Policy Options for Using Livestock to Promote Rural Income Diversification and Growth in Viet Nam

Final Report

February 2001

Hanoi, Viet Nam

VOLUME 1: TEXT

Submitted to the Royal Embassy of Denmark
and the Ministry of Agriculture and Rural Development

Submitted by:
International Food Policy Research Institute
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FOREWORD

This report presents the findings and recommendations of the Project on *Policy Options for Using Livestock to Promote Rural Income Diversification and Growth in Viet Nam.* The project has been funded by the Royal Embassy of Denmark and the International Food Policy Research Institute (IFPRI)and was implemented by IFPRI in collaboration with Agrifood Consulting International and the Department of Agricultural and Rural Development Policy of MARD. Other collaborating institutions include the Department of Extension, MARD; the Department of Animal Health, MARD; the National Animal Husbandry Research Institute; the Institute of Agricultural Sciences; and the National Veterinary Institute.

The preliminary findings and recommendations in this report are based on analysis of field data collected by the project during August 1999 to January 2000, background papers from different experts and discussions with various policy makers. The content of this report have been discussed in a serious of workshops including: an interim workshop held at MARD in Ha Noi, on July 12, 2000; a regional workshop held at the Department of Extension at MARD in Ha Noi on February 15, 2001; a national workshop held at MARD in Ha Noi on February 20, 2001; and a regional workshop held at the Animal Research and Training Center in Binh Thang, Binh Duong, on February 22, 2001.

Several people have contributed to this report including Francesco Goletti (team leader), Dominic Smith, Peter Gruhn, Nguyen Viet Hai, Tran Cong Thang, Dinh Xuan Tung, and Phan Sy Hieu. The final report takes into account the comments received during the workshops and various comments from collaborators. The responsibility for all remaining errors and opinions remains with the authors.

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CHAPTER 1

EXECUTIVE SUMMARY

1.1 Introduction

The basic assumption of this study is that the livestock sector has a key role to play in a strategy for rural development in Viet Nam. The assumption is based on the argument that sees agricultural diversification as the key component of rural development in Viet Nam. Given limited prospects in the growth of rice production and changing patterns of demand both in Viet Nam and in world markets, livestock sector development appears to be one important pillar of any development strategy for agriculture in Viet Nam. Such a strategy aims at achieving higher and more stable rural incomes, reducing the incentives for a flow of migrants from rural to urban areas, making farming system more sustainable in the long run, and alleviating rural poverty, especially among ethnic groups in mountainous and hilly areas.

The study, started in June 1999, was funded by the Royal Embassy of Denmark in Viet Nam and implemented by the International Food Policy Research Institute in association with the Department of Agricultural and Rural Development Policy of MARD. Several other departments and research institutes of MARD also joined the collaborative research activities including the Department of Extension, the Department of Animal Health, and the Department of Science and Technology at MARD, the National Institute of Animal Husbandry, the Institute of Agricultural Sciences, the National Institute of Veterinary Research.

The study reports the findings of various field surveys undertaken during 1999 and 2000 through ten formal questionnaires related to: i. Communes; ii. Producers; iii. Feed Traders; iv. Liveweight/meat traders; v. Feed processors; vi. Meat processors/slaughterhouses; vii. Veterinary services at province/district level; viii. Veterinary services at commune level; ix. Urban Consumers (Hanoi and HCMC); and x. Breeding Centers.

Descriptive data analysis is complemented by background reports written by several Vietnamese experts and by more formal analytical methods including time series analysis of market integration, econometric analysis of demand for meat, estimation of transportation cost functions, analysis of adoption of technology, and spatial equilibrium modeling. Wherever possible, cost and benefit analysis of alternative policy options was also provided.

1.2 Rationale

There are several reasons for devoting attention to the livestock sector in Viet Nam.

First, agricultural diversification requires shifting to higher value production per hectare and per unit labor than in the case of rice. Livestock production, particularly in the context of an agrarian structure characterized by very small farms, offers the opportunity to capture higher value added per hectare than crop-based agriculture.

Second, the prospects for increasing domestic and international demand for livestock products, particularly pork and poultry, appear fairly strong.

Third, livestock industry development relies upon some economies of scale in processing and feed production. However, it is small-size producers who carry out most of the livestock production in Viet Nam. This presents a major opportunity and a major challenge for development. The opportunity is that a better coordination between large commercial sector and small producers could lead to significant benefits for the income of the rural population. The challenge is how to integrate small producers with large companies.

Fourth, the development of livestock stands to markedly improve the nutritional status of the population by adding more protein to their diet and helping to alleviate protein deficiency.

Fifth, there are efficiency gains to be realized in both crop and livestock production through their development in an integrated system.

Sixth, evidence suggests that livestock can serve as an important engine of growth in providing a large share of cash income to farm households, which in turn can have strong multiplier effects on local communities.

Finally, livestock is an important source of income for the majority of Vietnamese farmers, and particularly those in upland areas where poverty rates are highest; therefore, its development carries important implications for poverty reduction and income distribution.

1.3 Past Achievements

Over the past 10 years, GDP in livestock sector grew at an average of 4.4 percent per year. The rate was the same as for the GDP of the crop sector, implying very little change in the contribution of livestock to total agricultural GDP, a contribution which remained almost constant at about 13 percent.

While GDP of the sector grew at 4.4 percent, the average growth of liveweight was about 6.4 percent, implying an average increase in consumption of meat per capita of about 4.6 percent. The growth was remarkably high, especially when compared to the average growth of rice consumption per capita at about 1 percent over the same period. The comparison highlights an important point, namely that while the growth of rice during the 1990s was mostly the result of increasing exports, growth of livestock was mostly the result of increasing domestic demand.

In spite of very high growth of demand, the average consumption of meat in Viet Nam, at about 22 kg/capita/year, is still lower than the average for both Asia and developing countries. However, because of high income elasticity of demand for meat, the prospect for sustained overall income growth in Viet Nam over the future decade promises well for the sustainability of the livestock sector.

The major determinant of livestock sector growth has been increasing demand for animal products due to rapid income growth and a change in diet patterns particularly in urban areas from staples such as rice toward higher value and protein rich foods. The opportunity for growth has been met by a production system mainly made of small producers and large investments in the feed industry, particularly by the private and foreign sector.

Genetic improvement in the animal herd have occurred albeit slowly and at an unbalanced rate in different parts of the country (more rapidly in peri-urban areas) and across different producers (more rapidly among large commercial producers). The adoption of improved breeds has been more rapid for poultry than for pigs and cattle, albeit slow overall. The organization of breeding centers, AI stations, and the quality and efficiency of the distribution system of genetic material has been characterized by a number of problems including lack of funds, absence of certification and standards, and duplication of efforts because of a generalized lack of coordination between national and local programs.

Even though the livestock sector GDP has grown as rapidly as the crop sector GDP, it has received much lower government support. For example, in 1997-98, only 4% of total state budget in agriculture was devoted to the livestock sector and veterinary services. In contrast, crops (including irrigation) received 61% and forestry about 24%. This allocation of the state budget in agriculture does not either reflect the importance of livestock in agricultural GDP nor the fact that the majority of the farming population is involved in livestock activities. Moreover, it does not seem to be related to the growth prospects of the livestock sector, since

both the crop and livestock sector have grown at a similar rate of 4.4 percent over the past decade. With an average of 149 billion Dong during 1997-98, the state budget to livestock represented only 1.1 percent of the value added created by the sector.

Partly as the result of little investment in research and technology dissemination, the growth of the sector has been achieved mostly through increasing inputs rather than increasing productivity. For example, pig liveweight grew at an impressive rate of 7 percent per year over 1990-99; however, while pig herd size grew at 5 percent, pig offtakes grew only at 1.9 percent. For poultry, the situation is similar. Liveweight for poultry grew at an average of 6.3 percent, but poultry herd size grew at 5.9 percent, and poultry offtakes grew at only 0.4 percent per year over the same period.

Livestock sector growth in Viet Nam shares many of the features of the Livestock Revolution currently underway in developing countries, particularly in Asia. If not directed properly, the Livestock Revolution will stretch the capacity of existing production and distribution systems and exacerbate environmental and public health problems. Governments and industry must prepare for this continuing transformation with long-run policies and investments that will satisfy consumer demand, improve nutrition, direct income growth opportunities to those who need them most, and alleviate environmental and public health stress. In Viet Nam, the livestock sector has received little budgetary support and also little regulatory role as related to marketing, health, and environment. This is most apparent in the case of animal health, condition and location of slaughtering/processing industry, and meat available for consumption in market stalls and restaurants. Even though the policy induced distortions in production, marketing, and feed industry are limited, the state has apparently directed its effort more towards production and commercial activities rather than in regulatory, capacity building, and research and extension activities.

1.4 Future Challenges

Looking at the past performance of the livestock sector in Viet Nam, there is a natural tendency toward complacency. The sector growth performance has been relatively good, with little policy distortions, a strong presence of the private sector in production, distribution and input supplies, and a sustained domestic demand. When looking at the future, one could easily think that nothing much should be done by the government. The past suggests that a minimum role of the state in the sector is not inconsistent with growth.

That view is correct, if the role of the government is thought of in terms of intervention in commercial activities. These activities are best if left to the private sector, with the government focusing on the provision of public goods that are undersupplied by the private sector. However, one could also easily point to several problems that, if left unresolved, risk creating serious problems to the sector in terms of three main dimensions, namely sustainability, acceleration, and participation of growth. These three dimensions are in fact three main challenges for the future.

Can past growth of the livestock sector be sustained?

The past growth of the livestock sector has been the result of herd size increase and improvement in offtakes (measured as liveweight divided by herd size) due to better breeds and feeding practices. The herd size effect has been stronger than the productivity effect. There is not enough evidence to show that the animal health situation has improved during this period. At the same time, there is some evidence that shows that hygiene and sanitary conditions in slaughterhouses, food processing and food distribution might have worsened. Food borne diseases might be on the rise as bigger quantities of meat are in the distribution system without complying with the necessary sanitary and public health standards. As urban demand for meat has increased, the production and processing of meat in urban and peri-urban areas has also increased, but without a parallel increase in health and sanitary

requirements. As a result environmental pollution of urban sewage systems through wastes and residues of animal production and animal product processing is reaching critical conditions.

In the next 10 years, if past rates of growth in liveweight are sustained, the stress on an already weak system will be intensified, as liveweight volumes will double from the current 1.8 million tons to 3.6 million tons. Several regulatory policies related to production, slaughtering, and processing of animal products will have to be set in place and enforced, the alternative being the rising of widespread animal disease and the negative effects on human health through contaminated water, food borne diseases, and epizootic diseases.

Can current growth of the livestock sector be accelerated?

Over the past 10 years, total liveweight grew at 6.6 percent while total GDP grew at 7.7 percent. Recent estimates of income elasticity of demand for meat in Viet Nam (as in many other countries at similar level of income) suggest a value of about 1, implying that more than 1 percent additional growth in potential meat demand could have been lost on average over the past 10 years.

The missed potential of increasing growth of the livestock sector is particularly worrisome since it is not due to lack of demand, but rather to lack of the necessary productivity and marketing improvements necessary to meet this demand.

On the productivity side, breed improvement could have been faster if a better breeding system was in place and appropriate investments in research and extension were made.

On the marketing side, the lack of an organized system of markets for livestock has reduced the flow of information between consumers and producers and, at the same time, reduced the power of producers vis à vis other participants in the marketing chain. High marketing

margins have thus penalized both producers and consumers, with negative effects on aggregate and sector income.

The acceleration of growth of the livestock sector is not just a desirable outcome for the future. It is also an important need in an agricultural system and rural economy where other sources of growth are becoming less important. While in the past most of the growth of agriculture in Viet Nam has been due to crops and, within crops, to rice, this is not going to be the case in the future, as rice demand growth will lower considerably and similar outcome will affect even high value commodities like coffee.

Can growth in the livestock sector be participated by the poor?

Appropriate policies might resolve the two first challenges above, namely the sustainability and acceleration of growth. The third challenge, however, is even more difficult than the previous two. As the livestock sector develops, there is no guarantee that it will benefit the poorest segments of the rural population. The development of the sector requires the commercialization of the livestock production system, including improved genetic material, better feeding, adequate animal health and veterinary services. In all these activities there is a strong bias of the service providers, both in the private and public sector, to target the richest and largest producers first. The question is whether or not this targeting makes sense from an economic point of view.

In the case of the feed industry, there is strong evidence from survey data of economies of scale. The largest mills do better in terms of quality of products, efficiency of operations, and higher profits than their smaller counterparts. Even in the case of slaughtering and processing industry there is some evidence of economies of scale. If the same situation of economies of scale occurs in livestock production, then the case for the poor is rather weak.

If the profitability of livestock production exhibits economies of scale, then the opportunity for small livestock producers to benefit from increasing growth is limited, as there will be a tendency for consolidation and investment in large commercial operations. However, if there are no economies of scale (or, on the contrary, there are diseconomies of scale) there is a scope for small producers to be involved in commercial production. Moreover, their involvement is not only justified by social equity considerations, but also in terms of economic efficiency. An active support of the small producers will actually improve the income of the sector. Of course, to be either small or large does not guarantee that economic opportunities will be taken. In the case of small producers, once they have the necessary information, market access, and credit, then their being small is not an impediment to obtaining higher profits ratios than their largest colleagues.

The study in fact shows that there are decreasing returns to scale in livestock production, both in poultry and pig production. Then, a set of measures that help the small scale producers to have access to technology, markets, and credit seems warranted both on social ground and on economic terms. By pursuing this broad-based growth strategy, the overall sector might benefit more than just by promoting the large producers.

