impact on the environment. Vietnamese and Asian livestock production are increasing, and as a consequence, large amounts of manure are produced that may be a hazard to the environment. Traditional technology and management practises for manure are not adapted to specialized livestock production. Further, there is limited information on the nutrient value of animal manure and on environment-friendly manure management by farmers. This lack of knowledge enhances the risk of polluting the environment by inappropriate use of manure and is also a potential risk for transferring pathogens among livestock and from livestock to humans (zoonoses) (Sommer et al. 2008).

## Manure management

The most important tool to improve manure management is reliable information about practises for managing manure on farms. In Vietnam, manure from all sizes of farm holdings is mainly separated manually in solid and liquid fractions inside the animal house. Urine from the housing diluted with washing water (liquid manure), is transported through open channels to the outside. On smallholder farms, pigs, dairy cows, and buffalo may be raised under confinement on floors bedded with rice straw, thereby producing manure with a high carbon content to improve soils poor in organic matter. Poultry manure is collected in a solid dry form (Sommer et al. 2008).

### Solid manure

Solid manure is composted, but for cattle manure the composting process will only take place if the manure is mixed with something else such as straw. Solid manure on most livestock farms is composted in quantities so small that only a limited temperature increase is achieved. On a few farms the manure is covered with plastic or composted indoors. The advantages of composting are a reduced risk of spreading pathogens and weed seeds, reduced volume, stabilization of the manure, and reduced hatching of insects. Hatching insects can still be a problem even after manure application. Solid manure in some regions is a commodity sold to farmers producing high-value crops such as vegetables and coffee, or to fish producers (Sommer et al. 2008).

### Liquid manure

In North Vietnam, liquid manure is discharged to fish ponds or rice fields. In the Red River Delta small-scale livestock farmers generally own 1000–3000 m<sup>2</sup> of land, typically used for fish and rice production. In the South, small-scale livestock farmers own more land (average 1 ha) and liquid manure is channelled or hosed onto crops in fields. The liquid is also manually spread on fields, an unpleasant practice that demands much manpower. Further, neighbours complain when the manure is transported through villages to the fields (Porphyre and Coy 2006). Some medium- and large-scale farmers are discharging liquid manure into canals or rivers after anaerobic treatment in lagoons (Sommer et al. 2008).

It appears that manure processing with the objective of reducing the risk of pathogen transmission is only carried out if there is no immediate need for the manure as a fertilizer. Otherwise, manure is spread directly without storage or pre-treatment. Thus, the research and development for appropriate manure handling technologies should focus on manpower requirements, plant nutrient availability, and pathogen reduction. There should be guidelines for efficient and sanitary safe use of animal manure, which include recommendations for introducing technologies to reduce nitrogen losses and improve the utilization of organic nitrogen from manure. Furthermore, farmers should be familiar with the capacity of manure as a fertilizer. Manure used efficiently would increase farmer income (Sommer et al. 2008).

A survey of manure management on pig farms in Northern Vietnam conducted by Vu et al. (2007) showed that most farmers knew that animal waste may negatively affect the environment and their health. One-half of the households believed that animal diseases could be transferred to humans. They were, however, reluctant to provide an opinion about their own manure management and its effect on the surrounding environment. This is understandable, because most farmers produce pigs or raise animals as their main source of income and it is unlikely they will complain about the effects of livestock production on the local environment. In the survey, one family never opened the window because of the heavy smell from the neighbouring farm. According to the farmer, the relationship within communities in rural areas is very important, and to avoid conflicts with neighbours the farmer will not complain about the smell.

## Impacts on ecosystem health

In Vietnam, rapid economic growth and urbanization during the past 15 years have led to diversified diets, and hence to an increased demand for meat, eggs, and dairy products (Minot et al. 2006). Maize is the primary feed for Vietnam's rapidly growing livestock and fish industry, so the demand for maize has grown dramatically and is expected to further increase in the future (DAO et al. 2002; Thanh Ha et al. 2004; Thanh and Neeffjes 2005). Consequently, maize production in Vietnam has sharply increased and is highly commercialized, especially since the government began to strongly support and promote hybrid maize technology in 1990 (Keil et al. 2013). Since then, higher-yielding hybrid varieties have been widely adopted, and maize has become the second most important crop after rice (Thanh Ha et al. 2004; Thanh and Neeffjes 2005). While this development has the potential to reduce rural poverty by offering attractive income opportunities to farmers (Delgado et al. 1999), it also exposes farm households that used to be subsistence-oriented to market-related risks. Furthermore, this development promotes the expansion of agricultural cultivation onto fragile hillsides, often leading to deforestation, soil erosion, and subsequent soil degradation (Dao et al. 2002; Wezel et al. 2002; Valentin et al. 2008), thus posing a threat to farmer livelihoods in the medium to long run.

Erosion is one of the main causes of soil degradation on the slopes of Vietnam, where three-quarters of the country is classified as upland areas. Hence, soil loss by erosion is a serious problem in this country. Together with erosion, human activities are also a main cause of soil degradation, contributing to an increase in the rate of soil loss by inappropriate cultivation methods on slopes and subsequently destroying the watershed forests (Ha 2009). For example, a study done by Keil et al. (2013) examining the intensive commercial agriculture in fragile uplands of Vietnam showed that although farmers in all wealth groups were well aware of soil erosion on their maize plots, effective soil conservation measures were rarely practised. The fact that maize is currently a highly profitable cash crop means that soil conservation measures incur high opportunity costs in terms of land lost for maize production. In the context of increasing demand for feed ingredients such as maize, the economic incentives for intensified maize production and expansion of cultivated area will likely pose a continuing challenge to balance the twin goals of supplying feed demand with issues around sustainable land use and effective natural resource management, including soil conservation.

## Greenhouse gas emissions

Livestock emit gases that contribute to global warming, eutrophication, and malodours. European emission inventories show that livestock production constitutes 70–80% of total ammonia emissions (ECETOC 1994). In areas where there is a high concentration of pigs, soil and ground water pollution affect public health. The need to eliminate or at least reduce environmental pollution is urgent (Kinh and Hai 2008). In Vietnam, livestock production contributes about 45% of GHG emissions (Boonyanuwat et al. 2013)

Global warming effects resulting from GHG emissions can influence pig physiology, and this is particularly important in Vietnam given the high pig population in the country. High temperatures can decrease feed intake and production efficiency of pigs (Hsia and Lu 1987). Higher temperatures can affect the quality and quantity of forage from grasslands and other food supplies (Adams et al. 1999). Hanson et al. (1993) found that climate change tended to restrict livestock productivity (e.g. reducing milk and meat production) through both declining forage quality and increased ambient temperature.

## Public health concerns

### Nutritional impacts

Pork is a problem when it is consumed in excess (more than one serving, twice a week). Excessive pork consumption is most problematic because this slow-to-digest food affects the overall digestive process. In general, foods that digest quickly (e.g. fruits and vegetables) are held in the stomach until slowly digesting foods are released into the small intestines. During this time, the quickly digesting foods begin to ferment, producing gastrointestinal disturbances (gas and indigestion) (Franklin, undated).

In the case of pork, consuming multiple servings in a day or even in a week can lead to a severe back-up in the digestive system. This back-up can make it difficult to absorb essential nutrients. Overtime, undigested foods will putrefy in the stomach and small intestines leading to toxicity.

Where conventional diets are deficient in some micronutrients not available in the dominant component of the diet, such as in cereal-based diets, pork may be able to provide these micronutrients, as well as increase the protein content of the diet.

### Food safety

Livestock manure contains many microorganisms, protozoa, and viruses that may pose a risk to human and animal health. Recent reviews on the current status of parasitic diseases in Vietnam have highlighted the risks of disease transmission through animal manure and human excreta (De et al. 2003). Highly contagious and pathogenic viral diseases may spread through animal effluents into waterways, and when one farm is infected, it may cause downstream farms to be exposed to a considerable risk of infection (Johansson et al. 2005).

Diarrhoeal infection risks caused by exposure to human excreta and wastewater were studied in Hanam province, North Vietnam. Untreated wastewater, discharged into watercourses by households and urban settlements further upstream, was highly contaminated with pathogens. Excreta handling and use of untreated wastewater for rice cultivation led to high risks of infection for the exposed population (Khuong et al. 2010).

Pigs are also susceptible to contracting zoonotic diseases that if not effectively managed on-farm, may likely be transmitted to humans through exposure on the farm, or through ingestion of contaminated pork.

## Summary

Animal manure can provide nutrients for crop and fish production and input for biogas production, but if managed inappropriately, can also have a negative impact on the environment. Pollution caused by pig production is now an issue in rural areas and more seriously in suburban areas where population density is high and the number of pig raisers has not significantly declined as desired by the government. This has two-fold implications: increasing risks for both animal and human health, and aggravating social issues (conflict) in the community. There is a need to explore technical solutions to the environmental issues from waste and odour generated from pig production. Research on technologies that reduce environmental pollution caused by animal production will help generate knowledge and evidence that will guide development of feasible and viable approaches.





# Livestock development strategies and activities

## Vietnam's 2011–2020 agriculture and rural development strategy

In 2009, the Ministry of Agriculture and Rural Development (MARD) adopted a new development strategy for the agriculture sector and rural development for 2011–2020. In this strategy, MARD also summarized major achievements during 2001–2010, including: (i) fast growth in agriculture, forestry, and fishery production (average GDP growth rate of these sectors during this period was 3.8% per year); (ii) structure of the agriculture, forestry, fishery sectors moved positively towards improving productivity, quality, and efficiency associated with market demand; (iii) ensured national food security; (iv) fast growth in exports and some agricultural and fishery commodities had good positions in the international market; (v) improved living standards for rural people; and (vi) strengthened economic infrastructure of rural areas.

In addition, this strategy also showed the major constraints and challenges for development of these sectors: (i) unsustainable growth and low competitiveness of the agriculture sector, especially the development of livestock and fishery industries; (ii) low quality, poor efficiency, and problematic hygiene and food safety of agricultural products; (iii) slow development of the industrial sector and rural services; (iv) slow changes in organizations and rural institutions; (v) low income and high poverty rate in rural areas; and (vi) increases in environmental pollution, and overexploited many natural resources.

Based on the achievements and constraints during 2001–2010, MARD created a development strategy for the agriculture sector and rural development for period of 2011–2020 with these general objectives:

- Develop a comprehensive agriculture sector with modern, sustainable, large-scale commodity production, high yields, quality, efficiency and competitiveness that ensures national food security in both the immediate and long terms.
- Build a rural economy with modern socioeconomic infrastructure; create an appropriate structure of the rural economy and production organizations; develop an agriculture sector that is associated with fast development of industry, services, and urban planning; stabilize rural society and colourful traditional culture; enhance education, protect the environment, and enhance the leadership role of the Party in political systems in rural areas.
- Continuously improve living standards of the rural population, harmonious development among regions of the country, faster development in more difficult and remote areas, farmers to have a knowledge level similar to farmers in advanced countries in the region, and train farmers to prepare for a new role in the new rural development.

To achieve the general objectives, MARD divided the development strategy into two periods (2011–2015 and 2016–2020) with specific objectives. This report is focused on the development strategy for the livestock sector:

- To meet increasing domestic demand, develop pig and poultry industries with high quality and good characteristics. The goal for the national pig herd is about 33 million by 2015 and 35 million in 2020, with output reaching 3.9 million tonnes of meat in 2015 and nearly 5 million tonnes in 2020. There will be 252 million chickens in 2015 and 306 million in 2020, with meat and egg production reaching 0.8 million tonnes and 9.1 billion in 2015, respectively, and more than 1.1 million tonnes and nearly 14 billion eggs in 2020. The goal for buffalo is to have nearly 3 million, and nearly 13 million cows in 2020, of which approximately half a million are dairy cows. Meat production is expected to meet domestic demand by 2020.

- Specific orientations for development of livestock sector in each ecological region are also presented in the strategy. The Red River Delta and South East regions will focus on developing pig and chicken farms in an industrial form with concentrated production areas. Ducks will be raised in the Mekong River Delta, shifting from extensive farms to highly intensive duck farms. Cattle (buffalo, beef cattle, and dairy cows) will be raised in the midland and mountainous areas and central highlands; goats in the northern midland and mountainous areas; and sheep farms in the Central all focus on high quality products and could partly satisfy domestic demand.
- Plan to develop concentrated livestock production areas far from residential areas to reduce disease risks and support safe processing factories, systems, and slaughtering units; encourage development of industrial slaughtering and processing facilities; enhance the capability and development of veterinary services; control diseases, especially at the local level; force quarantine at borders and gateways to important markets to ensure biosecurity and food safety; and build safe production areas in disease situations.
- The feed processing industry needs to be developed to improve the competitiveness of the livestock sector. Development of the feed processing industry should support large-scale, high quality, and low production costs per unit of feed. Increases in the percentage of livestock producers using commercial feeds will reach more than 67% (about 16.3 million tonnes) by 2015, and more than 70% (about 19.2 million tonnes) by 2020.