Of course, there is another angle to the issue of growth participation. This other angle refers to the integration of the activities of small-scale producers with large feed mills, breeding operations, and large processors. In the long term, it is this integration that might guarantee access to even higher value products both in domestic and international markets than currently is the case.

1.5 Current constraints

Before looking at strategies and policies to address the future challenges, it is necessary to understand the constraints that the sector is currently facing. The field work conducted within this project, together with the analysis of secondary data has allowed the study team to draw better understanding of constraints related to productivity, prices, feed, breeding, animal health and veterinary services, marketing, processing, extension and research. The following sections summarize the main findings about these constraints.

Constraint #1: Low productivity of livestock sector

Livestock provides 13 percent of value added in agricultural GDP; with about 70 percent of agricultural labor force involved in livestock production, that implies a low productivity in the sector per unit of labor (approximately $52). Some evidence suggests that 10 percent of the agricultural labor time is spent on livestock activities. If this is the case, then productivity of livestock sector, albeit low in absolute terms, may be slightly higher than for other parts of agriculture.

The survey work conducted for this study suggests that for livestock producers, the return to labor in livestock activities is higher than the return on other agricultural activities. Small producers gain an average of 73 percent of their agricultural income from livestock, while using 58 percent of their labor time. That implies a productivity of livestock activities 25 percent higher than other agricultural activities.

The increase in the supply of liveweight in Viet Nam is mostly due to increases in the size of the national herd, rather than improvements in the slaughter rate, time to slaughter, or slaughter weight. This may imply that the introduction of improved breeds of animals into the national herd is not having a major effect on productivity figures, either because the diffusion

of improved genetics is not at sufficient levels, or because the performance of improved animals (particularly low level crossbreeds) is not markedly better than that of local animals.

Constraint #2: High and variable prices and low quality of meat

Meat prices in Viet Nam are relatively high by world standards, and not competitive. The potential for large-scale meat exports is still limited in terms of both price and quality. The quality of livestock products is relatively low, both in terms of lean meat percentage and carcass yields and also in terms of hygiene and disease standards.

Meat prices and slaughter animal prices have shown high degrees of variability over the past ten years. Poultry prices have increased, particularly in the second part of the 1990s; pig prices have been characterized by strong fluctuations with no clear trend. The prices of livestock products fluctuate highly within the year due to seasonal factors. Seasonal fluctuations of chicken liveweight prices differ considerably across provinces. In the Center and in the North seasonal fluctuations are usually more pronounced than in the South.

There are large variations in prices of meat and livestock between the North and the South. The South generally displays much higher prices than the North. This situation is not the results of restrictions on domestic trade, since the price differential between North and South is largely explained by transportation cost and by the absence of cold value-chains. Long-distance trade in live animals adds high cost to transportation reflected by substantial weight loss in animals transported over long distances. The widespread transportation of meat between regions is largely prevented by the lack of cold chains and refrigeration between north and south and a still prevalent preference for fresh meat consumption.

Constraint #3: High prices and low quality of feed

The feed industry in Viet Nam has seen remarkable growth since 1994. As a result of Doi Moi, new domestic and foreign investment have been made in the sector. Commercial feed production has increased at a rate of over 23 percent over the period from 1988 through 1998 and its share of commercial feed consumption has grown from about 1 to about 27 percent. While commercial feed quality, supply, and demand are increasing and prices are falling, the industry is affected by a number of problems that are constraining the development of a healthy, profitable feed industry and affecting the adoption of commercial feed by producers.

Prices for feed in Viet Nam are high by international standards, particularly for high protein raw materials such as maize and soybeans. Contributing to the high cost of high protein raw materials are limited local production, low yields, and import duties.

Since the passage of the new investment law of 1994, investment in the feed industry has increased. The large increase in investment has been mainly undertaken by the private sector, both domestic and foreign, which in turn has led to a dramatic increase in feed production and capacity. Although it is still early to predict the future development of the feed industry in Viet Nam, the local private companies may be too small to be competitive over the long term. For example, the five largest domestic companies process about 19 percent of the commercial feed produced in Viet Nam, the five largest foreign mills produce about 62 percent. Part of the difference in the size of the local and foreign mills may be due to insufficient access to credit. If the local private feed industry is to be competitive with the foreign owned mills and feed imports over the long term, it will need to consolidate in order to grow its share of the local feed market.

Feed produced by foreign, local private, and state run mills differ in a number of respects including the type, quality, and price of the product. Foreign and large newer mills appear to be targeting the production and sale of concentrated feed, whereas most local private and

state-owned mills mainly produce complete feed. Feed sold by foreign mills has a higher level of protein and higher price then the same type of feed produced by local private mills. Coupled with generally higher rates of capacity utilization, it appears that local private mills are for the most part targeting the lower end of the market by selling a higher volume of lower quality less expensive feed to livestock producers. While this strategy may be the most appropriate for the local private mills at the present time under current market conditions, as the demand for high quality feed increases, local private feed processors run the risk of either targeting a smaller, shrinking niche market for cheaper, low quality feed, or they will need to substantially increase their investment in order to successfully compete with the large feed producers.

Like the feed processing sector, the feed trader sector has seen dynamic changes and rapid growth since the mid 1990s. The quantity of feed traded has increased and investment by traders has more than doubled in the later half of the 1990s. New traders have entered the feed marketing sector, which in turn has led to an increase in competition and contributed to a general reduction in the price of animal feed. Over the last two years, the number of direct competitors to each trader has increased by about 50 percent, and is expected to continue to become more severe over the next few years. Since feed constitutes about 70 percent of the average producers costs for raising livestock, the decline in prices is beneficial to producers as their feed related costs decline, and traders who can do a larger volume of business as farmer demand increases.

Although traders complain about the level of competition, scale appears to be an important determinant in maintaining and enhancing a trader's profitability. For those traders that have been able to grow their business by increasing the quantity of feed that they trade, their profits have more often than not either improved or stayed constant even though the level of competition has increased. In general, the larger trading business are able to structure their operations such that they have lower operating costs on a per unit basis, pay higher wages to

their employees, sell feed at or below the average trader price, and invest proportionately more in productive assets.

Compared to their problems related to the high level of competition and the lack of consumer demand, few traders site the effect of government restrictions, regulations, and bureaucracy as a major impediment to their trading operations. For the most part, liberalization has been good for feed traders, and other than perhaps investments in infrastructure, there appears to be little desire among traders for government intervention in the sector. Nevertheless, a number of problems exist, particularly for traders who transport goods over longer distances and across many district and provincial borders, where random roadside checks by police increase the cost of transporting feed in terms of both time and money. With respect to credit markets, small and medium size traders have difficulty obtaining loans because of insufficient collateral, and also large traders complain of complicated banking procedures.

Constraint #4: Low level and poor focus of genetic improvement

Increases in the proportions of crossbred and exotic animals in the livestock herd in Viet Nam have been at least partially responsible for increases in offtake rates over the past ten years. While the pig herd size has increased by 5 percent per year, the average production of liveweight has grown at around 7 percent per year. The size of the national poultry flock increased at an average rate of 5.9 percent and liveweight production increased at an annual average rate of 6.3 percent. This annual increase in offtake is due in part to increase in farmer adoption of improved breeds, with higher slaughter weights and earlier slaughter ages. Further increases in offtake rates are likely to be driven by increased adoption of exotic breeds by producers and improvements in the quality of crossbred animals used by farmers. The government has promoted the breeding center system in order to develop high level exotic bloodlines for dispersal through a pyramid breeding system into the general livestock

population in order to achieve these aims. However, the current system has a number of problems.

Adoption of exotic breeds by producers and improvements to crossbred genetics have been slow for a number of reasons, including lack of suitability of many exotic breeds for smallholder raising, difficulties of access of smallholders to appropriate genetics and inefficiencies in breed development in the breeding center system, where the focus of activities has been largely in the production of fattening animals rather than dispersal of breeding stock. This slow level of adoption and genetic improvement, particularly by small farmers has resulted in lost potential for growth in offtake rates.

Adoption of Improved Breeds

Commercial producers have largely undertaken adoption of exotic breeds. Small farm systems still rely heavily on local breeds, or crossbreeds of low genetic quality.

Adoption of exotic pigs is largely undertaken on large farms. Only 9 percent of small farms and 56 percent of large farms keep exotic pigs. Exotic pig adoption has been largely confined to commercial producers in the North East South and Mekong River Delta, where 86.5 percent and 70.5 percent respectively of producers keep only exotic pigs, compared to an average of 2.0 percent of producers in the rest of Viet Nam.

Adoption of crossbred pigs has been relatively widespread, with around 58 percent of small farmers and 25 percent of large farmers having at least one crossbred pig in their herd. However, many of these crossbred pigs, especially those on small farms are likely to be of

very low genetic quality, and have productive performance levels that are not significantly greater than those of local animals.

Adoption of exotic breeds of chicken has found wider acceptance than adoption of exotic pigs. Exotic chickens are the only chicken type kept by 32 percent of producers. As was the case with exotic pig adoption, the adoption of exotic breeds has been more widely undertaken by large farms, with around 75 percent adopting exotic breeds, and almost all of these having flocks consisting entirely of exotic chickens. In contrast, only 18.5 percent of small farms have flocks consisting entirely of exotic chickens.

Around 26 percent of producers had adopted exotic breeds of duck, with almost all of these having adoption rates of 100 percent. Around 50 percent of large farms and 23 percent of small farms have adopted exotic duck breeds.

Suitability of Improved Breeds for Small Farm Systems

Small farmers utilize relatively low cost local resources in feeding local pigs. The dominant local pig feeding system was a roughage only diet, with the second most common diet being roughage supplemented with concentrates. On average, local pig diets consist of 55.5 percent crude material, 42 percent fodder and 2.5 percent quality feed. The quality feed fed to local pigs is mostly concentrated feed for breeding.

The feeding system adopted by large farms is focused on intensive fattening. The diet fed to exotic pigs consists of an average of 60.1 percent crude materials, 23.1 percent fodder and 16.8 percent quality feed. The majority of quality feed fed to exotic pigs is designed for fattening rather than breeding.

The divergent livestock management systems and feeding systems adopted by small and large farms mean that they demand pigs with different characteristics. Small farms demand pigs which are able to utilize lower quality feed resources and have high reproductive potential. Large farms demand pigs that can produce a higher proportion of lean meat, and can fatten quickly to a high slaughter weight.

Small farmers utilize local resources for feeding of local chickens, with the diet consisting of 92.2 percent crude material, 3.8 percent fodder and 4 percent quality feeds. The dominant livestock management system for exotic chickens on small and large farms is fattening. Exotic chickens are fed an intensive fattening diet consisting of an average of 38.9 percent crude materials, 1.9 percent fodder and 59.2 percent quality feeds.

Production performance of exotic chickens is superior to those of local chickens. The cost per kilogram of weight gain is lower, average slaughter weights are around 700 grams higher and slaughter age is an average of around two months earlier than for local chickens. However, the poorer quality of feeds and less controlled raising conditions available to small farmers mean that the average cost per kilogram of weight gain for chickens on small farms is higher than that on large farms. Slaughter weights of exotic chickens on small farms are lower than those on large farms and slaughter age is higher.

Access to High Quality Genetics

Exotic breeds have higher productive and reproductive performance when raised under intensive management systems and fed high quality rations. However, the performance of exotic animals under the management system and feeding systems adopted by small farms is in many cases inferior to that of local animals. The most appropriate method for improvement in the genetic quality of breeds in the small farm system may be the use of crossbreeding to

produce animals with some of the production characteristics of exotic animals and some of the feeding characteristics of local breeds.

The dissemination of high quality genetics to small farmers through the breeding center system, either to produce crossbred animals or to supply exotic breeding stock has not been effective. Based on the buying behavior of small and large producers, there appears to be a mismatch between the breeding stock needs of small producers and the breeding stock available from breeding centers. Breeding stock sourced by small farmers comes predominately from other farmers, while a higher proportion of breeding stocks used by large farms comes from state sources.

Overall, about 5 percent of breeding stock of small producers is obtained from state sources. Large farms sourced an average of more than 16 percent of their pig breeding stock from state sources and a further 5.6 percent on average from private businesses. It appears that the government breeding system has only achieved a high level of breeding stock dispersal in North East South and Mekong River Delta, where producers indicated that they obtained an average of 30 percent and 32.3 percent of their breeding stock respectively from government sources. Producers in other regions only obtained an average of 2.6 percent of pig breeding stocks from government sources.

The proportion of poultry breeding stock obtained by producers from government sources was higher than that for pigs, an average of 18.6 percent. The proportion of poultry breeding stock obtained from government sources is greater for large farms than that for small farms. In contrast to the pig breeding system, large farms are more reliant on private business for supply of breeding stocks. Only producers in Red River Delta and North East obtained the majority of their breeding stock from government sources.

Focus of the Breeding Center System

The low level of genetic improvement on smallholder farms is largely due to poor access to genetics. As shown above, small farms only obtain a minority of breeding stocks from government sources and are reliant on animals provided by other farmers and traders to utilize for breeding. The animals obtained from other farmers and traders are likely to be of low genetic quality compared to crossbreds developed through an efficiently operating breeding system.

Breeding centers have experienced a lack of success in promoting and disseminating exotic breeds and high level crossbred stock to small farmers. Effective dispersal of genetics should involve the sale of exotic breeding stock and exotic semen and the development of a system of breeding households supplying crossbred genetics from the breeding center system into the general animal population.

The high cost of raising exotic breeding stock and low demand for grandparent and parent stock by both commercial and small farms has meant that the focus of activities of many breeding centers has changed from breed development and dispersal of genetics, to the production and sale of piglets for fattening. This has not only resulted in a lower level of exotic breeding stock sold by the breeding center system, but has also meant that the development of a core of medium to large breeding households sourcing parent stock level breeding stock from the centers and supplying crossbred stock to small farms has been frustrated.

Both central level and provincial level pig breeding centers gain the majority of their income from sales of piglets for fattening, rather than the sale of gilts and barrows for breeding. Central level chicken breeding centers also gain a majority of their income from the sale of

commercial chicks. The proportion of income derived from sale of commercial piglets and chicks has been increasing for both central level breeding centers and provincial centers.

The numbers of piglets sold relative to the number of breeding animals indicates that sales of piglets for fattening are not restricted to merely the lowest genetic quality piglets that should be excluded from the breeding pyramid, but also include many exotic piglets of high genetic quality that are being sold for fattening because of relatively low levels of demand for high quality exotic breeding animals by producers. In the case of provincial breeding herds, with a high proportion of PS sows, many of the piglets sold may be of a true "commercial" genetic level. In the case of central breeding centers however, this implies that a large proportion of the animals intended for sale as high value, high genetic quality breeding animals are merely being sold for fattening and slaughter. It is also possible that many of the barrows and gilts sold by breeding centers as breeding animals may also be fattened and slaughtered. This is also the case for central chicken breeding centers, where the high proportion of chicks being sold indicates that much potential for widespread genetic improvement is being wasted through the sale of high quality animals for fattening and slaughter.

The result is that the breeding centers distribution system is largely geared towards the production of exotic fattening stock for sale to large household farms and commercial fattening operations and exotic breeding stock for sale to commercial operations and other breeding centers. Very little of the genetic potential of exotic stocks kept within the breeding centers has been able to disperse through the small farm system in the form of exotic semen for crossbred production, or in the form of crossbred or exotic parent stock for a core of local breeding operations supplying stock for dispersal to small farmers.

Constraint #5: Poor state of animal health and veterinary services

The limited knowledge of livestock disease incidence and economic impact in Viet Nam imposes a substantial constraint on the development of effective animal health policy. While overall reported livestock losses to disease are moderate, the sporadic outbreak of some epizootic diseases can cause devastating losses to smallholder farmers. While the supply of veterinary medicines and vaccines is not often a major constraint, price and quality factors may impede their effective use. The relatively low level of animal health knowledge at both the farm and field service level is also a major factor in the low adoption of proven disease control measures. At the national level a reasonable legislative and regulatory base for disease management is eroded by a weak chain of command to the field level, under resourced institutions with inadequately trained staff and poor data collection, storage and retrieval systems.

Coordination of programs and goals between provincial veterinary services is made difficult by the organization of provincial services as essentially separate units, each with almost total autonomy in decision making within their province. The concentration of power at the provincial service level is reinforced by the fact that funding for each service level is their own responsibility.

This makes the development of a coordinated national (or even regional) animal heath strategy extremely difficult. The introduction of regional animal heath centers was designed to alleviate this problem, but the strategy has essentially failed. As the regional centers do no contribute any funding to the provincial services, their influence over the activities of the provincial services is minimal. Without adequate funding, the regional centers have been forced to earn revenues from quasi-commercial activities such as meat and livestock importing and exporting services. These activities are now the main focus of their operations.

Effective identification and control of animal diseases is hampered by disincentives to report disease at every level from producers to the central government. Producers are reluctant to report an outbreak of animal disease because they do not wish to pay for treatment or have their animals destroyed. In many cases, producers' response to disease is immediate sale or slaughter of the affected animal for sale as meat in the local area. Similarly, commune, district and provincial veterinary service officials have strong disincentives to report disease. Outbreaks reported at this level would require costly response programs. A consequence of these disincentives is a number of information gaps between participants in the system. This is a problem because although producers and communes are the participants dealing directly with animal diseases, the provincial level veterinary service is the organization setting the agenda for animal heath programs at all levels within its jurisdiction.

While reports of disease occurrence in pigs and poultry appear to be relatively consistent between producers and commune level veterinary officials, there appears to be a lack of communication between these levels and district and provincial officials regarding the relative importance of disease. This is important because resources may be devoted to minimizing a disease problem that is relatively unimportant, while diverting resources away from potentially more serious problems. This can be seen by comparing the reports of pig and poultry diseases by producers and commune level officials with the rankings of diseases importance by district and commune level officials.

While only 6.4 percent of producer pig disease reports and 9.4 percent of commune pig disease reports were of swine fever, almost 36 percent of provincial and district veterinary officials rated swine fever as the most common pig disease in their area. While Newcastle Disease was the fifth most commonly reported disease by producers, almost 53 percent of provincial and district officials ranked Newcastle Disease as the most frequent poultry disease in their area. The largest percentage of disease reports by producers was for Avian

Pasteurellosis, but only 11 percent of provincial or district officials ranked pasteurellosis as the most frequent disease.

More than 86 percent of producers had at least some of their animals vaccinated during the preceding year. Around 47 percent of producers had at least some of their animals treated for internal parasites during the preceding year. Around 43 percent of producers utilized veterinary services to perform castrations. Clinical assessments were only ma de on 20.1 percent of farms. Disinfection is only performed on 20.3 percent of farms and artificial insemination is only performed on around one third of farms. Regular stock examinations are performed on less than one percent of farms. It is obvious that preventative veterinary services are limited to vaccination programs, and do not include regular stock examinations.

Veterinary treatments were reported by producers to be effective in around 76 percent of cases. Treatment effectiveness levels were highest in North Central Coast and lowest in North West, where almost 40 percent of veterinary treatments were reported as not being effective. Amongst the diseases with the lowest levels of reported effective treatment are Swine Fever, mineral deficiency and Newcastle Disease. Treatments of disease are not reported as effective for many reasons. Producers nominated incorrect diagnosis, incorrect treatment and other factors (including untimely treatment, lack of skill of the animal health technician and ineffectiveness of drugs) as the major reasons for lack of effective treatment.

Ineffectiveness of treatment may occur because of lack of training of veterinary staff or because of lack of adequate equipment. The proportions of graduate and postgraduate staff in the district and provincial veterinary service units are much higher than in commune level veterinary service units. The vast majority of staff in commune level veterinary service units are technicians and village level agents with relatively low levels of training. District and provincial level veterinary service units also have more technical equipment than commune level veterinary service units. Low levels of drug quality also have an impact upon disease

treatment effectiveness. Commune level veterinary service unit officials rated less than 75 percent of vaccines used as having good or very good effectiveness. Roughly 75 percent of veterinary drugs used by commune officials were ranked as having very good or good effectiveness. Improvements in all of these areas could have a positive impact on treatment effectiveness.

The annual costs associated with animal mortality could be as high as 4.1 percent of livestock GDP (that is about $52 million). This is calculated by considering the foregone value of sales of animals that died by species and animal type. Even though this calculation might overestimate the actual value of losses due to mortality because it ignores the salvage value of animals (animals that have died as a result of disease are frequently sold in rural areas for food consumption), it does not include the effects on production or reproductive performance of animal morbidity, which may well increase the value of economic loss suffered as a result of animal disease.

Despite the substantial losses that may be incurred as a result of diseases, the rate of vaccination against many diseases remains low. Cost-benefit analysis of mass vaccination campaigns shows a high benefit/cost ratio for vaccination campaigns of swine pasturellosis. The calculations show a potential benefit derived from eradicating the disease of more than three times the estimated cost of vaccination.

Veterinary Service Units at the provincial and district level undertake a range of inspection functions. These include inspections of live animals and carcasses, inspections of wholesale and retail markets, restaurants and food premises. The most common types of inspections performed are of domestic carcasses and for the transportation of live animals. Some of these inspections take a number of hours and others require a number of daily visits over a period of weeks, or even months. The major inspection types performed by provincial level veterinary service units are live animal transport inspection, disinfection and carcass inspection for the

domestic market. District level veterinary service units most frequently undertake transmissible disease inspection and export meat inspection.

Given the importance of inspection activities to ensure animal health and fitness for human consumption, it seems that the limited staff of the veterinary service units cannot perform this function adequately. The number of person days allocated for inspection by provincial level veterinary service units is far greater than that of district level units. However, the proportion of total staff time devoted to performing inspections is greater for district level units than for provincial level units. Inspection fees as a proportion of 1999 budget levels are higher for district level veterinary service units than for province level veterinary service units. Inspection fees at both the provincial and district levels represent a lower proportion of annual budget than the proportion of person-days devoted to inspections.

Constraint #6: Weak marketing

Considerable spatial price differences in the price of liveweight and livestock products among different parts of the country suggest weak market integration. An analysis of price margins among 16 different markets distributed all over the country and over the period 1994-98 revealed that prices margins are relatively high and do not show convergence. The analysis of regional price margins for different types of meat provides an indirect test of market integration. Over time, there is no tendency for regional price to converge toward each other. In fact, for some regions, there are even indications of a divergence of prices, as in the case of chicken liveweight in the Northern and Central regions and beef topside prices for the Central region. Margins are highest in the case of pigs, and lowest for chickens. Analysis of correlations of prices revealed that markets are not well integrated. For example, the average correlation coefficients among livestock product prices are much lower than in the case of rice.

Most of the trade is local. Most farmers sell at the farmgate, without access to organized markets and auctioning systems. As a result, information about markets, prices, and other supporting information is limited and mostly gained informally. The lack of a widespread system of organized live animal markets in Viet Nam means that the majority of marketing and distribution of live animals and animal products is undertaken through a network of marketers operating in informal groupings and often undertaking exchanges on a face to face basis. The development of the marketing system in the previous ten years means has created many layers between producers of livestock products and the end consumers of those products.

The lack of an organized system of markets for livestock has had two major effects on producers. First, the lack of direct links with a large number of market participants on a regular basis means that there may be very little reliable information flow between consumers and producers. Producers may have little incentive to change production habits and very little reliable information on which to base such a change.

Second, the lack of a competitive environment such as that provided by a livestock market system means that farmers' market power is very low compared to that of assemblers and wholesalers. In addition to better market information, wholesalers and assemblers have more economic power than producers and are able to heavily influence the procurement price for livestock products in many cases. The major market and price information source for producers was assemblers and other traders, who are also the major purchasers of products from producers.

While the distribution system that has evolved in Viet Nam to link producers and consumers of livestock products may be efficient in an economic sense, and certainly profitable for the participants, the structure of the system is such that producer market power is low. Possible

solutions to this are formation of co-operative selling associations by farmers, the development of local and regional livestock markets and increased levels of information provision to producers. Any effective strategy will have to include all of these measures to some extent.

Marketing is also limited by several restrictions related to transportation of livestock commodities. Many of the assemblers and wholesalers experience restrictions, particularly in the form of police conduct. These restrictions might well be justified on the basis of health-related aspects. However, this is not the case, since less than four percent of the restrictions are due to animal health and veterinary inspections.

The method of transport, its cost, and restrictions on the movement of goods can significantly affect the structure and performance of the marketing system. Poor infrastructure and transport equipment impede the timely movement of goods across distances. As discussed in the next section, the lack of a cold chain in Viet Nam has constrained the movement of meat and the development of the meat trading and processing system. Restrictions on the movement of goods also have a serious impact on the efficient transport of feed and meat within Viet Nam. Between 25 and 30 percent of feed and meat traders, feed processors and slaughterhouses periodically have problems with restrictions on the movement of their goods. The most prevalent problem is not the high cost of tolls or animal health inspections, but rather frequent random roadside checks and fines by the police. Overall, over 25 percent of feed traders, 27 percent of meat traders, 14 percent of slaughterhouses, and 20 percent of the feed processors have been affected and list police conduct as the primary impediment to the movement of their products. Larger businesses, who generally transport a larger volume of goods, more frequently, and over longer distances are particularly affected by the actions of the police.

Constraint #7: Underdevelopment of slaughtering and processing industry

Animal slaughtering and meat processing in Viet Nam suffer from a number of problems. In most highly developed and other ASEAN countries consumers generally have high expectations about the quality of the meat they consume, and governments have established stringent health standards and laws. At present, the meat available in Viet Nam generally fails to meet these standards, which in turn limits not only export market opportunities but, even more importantly, endangers the food supply and public health of the Vietnamese population.

Unhygienic conditions characterize the animal slaughtering, the meat processing, and the meat distribution system. The problems arise from the arrival of poor quality and damaged animals at the slaughterhouse door, through the recurrent contamination of meat as it moves from the slaughterhouse, to the processor, to the retailer, and finally to the consumer. Much of the blame for the recurrent contamination of meat is due to poor practices at and between each level. Part of the problem also revolves around the low level of infrastructure. For example, limited clean fresh water supplies and poor sanitation affect the quality of water, which has a direct correlation between disease and mortality rates. Without basic infrastructure and facilities that can provide necessities like clean water, the goal of raising the hygienic state and quality of meat to improve public health and eventually export processed meat products will be difficult to achieve.

Although there exist numerous regulations and standards on the industry imposed by various levels of government and their agencies, the meat available in Viet Nam has a deservedly poor reputation for quality and hygiene. In order to begin to reverse this reputation, the various levels of government and their agencies need to take action. First, the government should review existing standard and regulations for raising healthy livestock, maintaining sanitary conditions at slaughterhouses and meat processing facilities, and for safely disposing

of and treating facility waste. The goal of the review would be to improve the design and enforcement of the regulations and standards, as well as to bring them in line with their international equivalent (for example using methods such HACCP).