## Vietnam's 2020 livestock industry development strategy

In 2008, the Ministry of Agriculture and Rural Development (MARD) adopted a new development strategy for Vietnam's livestock and meat industries with a time frame of 2010 to 2020. The broad objectives of this strategy are to:

- Reorganize and industrialize livestock production and processing in Vietnam. The goal is to develop an industry that: (i) is more integrated, intensive, and geared towards the use of modern production and processing capabilities and facilities, including modern slaughterhouses; and (ii) use higher quality manufactured animal feeds made in Vietnam.
- Create higher productivity, improve product quality, and develop an industry that can meet safe food requirements as demanded by: (i) export markets (e.g. in Hong Kong and Singapore); and (ii) more health and safety conscious domestic consumers.

MARD set targets when formulating its 2020 strategy, of which the following are specific to pigs and pig production:

- Expand the share of livestock production, when compared to total agricultural production, to 42% in 2020. Currently, the share is between 26 and 28%.
- Increase meat and poultry production to 5.5 million tonnes by 2020 (63% pig meat, 32% poultry, and 4% beef), when per capita consumption will have reached 56 kilograms, with commercially produced meat accounting for 40% of production in 2020.
- Establish standing inventories of 12.5 million beef cattle and 35 million pigs by 2020.

To achieve the formulated targets, MARD also presented strategic orientations and activities in the 2020 livestock development strategy, of which the following are relevant to pigs and pig production:

- **Pig production.** Quickly increase the exotic pig herd following the industrial/intensive farm model in areas where land is available, control diseases, and protect the environment; maintain a certain scale of crossbred and specialty pig production that is consistent with economic conditions of households and given regions. The total national pig herd will increase at an average annual growth rate of 2%, reaching 35 million, of which 37% are exotic pigs raised on the industrial/intensive farms.
- **Feed production.** Promote development of the feed processing industry by expanding production scale, use modern technologies, improve feed quality, and reduce unit costs of feed produced. To achieve this goal, a portion of agricultural land will need to shift to intensive grass and feed crops (using high productivity and protein seeds); improve the processing capability of the domestic feed industry and fully utilize the raw materials coming from agricultural and industrial by-products for industrial feed production. Total domestic industrial feed output is expected to increase by 8% per year and reach 19 million tonnes by 2020.

- **Slaughter.** Build slaughtering and processing units at an appropriate scale that employ modern technologies, create advanced facilities associated with intensive livestock production areas, and diversify processed livestock products to satisfy consumer demand. The small-scale slaughtering and processing units must follow sanitary and food safety guidelines and ensure product quality standards. To activate the 2020 strategy, there will be seven new modern slaughtering and processing centres established in strategic locations across Vietnam, and incentives for the private sector to invest in upgrading their existing meat processing operations and new modern meat processing plants.
- **Diseases.** Improve and enhance disease control veterinary systems from the local to central level to reduce risks for livestock producers, especially smallholders.

To successfully implement this development strategy, MARD also proposed nine programs related to the livestock sector, of which the following are relevant to pigs and pig production: (i) develop pig production; (ii) develop a feed processing industry; (iii) encourage development of industrial livestock farms, and the livestock slaughtering, storage, and processing industries; and (iv) enhance the capability of the animal health sector.

While targets for pigs in this strategy appear to be attainable, there are still remaining issues that may be constraints, for example, the level of investment that is available and the willingness of the private sector to invest in the industry. In other ASEAN countries, there have always been private sector funds available for a range of livestock sector investments, including pigs (Stanton and Sia 2011).

In Vietnam, the pig farming system mainly involves smallholder farmers and household/backyard pig raisers producing about 80–90% of the pigs and 75–80% of the national pork supply. MARD generally considers the pig smallholders to be competitive as pork suppliers to domestic markets. This perspective is also solely based on financial consideration, i.e. a lower pork price for consumers, which is viewed as highly positive for this segment of the pig and pork sector.





# R&D partnership landscape

## Partnership landscape in livestock R&D

In Vietnam, government and non-government institutions are involved in livestock R&D.

The Ministry of Agriculture and Rural Development (MARD) is the main government body that conducts research and development in livestock and feed. Under MARD, there are several institutes, departments, and centres—the National Institute of Veterinary Research (NIVR), the National Institute of Animal and Husbandry Science (NIAS), and the National Agriculture Extension Centre (NAEC). NAEC and its network, Department of Livestock Production (DLP) and Department of Animal Health (DAH), are major line agencies of MARD that are involved directly in livestock development.

Universities of agriculture also undertake specific research on livestock and fishery. In Vietnam, the leading agriculture universities are:

- Hanoi University of Agriculture
- Thai Nguyen University
- Hue University
- Nong Lam University
- Can Tho University
- Tay Nguyen University

Non-government agencies doing research in livestock and feed are:

- International Livestock Research Institute (ILRI), FAO, World Bank, ADB, GTZ, InVivo NSA Vietnam, and AsVeLiS.
- Private companies operating in production and breeding of livestock are also involved in research, including C.P. group and DaBACo group.

The private sector (input and processing industries), non-government organizations, and associations are actively involved in the development of livestock in Vietnam.

## Research institutes

### NIAS

NIAS is a research institute that belongs to MARD. It was founded in 1952. NIAS is based in Hanoi and has a branch in the South. It conducts basic and applied research in biochemistry, molecular genetics, embryos, semen, metabolism etc.; and on animal selection, breeding, feed diets, feeding and management systems, and others. Research

in animal economics is also carried out to promote livestock production. In addition, NIAS disseminates research output and technologies on livestock and feed production and trains staff. NIAS has 13 research centres distributed across the country.

Pig breeding has been a focus by MARD and NIAS over the years. During 1995–2000, the ACIAR project ‘9423 Pig Breeding and Feeding in Australia and Vietnam’ was implemented with participation by the Institute of Agricultural Science of South Vietnam (IAS) and the Animal Research Institute of the Department of Primary Industry–Queensland (ARI), with participation from key agricultural universities and NAEC. The project aimed to enhance pig production, especially amongst small-scale producers, through programs to improve breeding and feeding. Improved pig breeds imported from Australia were evaluated for adaptation to Vietnamese conditions. This project was evaluated as a successful research and development project to enhance benefits for the poor in Vietnam.

## NIVR

NIVR is a government research agency under MARD that conducts research, transfers technology on livestock and feed production, provides higher education, and consults on veterinary issues as regulated by law. NIVR carries out basic and applied research in the veterinary field on viruses, bacteria, and parasitic diseases. It develops tool kits to diagnose animal diseases, protocols for disease treatment, technology to produce vaccines used in veterinary medicine, gene banks for veterinary research, and protocols to prevent diseases and treat sick animals. NAVECO is a company under MARD and NIVR, responsible for research, production, and trade of veterinary medicines. The company produces 15 types of vaccines, and more than 100 types of veterinary products for livestock and fishery production. NAVECO also manages a Centre for Veterinary Research located in Ho Chi Minh City.

During 2007–2013, NIVR conducted a number of projects, including vaccine production, research on meat contamination by salmonella in different types of slaughterhouses, and research on antibiotic resistance of bacteria isolated from pigs on farms and in slaughterhouses in Northern Vietnam.

## Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD)

IPSARD was established in 2006 under MARD, mandated to do research on agriculture and rural development, and assess impacts of policies, strategies, plans, and programs in agriculture and rural development. IPSARD also provides multi-dimensional and multi-media information to support decision-making in management, production, trade, and investment related to agriculture and rural development. IPSARD cooperates with domestic and foreign institutions and individuals on research and disseminates technology, and also provides training as well as consultation for development of agriculture and the rural sector. The *Rural Development Centre* (RUDEC) is a unit under IPSARD, responsible for research on a variety of rural socioeconomics such as agricultural R&D, food supply chains, commodity chains, and quality management

# Universities

## Hanoi University of Agriculture

Hanoi University of Agriculture (HUA), founded in 1956, is a key national university that provides resource training and scientific research for agriculture and rural development, and is becoming more diversified, with ever increasing prestige among the higher education system of Vietnam. Research has increasingly been important to the university and is considered as the mission of HUA. Today, the university has about 1300 staff and 25,000 students. There are 13 faculties in the university, including Animal Science and Aquaculture, Veterinary Medicine, Economics and Rural Development, and Biotechnology. Most students graduating from the Faculty of Veterinary and Faculty of Animal Sciences after 1994 now have important positions in veterinary companies, feed manufacturers, and large-scale production units in the country.



## Nong Lam University (<http://en.hcmuaf.edu.vn/>)

The university was founded in 1975 and is now located in Ho Chi Minh City. It is striving to become a multi-disciplinary university in education and research, with an international standard in educational programs, making efficient contributions to national development. At present, NLU has 12 faculties, including Animal Science and Veterinary Medicine, Economics, and Fisheries.

The Faculty of Animal Science and Veterinary Medicine is one of the largest. The faculty has one veterinary hospital, practise farms, and 10 laboratories on campus. It has strong relationships with companies, manufacturers, and farms in animal production and veterinary. Research focuses on improved indigenous livestock species and adaptability of breeds; new technology for animal production; use of animal waste in fuel production; application of biotechnology to intensify livestock production; common diseases of livestock; residues in animal-sourced products; veterinary medicine of toxics; food safety and veterinary law; and nutrient requirements and optimal feed formulations.

## Hue University

Hue University of Agriculture and Forestry was founded in 1967 and named the University of Agriculture Number 2 (Hanoi University of Agriculture was the Number 1). The university has eight faculties, among which are Animal Sciences, Fishery, and Rural Development. The faculty of Animal Sciences has six departments, one laboratory, and one veterinary clinic. The Faculty of Fishery includes four departments and one research centre.

## Thai Nguyen University of Agriculture and Forestry

Thai Nguyen University of Agriculture and Forestry (TUAF), as a member of Thai Nguyen University, was established in 1970. TUAF is located in the North West of Vietnam. The Faculty of Animal Husbandry and Veterinary Medicine includes six departments. Apart from training and education responsibilities, the faculty conduct research on technology transfer in the fields of animal husbandry, veterinary medicine, and aquaculture.

## Tay Nguyen University of Agriculture and Forestry

Tay Nguyen University was founded in 1977 and is now located in the Central Highlands. At present, the university has nine faculties, among which are Animal Science and Veterinary, and Economics. There is one veterinary clinic and five departments in the Faculty of Animal Science: Animal Biology, Animal Science, Animal Nutrition and Feed, Basic Veterinary, and Veterinary.

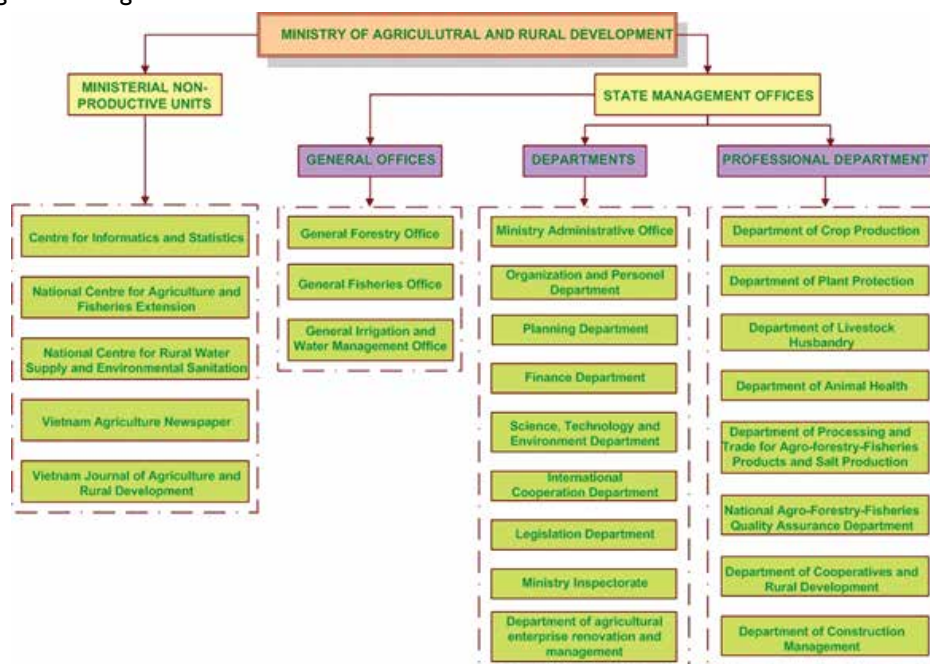
# Line agencies responsible for livestock and fish

## Ministry of Agriculture and Rural Development (MARD)

MARD was established in 1995, aggregating the Ministry of Agriculture and Food Industry, Ministry of Forestry, and Ministry of Irrigation. MARD is a governmental agency performing state management functions in the fields of agriculture, forestry, salt production, fishery, irrigation/water services, and rural development nationwide, including state management functions for delivery of public service in accordance with legal documents (Figure 35). MARD submits development master plans and strategies to the Prime Minister, as well as annual, five-year, and long-term plans, and key programs and projects within the Ministry's mandated areas.