Second, better enforcement of regulations and standards is necessary. Many abattoirs and processors have not received health inspections, and many also do not dispose of waste properly. Both government and industry should undertake efforts to follow, and where not followed, implement regulations and standards to improve the hygienic conditions of abattoirs, processors, and transporters. Regular inspections by both government and industry representatives should help enforce compliance with regulations. When necessary, businesses that repeatedly fail to bring their facilities in line should be closed.

Third, the government together with industry, and intermediate and final consumers of meat and meat products should review and establish appropriate standards for a livestock and meat grading system. Such a system should reflect expected carcass characteristics and the market value of the meat. Carcass characteristics of economic importance may include such factors as weight, gender, maturity, fat tissue, muscular development, marbling, and color of muscle and fat tissue. Such a grading system for livestock and meat is important in order to help form prices, promote more efficient production, reduce inspection and product assessment time, help consumers to better determine what they are paying for, and eventually be the standards through which Viet Nam can freely export animals, meat, and processed products. Once established, government and industry have a role to play in educating producers, processors, and consumers of animals and meat to understand, and where market needs and conditions warrant, adopt the standards to improve the efficiency of marketing.

In addition, the establishment of an effective cold chain for the storage and distribution of meat can help reduce spoilage and maintain hygienic conditions of meat. An effective cold chain can create incentives for rewarding quality of carcasses and meat. Despite the large and growing proportion of household owning refrigerators in major cities, development of a cold

chain has been limited. Among other factors, consumers prefer fresh meat. Freezing and thawing of meat can induce changes in texture and appearance, and may cause some loss of flavor. In addition, cold storage and transport increases overhead costs, requires a reliable power supply, and need regular and good equipment maintenance. Furthermore, if consumers doubt the effectiveness and efficiency of the cold chain, they are even less willing to purchase chilled and frozen meat.

The lack of a cold chain also impedes the greater development of an efficient animal slaughtering and meat processing industry. Without a cold distribution chain, meat can not be transported over large distances from inexpensive surplus areas to expensive deficit areas. Similarly, because of the prohibitively expensive cost in terms of time, money, and meat quality, of resting, feeding, and watering livestock when they are transported over large distances, or the costly loss of liveweight when not cared for properly, little long distance livestock trade occurs in Viet Nam. Consequently, the industry is principally characterized by small scale slaughtering and processing businesses which use small local markets to purchase and sell their limited throughput. While small businesses with little invested in fixed equipment can be flexible in their operations, large businesses with high overhead costs and larger labor forces by contrast, have more difficulty in securing a stable daily, weekly, and seasonal supply of livestock and meat to maintain a high utilization rate, nor can they offer a steady supply of product for other large intermediate user, wholesalers or retailers.

Furthermore, even though economies of scale exist in both slaughtering and processing, without sufficient and secure supplies of livestock and meat markets, the industry cannot readily capture scale economies. Over time however, as the disposable income of households increases, the availability of locally produced meat and meat products expands, and the time consumers have available for grocery and meat shopping declines, consumer preferences could quickly change in favor of the consumption of chilled and frozen meats, and lead to the

rapid development of an effective and efficient cold distribution chain, and expansion and consolidation within the slaughtering and meat processing industries.

Constraint #8: Underfunded and mediocre performance of extension system

The state budget for extension services is at a low level and the portion of extension budget devoted to livestock related activities is around 20 percent. Lack of resources means that equipment, transportation resources and incentives for extension providers are low. Only 28.4 percent producers received extension services and many of these received extension from sources other than the Department of Extension Services.

Most extension staff are specialists with little or no training in communication and marketing skills. Extension provision is focused on technical aspects of production, rather than on providing information on markets, regulations or credit. Price and market information is mostly obtained by producers from personal contacts and traders. The major source for information on the regulatory environment was the radio or television. Banks were the major sources of information about credit availability and conditions. Extension agents were only sources of market, regulatory or credit information for less than 10 percent of producers.

Private companies and the Extension Services Department are the dominant suppliers of extension services to producers. Private companies are the dominant providers of animal nutrition and marketing extension advice. The extension services department is the major supplier of crop management and animal husbandry extension. State owned enterprises and cooperatives are the major providers of breeding extension services.

Overall, producers do not consider the quality of the extension services they receive to be very good. Although many public and private organizations provide extension services, cooperatives and private companies are cited most frequently for providing the best

information to producers on breeding animals and animal nutrition, respectively, where there is choice in extension service providers. Practically no assistance is provided to livestock producers in terms of marketing related extension.

Constraint #9: Underfunded and weak capacity of research system

Total public expenditures for agricultural research in 1998 and 1999 were about VND 80 billion, the equivalent of 1.7 percent of public expenditures in agriculture and .08 percent of agricultural GDP. In comparison to Agricultural GDP, China spends 4 times as much as Viet Nam and Thailand 14 times as much. By most standards, the amounts in Vietnam are very low and cannot sustain an effective research program to develop a modern agriculture. More than half of agricultural research expenditures are used to cover salaries, and current expenditures on research equipment and machinery. Spending on salaries and current expenditures for research staff for 1999 was VND 43 billion, or the equivalent of VND 10.5 million per staff per year ($750). As a result of resource constraints, research organizations engage themselves in commercial activities. Moreover, limited funding results often in poor laboratories, equipment, and few on-farm trials.

In the case of livestock sector, total funding for livestock research institute from central budget is about 14 percent of total funding .The share of total funding to livestock has shown a slight increase over the years from 11 percent in 1993 to slightly over 15 percent in 1999. Between 50 and 60 percent of total budget is for salaries cost. For example, in 1999, the total budget for livestock and veterinary research was about 12 billion Dong ($857,000). The salary budget was 50 percent of the total, leaving only about $430,000 for actual research activities. In terms of GDP contribution by the livestock sector, the total state budget for research was less than 1 percent.

In spite of having staff with good qualifications (with more than half having obtained a B.Sc. and more than a quarter having either a Ph.D. or M.Sc) actual research skills of several of the staff may not be very high, because of several reasons. First, the opportunities of learning by doing research are limited because of limited research funding. Second, an inflation of high degrees was produced in the mid-1990s based on upgrading of many staff to Ph.D. degree level. However, many of these degrees were not based on formal training and professional standards. Third, access to updated information is limited. Recent publications and literature from the rest of the world is not readily available to the research community in Viet Nam. Fourth, English skills and computer skills of the vast majority of the research staff are low, making very difficult to carry out research of good quality. Fifth, only few staff had training abroad, thus constraining their opportunity to upgrade their skills with the most updated scientific advances and analytical methods. Finally, research in livestock tends to be rather technical, with low priority given to socio-economic aspects, thus again limiting the effectiveness of research programs to meet the needs of the rural population.

The part of the state budget to research organizations in livestock and veterinary science that is actually devoted to carry out research project is much lower than the total budget. It has been estimated to be about 4.4 billion Dong in 1999 and is originated by national programs, ministerial programs and other studies. Of this budget, about 35 percent is devoted to pig, 32 percent to poultry, and 20 percent to cattle and buffalo . The allocation to different species does not seem to reflect the importance of each species in the aggregate GDP nor the rate of growth of the subsector. From the discipline point of view, most of the research is applied to breeding (about 39 percent) and veterinary research (about 26 percent). The process of priority setting in livestock research is not well defined and does not seem to be taking into account different stakeholders in the sector, such as farmers, traders, and private industry.

1.6 Strategy for livestock sector

The overall goal of livestock development can be expressed as follows.

Livestock Development Strategy Goal

To accelerate growth of the value added generated by the livestock sector through sustainable improvements in productivity, quality, and health of animals and livestock products, and participation of growth by the largest number of producers in order to meet the requirements of an increasing domestic demand.

In particular, the strategy should be appropriate to address the three main challenges for the future, namely sustainability, acceleration, and participation of growth. In order to achieve sustainability of growth, a number of regulations of the livestock production and slaughtering, animal products processing, and distribution should be set in place to minimize the risk of disease and environmental problems associated to growth of the livestock sector.

In order to accelerate growth, measures at increasing productivity and improving marketing will be required to move the livestock sector on a new path growth that is based on intensive use of modern science and technology and adherence to the market economy.

In order to ensure maximum participation in growth, appropriate institutions should be designed and made effective to ensure that the growth benefits are shared among the largest number of producers and consumers, and particularly among those who are most disadvantaged.

The government's key role should be in providing services that would otherwise be undersupplied by the private sector. If the private sector can undertake an activity profitably

and without affecting public health and the environment negatively, it should be allowed to do so without state intervention. Development of the sector will depend upon a liberalized market, supported by appropriate institutions, and regulated by laws to protect animal and consumer health.

In order to achieve this goal, the livestock sector strategy advocated in this study consists in:

- Ensuring a regulatory framework and implementation capacity for the production of healthy livestock and livestock products and for dealing with environmental problems related to commercial livestock production.

- Creating a competitive market environment in which farmers will increase investment in ways to improve productivity in the livestock sector and both private and public sector will supply services and medicines, livestock feed, and improved breeds.

- Providing sufficient funding for the conduct of relevant livestock research and effective information dissemination with participation of stakeholders and integration of livestock with farming systems.

- Building participatory institutions of collective action for small-scale producers that allow them to be vertically integrated with input suppliers and livestock processors, market their products efficiently, and provide an effective feedback to state-funded initiatives such as breeding programs, extension activities, and investment and credit plans.

- Providing transitional support to address areas of market failure in the sector, such as those related to the reorganization of the breeding system, the lack of organized markets, and the establishment of standards.

A key feature of this strategy is that it is tailored to improve the capacity of the system to meet domestic demand by improving the marketing, health, and environmental aspects associated with the livestock sector. As such, the strategy does not pursue an active export orientation. This is not to deny that exports in the medium or long term might be an important aspect of growth in the sector. However, they have not been a major source of growth in the past and are not likely to be in the short to medium term mainly because of lack of competitiveness and lack of meat of adequate quality and sanitary conditions acceptable in international markets.

Fortunately, the lack of an export orientation of this strategy for the medium term should not be seen as an impediment to growth. Differently from crops, the domestic demand for animal products is very sustained and its growth is likely to continue as long as the overall income growth of the country. Therefore, the priorities for development of the sector should take into account a rapidly growing and huge domestic market rather than a slow growing and small export market. By improving the conditions of domestic market, the strategy will also set the conditions for access to international markets in the long-term and ensure a more broad-based growth of the sector.

1.7 Policy Recommendations

The study provides a set of policy recommendations consistent with the strategy described above. The policies are organized into a matrix framework. The columns of the matrix represent the elements of the strategy, namely regulation, competitive environment, science and technology institutions, participatory institutions, and transitional support to address market failure. The rows represent different set of policies related to breeding, marketing, animal health and veterinary services, and feed and animal nutrition. For each set of policies,

the study provides the key facts, the key issues, the proposed solutions, and the discussion of the role of the state.

Policies related to Breeding

- Establish an overall coordination unit for livestock production in Viet Nam, possibly in the form of a Department of Livestock Production at MARD. The Department could take a leading role in regulation, monitoring, inspection, coordination for the livestock sector, leaving other organizations to focus on their main mandates (for example extension or research).
- Review roles, activities, and performance of breeding centers in Viet Nam, both state, private, and foreign.
- Establish a National Breed Improvement Board for each species to coordinate and oversee a national strategy for breed improvement and exotic breed introduction. The Board would consist of representatives of all main breeding centers (both state and private), representatives of research centers, representatives from private sector (including feed and processing industry) and farmers, and representatives for animal health department and veterinarian profession.
- Establish a system of certification and inspection of breeding stock obtained by different centers. The system should allow a grading system of breeds that could be used to assess performance of the centers. The grading system and the periodic evaluation of centers should be made available to all communes in Viet Nam.
- Reorganize the state breeding centers, classifying into three categories: those that are making profit most of the time, those that are making losses most of the times, and those that are commercially viable but sometimes making losses and sometimes making profit. Equitize the ones that are making profit most of the time. Of the remaining centers, give the option of equitization, closure, or consolidation into three main state centers in the north, center, and south.

- The three main state centers should be at the apex of the breeding pyramid, focusing entirely on breeding activities of GGP and GP. Their main clients will be breeding centers (state and private) producing GP and PS. The second tier breeding centers will then sell to AI centers, lower tier breeding centers, and commercial farmers.
- In order to facilitate the reorganization of the system, medium-term commercial credit (5 years) might be targeted to the breeding system. No subsidies should be given. As the quality of the breeds produced by system improves, as the demand for improved breeds increases, prices of breeds should also adjust to cover costs. If the maintenance of pure lines results into loss making operations, then more appropriate lines should be selected and bred by the centers. There is no reason to subsidize exotic lines that are demanded by producers.
- Considerable increase in support to research centers breeding activities should be considered in order to test new breeds and cross-breeds appropriate to the improvement of the genetic pool in Viet Nam.
- Considerable improvement in the system of AI centers should be attained by investment in creating a system of AI centers in almost each district of Viet Nam with adequate facilities, equipment, and trained staff. After initial investment in AI centers, targeted credit at commercial terms should be made available to the centers for the medium term (5 years). During and after this period no subsidies or other types of support should be considered.
- Considerable increase in support to extension activities that disseminate information about new breeds, feeding practices, and animal health requirements.

Policies Related to Marketing

- Promote the establishment of provincial and district livestock market places.
- Establish a livestock and animal products market information system to be publicly available at commune level.
- Implement market promotion for animal products.
- Expand commercial credit to marketers and processors of animal products.
- Establish system of meat grading and standards.

Policies Related to Animal Health and Veterinary Services

- Improve monitoring of animal diseases and assessment of economically important ones.
- Improve staff capacity and facilities of diagnostic centers.
- Strengthen reporting system from commune to higher levels.
- Promote formation of private veterinarian profession regulated by professional association under control of DAH.
- Zoning regulations for slaughterhouses and meat processing facilities.
- Establish strict health inspection systems at slaughterhouses.

Policy Related to Feed and Animal Nutrition

- Eliminate tariff rates on raw materials and ingredients used in the production of high quality commercial feed.
- Improve the performance of the seed multiplication system in order to achieve rapid growth in productivity of feed grains.
- Further liberalize hybrid seed distribution in order to increase farmer access to high quality hybrid maize seeds.
- Support research programs to develop high yielding varieties for maize and high protein raw materials used in feed production.

- In partnership with the private feed industry, establish a 'truth in labeling' program for animal feed and monitor compliance with an effective testing and inspection system.
- Provide support to research and extension of improved animal nutrition management methods appropriate to the needs and conditions of small size producers.

1.8 Policy Priorities

The study provides a set of policy recommendations as part of an overall strategy for the sector intended to meet the overall challenges arising from sustainability, acceleration, and participation of growth. For implementation purposes, policy priorities in the short, medium, and long terms will need to be established in order to guide the allocation of resources.

As the overall strategy is mostly focused on domestic demand, the first priority will be to increase productivity to meet the rapid growth of the domestic demand for meat and animal products. The productivity focus in the short term (next 5 years) will create the basis for an acceleration of growth and will require the reorganization of the breeding system, additional investment in AI stations, and expanded commercial credit targeted to breeding. At the same time, a considerable expansion of investment in capacity and facilities of the research and extension system will be needed to support the institutions required to promote the generation and dissemination of improved breeds appropriate to the needs of small farmers.

The second priority to be taken into account in the short term is to provide adequate incentives to the participants in the livestock system. That will imply maintaining market orientation while at the same time fostering a more competitive environment, a liberalized trade system, and supporting marketing institutions and facilities. Investment in improving market information and setting up appropriate market places will increase the flow of information between producers and consumers and at the same time increase the bargaining

power of farmers. These measures should result in lower marketing margins thus expanding production, consumption, and inter-regional trade.

The third priority consists in setting up the regulatory framework and the institutional bases for health, sanitary, and veterinary services effectiveness. That will include an increase in resources devoted to capacity building of the veterinary practitioners, improved facilities for diagnostics and epidemiology, and a privatization of the veterinarian profession. Several inspection systems related to health and environmental control will have to be set up or strengthened to protect animal health and the health of the population.

Over time, these priorities might change as the result of a more intensified production system, a higher consumption of meat and animal products, and higher income of the population. It is expected that the regulatory aspects as well as the health and environmental issues of the livestock sector will become the first priority. In the short terms (the next five years), however, there are still large improvements to be made in the intensification of the production system before other constraints become more binding.

1.9 An Important Role of the State in the Livestock Sector

Contrary to the crop sector, in the past, the livestock sector has developed largely without a strong support by the state. That is reflected in a rather small state budget investment and also in a relatively small commitment in terms of supporting services such as research, extension, animal health, and inspection systems necessary to enforce the existing regulations.

This situation, however, is destined to change. This is not only because Viet Nam crop agriculture during the 1990s has achieved enormous success and food surplus has been achieved to the point that a large amount of food is now exported. There are other reasons why the attention to livestock sector will grow. First, increasing domestic demand for animal products has already induced rapid growth of the sector over the past 10 years and more is

expected to occur in the future as income continue to grow and urbanization increases the demand for a more diversified diet. Second, livestock development is expected to contribute to more rapid income growth of the agricultural population than was the case for crops. Given land scarcity, intensive livestock production promises to generate more income than intensive crop production. Third, even more than in the case of crops, livestock sector development is linked to the development of other sectors in agriculture (for example feedcrops) and in industry (for example, feed industry, processing industry, animal drug industry). These wider linkages are associated to higher income multiplier effects than crop agriculture.

This study advocates a more active role of the state in the livestock sector. However, this more active role in the future should not be confused with the role that the state played in agriculture in the past, where for example, state organizations and SOE were involved in commercial activities that could be more effectively and efficiently pursued by the private sector. The more active role for the state envisaged here is as a provider of public goods necessary for maintaining, accelerating, and participating the growth of the sector.

The report has argued that in order to maintain the growth of the past decades, a more active role of the state will be needed to establish regulations, enforcement mechanisms, monitoring and reporting systems, and surveillance systems for ensuring animal health, prevention of animal diseases and epidemic outbreaks. This is predicated on the basis of the observation that livestock production is becoming bigger, more intensive, and the distribution of animal products on a much larger scale than at the beginning of the 1990s. If past growth continues, by the year 2010, meat consumption will be four times as much as at the beginning of the 1990s. Even though that promises well in terms of improved nutrition of the population and in terms of added income for livestock producers, the challenges for the animal system and the environment will have to be dealt appropriately in order to avoid serious outbreak of animal diseases, the escalation of food borne diseases, and the contamination of water and soil by wastes and residues associated to slaughtering and meat processing industry.

The second argument for a more active role of the state is related to the need of accelerating growth of the livestock sector. It is argued that in the future agriculture in Viet Nam will be affected negatively by the declining importance of rice to sustain growth. That is because of lower domestic and international demand for rice. Unless other sectors in agriculture can compensate for the lower growth in rice production, the overall growth of agriculture will suffer. That is an outcome that the government of Viet Nam would rather avoid in view of the critical role that agriculture provides as employer for the majority of the population of Viet Nam, a position that will continue to occupy for the next decade. Unless agriculture continues the growth of the past decade, and unless non-agricultural activities grow even more rapidly, rural areas will continue to lag behind urban areas and the prospect of widening gaps will be a reality. The acceleration of growth in livestock sector appears then as a need, not just as a desire. This need is within the reach of Viet Nam. Given that the growth during the past decade has been sustained at 4.4 percent without a concerted effort to provide adequate technological, marketing, and institutional support, one would expect that with a more active role of the state in providing the set of public goods necessary to increase productivity, better result will occur.

The third argument for a more active role of the state in the livestock sector is related to the creation of institutions to ensure that the greatest number of people, particularly among small-scale producers, shares the benefits of growth. There has been an implicit and sometimes explicit thinking among different state organizations suggesting that the most effective way to promote the livestock sector is to target the most commercialized and largest producers. The study has shown that even small-scale producers are highly commercialized and that specialized small-scale producers can be as efficient as larger ones. Because of the lack of increasing returns to scale in livestock production, the small-scale of production is not necessarily and impediment to efficiency for the sector, provided that the production is of a specialized and commercialized type and not a subsistence type. In order for small-scale

producers to be efficient, however, they need supporting institutions that improve access to technology, credit, and information related to markets, regulations, and contracts. The state has an important role to play in building and supporting these institutions. Their role is critical not only for maintaining and accelerating growth, but even more so for sharing the benefits of growth among the largest number of small-scale producers.

CHAPTER 2

INTRODUCTION

2.1 Rationale

An increasing rural-urban income gap, limited growth prospects in rice cultivation, and the changing pattern of demand both in Viet Nam and in world markets suggest the need for rural income diversification as a key element of a rural development strategy. Such a strategy aims at achieving higher and more stable rural incomes, reducing the incentives for a flow of migrants from rural to urban areas, making farming system more sustainable in the long run, and alleviating rural poverty, especially among ethnic groups in mountainous and hilly areas. Within this context of rural income diversification, livestock development offers the opportunity of meeting several objectives of rural development.

The basic assumption of this study is that, within the context of rural income diversification, the livestock sector has a key role to play. Livestock contributes about 13 percent of total agricultural GDP. In contrast to other agricultural sub-sectors such as rice, sugar, and fertilizer, the livestock and meat-processing sector does not seem to have immediately recognizable strong policy distortions. At the same time, in spite of the generally acknowledged importance of this sector for agricultural and rural development, there has not been a clearly specified set of priorities and policies comparable to that of other commodities such as rice and sugar. The policies related to the development of the livestock sector in Viet Nam do not seem to have matured beyond a generic indication of targets for livestock production and meat consumption. What is then the rationale behind the proposal for livestock development in Viet Nam?

The argument for livestock development rests on several pillars.

First, agricultural diversification requires shifting to higher value production per hectare and per unit labor than in the case of rice. Livestock production, particularly in the context of an agrarian structure characterized by very small farm size, offers the opportunity to capture higher value added.

Second, the prospects for increasing domestic and international demand for livestock products, particularly pork and poultry, appear fairly strong.

Third, livestock industry development relies upon some economies of scale in processing and feed production. However, it is small-size producers who carry out most of the livestock production in Viet Nam. This presents a major opportunity and a major challenge for development. On one hand, a broad-based growth strategy will have a major impact on overall rural economy and contribute to both growth and poverty alleviation. On the other hand, the modernization of the sector will imply a better coordination between large commercial sector and small producers. The opportunity is to stimulate broad-based growth; the challenge is to integrate such growth with the emergence of a large commercial sector.

Fourth, development of livestock stands to markedly improve the nutritional status of the population by adding more protein to their diet and helping to alleviate protein deficiency.

Fifth, there are efficiency gains to be realized in both crop and livestock production through their development in an integrated system.

Sixth, evidence suggests that livestock can serve as an important engine of growth in providing a large share of cash income to farm households, which in turn can have strong multiplier effects on local communities.

Finally, livestock is an important source of income for the majority of Vietnamese farmers, and particularly those in upland areas where poverty rates are highest; therefore, its development carries important implications for poverty reduction and income distribution.

2.2 Objectives

The goal of this study is to contribute to the formulation of a strategy for the development of the livestock sector as a key element of the rural development strategy in Vietnam. To achieve this goal, its specific objectives are to:

1) describe the structure of the livestock system including key characteristics of production and marketing, meat processing, trade and meat consumption;
2) identify the incentives and constraints to the development of a modern livestock system;
3) study the determinants of livestock supply and feed demand in the context of a diversified agricultural system;
4) study the characteristics of meat demand in Vietnam, particularly for rural areas;
5) identify the constraints and opportunities for meat exports and the comparative advantage of meat production in Vietnam vis a vis other countries in Southeast and East Asia;
6) identify barriers to entry of the poor and women into livestock production for the market, and policies to facilitate SMEs in expanding their commercial operations;
7) specify and analyze alternative policy options for development of the livestock sector, considering their impact on income and employment in rural areas; and

8) produce a set of policy recommendations for use an input to future policy making.

2.3 Approach and Methodology

A subsector approach has characterized the implementation of the study. Extensive field work was conducted in all different agroecological regions of Viet Nam with the objective of identifying the various linkages between production and final consumption, including feed industry and marketing, animal slaughtering and meat processing, animal health and veterinary services, breeding centers, and supporting institutions such as research and extension.

The field work included the collection of data through ten formal questionnaires related to: i. Communes; ii. Producers; iii. Feed Traders; iv. Liveweight/meat traders; v. Feed processors; vi. Meat processors/slaughterhouses; vii. Veterinary services at province/district level; viii. Veterinary services at commune level; ix. Urban Consumers (Hanoi and HCMC); and x. Breeding Centers. The details of each questionnaire will be provided in the following chapters.

A variety of analytical methods were used to analyze the data and to derive conclusions. The methods included time series analysis of market integration, econometric analysis of demand for meat, estimation of transportation cost functions, analysis of adoption of technology, and spatial equilibrium modeling. Wherever possible, cost and benefit analysis of alternative policy options was also provided.

2.4 Organization

The study is organized into 13 chapters.

- Chapter 1 is the Executive Summary.

- Chapter 2 is the Introduction.
- Chapter 3 provides an Overview of the livestock sector and the main issues dealt with in more detail in the remaining chapters.
- Chapter 4 gives a detailed analysis of the field level data related to the production system of livestock in Viet Nam.
- Chapter 5 presents the findings related to the marketing of live animals and animal products.
- Chapter 6 reports the findings related to the slaughtering industry and meat processing industry.
- Chapter 7 presents information related to the feed industry.
- Chapter 8 gives a detailed analysis of the feed marketing system.
- Chapter 9 provides a field-based view of animal health and veterinary services.
- Chapter 10 looks at the provision of extension services for livestock sector.
- Chapter 11 covers breeding centers.
- Chapter 12 gives information about urban consumption of meat in Ha Noi and HCMC.
- Chapter 13 provides an analysis of policy options.
- Chapter 14 presents the main conclusions.

CHAPTER 3.

OVERVIEW OF THE LIVESTOCK SECTOR IN VIET NAM

3.1 Introduction

The purpose of this chapter is to provide a general overview of the main issues related to the livestock sector in Viet Nam. The discussion in the chapter is based on data for the 1990's obtained from the General Statistical Office (GSO) and other secondary sources. It also benefits from a summary view of the findings reported in more detail in the following chapters based on field survey data.

The chapter is organized into 12 sections including this introduction. Section 2 provides general background information and presents the main issues identified both in the field work and in discussion with stakeholders. Section 3 to 11 present a discussion of these main issues. Section 12 gives the conclusions.