MARD also implements the regular tasks and duties of (i) the Central Standing Committee on Flood and Typhoon Control; (ii) forest protection, forest fire prevention, and anti-desertification; (iii) the on-line Office of the Mekong Committee of Vietnam; (iv) control of cross-border trafficking of seriously endangered wild animal and plants, and (v) implementation of the National Programme for Food Security in accordance with legal documents.

Figure 35. Organizational structure of MARD.



### Department of Livestock Production ([www.cucchannuoi.gov.vn](http://www.cucchannuoi.gov.vn))

DLP is the top agency responsible for livestock and husbandry under MARD, and helps manage line agencies in the specified field. It is responsible for 22 main tasks on state management in livestock and husbandry. For administrative management, DLP develops and proposes to MARD legal documents aligned with MARD's annual plans and other projects assigned by the Minister.

DLP is responsible animal breeding, animal feed, managing livestock and husbandry production, environment issues in livestock and husbandry, management of ASF quality and food safety, collecting data on livestock and husbandry production, organizing extension activities in livestock and husbandry production, and others.

DLP is based in Hanoi, has a branch in the Central and a branch in HCMC. There are four line departments in DLP: Cattle Husbandry, Livestock, Animal Feed, and Environment in Livestock and Husbandry Production. DLP also has a Centre for testing and quarantine of animal breeds and animal feed.

### Department of Animal Health

DAH is the top veterinary agency under MARD. It is located in Hanoi, has a branch in Ho Chi Minh City, and is responsible for 21 main tasks on governmental management in livestock and husbandry. DAH is responsible for prevention of animal disease outbreaks nationwide (also for fishery), animal (and fishery) quarantine, managing slaughterhouses including inspection of veterinary hygiene, management of veterinary medicines, issue/withdrawal of licences for professionals in the veterinary field, and collecting data on veterinary within the mandated areas.

DAH has eight main units: departments of Veterinary Epidemiology, Animal Inspection and Quarantine, and Veterinary Medicine Management. DAH has regional agencies in seven regions across the country and three Sub-Departments of Animal Inspection and Quarantine in border provinces. DAH also has other five centres: National Centre of Veterinary Inspection, National Centres for Veterinary Medicine Testing No. I and No. II, and National Centres for Veterinary Hygiene Inspection No. I and No. II.

## Department of Agriculture and Rural Development (DARD)

DARD is the immediate lower level of MARD in all provinces of Vietnam, governed by both MARD and the Provincial People's Committee (PPC). DARD helps PPC implement state management functions in agriculture, forestry, fishery, irrigation and rural development, flood prevention, food safety from production to market, and other public services in agriculture and rural development. There are line units of MARD within DARD, for example, those related to livestock and fishery production.

At the district level, DARD has lower line departments, called District DARD (DDARD). DDARD belongs to the District People's Committee (DPC) and implements state management functions in agriculture, forestry, fishery, irrigation and rural development, and other related areas. DDARD normally has five to 10 staff who are responsible for specific areas as mandated. DDARD is under management of both DARD and DPC.

## National Agricultural Extension Centre (NAEC)

NAEC, founded 1993 under MARD, is the dominant service provider for agricultural extension in the country. The agricultural extension system in Vietnam is organized at four or five levels: central, provincial, district, commune, and village level in some provinces. At the provincial level, the responsibility is in the provincial centre for agriculture. NAEC provides training, demonstration models, production guides, and other services in the fields of crop production, livestock, forestry, and fishery. However, agricultural extension programs on crop production are more focused.

Private sector and other organizations also participate in providing agricultural extension through training, support, and demonstration models. Some closely coordinate with NAEC, such as women's unions, youth unions, and commodity-specific producer associations.

# Associations

## Vietnam Veterinary Association (VVA)

VVA, founded in 1991, is based in Hanoi and a member of the Vietnam Alliance of Associations of Science and Technology and is financially independent. VVA provides consultancies in various areas such as in building capacity of the veterinary system, epidemiology diagnosis, food safety, management and use of veterinary medicine, and preventive measures against serious animal diseases. VVA also organizes training in food safety, prevention of animal diseases, and improves local veterinarian capacity. VVA has three centres: Transferring Technology in Veterinary, Transferring Technology in Veterinary in Mountainous Areas, and Community Veterinary Centre.

VVA is now a member of the Federation of Asia Veterinary Associations (FAVA), and cooperates with veterinary associations from Japan, Korea, and other ASEAN countries. VVA also has good cooperation with CEVEO (Coopération et Échanges Vétérinaires Est-Ouest), a non-profit organization made up mainly of French private veterinary surgeons.

## Vietnam Husbandry Association (VHA)

VHA was found in 2002, is based in Hanoi, and has a branch in HCMC and is a voluntary organization. The association links members who are engaged in animal production and veterinary to support members in production, processing, and marketing of animal products. VHA also participates and provides consultancies in various areas in husbandry, such as economic development projects. VHA organized a network for disseminating knowledge and technology to members, providing services on animal breeds and inputs for production in the mandated areas. VHA has branches in provinces.

### Vietnam Feed Association (VFA)

VFA is a non-government association with members representing all economic sectors operating in feed products—manufacturing, trading, and consumption. VFA's main tasks are to: (i) disseminate among its members policies related to the feed industry; (ii) develop and propose policies, incentives, and supportive measures towards development of the feed industry; (iii) encourage collaboration and cooperation among members; (iv) provide economic, market, and price information to the members for better economic performance; (v) organize seminars and conferences to exchange professional experience, and encourage cooperation among members for co-existence and development; and (vi) participate in programs and projects to develop animal husbandry and feed production, cooperate with government organizations and NGOs, and organize voluntary agricultural extension to deliver technical advances in agricultural production. VFA also publishes a magazine and documents disseminating techniques and economic management methods, participates in scientific and technical studies, produces new technologies for development of the livestock industry, especially cattle, poultry, and aqua feed.

### Viet Nam Veterinary Pharmaceutical Association (VVPA)

VVPA was founded in 2005 and is based in Hanoi. VVPA is a social-occupational association whose members operate in the field of veterinary medicine in Vietnam. VVPA is under management of MARD.

### Vietnam Farmers' Union (VNFU)

Vietnam Farmers' Union (VNFU) is a social-political organization of Vietnamese peasants under the leadership of the Communist Party of Vietnam, established in 1930. VNFU is organized at four levels from central level to grass roots. It has more than 10 million members. VNFU exists in all communes and villages where there are farmers.

VNFU is important in livestock and fishery development for its roles in connecting members with projects and programs reflecting member needs as well as complaints to leaders. VNFU provides guidelines for its members, organizes training, and acts as input suppliers. VNFU helps farmers acquire credit from banks, purchase inputs in bulk at lower prices and good quality, cooperates with extension agencies to organize training, and develops pilot models in agriculture. Most farmers belong to VNFU.

### Vietnam Women's Union (VWU)

Vietnam Women's Union (VWU) was founded in 1930, a non-profit organization that aims to raise capacity and knowledge, as well as improve the material and spiritual livelihood for women and promote gender equality. VWU has a membership of more than 13 million belonging to 10,472 local women's unions in communes and towns throughout the country. The organizational system of VWU is divided into four levels—Central, Provincial and Municipal (63 units), District (642 units), and Commune (10,472 units).

## Non-government, private sector, and other institutions

### International Livestock Research Institute (ILRI) (<http://www.ilri.org/>)

ILRI is a non-profit and non-governmental organization with headquarters in Nairobi, Kenya, and a second principal campus in Addis Ababa, Ethiopia. ILRI works at the crossroads of livestock and poverty, bringing high-quality science and capacity-building to bear on poverty reduction and sustainable development. ILRI works in Africa, South and Southeast Asia, and China. Total employment of ILRI is over 700 staff from about 40 countries. About 80 staff are recruited through international competitions and represent some 30 disciplines. Around 600 staff are nationally recruited, largely from Kenya and Ethiopia.

### Food and Agriculture Organization (FAO) (<http://www.fao.org/>)

The Food and Agriculture Organization (FAO) is a specialized agency of the United Nations with the mandate to combat hunger and ensure food security. It aims to raise levels of nutrition, improve agricultural productivity, and better the lives and livelihoods of rural populations as well as to contribute to the growth of the world economy. FAO started working in Vietnam in 1978, with main activities to share technical and policy expertise, and serve as a knowledge network on the issues of food and agriculture, encompassing farmers, policy makers, donors, research communities, and the general public. According to the FAO webpage, it has been involved in the implementation of more than 400 projects in the areas of sustainable agricultural development, food security, and nutrition. FAO's scope of current work in livestock production covers Highly Pathogenic Avian Influenza (HPAI) control and prevention, control of other animal diseases, and national capacity building in food quality and safety.

### World Bank (<http://www.worldbank.org/>)

The World Bank provides financial products and services with low-interest loans, interest-free credits, and grants to Vietnam, covering a wide array of investments, including agriculture. WB also shares innovative knowledge through policy advice, research and analysis, and technical assistance, and supports capacity development in Vietnam. Some WB projects are cofinanced with the government, other multilateral institutions, commercial banks, export credit agencies, and private sector investors in Vietnam. In the livestock sector, WB-financed projects in Vietnam include Avian Influenza Emergency Recovery Project, Vietnam Livestock Competitiveness and Food Safety, and Agricultural Diversification Project.

### United States Agency for International Development (USAID) (<http://vietnam.usaid.gov>)

According to the official webpage of USAID, the United States Agency for International Development (USAID) is the lead agency for the U.S. government providing economic development and humanitarian assistance to people around the world. In Vietnam, USAID has launched programs to help reduce the incidence of HIV/AIDS and avian influenza, facilitate trade and economic development, provide support for persons with disabilities, and provide disaster assistance. In livestock and animal health, USAID helps Vietnamese authorities to refine standard operating procedures and national strategies, including the 2011–2015 National Programme on Avian Influenza, Pandemic Preparedness, and Emerging Infectious Diseases, and created an animal influenza national program monitoring and evaluation strategy. Surveillance and response capacity to rapidly detect and control animal influenza has also been strengthened through training, an upgraded animal health information system, provision of avian and pandemic influenza-related equipment and commodities, laboratory diagnostic capacity, and the sharing of best practises and lessons learned. Public awareness and behaviour on avian and pandemic influenza has been improved through awareness and behaviour change programs. These activities are its response to the 2009 novel H1N1 influenza pandemic.

USAID's staff in Vietnam consult extensively with the government, the non-governmental organization (NGO) community, the U.S. Embassy, the private sector, and other groups to determine types of aid that are needed. To date, the U.S. government has invested more than USD 70 million to support the areas of avian and pandemic influenza, with ongoing programming shifting from a disease-specific focus to broader systems to strengthen health.

USAID launched an Emerging Pandemic Threats (EPT) program, starting in Vietnam in 2010, that includes four projects known as PREDICT (monitor for, and increase local capacities in, geographic 'hot spots' to identify the emergence of new infectious diseases in high-risk wildlife), RESPOND (improve infectious disease outbreak response capacity across human, animal, and wildlife sectors), IDENTIFY (help develop laboratory networks and strengthen diagnostic capacities in geographic 'hot spots' for common animal and human pathogens), and PREVENT (identifies and addresses behaviours and practises that increase the potential for new disease threats of animal origin to spread).