3.2 Background

Livestock development as part of a strategy for agricultural diversification

The GOV has increasingly stressed the importance of a more diversified agriculture to achieve its goals of modernization and rural industrialization. This is consistent with similar strategies followed by other Asian rice economies during the 1970s and 1980s, where agricultural diversification was seen as a desirable response to changes in supply (the success of the green revolution resulted in food self-sufficiency and declining real rice prices) and demand (rising income and urbanization increased the demand for non-rice food products). Some of these

economies have been successful at diversifying the agricultural and rural economy. However, it was also realized that agricultural diversification was a much more complex process than changing the output mix.

Agricultural diversification, considered narrowly, involves increasing the variety of agricultural commodities produced at the farm level. From this perspective, Southeast Asia was remarkably successful in agricultural diversification in the nineteenth and early twentieth centuries when, in response to growing demand from the West for tropical products, new lands were cultivated with cash crops such as sugar, coffee, tea, and rubber. Agricultural diversification in this narrow sense may also be the response of subsistence farmers to risks arising from climatic, biotic, or seasonal factors. Indeed, this response is typical of subsistence farmers in Africa and in non-irrigated Asia.

A broader outlook suggests that agricultural diversification is a process accompanying economic growth, characterized by a gradual movement away from subsistence food crops (mostly rice in Viet Nam) to a diversified, market-oriented production system, triggered by improved rural infrastructure, rapid technological change in agricultural production, particularly food staple production, and diversification in food demand patterns.

From this broader view, agricultural diversification goes beyond merely growing crops other than rice and raising livestock to involve the entire rural economy. As such, it is linked to both increasing commercialization and the structural transformation of the economy, where the agricultural share of GDP contracts. The process involves new marketing and agrofood based industrial activities that affect the overall rural economy. Effective diversification requires key investments in infrastructure and institutional changes to promote the private sector, particularly in rural areas. Eventually, the process of structural transformation of agriculture will lead to the

exit of a significant proportion of the rural work force from agriculture, though not necessarily from rural areas. Thus, rural income diversification encompasses both agricultural diversification and the stimulation of rural non-farm sources of income.

Diversification is a process accompanying the structural transformation of agriculture rather than an objective of agricultural development. It is what individual producers, rural households and enterprises, regions, and nations do to pursue their various objectives in response to changed market and technological conditions. The objective of a well-diversified agricultural system is to gain sufficient flexibility to adjust to the changed conditions smoothly.

The development of livestock sector is an important example of agricultural diversification because it shares many of the opportunities and challenges mentioned above.

Rapid growth of the livestock sector

Over the past ten years, Viet Nam's livestock sector GDP has grown at an average of about 4.4 percent, and accelerated in the second part of the 1990s (See Table 3.1). This growth is the same as in the crop subsector. Section 3 will show that most of this growth has been the result of increasing number of animal stock rather than increase in productivity.

Domestic demand for meat still low but growing rapidly

Average meat consumption is still low by international standards. FAO data suggests that in 1998, per capita meat consumption was 21.2 kg in Viet Nam compared to 46 kg in China, and 25.8 kg in developing countries. The main explanation behind the rapid growth of the sector (See Table 3.2) has been investment by the private sector in feed industry, breeding, and slaughtering/processing stimulated by strong domestic demand. The rapid increase in demand for meat (at about 6 percent per year) was induced by rising income, particularly in urban areas.

However, differently from the crop subsector, the livestock sector has been characterized by limited government support.

Limited government support

Even though the livestock sector has grown as rapidly as the crops sector, it has received much lower government support. For example, in 1997-98, only 4% of total state budget in agriculture has been devoted to the livestock sector and veterinary services (See Table 3.3). In contrast, crops (including irrigation) have received 61% and forestry about 24%. This allocation of the state budget in agriculture does not either reflect the importance of livestock in agricultural GDP (13%) nor the fact that the majority of the farming population is involved in livestock activities. Moreover, it does not seem to be related to the growth prospects of the livestock sector, since both the crop and livestock sector have grown at a similar rate of 4.4 percent over the past decade. With an average of 149 billion Dong during 1997-98 (equivalent to about $11.5 million), the state budget to livestock represents only 1.1 percent of the value added created by the sector.

Limited government regulatory role

Livestock sector growth in Viet Nam shares many of the features of the Livestock Revolution currently undergoing in developing countries, particularly in Asia. If not directed properly, the Livestock Revolution will stretch the capacity of existing production and distribution systems and exacerbated environmental and public health problems. Governments and industry must prepare for this continuing transformation with long-run policies and investments that will satisfy consumer demand, improve nutrition, direct income growth opportunities to those who need them most, and alleviate environmental and public health stress. In Viet Nam, the livestock sector has received little budgetary support and also little regulatory role as related to marketing, health, and environment. This is most apparent in the case of animal health, condition and location of slaughtering/processing industry, and meat available for consumption in market stalls and

restaurants. Even though the policy induced distortions in production, marketing, and feed industry are limited, the state has apparently directed its effort more towards production and commercial activities rather than in regulatory, capacity building, and research and extension activities.

Potential for the sector is high

The main reasons beyond rapid growth in the past have been an increasing demand due to rapid income growth and a change in diet patterns particularly in urban areas from staples toward higher value and protein rich foods. The private sector has responded with investment in the feed industry, livestock herds, and slaughtering industry. The growth has been achieved in spite of a limited role of the government. There is however a strong presumption that a more clear strategy for the sector will be needed not only for further encouraging the development of the sector and accelerating its growth, but also for providing important public goods in terms of effective regulatory institutions to deal with the threat of environmental and health crises stemming from livestock production.

Acceleration of growth in the sector could be achieved with better policies. To evaluate the growth benefits of the livestock sector a simple exercise shows that, over a period of 10 years, the additional net income for the sector could grow by over $1.1 billion as a consequence of an increase in growth of value added of 2% relatively to its current growth level. This seems an achievable target, given the current tendency of market demand, availability of technology, and human resources.

Constant share of livestock in agricultural GDP

Despite its growth, and its importance to agriculture, the share of livestock in total agricultural GDP, at about 13 percent, has changed little over the past decade. Its further growth will depend on reducing the constraints to development of the sector (see table 3.4).

Constraints identification

The project implemented by IFPRI in collaboration with Department of Agricultural and Rural Development Policy and various research and extension organizations, has highlighted nine key issues that constrain the development of the sector.

1. Low productivity of livestock sector
2. High and variable prices and low quality of meat
3. High prices and low quality of feed
4. Low adoption of improved breeds
5. Poor state of animal health and veterinary services
6. Weak marketing channels
7. Underdevelopment of slaughtering/meat processing industry
8. Underfunded and mediocre performance of extension system
9. Underfunded and weak capacity of research system

3.3 Low productivity livestock sector

Low productivity of livestock sector

Livestock provides only 13 percent of value added in agricultural GDP (1999). When compared to the labor force in agriculture of which about 70 percent in involved in livestock production,

that translates to an average of 0.733 million Dong per agricultural worker (approximately $52). In fact not all time spent by labor force in agriculture is devoted to livestock activities. There is not available data to assess the average amount of time the average labor force in agriculture devotes to livestock activities. The scanty evidence suggests that about 10 percent of the time spent on agricultural activities is devoted to livestock (husbandry, feeding, marketing, breeding). If this is to be believed then the labor productivity in livestock is slightly greater than in crop sector.

Return to labor in livestock production greater than in other agricultural activities.

The IFPRI survey suggests that for livestock producers, the return to labor in livestock is higher than the return on other agricultural activities. For small producers, with 59 per cent of labor engaged in livestock, they can produce 75 percent of their agricultural income. That suggests that for these producers, livestock activities are 1.27 times more productive than other agricultural activities (See Table 3.5).

Increase in liveweight supply mostly due to increasing herds rather than offtakes.

Another measure of productivity is the offtake rate, defined as the annual production (measured in liveweight of slaughtered animals) per head in the herd. The offtake rate is a measure of both the time it takes to raise the animal and the weight that it achieves in that time. A high offtake rate implies more rapid slaughter and a higher slaughter weight. In 1999, overall offtake rates per head were 70 kg for pigs, 1.5 kg for poultry, 21.0 kg for cattle and 15.6 kg for buffalo. Offtake grew just over 1 percent per year on average. As shown in Table 3.6, cattle offtake grew the most (2.5 percent per year) followed by pigs (1.9 percent), buffalo (1 percent), duck (.7 percent) and chicken (.4 percent). With the exception of buffalo, offtake rates increased markedly in the second half of the decade, and particularly so for cattle and pigs. On the other hand, herd size

grew considerably for pig and poultry (between 5 and 6.1 percent), about 3 for cattle and was stagnant for buffalo as the result of mechanization of agriculture (See Table 3.7).

3.4 High and variable prices and low quality of meat

High prices of meat in Viet Nam

As shown in Table 3.8, when compared to the rest of the world, meat prices in Viet Nam are still relatively high and not competitive. The potential of meat exports is still limited both in terms of prices and quality. This, however, does not imply that it would be profitable for Viet Nam to import meat, as consumer preference for fresh meat and transport and marketing cost make Viet Nam still effectively isolated from world markets.

Different rates of growth of liveweight prices

Prices of liveweight have varied considerable for different species over the past decade (See Figure 3.1). While poultry prices have increased, particularly in the second part of the decade, pig prices have been characterized by strong fluctuations with no clear trend (See Figure 3.2). Buffalo prices have been stagnant, whereas cattle prices growth has been moderate after a strong growth in the first part of the decade (See Table 3.9).

Large variation in prices between the North and the South

Within the country, there is large variation in prices of meat between the North and the South (See Table 3.10). The South generally displays much higher prices than the North. This situation is compatible with the absence of restrictions on domestic trade, since the price differential between North and South is largely explained by transportation cost and by the absence of cold value-chains. Long-distance trade in live animals adds high cost to transportation reflected by substantial weight loss in animals transported over long distances. In principle, meat could be

moved from the low price production areas in the North to the high price areas in the South, while feed, which is less costly in the South than the North, could move in the opposite direction. However, this is actually prevented by the poor transportation system, the absence of organized marketing chains (including cold storage, cold transportation), and a still prevalent preference for fresh meat consumption.

Strong seasonal variability

Apart from difference among regions, price of livestock products fluctuate highly within the year due to seasonality factors. Seasonal fluctuations of chicken liveweight prices differ considerably across provinces. In the Center and in the North seasonal fluctuations are usually more pronounced than in the South. The amplitude of seasonal fluctuations is about 16 percent in the Center, 14.76 percent in the North, and 9.05 in the South respectively (See Table 3.11 and Figure 3.3). During the year, prices tend to increase sharply between January and February, as a result of strong demand for meat during the TET holiday. The seasonal fluctuations are more apparent at the province level. For example, the seasonal range reaches up to about 18.73 percent in Quang Ngai, and up to 24.85 percent in Thai Nguyen. Similar behavior is shared by beef prices. In the case of pig prices, seasonal movements of price in the North and South are more similar, but the Central region displays more variability.

Low quality of meat

Besides high price, quality of animal meat is low. One main reason is related to the poor health of animals, as section 8 will show more in detail. Apart from diseases, percentage of lean meat is still low with respect to other countries (See Table 3.12). On average, percentage of lean meat for local pig is only 34.5 %. This number is higher for cross breed pig and exotic pig with 42.6 percent as the result of breeding improvement. Also the percentage of deboned meat for cattle is low with only 36.6 percent. The low quality of meat is not only originated from production

pattern but also sourced from poor storage facilities and especially backward slaughtering and processing technology (see Section 10). Old technologies and poor sanitary conditions of most meat processors do not meet hygiene requirements. For example, apparently, only three locations meet hygiene standards for export: Vinh Niem Processing for Export Plant, Vissan, and Lam Son Food Processing. However, the low hygiene standards of meat consumed in Viet Nam is a much more serious problem than limited export potential. It directly affects the health of the population, as indicated by the recent increase in food borne diseases in Viet Nam.

3.5 High prices of feed

High feed prices

Typically, feed is the most costly element of livestock production, accounting for 70 percent of the cost of raising livestock in Viet Nam (See Table 3.13). Its quality is also a key determinant of animal growth and health. Concentrate and commercial feed use are growing rapidly, but nonetheless the domestic industry faces several constraints to increasing and improving production. Feed prices in Viet Nam are high when compared to those in other Asian countries. For example, complete feed for pig fattening was about 28 percent higher in Viet Nam than in Malaysia during early 2000, and starter feed for broilers was about $285 in Viet Nam, and about $213 in Malaysia. High feed prices are in part due to the relatively high price the key raw materials used in feed production. Contributing to the high cost of feed in Viet Nam are the import duties applied to raw materials. For example, import duties on maize range from 5 to 7.5 percent. By contrast, the import duty on maize in Malaysia, Indonesia, and Japan is zero. Similarly, import duties on soybeans (30%) and fishmeal (about 10 percent) in Viet Nam are higher than similar rates in most other Asian countries where they vary from 0 to 5 percent. Overall, approximately 60 percent of the feed mills in Viet Nam have indicated that the high price

of raw materials such as maize and soybean cakes is one of the main constraints to the future development of the feed industry and the expansion of farmer demand for high quality commercial feed, particularly since maize, apart from rice bran, is currently the main component of the pig and poultry feed produced in Viet Nam.