### Asian Veterinary and Livestock Services (ASVELIS) (<http://www.asvelis.com/>)

ASVELIS is a private group dedicated to the provision of services in the animal sector with a primary focus on Southeast Asian countries. Its multi-disciplinary team includes experts on animal health, veterinary public health,

livestock value chains (from the farmer to the consumer), and project management. ASVELIS is based in Hanoi, but has access to a large network of international and national specialists based in Asia, Africa, and Europe. In the past 10 years, ASVELIS has provided services to a wide range of stakeholders involved in livestock value chains, animal disease control, and food safety, including multilateral and bilateral donors and cooperation agencies, research institutes, farmer cooperatives, and agribusinesses of all sizes.

### InVivo NSA Vietnam (<http://invivo-nsa.com.vn/>)

InVivo NSA Vietnam, established in 1995, is a subsidiary of InVivo NSA Group (France). InVivo NSA Vietnam has more than 650 employees, 20 branches, factories, laboratories, and centres across the country. InVivo NSA Vietnam operates in various fields (both research and development)—feed manufacture, animal health and hygiene, laboratory, genetic cooperation, and technical services.

InVivo NSA Vietnam currently owns three research and development centres for livestock including pigs, poultry, and aquaculture, with a total area of more than 30 hectares. Goals of the research centres are to: (i) complete and optimize product quality suitable for geographical conditions in the locality and the genetic characteristics of each type of livestock, (ii) inspect new materials and new products, and (iii) develop and optimize a nutritional feed program.

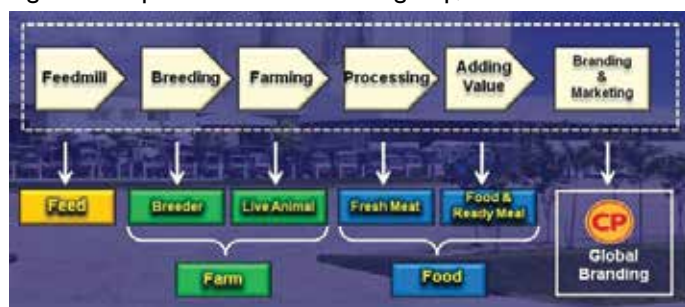
### Feed manufacturers

With rapid development of livestock and fishery production, and an increasing trend of using manufactured feed, feed manufacturers have become a key actor in the development of the livestock and fishery sector. According to Swiss Business (2012), key foreign feed manufacturers in Vietnam include Cargill (US) (since 1995) with seven factories supplying approximately 750,000 t/year; Charoen Pokphand CP (Thailand) (since 1993) with about 10 factories countrywide, engaged in supplying seeds, feed, aqua-farming, breeds of pigs, chickens, equipment for livestock and aqua-farming, and food processing; and De Heus (since 2008) with three factories for livestock feed and one for fish.

Top Vietnam domestic feed manufacturers are VIC company-Golden Pig Ltd (since 1999) in Hai Phong province, with four manufacturing factories; Dabaco (since 2004) with a total capacity of 290,000 t of feeds per year; Quang Dung Company (since 1999) in Ho Chi Minh City, specializing in feed-related distribution and logistics; and Quang Minh Corporation (since 2002) in Hanoi. Others are VietThang Feed Joint Stock Company, Vasafeed Joint Stock Company, Vietland Joint Stock Company, and Hong Ha Nutrition Joint Stock Company.

Some big feed companies operate not only in feed, but food and fishery. C.P. and DABACO participate in almost all nodes of the ASF value chain—input, production, slaughter, and market products. For example, DABACO has one state-of-the-art food processing line. C.P. group operates along the meat value chain (Figure 36). C.P. and DABACO groups have their own laboratories for product R&D.

Figure 36. Operational areas of C.P. group, Vietnam.



Source: <http://www.cp.com.vn/TAGS/about.aspx>

Some big feed groups also have contracts with farmers to produce animal breeds and finished products, for example, C.P. group and DABACO group contract farmers to produce chickens and pigs.

## Veterinary producers and trading companies

According to <http://yellowpages.vnn.vn/>, there are about 129 companies in Vietnam engaged in import, production, and trading of veterinary products. Among those are 15 companies holding GMP certificates from DAH. Veterinary suppliers are very important for livestock and feed because expanding production and disease outbreaks have recently raised demand for their products.

## Wholesalers and retailers

Food wholesalers and retailers play a very important role in distributing meat from slaughterhouses to consumers. Vietnamese consumers prefer fresh pork to chilled/frozen meat, therefore, traditional (open) markets are still the choice of most people. Modern food retailers have become increasingly important, especially for young consumers and in time of disease outbreaks.

## Summary

There are various institutions involved in R&D in the livestock and pig sectors in Vietnam, both government and non-government. The government focuses more research for breeding and animal health, which are more likely to benefit large numbers of small farmers. Technology in feed production is largely developed by the private sector or imported, which contributed to dependence of Vietnam on imported ingredients. There is limited research on food/pork processing technology and it is largely developed by the private sector. Public-private cooperation in R&D is quite limited, especially research in the livestock sector.

## Information gap

There is limited information on research in livestock, especially by the private sector. Many institutions are involved in R&D in livestock but there is a lack of rigorous evaluation of the role played by the various institutions or public-private sectors in this area. Follow-up activities and reports of the impact of research projects or development projects in livestock are also hardly to be seen.





# Developing the pig value chain to benefit the poor

## Opportunities

Governments in developing countries can improve the lives of poor people by investing and promoting the livestock sector. In Vietnam, the pig value chain offers livelihood opportunities for the poor. Lapar et al. (2012) emphasise that high and increasing demand for pork and consumer preferences present market opportunities for smallholder pig producers in Vietnam. Smallholders participate in the pig value chain mostly as producers (RIA 2013). With about 80% of pig raisers identified as smallholders—those who are likely to be poor or near poor—the development of the pig sector is very important for improving income and generating family employment. According to GSO data, there were still about 11 million poor people in 2011, of which 9.5 million live in rural areas (Table 34). Developing the pig sector to benefit poor people will improve their income and stimulate pork demand for the entire economy, but these efforts need special attention from the government. FAO (2002) notes that a rapid increase in large-scale production in developing countries did not necessarily benefit all income groups, even with increasing participation by smallholders in economic growth.

Table 34. Poverty in Vietnam, 2011

	Poverty rate (%)	Population (millions)	Number of poor people (millions)
Country	12.6	87.84	11.1
Urban	5.1	27.89	1.4
Rural	15.9	59.95	9.5

Source: Computed from the GSO data.

Pig production also allows effective utilization of feed produced by farmers, especially in crop-based pig systems that are dominant in the country. The continued viability of these systems will be important to ensure that smallholder pig producers will remain viable with lower production costs. Use of household scraps and other feeds that would otherwise be unused or unmarketable allows smallholder pig producers to be less dependent on feed imports and hence sheltered from feed price volatility. Pig producers also capture about half of the value added in the pig value chain, a demonstration of how important they are. This contribution is significant in the context of sector development, and the broader rural development agenda (Lapar et al. 2012).

Rising incomes is one of the driving factors for pork demand (Lapar et al. 2012). Costales (2006) and Delgado et al. (1999) also confirm that growth in the livestock sector and demand for livestock products is driven by rising incomes. Vietnamese consumer income has grown persistently at above 4% over the last 20 years (Figure 37). This trend in rising incomes is seen to drive the increase in demand for livestock products over time.

Figure 37. Per capita income in Vietnam, 1990–2012.



Source: Computed from World Bank data.

Urbanization is also considered as a driver of demand growth for livestock products, as well as dietary shifts towards more processed and prepared foods (Delgado et al. 2003; Satterthwaite et al. 2010). According to the World Factbook (2012), Vietnam attains quite a high rate of urbanization at 3% annually (estimated for 2010–2015), while this figure is nearly 2% for the world total. This is probably one reason for the rapid increase in meat demand during the last decade, and likely to continue in the coming years. Yet a high rate of urbanization does not much change consumer preference for fresh meat. At present, a significant share of demand for pork by Vietnamese consumers is for fresh and traditional pork products.<sup>14</sup> Among smallholders where feeding practises rely more on feed they produce, these feeding practises are likely to supply local markets with pig meat with attributes that are preferred by Vietnamese consumers, e.g. better taste.<sup>15</sup>

Recent projections also suggest a growth in market share of modern pork products could be cost-effectively produced from imported cheap frozen/chilled pork (Minot et al. 2010), however, modern pork products will not likely be a significant share of consumer pork consumption. The modern pork sector will grow about 4% in the next 10 years even if there is no technological growth in the traditional pig sector. Therefore, domestic pork production will likely remain and keep a dominant share in total pork supply in the country, suggesting potential for the development and expansion of small- and medium-scale pig production. Changes in the composition of pork demand will not squeeze out small- and medium-scale pig producers within the next decade and beyond (Minot et al. 2010). While movement towards larger-scale commercial production of pigs is apparent—as bolstered by supportive government policies for development of a modern industrial livestock sector—sector model projections suggest that the large, modern pig sector will not be a dominant player in Vietnam's pig industry within the next decade. MARD has recently highlighted the important contribution of small-scale livestock (pig) production, and the need for supportive policies to this particular group in the sector. Huan (2013) reported that MARD and DLP were preparing a draft which proposes restructuring that focuses on four main themes—types of animals to be promoted, regions for livestock development, production system, and slaughtering. Among the four themes, restructuring of production systems to improve economic performance and efficiency for small-scale farmers is an urgent task.

Demand drivers are also increasingly associated with increasing consumer concerns about food safety (particularly among urban consumers) and a trend toward highly intensive livestock production systems (Delgado et al. 2003; Satterthwaite et al. 2010; Lapar et al. 2012). Vietnamese consumers are more concerned about food safety after cases of food poisoning and detection of toxic residue in meat, especially at time of disease outbreaks. Vietnamese consumers show a preference and willingness to pay for quality meat, which has important implications for growth of the pork value chain.

14. The modern pig sector is defined on the production side as large-scale commercial farms raising more than 100 pigs. On the consumption side, modern pork products are defined as chilled, frozen, and processed, while traditional pork products are fresh, unprocessed pork. It is assumed that the modern pig sector can only produce modern pork products, while the traditional pig sector can only produce traditional pork products (Minot et al. 2010).

15. Consumers said that pigs fed without or little manufactured feed had a better cooking quality than those fed with compound/concentrated feed (RIA 2013).



Lapar and Tiongco (2011) argue that private standards may dictate the use of specific process performance standards (for example, husbandry management for disease control, use of breeds and feeds) that could potentially be tested in pig value chains involving smallholders. This could present opportunities to upgrade smallholder production processes to deliver products with better quality. During the transformation and upgrading, smallholders may learn new skills and develop new competencies, and new institutions may evolve to support new processes and organizations in the pig value chain. Strategies that build on principles of vertical integration in the pig value chain will need to be encouraged. Such approaches will facilitate easier and transparent monitoring of the products, their origin, and the processes along the value chain.

## Constraints and proposed actions

Development of the pig value chain that benefits the poor needs strong support and involvement of the government. Rapid urbanization and rising income might contribute to a longer and more complex livestock value chain and increase concerns for food safety. These food safety issues are likely to pose new constraints to smallholder participation and ability to compete in modern markets. McDermott et al. (2010) recommends that arrangements between primary producers, processors, and distributors are necessarily becoming increasingly sophisticated in this situation. Due to high transaction costs in designing and implementing agreements between an upstream chain actor with a number of small-scale and scattered pig farmers, proactive policies and investments can help ensure inclusion rather than exclusion of the poor who produce and sell on a small scale (McDermott et al. 2010).

MARD has played a key role in designing pro-poor policies and rural poverty alleviation in Vietnam. It has implemented a number of policies to support, invest in, and promote the livestock industry and pig value chain specifically. However, there are still gaps that need to be considered, especially the fact that MARD strongly emphasises the production side with little attention paid to product marketing and the accompanying issues of supply vs. demand, distribution, and prices. Therefore, smallholders might still face risks for not being able to market their products. Through the Pro-Poor Livestock Policy Initiative Project launched in Vietnam in 2001, FAO (2013b) raised some weaknesses of livestock policies in Vietnam as (i) bottom-up inputs to the policy making process are not systematically encouraged in the political system, which has occasionally led to rural unrest; (ii) livestock policies have not directly and specifically addressed the role of the poor, nor have specific measures been designed to assist them, and (iii) state investment in livestock remains insignificant relative to crops. The reason for insufficient commitment to poor producers is bureaucratic ignorance of their needs, from an official vision of rural industrialization that only values large-scale industrial production for export, and from negligence of livestock as a productive sector with high potential (FAO 2013b).

In production, MARD has issued a number of policies for livestock sector development, the most important being the Livestock Development Strategy to 2020 that has recently been updated to reflect the government's policy directions to 2030. The main challenge has been the weakness of the policies themselves (not strongly grounded on relevance and context of the country and its systems) as well as in the implementation (mismatch between targets and resources). A number of issues that pose significant constraints to the development of a pro-poor and well-functioning pig value chain can be categorized as breeding, animal health, feed prices, market and output prices, food safety, and environmental pollution.

### Breeding

While farmers have been traditionally more active in supplying piglets for themselves through on-farm production, many still depend on outside sourcing, especially good quality breeds and especially during/after disease outbreaks. MARD has introduced a state law on animal breeding, however, but implementation is not effective (VWS 2013). Farmers are unable to test/check for quality of piglets sourced from markets or traders, which are also likely sources of disease outbreaks. Hence, better state control/management of piglet quality and supply in markets is an urgent task.

Participants in WS (2013) also raised a problem of breeding quality. While most high quality pig breeds in the world are now available in Vietnam, their productivity remains low compared to those in other countries. The deterioration of indigenous breeds is now of increasing concern due to a strong push by the government for widespread dissemination and use of exotic breeds.

## Animal health

In Vietnam, the production, distribution, and application of veterinary practises, medicine, and other veterinary inputs are not properly regulated nor are the markets for veterinary services and products adequately monitored for compliance with appropriate standards. This subsequently leads to a proliferation of low-quality veterinary drugs and low effectiveness of treatment, resulting in higher risks in pig production and the veterinary and human health. Cases such as these predominantly occur among small-scale farmers in the middle regions and mountainous areas that are less served and difficult to reach by public veterinary services. While training in animal health service has been organized for farmers, including the creation of a para-professional cadre of veterinary staff at the local level, many of these para-professionals have weak skills in diagnosis and treatment of animal diseases let alone 'new and emerging diseases'.

Many farmers think animal health is affected by climate change (RIA 2013). In case of disease outbreaks, MARD always has been prepared with emergency solutions to manage the situation, but the implementation of these programs at the local level has been less than desirable and not effective at controlling diseases, nor curtailing transmission and the accompanying economic losses. The programs have not been able to elicit appropriate responses by farmers for risk reduction, and in fact have encouraged risky practises such as farmers selling diseased pigs or dumping them in public places, especially ponds and rivers.

## Feed and feed prices

The feed market is concentrated with a small number of large manufacturers capturing high market shares (most are FDIs, e.g. Cargill, C.P.). This market structure limits smallholders' ability to significantly affect feed markets, particularly prices. The high dependence of the domestic feed industry on imports such as maize, soybean meal, and premixes also creates volatility in feed markets and exposes farmers, particularly smallholders, to market risks. After joining the WTO, the government set tariffs for feed ingredients to zero, thereby allowing the market to accommodate a free flow of imported feed ingredients, with anticipated desired price effects. However, the domestic feed manufacturing sector and feed markets are not effectively organized in a structure that allows appropriate supply responses to these new trade policies that would likely benefit a majority of industry stakeholders. There is a perception that these policies only exposed unfair treatment and unbalanced access to preferable government incentives to a few key players with clout in the sector, leaving the majority of industry players at a disadvantage. This suggests the need for a long-term strategy to develop a feed industry less dependent on imports and more effective and transparent management of government trade policies on feeds.

Participants in WS (2013) also raised issues of feed ingredients imported from China that might not meet strict quality control standards, and might contain substances that promote animal growth but harm consumers. There is a need for more research on feed technologies for farmers, particularly those technologies that they could produce at home and utilize low-cost feed ingredients.

## Prices of pig and pork products

Tariff reductions in meat among WTO member countries and other AFTA countries obviously expose Vietnamese pig farmers to strong market competition with important implications for domestic pork markets. Cheap imports of meat and edible offal flowing into the domestic market likely dampen local live weight prices in the short to medium term. In the context of small and scattered pig production, these price effects are likely to put small producers at

great market risk, especially if they are faced with prices that barely allow them to cover production costs. From a broader sector perspective, the Vietnam government will need to consider how recent trade policies on tariffs for meat and meat products will likely impact domestic supply and prices. There is a concern that application of some non-tariff measures to protect domestic producers is an appropriate strategy to shield Vietnamese consumers from proliferation of cheap but low-quality meat imports. Absent strong and compelling evidence, this will need further investigation to ensure policy recommendations are based on a rational examination of facts.

## State management and food safety

Aside from issues of policy design and implementation mentioned earlier, state management in some nodes of the value chain still creates inconsistency and difficulties. One notable example is food safety management, where several government agencies are involved—MOH, MARD, and Ministry of Industry and Commerce. Meat processors interviewed in VWS (2013) also revealed that MARD and the ministries of Natural Resources and Environment, Industry and Commerce, Public Security, Health, and Finance are also involved. These create a mix of functions and responsibilities among ministries (especially food safety), especially with slow and poor cooperation among ministries, and create difficulties for actors in the pig value chain.

The government's role in the management of food safety is important. This is a problem in Vietnam, however, when agencies involved in this task are not well coordinated and cooperation is weak. The recently established Food Safety Law is a case in point. With weak coordination among responsible agencies, the law is not effectively implemented. There is a perception among stakeholders that the food safety law has not improved food safety, particularly in developing consumer trust in food quality. Developing a credible and transparent food safety system is especially critical in meat and meat products where quality and safety attributes could not be observed visually. Absent this credible and well-functioning quality and safety assurance system, food safety scares will continue to persist and create undesirable consequences, hindering the development of a well-functioning pork value chain that benefits consumers, while ensuring an equitable distribution of returns to all value chain actors and thereby sustaining effective participation by smallholders.

To improve the food safety situation in the pig value chain, coordination among farmers with other upstream actors should be established and developed. Transaction costs for designing and implementing agreements among them are usually high (ILRI–HUA–IFPRI 2007; McDermott et al. 2010; Lapar and Tiongco 2011), so proactive policies and investments can help ensure the inclusion rather than the exclusion of the poor pig farmers who produce and sell on a small scale.

## Environmental externality

Pollution caused by pig production is now an issue in rural areas and more seriously in suburban areas where population density is high and the number of pig raisers has not significantly declined as desired by the government. This has two-fold implications—increasing risks for both animal health and human health, and aggravating social issues (conflict) in the community. MARD has encouraged farmers to move animals (such as pigs) out of residential areas, however, the policy has not been successfully implemented due to limitations of land and farmer hesitance to locate pig production to areas not near their homes. There is a need to explore technical solutions to the environmental issues from waste and odour generated from pig production. Research on technologies that reduce environmental pollution caused by animal production will help develop feasible and viable approaches. One technology that has been developed and undergone some limited on-station testing is the biology mattress for small pig farmers developed by researchers from Hanoi University of Agriculture with support from international and government partners. This technology is applied in small-scale settings and has shown promising results. If shown to be widely acceptable, it could potentially contribute to solving one of the important environmental issues in the pig sector.

## Information gaps

Knowledge and updated accurate information on pig value chains are very important for their development. At present, some key information and knowledge gaps have been identified which are crucial to supporting development of the pig value chain that will benefit the poor:

### Production and its logistics

#### Cost and efficiency of feed production

- Feed market structure, conduct, and performance;
- Updated information on economic performance of pig production in different systems, scale, and breeding;
- Pig producer's behaviour and dynamics during transition period in Vietnam, e.g.a more market-oriented focus;
- Breeding capacity and strategies to improve breed quality of pigs;
- Climate change and its relationship to animal health (pigs);
- Production and market risks in pig production;
- Contract farming in pig production and other links (horizontal and vertical); and
- Effectiveness of the veterinary system and delivery of animal health services.

#### Slaughtering, processing, transporting, meat trading, and meat retailing

- Economic performance of animal slaughtering houses;
- Economic performance of processing sector;
- Meat retail market in Vietnam (structure and dynamics);
- Movement/trading of diseased pigs/sick pigs;
- Movement of imported meat, use, and disposal;
- Food safety issues and incidence of food safety risks along the chain; and
- Examples of a new and emerging pork value chain for safe meat in cities and assessment of performance to manage food safety risks.

### Consumption

- Characteristics and levels of meat/pork consumption (including away-from-home consumption, processed meat) and dynamics of consumer behaviour; and
- Characteristics of and demand for meat and pork by institutional meat consumers.

#### Policy/state management and R&D

- Evaluation of policies, programs in pig value chain, especially for small-scale pig farmers;
- Evaluation of state management along pig value chain (input, production, output, food safety, marketing, labelling);
- Roles played by various agencies/institutions in livestock development; and
- R&D in the livestock sector, especially the private sector.



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## Annexes

### Annex 1. Contribution of different activities to rural household income in Vietnam, selected years (%)

Year	Crop and livestock production	Forestry	Fishery	Salary or wage	Others	Total
2002	36.0	2.0	5.4	24.8	31.8	100
2004	35.1	1.6	5.3	26	32.1	100
2006	33.0	1.3	5.1	27.7	32.9	100
2008	33.8	1.2	4.4	28.4	32.3	100
2010	28.9	1.2	3.3	36.4	30.2	100

Source: Computed from GSO (2011).

### Annex 2. Definition of selected meat products

Term	Definition
Meat	Edible parts of slaughtered animals, including edible offal
Fresh meat	Meat from livestock animals after slaughtered, cut or grounded and preserved at normal temperature or from 0–4oC temperature
Carcass	Carcass of post-mortem after removing blood and offal
Frozen meat	Fresh meat is frozen and preserved in not higher than –12oC temperature

Source:TCVN 6162-1996;TCVN 7407-2002;TCVN 7046-2002.

### Annex 3. Forms of pork meat and meat products

Term	Description
Head meat	Meat from pig head, including ears, snout, cheek and jowls, tongue, brain, and eyes.
Loin	Loin or back of the pork, the tenderest meat, created from the tissue along the top of the rib cage
Shoulder butt	Pork shoulder contains shoulder muscles interspersed with fat, no bone
Bacon/belly	Boneless cut of fatty meat from the belly of a pig
Ham	Comes from the back legs of the pig (thigh and rear end of the pig)
Shoulder picnic	Shoulder meat picnic is also considered the same as ham by Vietnamese consumers.
Leg	Ham with bone left in, plus with feet/trotter
Ribs	There are two types of pork ribs—baby back ribs, from the loin area—and spare ribs or side ribs, which are longer and fatter, but less meaty ribs from the belly side of the pig's rib cage.
Other bones	Head, tail, leg, back bones (separated)

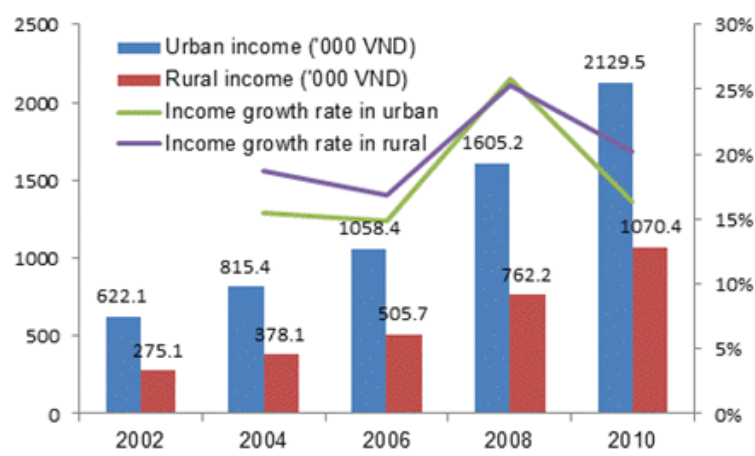
Source:The pig site, Wikipedia, <http://www.thenibble.com>, and RIA (2013).