Insufficient local production of maize and high-protein raw materials

In addition to high prices, total local production of high protein raw materials for feed use seems insufficient to meet the demand of the feed industry, even though domestic production has increased. For example, production of maize grew at a rate of nearly 10 percent per year between 1990 and 1998. This substantial increase in maize production was due in equal parts to area expansion and increased yield. However, the average yield of just under 2.5 ton/ha is still very low when compared to yields of 8 tons/ha obtained with the best quality hybrid seeds. The relatively low production of maize and other feedgrain production, coupled with their low productivity, expanding demand for commercial feed, and import tariff, suggests that maize and other feedgrains will remain expensive unless action is taken to increase productivity and liberalize trade.

Rapid growth of the feed industry

The domestic feed industry has seen particularly rapid growth over the past few years due to heavy investment by the private sector. In 1994, with annual use of only 154,000 metric tons, commercial feed constituted about 2.5 percent of concentrated feed use, and 0.6 percent of the total feed and raw material used as animal feed. Only five years later in 1998, use of commercial feed had grown to over 2 million metric tons, which corresponds to about 26.9 percent and 7.4 percent of the concentrated and total feed and raw materials fed to animals, respectively. The rapid expansion in commercial feed production and consumption, are in part due to the passage of the new investment law of 1994 and the heavy investment in feed production facilities it induced.

In the 6-year period from 1988 to 1993, average annual real investment in equipment, buildings, transport and other feed mill assets was about D 498 million. With the passage of the investment law, average annual real investment by the feed mills increased to over D 1.8 billion.

Mostly induced by private investment (domestic and foreign)

Investment in the feed sector has been mainly undertaken by the private sector, both local and foreign. In comparing real annual investment over the period from 1988 to 1993 and 1994 through 1999, investment in equipment and buildings by local private mills was over 21 times higher in the latter period at about D 0.3 billion per year. Real annual investment in equipment and buildings by foreign and joint venture mills of about D 12.9 billion were about 3.5 times higher during the latter period. Investments and expansion of state owned mills, although higher, have not kept pace with the increase in investment by the private sector. Over the period from 1994 to 1999, real investments in buildings and equipment were about D 0.4 billion per year, about 2.7 times higher than during the earlier period.

A credit-constrained domestic private industry

The heavy investment in the feed sector has led to a dramatic increase in feed production and capacity. In 1999, commercial feed production in Southern Viet Nam was about 1.7 million tons, of which the foreign, private and state feed mills produced about 1.0, 0.5, and 0.1 million tons respectively. The 10 largest mills, of which 50 percent are locally owned by the private sector, produce nearly 81 percent of the commercial feed produced in Southern Viet Nam. Feed production by the state mills is negligible. Although it is still early in the development of the feed industry in Viet Nam, the local private companies may be too small to be competitive over the longterm. For example, while these five private companies are among the ten largest in Viet Nam, they only process about 19 percent of the commercial feed produced in Viet Nam, whereas the five largest foreign mills produce about 62 percent. Part of the difference in the size of the foreign

and local feed mills may be explained by insufficient credit for feed mill expansion and construction. Although both local and foreign private feed companies borrow money through both formal and informal channels to fund their raw material purchases, the foreign mills also appear to use credit to help finance the construction of their mills in Viet Nam. By contrast, the construction costs for the local private mills appear to be largely self-financed. Consequently, reduced fund availability together with insufficient access to credit, may force the feed company to build smaller less efficient mills. If the local private feed industry is to be competitive with the foreign owned mills and feed imports over the long term, it will need to consolidate in order to grow its share of the local feed market. Furthermore, if the demand and market for feed grows, it will be for higher quality feed forcing the companies to change their feed composition and marketing strategy, and further encourage the consolidation and large-scale expansion of plant capacity in order to operate efficiently, effectively, and compete successfully.

Economies of scale in feed industry

Economies of scale and the feed production strategy of the firm play an important role in the profitability of the feed companies. As shown in Table 3.14, the profits per ton of feed produced increase with the scale of the mills operation. Profits per ton are lowest for private mills and largest for the foreign mills. Similarly, the share of profit in total sales increases with mill size, and is lowest for the local private mills. Despite the low per unit profit, the local private feed companies are able to obtain a fair return on their assets by selling a cheaper product in a larger volume and using their feed milling capacity more effectively. By most measures, the foreign and largest feed processors are the most profitable, utilize their capacity better and have the highest return on their investment. The GOE mills are the exception. Although their profits per ton of feed produced and profit share are higher than the local private feed companies, the relatively high cost of their product, its generally lower quality, the relatively lower sales volume, and poor

capacity utilization, along with other factors, result in a low average return on investment in comparison to the rest of the industry.

Different marketing strategy of private and foreign industry

Although private sector investment in the feed industry has expanded rapidly, the type and quality of the feed produced and the markets targeted by the foreign, local private, and state run mills are different. The efforts of the foreign and large newer mills appear to be targeted at the production and sale of concentrated feed, whereas most local private and state-owned mills largely produce complete feed (See Table 3.15). The feed produced by the different types of mills differs in quality as well. For example, the feed produced by foreign mills has a higher level of protein then the same type of feed produced by local private mills, on average (See Table 3.16).

Difference in feed quality of private and foreign industry

The difference in quality is in part reflected by differences in the price of the feed. Feed produced by the private sector in Viet Nam is cheaper on average than the same type of feed produced by foreign and state-owned mills (See Table 3.17). Coupled with a generally higher rate of capacity utilization, it would appear that the local private mills are trying to target the lower end of the market by selling a higher volume of lower quality, less expensive feed to livestock producers. Conversely, the foreign mills are targeting the upper end of the market for higher quality, more expensive animal feed. Taking into account the relatively low use and high cost of commercial feed to producers, the private-sectors strategy may be most appropriate for the current status of the market. Overtime, however, as demand for high quality feed increase, the local private feed processors run the risk of either targeting a smaller, shrinking niche market for cheaper, low quality feed, or they will need to increase their investments substantially in capacity and advertising to overcome lower quality perception of their brands in order to successfully compete

with the large feed producers, who are better positioned to reap the benefits of economies of scale.

3.6 Low adoption of improved breeds

Still low adoption of improved pig breeds

Many livestock producers have at least partially adopted the use of improved breeds of pigs. Of the surveyed producers who kept pigs, around 75 percent had at least one crossbred or exotic pig in their herd. This proportion ranged from 69 percent of small farms to almost 90 percent of large farms. While crossbred pigs have won some acceptance, adoption of exotic pig breeds is at far lower levels. Only 20 percent of farmers had at least one exotic pig in their inventory, and only 18 percent of producers had exotic pig adoption rates of 100 percent (See Table 3.18). Exotic pig adoption is heavily dependent on farm size and location. Only around 10 percent of small farms have any exotic pig breeds in their inventories, whilst over 55 percent of large farms have some exotic pigs and 45 percent of large farms have inventories consisting entirely of exotic pigs. In the North East South and Mekong River Delta areas, 86.5 percent and 70.5 percent of pig producers respectively keep only exotic pigs in their inventory. In all other regions the proportion of producers with some exotic pigs averages 4.6 percent and the proportion of producers with only exotic pigs averages 2.0 percent.

Increasing adoption of improved chicken breeds

There is a clear divide between producers who have adopted improved breeds of chickens and producers who keep only local breeds of chickens. Around 59 percent of producers keep only local chickens in their inventories and 38.31 percent of producers keep only crossbred or exotic chickens. Only around 2.6 percent of producers keep both local chickens and exotic or crossbred

chickens. Adoption levels of exotic chicken breeds are relatively higher than adoption levels of exotic pig breeds. Around 34 percent of producers keep some exotic chicken breeds and 32 percent of producers keep only exotic breeds. In common with exotic pigs, exotic chicken breed adoption is dependent on farm size and location. Around 22 percent of small farms have some exotic chickens and 20.6 percent of small farms have inventories consisting entirely of exotic chickens. Around 70 percent of large farms have some exotic chickens and almost all of these have adoption levels of 100 percent. More than 40 percent of producers in Red River Delta, South Central Coast, Central Highlands, North East South and Mekong River Delta have inventories consisting entirely of exotic chickens. Only 15.6 percent of producers in the other regions have inventories consisting entirely of exotic chickens.

Higher adoption of improved varieties of ducks

Almost 37 percent of duck producers had inventories consisting entirely of crossbred or exotic ducks. Around 26 percent of producers had some exotic ducks in their inventory and almost all of these producers had inventories consisting entirely of exotic ducks. As was the case for pigs and chickens, adoption of exotic duck breeds is dependent on the size of the farm and the location of the farm. Around 21.3 percent of small farms keep exotic ducks compared with almost 43 percent of large farms. All of the large farms keeping exotic ducks have adoption rates of 100 percent. 100 percent of duck producers in North East South have inventories consisting entirely of exotic ducks. This proportion is 41.67 percent in Mekong River Delta and 31.25 percent in North East. For all other regions the proportion of duck producers having exotic ducks is 11.1 percent.

Factors influencing low adoption levels: suitability and access

There are a number of factors that may influence low levels of exotic breed adoption by producers. These include the lack of suitability of many exotic breeds for raising on small farms and problems with access to high quality genetics.

Unsuitability of Exotic Breeds for Small Farm Raising

The dominant pig management systems identified by small farmers were the use of local pigs for breeding and production of piglets for sale. These systems were identified as the major local pig raising system by over 95 percent of small farmers. Small farmers utilize relatively low cost local resources in feeding local pigs. The dominant local pig feeding system was a roughage only diet, with the second most common diet being roughage supplemented with concentrates. On average, local pig diets consist of 55.5 percent crude material, 42 percent fodder and 2.5 percent quality feed. The quality feed fed to local pigs is mostly concentrated feed for breeding.

In contrast, almost 57 percent of large farms indicated that the primary exotic pig management system is a fattening system. A further 14 percent indicated that piglet production and fattening was the dominant exotic pig management system.

The feeding system adopted by large farms is focused on intensive fattening. The diet fed to exotic pigs consists of an average of 60.1 percent crude materials, 23.1 percent fodder and 16.8 percent quality feed. The majority of quality feed fed to exotic pigs is designed for fattening rather than breeding.

The divergent livestock management systems and feeding systems adopted by small and large farms mean that they demand pigs with different characteristics. Small farms demand pigs which are able to utilize lower quality feed resources and have high reproductive potential. Large farms demand pigs that can produce a higher proportion of lean meat, and can fatten quickly to a high slaughter weight.

Younger age at first parturition, a greater number of parturitions per lifetime and a larger litter size mean that the expected lifetime piglet production of a local sow is almost twice that of an

exotic sow. Local pigs are able to achieve this reproductive performance while being fed on a relatively low quality diet and being kept under local conditions.

Because of the higher quality feed rations, the cost per kilogram of weight gain of exotic pigs is slightly higher than that of local pigs. However, exotic pigs can be slaughtered an average of two months earlier than local pigs, with a slaughter weight over 25 kilograms higher than local pigs. This performance however, is only achievable under controlled conditions (such as those on commercial farms) and with high quality feed rations.

These factors mean that not surprisingly, small farms have a preference for local pigs and large farms have accepted exotic pig breeds. Another factor deterring small farmers from adopting exotic pigs for piglet production is that marketers do not pay a substantial premium per kilogram liveweight for exotic piglets (See Table 3.19).

Small farmers identified fattening and production of young chicks as the primary livestock management systems for local chickens. Small farmers utilize local resources for feeding of local chickens, with the diet consisting of 92.2 percent crude material, 3.8 percent fodder and 4 percent quality feeds.

The dominant livestock management system for exotic chickens on small and large farms is fattening. Exotic chickens are fed an intensive fattening diet consisting of an average of 38.9 percent crude materials, 1.9 percent fodder and 59.2 percent quality feeds.

Production performance of exotic chickens is superior to those of local chickens. The cost per kilogram of weight gain is lower, average slaughter weights are around 700 grams higher and slaughter age is an average of around two months earlier than for local chickens.

As many small farms and almost all large farms have fattening as one of the primary chicken management systems, it is not surprising that the adoption rate of exotic chickens is higher than that of exotic pigs.

However, the poorer quality of feeds and less controlled raising conditions available to small farmers mean that the average cost per kilogram of weight gain for chickens on small farms is higher than that on large farms. Slaughter weights of exotic chickens on small farms are lower than those on large farms and slaughter age is higher. These factors may have an impact on the wider adoption of exotic chickens by small farmers. Small and large farms indicated that they kept exotic and local ducks for the same purposes. These are fattening and egg production. Local ducks are fed a ration consisting of an average of 88.2 percent crude material, 2.4 percent roughage and 9.4 percent quality feed. Exotic duck rations contain an average of 67.8 percent crude material, 8.8 percent fodder and 23.4 percent quality feed.

Cost per kilogram of weight gain and average slaughter age of exotic ducks are similar to local ducks, but the average slaughter weight of exotic ducks is around 700 grams higher.
The performance of exotic ducks on small and large farms is similar. However, the small farms keeping exotic ducks adopted the same feeding systems as large farms. This indicates that the impediments to further adoption of exotic duck species may lie in the lack of access of small farmers to exotic duck breeds or the lack of appropriate feed resources in some regions.

Limited access to genetics

Adoption of exotic breeds by smallholders may be restricted by lack of access to exotic genetics (See Table 3.20). Almost 75 percent of pig producers indicated that they obtained pig breeding stocks from other farmers and a further 13.43 percent of pig producers indicated that they obtain pig breeding stocks from traders. Only around 8 percent of producers indicated that they obtained pig breeding stocks from government agencies.