## Annex 4. Per capita consumption of eggs, livestock, and fishery products in Vietnam, selected years

Food items	Region	2002	2004	2006	2008	2010
Meat(kg)	Country	15.6	16.8	18	16.8	21.6
	Urban	21.6	21.6	22.8	22.8	25.2
	Rural	13.2	15.6	16.8	15.6	20.4
Fishery (kg)	Country	13.2	16.8	18	16.8	16.8
	Urban	14.4	18	19.2	16.8	16.8
	Rural	13.2	16.8	18	15.6	16.8
Eggs(pieces)	Country	26.4	28.8	30	34.8	43.2
	Urban	40.8	37.2	38.4	46.8	50.4
	Rural	22.8	26.4	26.4	30	40.8

Source: VHLSS reports (various issues).

## Annex 5. Monthly per capita income in urban and rural areas, Vietnam, 2002–2010



## Annex 6. Per capita meat consumption (kg) in regions of Vietnam, selected years

Region	Quantity (kg)			Comparison 2010/2002
	2002	2008	2010	
Red River Delta	18.5	23.4	29.7	1.6
North East	19.8	21.3	28.9	1.5
North West	15.0	16.5	25.0	1.7
North Central Coast	12.3	14.6	21.3	1.7
South Central Coast	11.0	13.0	16.0	1.5
Central Highland	12.4	15.2	20.4	1.6
South East	19.0	21.3	23.2	1.2
Mekong River Delta	15.1	15.8	20.3	1.3

Source: Calculated from VHLSS data, various years.

## Annex 7. Per capita consumption (kg) of pork and broilers in Vietnam, selected years

Meat	2007	2008	2009	2010	2011
Pork	21.4	21.5	21.2	21.0	21.0
Broiler	5.2	6.4	6.1	7.2	6.6

Source: USDA (2011).

## Annex 8. Livestock and fishery expenditures as percentage of total household food expenditures

Year	Percent of total food expenditures		Percent of total protein-source food expenditures	
	Livestock and fish	Livestock	Livestock and fish	Livestock
2002	33.1	24.9	87.9	66.2
2004	34.5	25.0	88.1	63.9
2006	35.6	26.0	85.3	62.3
2008	35.1	25.9	85.2	62.7
2010	32.5	25.2	81.2	62.9

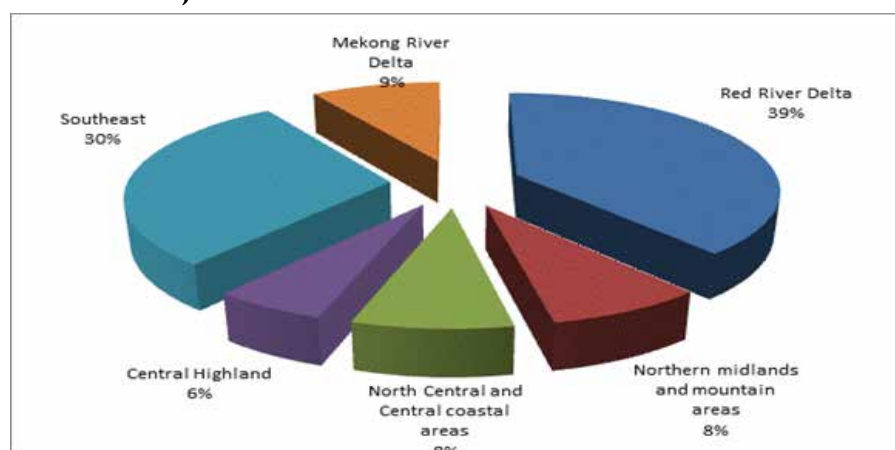
Source: computed from GSO(2012b).

## Annex 9. Annual growth rate of household food expenditures, by region in Vietnam, selected periods(%)

Expenditure	2002–2004	2004–2006	2006–2008	2008–2010	Average (2002–2010)
Food expenditure					
Urban	13.0	10.8	26.0	26.8	17.27
Rural	14.9	12.5	26.9	28.4	18.62
Meat expenditure					
Urban	10.02	15.38	25.20	20.24	16.17
Rural	18.28	17.10	25.48	30.89	20.60

Source: Calculated from VHLSS reports (various issues).

## Annex 10. Distribution of commercial livestock farms in Vietnam, 2011



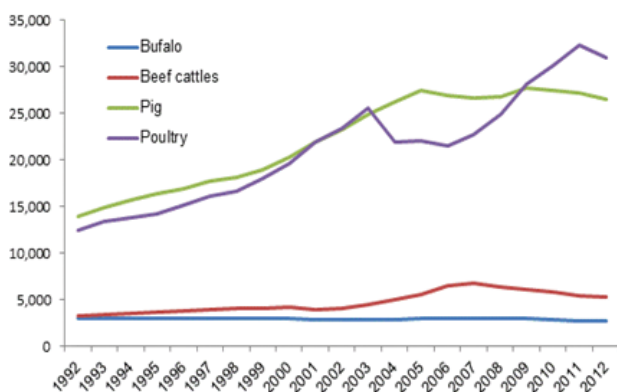
Source: GSO (2011)

## Annex I I. Pig production systems in Vietnam

Production system	Characteristics	Farming Scale
Small production with low bio-security level	+ Local breed, cross-bred  + Few investments (pigsty, agricultural by-products)  + Very limited epidemic Prevention	1–2 sows or < 20 fat pigs
Small commercial production with minimal bio-security level with fish-pond	+ Cross-bred, imported pigs,  + Moderate investment  + Interested in epidemic prevention at minimal level	5–20 sows or< 100 fat pigs
Large commercial production, integration with high bio-security level	+ Imported breeds, industrial feed  + Good pigsty (close, open)  + Good epidemic prevention, Veterinary	600–2400 sows or 500–10,000 fat pigs
Cooperative or group of pig production with from average to moderate bio-security	+ Cross-bred, imported pigs  + Share their experiences, feed or sale of pigs  + Not yet develop new experiments	20–50 sows or 100–200 fat pigs

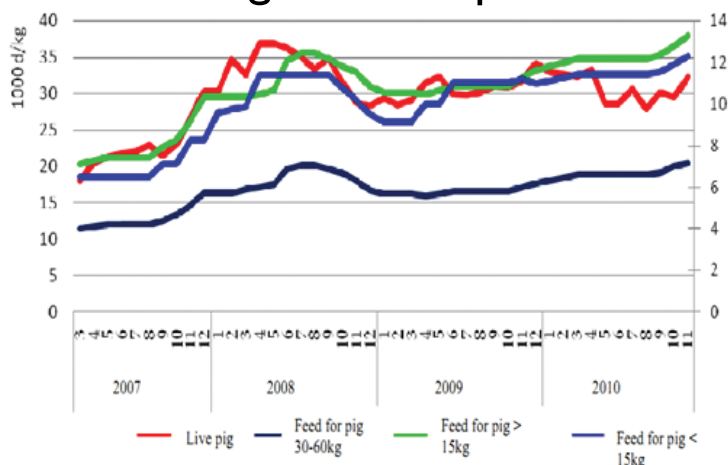
Source: Ton (2010).

## Annex I 2. Population of selected animals in Vietnam, 2000–2012 ('000 head except chickens 10,000).



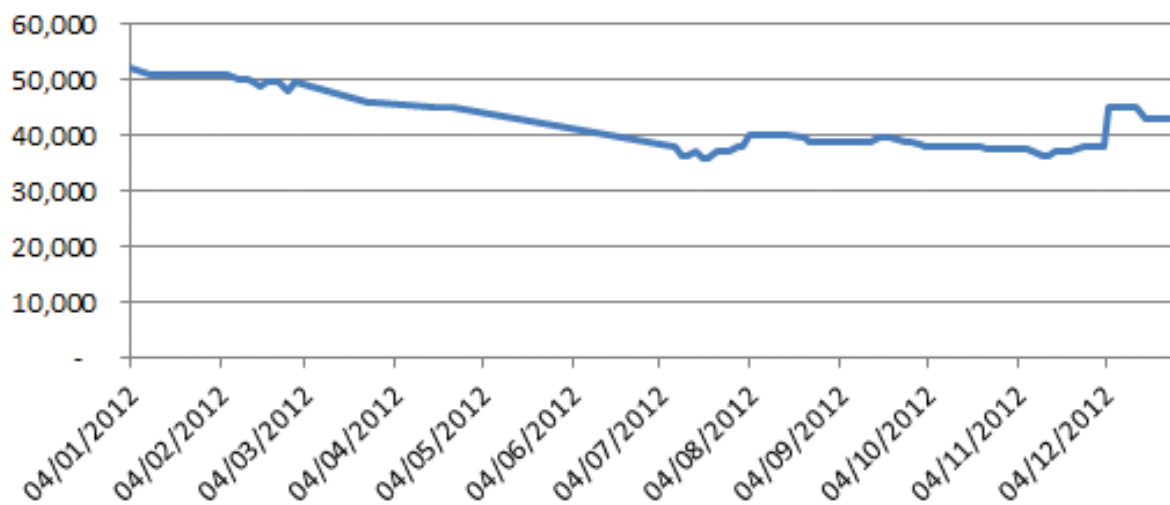
Source: GSO data.

## Annex I 3. Pig and feed prices in Vietnam, 2007–2010



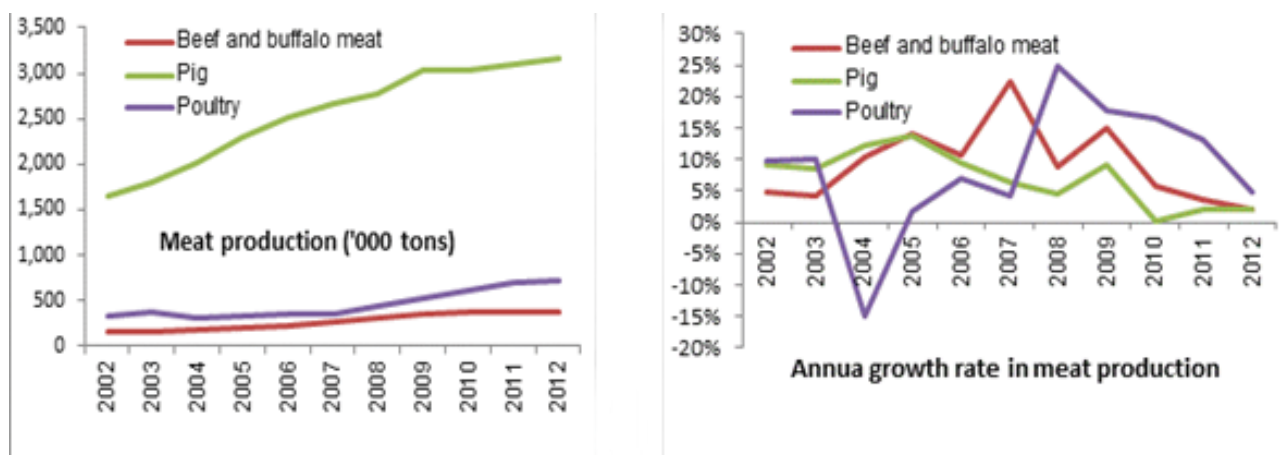
Source: Thao et al.(2010).

## Annex 14. Pig prices in Vinh Long province, Vietnam, 2012



Source: Tri (2012).

## Annex 15. Meat production in Vietnam, 2002–2012



Source: GSO data.

## Annex 16. HS code of meat and edible meat offal of WTO

Code HS	Description
201	Meat of bovine animals, fresh or chilled
202	Meat of bovine animals, frozen.
203	Meat of swine, fresh, chilled or frozen
204	Meat of sheep or goats, fresh, chilled or frozen.
205	Meat of horses, asses, mules or hinnies, fresh, chilled or frozen
206	Edible offal of bovine animals, swine, sheep, goats, horses, asses, mules or hinnies, fresh, chilled or frozen.
207	Meat and edible offal, of the poultry of heading 01.05, fresh, chilled or frozen.—Of fowls of the species Gallus
208	Other meat and edible meat offal, fresh, chilled or frozen
209	Pig fat, free of lean meat, and poultry fat, not rendered or otherwise extracted, fresh, chilled, frozen, salted, in brine, dried or smoked
210	Meat and edible meat offal, salted, in brine, dried or smoked; edible flours and meals of meat or meat offal

Source: Schedule CLX—Socialist Republic of Viet Nam, Chapter 2.

## Annex 17. Policies supporting the development of the pig sector

### Animal health policies

There are a number of policies related to veterinary and animal health as follows:

Decision No. 71/2007/QĐ-BNN dated 6 August 2007 concerning regulations on order of steps and procedures for veterinary medicine testing and experimenting. This decision provides the orders, testing procedures, testing of veterinary drugs, vaccines, biological products, microorganisms, chemicals used in veterinary medicine (hereinafter referred to as veterinary drugs). Organizations and individuals in and outside of the country which have active research, production, sales, import, testing, veterinary testing in Vietnam must comply with the rules and regulations of the other relevant laws.

Decree 72/2007/QĐ-BNN of MARD promulgated the regulation of inspecting veterinary medicine quality. This regulation prescribes the order and procedures for quality control of raw materials for veterinary medicine and veterinary medicine (hereinafter referred to as veterinary drugs) manufacturing, trading, import and circulation in Vietnam. Organizations and individuals in and outside of the country have engaged in production, processing, repacking (hereinafter referred to as manufacturing), business, import, export and veterinary organizations and individuals working activities related to quality control of veterinary drugs must comply with this Regulation and the provisions of other legal documents involved.

Decree 100/2007/QĐ-BNN dated 03/12/2007 with the revision and amendment of some articles of the decree 72/2007/QĐ-BNN about the regulation of inspecting veterinary medicine quality.

The Circular No. 51/2009/TT-BNNPTNT dated August 21, 2009, prescribing the inspection and certification of satisfaction of conditions on production and trading of veterinary drugs, biologicals, microorganisms or chemicals used in veterinary medicine and aquatic animal health protection. This Circular prescribes the conditions and procedures for testing and certification of manufacturing conditions, the business of veterinary drugs, veterinary drugs, biological products, microorganisms, chemicals used in veterinary medicine, animal medical aquatic veterinary medicine raw materials, veterinary medicine (hereinafter referred to as veterinary drugs). This Circular applies to the manufacturing facility without veterinary certification of good manufacturing practise (GMP), business establishment, import, export, storage, preservation and veterinary medicine without certification received good maintenance practises (GSP); stores, veterinary drug agents are not certified pharmacy best practises (GPP).

Circular 15/2009/TT-BNNPTNT of MARD promulgating the list of drugs, chemicals, antibiotics banned and restricted to use in Vietnam which including (i) The list of chemicals, antibiotics banned for manufacturing, trading in aquaculture; (ii) The list of drugs, chemicals, antibiotics banned for veterinary uses; (iii) The list of chemicals, antibiotics restricted for manufacturing and trading in aquaculture; (iv) The list of drugs, chemicals, antibiotics restricted for veterinary uses.

Circular 90/2009/TT-BNNPTNT of MARD regulated the labelling of veterinary medicines.

Circular 90/2011/TT-BNNPTNT of MARD promulgated the list of veterinary medicines, vaccine, probiotics, microorganism, chemicals extended to be used in veterinary services in Vietnam until 31 December 2012.

Circular 77/2011/TT-BNNPTNT of MARD supplemented the list of veterinary medicines, vaccine, probiotics, microorganism, chemicals in Vietnam.

Circular 57/2011/TT-BNNPTNT of MARD supplemented some articles of the decree 15/2006/QĐ-BNN dated 08/03/2006 about the process, animal quarantine procedure, animal products and veterinary hygiene inspection.

Circular 30/2012/TT-BNNPTNT of MARD promulgated the national technical standards of veterinary hygiene conditions. This Circular promulgates two national technical standards, which are: National Technical Regulation on veterinary hygiene isolation and quarantine of animals and animal products. National Technical Regulation: General requirements for veterinary hygiene equipment, tools, transportation of animals and fresh animal and processed products.

Circular 07/2012/TT-BNNPTNN of MARD dated on January 13, 2012 regulated the procedures for registration, inspection and certification of veterinary medicine manufacturer satisfied the standards of good manufacturing practise (GMP).



Circular 08/2012/TT-BNNPTNN of MARD dated on January 13, 2012 regulated the procedures for registration of veterinary medicine production units which applied for all domestic and foreign businesses operating in the field of producing veterinary medicines in Vietnam.

On May 31st 2013, Ministry of Agriculture and Rural Development (MARD) issued the Circular 28/2013/TT-BNNPTNT regulating the list of veterinary drugs allowed to circulate in Vietnam; Particularly it comprehends the list of vaccines, bio-products, microorganisms and chemicals, for veterinary usage, allowed to circulate in Vietnam. This Circular replaces the previous circulars as follow:

- MARD's Circular 31/2011/TT-BNNPTNT dated April 21, 2011 promulgating the list of veterinary drugs allowed in Vietnam.
- The Circular 32/2011/TT-BNNPTNT of April 21, 2011, promulgating the list of vaccines, bio-products, microorganisms and chemicals, used in veterinary practises, allowed in Vietnam
- The Circular 77/2011/TT-BNNPTNT, dated November 4, 2011 of MARD, promulgating the additional list of veterinary drugs, vaccines, bio-products, microorganisms and chemicals, used in veterinary practises, allowed in Vietnam
- The Circular 15/2012/TT-BNNPTNT of March 30, 2012 of MARD on promulgating the additional list of veterinary drugs, bio-products, microorganisms and chemicals used in veterinary medicine which are allowed to be available in Vietnam
- The Circular 58/2012/TT-BNNPTNT of November 7, 2012 of MARD promulgating the additional list of veterinary drugs, vaccines, biological products, microorganisms, chemicals used in veterinary medicine which are allowed to be available in Vietnam.

### Policies related to pig genetics

The following policies have had direct impact on the use and management of livestock and fishery genetic resources:

Decision 125/CT dated 18/4/1991 of the Chairman of the Minister Council (now it is Prime Minister) on subsidy fund for maintaining and improving the livestock and poultry breeding herds.

The 14/CP government's decree (19/3/1996) on animal breeding management and MARD's circular letter to instruct the implementation of the 14-CP government's decree. In those documents, the production and management of pure breeds (GGP, GP breeds), the farm animal resources management, importing new breeds, the animal breeding policies, the list of farm animal breeds which are allowed to trade and the standard for breed quality characterization are clearly defined.

The resolution No 06 of Central government (10/11/1998) on solutions for the development of agriculture and rural areas.

The Government's Decision 225/1999/QD-TTg (10/12/1999) on the Programme on Animal breeds, crop plant, forest-plant varieties in the period 2000–2005. This decision issued to ratify the program of plant seeds, livestock breeds and forest tree seeds in the 2000–2005 period, which aimed to: (1) Ensure enough seeds and breeds of good quality to supply for the need of production development, first of all in the important production branches related to the income of the masses of farmers and of large export value such as paddy and rice, coffee, rubber, tea, cashew, pepper, vegetables, fruit trees and oil-bearing plants, sugarcane, fodder plants, pigs, beef cattle and dairy cattle, poultry, important forest trees catering for the production of paper and timber; (2) Apply new and traditional scientific achievements and technologies by using the advantages of cross-breeding while preserving bio-diversity, step by step applying bio-technology in cross-breeding; (3) Set up a production and service system in plant seeds, livestock breeds and forest tree seeds suited to the market mechanism.

The Government's decision 09/2000/NQ-CP dated 15/6/2000 on solutions and policies for shifting the agricultural economy structure and products consumption.

The Decree 166/2001/QĐ-TTĐ issued by the Prime Minister on October 26, 2001 focused on the solutions and policies for the development of pig sector towards exportation in period 2001–2002. The article 3 of this decree mentioned that the government encourages all organizations, individuals and households of all economic sectors as well as foreign investors to develop pig breeding units following the export standards; and the pig production areas for export must have breeding grandparents facility (300–500 heads) and parent pigs to provide enough good pig breeds demand in the region. Therefore, this decree did have significant contribution to the improvement of national pig herd as well as genotype diversity.

### Policies related to feed

Decree 54/2002/QĐ-BNN issued by the Minister of MARD on 20/06/2002 about the ban of the production, importation, and use of some specific chemicals in commercial feed production and business.

Decree 88/2008/QĐ-BNN issued by MARD promulgated the list of imported feeds and raw materials for feed production followed the HS codes.

Circular 81/2009/TT-BNNPTNT of MARD regulated the national technical standards on feed sector. It provides national technical regulation on animal feeding stuffs—Maximum level of antibiotics, drugs, microorganism and heavy metals in completed feeds for chickens, ducks, pigs, and cattle beef.

Decree 08/2010/NĐ-CP of the government dated 15/02/2010 on the management of livestock feed industry, in which the State encourages organizations and individuals to invest on research, technological transfer, nutritious animal processed feeds, in order to reduce the percentage of imported feeds. This Decree provides for production, trading, export, import, assay and accreditation of livestock feeds; state management, examination, inspection and administrative violations in the domain of livestock feeds. This Decree applies to domestic and foreign organizations and individuals engaged in livestock feed-related activities in the Vietnamese territory.

Decree 08/2011/NĐ-CP of the government dated 25/01/2011 prescribed administrative sanctions for the violation in animal feed production. The administrative violations of animal feed, including: (i) Violations of regulations on the production, processing feed; (ii) Violations of regulations on business and feed use; (iii) Breaching regulations on importation of animal feed; (iv) Violations of regulations on assaying and testing feed; (v) Obstructing state administration of animal feed.

Circular 61/2011/TT-BNNPTNT of MARD dated 12/09/2011 regulated the national technical standards on feed sector. The circular provides national technical regulations on animal feed mill—conditions for veterinary hygiene and food safety, and animal feeding stuffs—criteria of safety and maximum level in animal feed stuff.

Circular 23/2012/TT-BNNPTNT issued by MARD on 18/06/2012 to amend and supplement some regulations on the national technical standards on animal feed attached with the circular 81/2009/TT-BNNPTNT dated 25/12/2009.

Circular 26/2012/TT-BNNPTNT of MARD promulgated the temporary list of livestock feeds permitted to circulate in Vietnam, including: List of livestock feeds that are produced domestic; List of livestock feeds that are imported (consisting of Animal feed has technical standards; and animal feed not having technical standards).

Circular 41/2012/TT-BNNPTNT of MARD promulgated the national technical standards on assay and inspection of animal breeds and feeds. It provides 4 national technical standards on assay and inspection for honey bee breeding, ostrich breeding, chicken feed, and pig feed.

### Policies related to food safety

Decision No. 87/2005/QĐ-BNN of the MARD dated 26/12/2005 promulgated the procedures for control of animal slaughtering. The slaughter of animals for business must be operated at centralized slaughterhouses with qualified veterinary hygiene conditions which are controlled before, during and after slaughtering by the authorized animal health agencies. Animals used for slaughtering must satisfy veterinary hygienic standards and quarantined by the authorized animal agencies. And animals must be transferred to slaughterhouses at least 6 hours before slaughtering.

Decision No. 15/2006/QĐ-BNN issued by the MARD on 08/3/2006 promulgated the regulation on the order and procedures of quarantine of animals and animal products, and veterinary hygiene inspection.

The Circular 42/2006/TT-BNN of the MARD dated 1/6/2006 guided the implementation of the Decision 394/QĐ-TTg issued by the Prime Minister on 13/3/2006 which focuses on encouraging investment on the construction of new slaughtering units and expansion of the existing slaughterhouses, preservation and processing units of cattle and poultry, and industrial concentrated poultry production.

The Circular 06/2007/CT-TTg was issued by the Prime Minister on 28/3/2007 about the implementation of necessary solutions ensuring food safety, in which People's Committees of provinces and cities were required to guide related specialized Departments, Sectors and People's Committees at lower levels to construct sanitary concentrated cattle and poultry slaughterhouses associated with environmental protection.

The Circular 30/2009/TT-BNN of the MARD dated 4/6/2009 regulates inspection, sanitary veterinary surveillance for production and business of animal products, animal slaughtering used for food.

The Circular 60/2010/TT-BNN of the MARD dated 25/10/2010 regulates the hygienic veterinary conditions for pig slaughterhouses. This Circular provides veterinary hygiene conditions for slaughterhouses killing pigs by the manual or semi-automatic method. This Circular applies to domestic and overseas organizations and individuals engaged in pig slaughter in Vietnam.

The Vietnamese Food safety law (FSL) was signed by Former President Nguyen Minh Triet on June 28, 2010, and ratified by the National Assembly on June 17, 2011. The FSL entered into force on July 1, 2011. It provides organizations and individuals with rights and obligations to ensure food safety; conditions for food safety; food production and trading; food import and export; food advertisement and labelling; food testing; food risk analysis; prevention and dealing with food safety incidents; information, education and communication on food safety; and state management of food safety.

On April 25, 2012, Prime Minister Nguyen Tan Dung signed Decree No.38/2012/ND-CP detailing the implementation of some articles of the FSL. Decree 38 provides guidance to MARD, MOIT, and MOH on implementing provisions of the FSL, including: 1) Declaration of Conformity to Technical Regulations or Food Safety Regulations; 2) Safety requirements for genetically modified foods; 3) Granting, and withdrawing Food safety certificates for establishments that meet food safety requirements; 4) State inspection on food safety for imported and exported foods; 5) Labelling of food products; and 6) Delegation of responsibilities for state management of food safety to the relevant Ministries including MOH, MARD, and MOIT. Vietnam notified Decree 38 to the WTO SPS Committee on March 25, 2011 (G/SPS/N/VNM/27). Decree entered into force on June 11, 2012. The implementing Ministries are currently developing Circulars and Technical Regulations to enforce sections of Decree 38. The roll-out of these Circulars and Regulations has been slow as MARD, MOH, and MOIT continue to identify ministry-specific responsibilities and products with shared jurisdiction.

## Annex 18. Timeline of credit policies (1983 to present)

	1983–1996	1997	1998–1999	2000–2001	2002–present
Name of ordinance, decision, decree	QD-52, CT-13, CT-06, ND-65, QD-67, QD-367, QD-217, QD-525, TT-01	Law 01: Bank Law Law 02: Credit Law CV-416	ND-165, ND-178 QD-67, QD-266, QD-287, QD-383, CV-230, CV-242	QD-41, QD-101, QD-108, QD-135, QD-241, QD-248, QD-991, CT-02, TT-06, TT-11, TT-92, TT-97, TT-98	ND-85, ND-48, QD-92, QD-1269, TT-03, TT-09, 41/2010/NĐ-CP
Content	<p>Establishment, organization, performance, strengthening, and development of Credit Cooperatives in rural areas.</p> <p>Set up Vietnam Bank for Agriculture and Rural Development (VBARD) in 1989, and Vietnam Bank for the Poor (VBP) in 1995.</p> <p>Organization of Vietnam banking system: Vietnam State Bank, Vietnam Bank for Foreign Trade, Vietnam Bank for Investment and Construction, and Vietnam Bank Serving People.</p>	<p>Credit law: development of credit policies for agriculture, rural areas, farmers, forming of credit institutions, formulating different lending forms, especially strengthening network of credit branches in rural areas, facilitating credit for poor farmers in terms of loan procedures (without collateral), subsidized interest rate, loan criteria, and loan duration.</p> <p>Allocation of borrowing capital from ADB for rural credit institutions and programs.</p>	<p>Priority of credit is given to the development of agriculture and rural areas. Increased loans for the poor through VBP.</p> <p>Loan amount is up to 10 million dong (USD 870) per household without guarantee/ or collateral.</p> <p>Credit institutions can make loan without guarantee or collateral by assets.</p> <p>Social organizations (Farmer Association, Women's Union, Youth Union, League of Employment, Veteran's Association, credit group, etc.) can act as guarantee for poor household to borrow capital from credit institutions or programs.</p> <p>Diversified loan duration: long-term (&gt; 60 months), medium-term (12–60 months), short-term (12 months).</p> <p>Adjusted loan interest at 1.05% per month; low interest at 0.85% is given priority for rural areas.</p> <p>Expanded credit networks in remote areas.</p> <p>Payment period is partly based on crop–animal cycle.</p> <p>Loan procedure is simpler than that of previous years.</p> <p>Providing conditions to ensure credit loan: assurance, mortgage, or guarantee of third parties or assets generated by loan.</p>	<p>Management of People's Credit Fund at state and local level, non-collateral loan.</p> <p>Controlled interest rate and procedures of credit loan. Improved procedures to meet capital demand of farmers.</p> <p>Strengthen non-guaranteed form (under guarantee or collateral of social organizations). Make it easy for poor people to obtain a nonsecured loan.</p>	<p>Operations and organizations of the People's Credit Fund.</p> <p>Guidelines for determining assets to be recovered by institutions in cases of default, helping credit institutions to take certain measures to secure their loans with assets, and selecting borrowers for nonsecured or nonguaranteed loans.</p> <p>Modification and adjustment of Ordinance No. 178 on these items: assessment of real value of land for mortgage loans (related to large amount of loan), and acceptance of assets that were generated from loan.</p> <p>Clearly specify cases for nonsecured loans with specific conditions (related to the poor or smallholders).</p>

## Annex 19. Responsibilities of the public sector for food safety in Vietnam

Ministry	Responsibilities
Ministry of Health (MOH)	<p>General responsibilities: (i) Presiding over the development, promulgation and implementation of national strategies and master planning on food safety; (ii) Promulgating national technical regulations on criteria and safety limits in respect of products, tools and materials used for packaging and containing food. Responsibilities in sectoral management:</p> <ul style="list-style-type: none"> <li>+ To manage food safety throughout the process of production, preliminary processing, processing, preservation, transportation, export, import and trading of food additives, food processing aids, bottled drinking water, natural mineral water, functional food and other foods under the Government's regulations;</li> <li>+ To manage food safety with regard to food-packaging tools and food packages and containers in the process of food production, processing and trading in its assigned management domain;</li> <li>+ To inspect, examine, and handle violations of the law on food safety in the process of food production, export, import and trading in its assigned management domains.</li> </ul>
Ministry of Agriculture and Rural Development (MARD)	<p>General responsibilities: Presiding over the formulation, promulgation of policies, master plan, and regulations on food safety within the sector.</p> <p>Responsibilities in sectoral management: Management of food safety during production, collection, slaughtering, primarily processing, processing, preservation, transportation, export, import and trading of cereals, meat and meat products, aquaculture and aquatic products, vegetables, bulbs, fruits, eggs and egg products, fresh milk used as an input, bee's honey, and honey products, genetically modified foods, salt, and agricultural foods in accordance with the provisions of the Government.</p>
Ministry of Industry and Trade (MOIT)	<p>General responsibilities: Presiding over the formulation, promulgation of policies, master plan, and regulations on food safety within the sector.</p> <p>Responsibilities in sectoral management: Managing food safety during production, collection, slaughtering, primary processing, processing, preservation, transportation, export, import and trading of alcohol, beer, beverages, processed milk, vegetable oil, products used as materials for production of powder, starch, and other food in accordance with the provisions of the Government.</p>
People's Committees at all levels	<p>General responsibilities: To promulgate according to their competence or submit local legal documents and technical regulations to competent state agencies for promulgation; to formulate and implement master plans on safe food production zones and establishments so as to ensure management in the entire food supply chain.</p> <p>Responsibilities in sectoral management:</p> <ul style="list-style-type: none"> <li>+ To manage food safety assurance conditions for small-scale food production and trading establishments, street food, catering establishments, and food safety at local markets and subjects in their assigned management domain.</li> <li>+ To organize the work of information, education and communication to raise awareness about food safety, the sense of observing the law on food safety management, the sense of responsibility of food producers and traders toward the community and the awareness of consumers about food safety.</li> <li>+ To inspect, examine and handle violations of the law on food safety in their respective localities.</li> </ul>

## Annex 20. Policy analysis matrix for pig production at the farm level (million tonnes liveweight pork), 2009

Indicator	Average		North Region		Central Region		South Region	
	Smallholder farm	Commercial Farm	Smallholder farm	Commercial farm	Smallholder farm	Commercial farm	Smallholder farm	Commercial farm
Market value								
Revenue	28.77	31.78	26.79	32.68	28.59	31.03	31.15	32.11
Input Materials	21.47	22.68	17.52	21.93	23.67	21.44	23.45	23.49
Domestic resources	7.25	3.66	10.04	4.34	4.55	2.84	7.06	3.64
Profit	0.05	5.44	-0.77	6.42	0.37	6.75	0.64	4.98
Social value								
Revenue	28.19	27.33	28.94	28.84	28.88	28.24	27.72	28.26
Input Materials	19.33	20.93	16.93	21.77	22.87	21.41	19.70	21.51
Domestic resources	6.10	3.34	8.55	4.29	3.90	2.80	5.78	3.47
Profit	2.76	3.05	3.46	2.38	2.11	4.03	2.24	3.28
Shift/Comparison								
Revenue	0.58	4.45	(2.14)	4.25	(0.29)	2.79	3.43	3.85
Input Materials	2.14	1.75	0.59	0.17	0.80	0.02	3.75	1.98
Domestic resources	1.15	0.31	1.50	0.04	0.65	0.05	1.28	0.17
Profit	-2.7	2.39	-4.23	4.04	-1.74	2.72	-1.60	1.70
% shift								
Revenue	-2.04	-16.28	7.41	-14.94	0.99	-9.89	-12.36	-13.64
Input Materials	-11.08	-8.37	-3.48	-0.77	-3.50	-0.11	-19.03	-9.22
Domestic resources	-18.77	-9.32	-17.52	-1.04	-16.80	-1.65	-22.14	-4.86
Profit	98.19	-78.14	122.11	-169.72	82.34	-67.56	71.46	-51.92

Source: Tung et al. (2010).

## Annex 21. Unit cost per kg weight gain by production system and scale, 2007 (value in '000 VND)

Note: a: significant difference between small and medium scale; b: significant difference between small and large scale; c: significant difference between medium and large scale; x: significance at 10% level; xx: significance at 5% level; xxx: significance at 1% level where x is a,b,c.

Source: Lapar (et al. 2012).

Cost item	1. Farrow to wean						2. Farrow-to-finish						3. Grow-to-finish					
	Small N=112		Medium N=51		Large N=8		Small N=114		Medium N=64		Large N=26		Small N=200		Medium N=75		Large N=35	
	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%	Value	%
Stock cost (piglet/sow)	0.03	0.1	0.0	0.0	0.0	0.0	0.2 <sup>a</sup>	1.3	0.1 <sup>t</sup>	0.7	0.0 <sup>bc</sup>	0.0	6.0 <sup>a</sup>	31.0	6.7 <sup>a</sup>	32.8	6.0	30.5
Feed cost	21.3 <sup>a</sup>	90.9	18.1 <sup>a</sup>	92.7	15.1	88.7	14.0 <sup>xxx</sup>	99.2	15.9 <sup>a</sup>	94.3	18.4 <sup>xxx</sup>	95.8	12.5	64.6	13.1	64.4	13.0	66.3
Feed purchased	10.9	46.4	12.4	63.6	14.0	82.1	9.8 <sup>xxx</sup>	65.4	12.5 <sup>xxx</sup>	74.2	17.5 <sup>xxx</sup>	91.5	6.9 <sup>xxx</sup>	35.9	10.8 <sup>xxx</sup>	53.0	11.6 <sup>xx</sup>	59.3
Feed self-produced	10.4	44.4	5.7 <sup>bc</sup>	29.1	1.1 <sup>bc</sup>	6.6	4.2 <sup>xxx</sup>	27.7	3.4	20.1	0.8 <sup>xxx</sup>	4.3	5.5 <sup>xxx</sup>	28.6	2.3 <sup>xxx</sup>	11.4	1.4 <sup>xxx</sup>	7.0
Breeding cost	0.4	1.5	0.3	1.5	0.4	2.5	0.1	0.8	0.1	0.6	0.1	0.5	0.01	0.1	0.05 <sup>bc</sup>	0.0	0.02 <sup>bc</sup>	0.1
Veterinary cost	0.7	3.0	0.5	2.7	0.6	3.5	0.3	1.8	0.2	1.5	0.3	1.5	0.2	1.2	0.2	1.1	0.2	0.9
Loan cost	0.4	1.6	0.1	0.6	0.4	2.5	0.1	0.9	0.2	1.2	0.1	0.6	0.1	0.5	0.1	0.5	0.2	0.9
Hired labor cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.0	0.0	0.0	0.1	0.4
Other	0.6	2.6	0.4	2.3	0.4	2.2	0.3	1.7	0.2	1.4	0.2	1.2	0.5	2.3	0.2	1.0	0.1	0.7
Total variable cost	23.4	100.0	19.6	100.0	17.0	100.0	15.0 <sup>xx</sup>	100.0	16.8	100.0	19.2 <sup>xx</sup>	100.0	19.3 <sup>xxx</sup>	100.0	20.3 <sup>xxx</sup>	100.0	19.6	100.0

Note: a: significant difference between small and medium scale; b: significant difference between small and large scale; c: significant difference between medium and large scale; x: significance at 10% level; xx: significance at 5% level; xxx: significance at 1% level where x is a,b,c.

Source: Lapar (et al. 2012).

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