The source of pig breeding stocks is related to the size of the farm and the location of the farm. Almost 93 percent of small pig farmers indicated that they obtained their pig breeding stocks from either other farmers or traders. Only around 5 percent of small farms obtained pig breeding stocks from government sources. In contrast, 16 percent of large farms obtained their pig breeding stocks from government sources and a further 5.6 percent obtained pig breeding stocks from private businesses other than traders. 30 percent of producers in North East South and 32.3 percent of producers in Mekong River Delta indicated that they obtained pig breeding stocks from government sources. Only 2.6 percent of producers in the other regions obtained breeding stocks from government sources.

Around 32.15 percent of producers indicate that they obtained poultry breeding stock from private businesses other than traders. Almost 24 percent of producers obtained poultry breeding stocks from other farmers, 16.32 percent from traders and 18.6 percent from government owned enterprises. As was the case with pig breeding stocks, the sources of poultry breeding stocks vary with farm size and location. 42 percent of small producers obtain poultry breeding stocks from government enterprises and other private enterprises (See Table 3.21). This figure is almost 75 percent for large farms. Only 15.4 percent of large farms obtain poultry breeding stocks from farmers and traders.

More than 51 percent of producers in South Central Coast, Central Highlands, North East South and Mekong River Delta indicate that they obtain poultry breeding stock from private businesses. Only 22.5 percent of producers in other regions obtain breeding stock from other private business. Government enterprises are the major supply sources in Red River Delta and North East.

It is apparent that government and quasi-government exotic breed programs and genetics distribution are focused on supplying the needs of large commercial enterprises, in particular

those in North East South and Mekong River Delta regions. Through a combination of breed improvement designed to produce commercial quality animals suitable for intensive fattening and a distribution system targetting small numbers of commercial operations, small farmers and farmers in relatively remote regions have not been the main beneficiaries of breed improvement programs.

3.7 Poor state of animal health and veterinary services

Limited and confused knowledge about animal disease

The limited knowledge of livestock disease incidence and economic impact in Viet Nam imposes a substantial constraint on the development of effective animal health policy. While overall livestock losses to disease are moderate, the sporadic outbreak of some epizootic diseases can cause devastating losses to smallholder farmers. While the supply of veterinary medicines and vaccines is not often a major constraint, their price and quality may impede use. The relatively low level of animal health knowledge at both the farm and field service level is also a major factor in the low adoption of proven disease control measures. At national level a reasonable legislative and regulatory base for disease management is eroded by a weak chain of command to the field level, under resourced institutions with inadequately trained staff and poor data collection, storage and retrieval systems compound the field level constraints.

Coordination of programs and goals between provincial veterinary services is made difficult by the organization of provincial services as essentially separate units, each with almost total autonomy in decision making within their province. The concentration of power at the provincial service level is reinforced by the fact that funding for each service is their responsibility.

This makes the development of a coordinated national (or even regional) animal heath strategy extremely difficult. The introduction of regional animal heath centers was designed to alleviate this problem, but the strategy has essentially failed. As the regional centers do no contribute any funding to the provincial services, their influence over the activities of the provincial services is minimal. Without adequate funding, the regional centers have been forced to earn revenues from quasi-commercial activities such as meat and livestock importing and exporting services. These activities are now the main focus of their operations.

Effective identification and control of animal diseases is hampered by disincentives to report disease at every level from producers to the central government. Producers are reluctant to report an outbreak of animal disease because they do not wish to pay for treatment or have their animals destroyed. In many cases, producers' response to disease is immediate sale or slaughter of the affected animal. Similarly, commune, district and provincial veterinary service officials have strong disincentives to report disease. Outbreaks reported at this level would require costly response programs. A consequence of these disincentives is a number of information gaps between participants in the system. This is a problem because although producers and communes are the participants dealing directly with animal diseases, the provincial level veterinary service is the organization setting the agenda for animal heath programs at all levels within its jurisdiction.

Mismatch of disease reporting system at different levels

Pig producers and commune officials rated scouring, salmonella and pasteurellosis to be the three most common diseases of pigs. Commune officials underrated the importance of scouring and overrated the importance of almost all other diseases. While only 3.18 percent of producer disease reports and 8.02 percent of commune disease reports were of swine fever (See Table 3.22), almost 33 percent of provincial and district veterinary officials rated swine fever as the most common pig disease in their region. Scouring was the most common disease reported by

producers and commune officials. However, only 11 percent of provincial and district officials felt that scouring was the most common pig disease in their region.

Producers ranked pasteurellosis as the most common poultry disease, while Newcastle disease was ranked as the most common poultry disease by district and provincial officials. Commune officials reported that the proportional importance of parisitism, salmonella, Newcastle Disease, Duck Plague, Fowl Pox and Gumboro was higher than the reported proportional importance attached to these diseases by producers (See Table 3.23).

While producers ranked Newcastle Disease as the sixth most important disease, almost 53 percent of provincial and district officals ranked Newcastle Disease as the most frequent poultry disease in their area. Producers identified Pasteurellosis and scouring as the most prevalent poultry diseases, but only 11 percent of provincial or district officials ranked pasteurellosis as the most frequent disease and no provincial officials identified scouring as the most frequent poultry disease.

Limited use of veterinary services, particularly by small farmers

Producer use of veterinary services is largely focused on prescriptive treatment rather than on preventative treatments. Table 3.24 shows that while a high proportion of producers indicated that they utilized services such as parasite treatment and infection treatment, only a very small proportion of producers utilized veterinary services to provide regular inspections of their stock. Amongst producers receiving veterinary services, the average number of visits per farm per year was 4.93. The majority of these visits were for disease treatments and vaccinations. Cooperatives were the major source of disease treatments and vaccination services for small farms, whilst the Veterinary Service Department, Extension Services Department and cooperatives were the main source of disease treatments and vaccinations for large farms.

A wide range of sources of mortality reates

Mortality rates reported by livestock farmers are shown in Table 3.25. These rates represent annual animal deaths as a proportion of annual inventory level. This inventory is defined as intitial stock of animals plus the annual level of births, net gifts and purchases. Deaths of animals are caused by a number of disease types. Table 3.26 shows the average proportions of producers' livestock deaths caused by various types of disease. Producer's lack of knowledge about animal diseases is highlighted by the high proportions of animal deaths caused by unknown diseases. This figure is as high as 60.71 percent for cattle deaths.

High Cost of Mortality

A simple definition of the direct cost of mortality is the foregone potential sale value of the animal lost because of death. The direct mortality cost for a producer is the sum of the potential sale values of all animals that died during the year. Table 3.27 presents the average mortality cost as a proportion of producer sales value by species. This value is then extrapolated to a national mortality cost by applying the mortality cost proportion to the national gross production value for each species. The loss of production value due to mortality is equivalent to 4.09 percent of livestock production value, or $US57.71 million. The direct mortality costs of various diseases can be estimated by applying the average proportion of deaths caused by each disease to the national mortality cost level from Table 3.28.

Low Vaccination Rates and Cost-Benefit of Vaccination Campaigns

Despite the substantial losses that may be incurred as a result of diseases, the rate of vaccination against many diseases remains low. Table 3.29 shows the proportion of animal types within the province that provincial level veterinary officials indicated were vaccinated against a number of diseases.

Costs of vaccination include a labor component and a veterinary drug component. Labor cost components are difficult to estimate because vaccinations are frequently administered by the producer, or the vaccination fee is subsidized or provided at no cost by the veterinary service. Table 3.30 presents the cost paid by district veterinary services for a single vaccine dose.

The estimated costs of mass vaccination campaigns aimed at disease eradication are shown in Table 3.31. These costs are derived by multiplying national inventory levels by the per animal cost of vaccination drugs. The benefit/cost ratio is defined as the ratio of the benefits derived from eradicating disease (the value of foregone production) over the cost of disease eradication (cost of vaccinations).

Limited time devoted to inspection

Veterinary Service Units at the provincial and district level undertake a range of inspection functions. These include inspections of live animals and carcasses, inspections of wholesale and retail markets, restaurants and food premises. The most common types of inspections performed are of domestic carcasses and for the transportation of live animals. Some of these inspections take a number of hours and others require a number of daily visits over a period of weeks, or even months (See Table 3.32). Inspections are often carried out by more than one inspector. If an inspection takes one day or less, then the number of person days required to undertake the inspection is the number of inspectors multiplied by the time taken to perform the inspection. If the inspection period is longer than one day, the person days taken to perform the inspection is defined as the number of inspectors multiplied by the number of visits undertaken to perform the inspection. Transmissible disease inspections take the greatest number of person days.

The major inspection types performed by provincial level veterinary service units are live animal transport inspection, disinfection and carcass inspection for the domestic market. District level veterinary service units most frequently undertake transmissible disease inspection and export meat inspection.

Given the importance of inspection activities to ensure animal health and fitness for human consumption, it seems that the limited staff of the veterinary service units cannot perform this function adequately. The number of person days allocated for inspection by provincial level veterinary service units is far greater than that of district level units. However, the proportion of total staff time devoted to performing inspections is greater for district level units than for provincial level units (See Table 3.34). Inspection fees as a proportion of 1999 budget levels are higher for district level veterinary service units than for province level veterinary service units. Inspection fees at both the provincial and district levels represent a lower proportion of annual budget than the proportion of person-days devoted to inspections.

3.8 Weak marketing channels

Persistent high regional price margins

Considerable spatial price differences in the price of liveweight and livestock products among different parts of the country suggest weak market integration. An analysis of price margins among 16 different markets distributed all over the country and over the period 1994-98 revealed that prices margins are high and do not show convergence among them (See Table 3.35).

The analysis of regional price margins for different types of meat provides an indirect test of market integration. Over time, there is no tendency for regional price to converge toward each

other. In fact, for some regions, there are indications of a divergence of prices, like in the case of chicken liveweight in the North and Center and beef topside prices for the Central region. Margins are highest in the case of pigs, and lowest for chickens.

Co-movements of prices are low

Moreover, analysis of correlations of prices revealed that markets are not well integrated (See Table 3.36). When compared to rice markets, for example, the average correlation coefficients among livestock products prices are much lower.

Limited market information

Most of the trade is local. Most farmers sell at the farmgate, without access to organized markets and auctioning systems (See Table 3.37). As a result, information about markets, prices, and other supporting information is limited and mostly gained informally (See Table 3.38).

Difficulties related to transportation of live animals

Marketing is also limited by several restrictions related to transportation of livestock commodities. Many of the assemblers and wholesalers experience restrictions, particularly in the form of police conduct (See Table 3.39 and Table 3.40). These restrictions might well be justified on the basis of health-related aspects. However, this is not the case, since less only four percent of the restrictions are due to animal health and veterinary inspections.

Difficulties related to other livestock products and feed

The method of transport, its cost, and restrictions on the movement of goods can significantly affect the structure and performance of the marketing system. Poor infrastructure and transport equipment impede the timely movement of goods across distances. As discussed in the next section, the lack of a cold chain in Viet Nam has constrained the movement of meat and the

development of the meat trading and processing system. Restrictions on the movement of goods also have a serious impact on the efficient transport of feed and meat within Viet Nam. Between 25 and 30 percent of feed and meat traders, feed processors and slaughterhouses periodically have problems with restrictions on the movement of their goods. The most prevalent problem is not the high cost of tolls or animal health inspections, but rather frequent random roadside checks and fines by the police. Overall, over 25 percent of feed traders, 27 percent of meat traders, 14 percent of slaughterhouses, and 20 percent of the feed processors have been affected and list police conduct as the primary impediment to the movement of their products. Larger businesses, who generally transport a larger volume of goods, more frequently, and over longer distances are particularly affected by the actions of the police.

3.9 Underdevelopment of meat/slaughtering industry

The animal slaughtering and meat processing industry suffers from a number of key deficiencies that have limited the development of the sector. Important aspects which have contributed to the slow development of the industry, include poor hygiene and waste treatment, the lack of a cold chain to increase the shelf life of meat and aid in its distribution, and the scale of the typical businesses operations.

Poor hygiene conditions and limited inspection

The slaughter of animals for meat occurs at both slaughterhouses and at smaller slaughter sites often located outdoors by the side of the road. At many of these sites, particularly the informal ones, little regard is taken for maintaining safe hygienic surfaces and forestalling the contamination of meat. In order to ensure that a sanitary environment exists for the slaughter and distribution of meat, slaughtering and processing businesses are supposed to be inspected periodically. Overall, however, about 33 percent of the abattoirs and 46 percent of meat

processors in Viet Nam have not had a sanitary condition inspection to ensure that regulations are followed, and that waste is disposed of properly. Overall, large-scale abattoirs and processors are the most likely to be visited periodically, while small scale operations are visited least often. Although the quality of an inspection is difficult to measure, sanitary and waste inspections appears to be treated more seriously in Southern Viet Nam, where over 95 percent of the meat processors and slaughterhouses are visited periodically by inspectors. By contrast, only about 55 percent of abattoirs and 42 percent of the processors located in the North are inspected periodically.

Poor enforcement of sanitary regulations

When visited, not all abattoirs and slaughterhouses take measures to meet government regulations. Overall, about 8 percent of the abattoirs and meat processors in Viet Nam are fined for violating waste and sanitary condition regulations during a given year. The average fine levied is about D 486000 for abattoirs and D 687500 for meat processors. Surprisingly, of those fined, only 11 percent are required to or at least take remedial action to improve sanitary conditions or their method for waste disposal. While some businesses are not required to take remedial action despite being fined, nearly 20 percent of the businesses who are visited by an inspector and not fined take remedial actions to improve sanitary conditions and dispose of waste properly.

Waste disposal

Only half of slaughterhouses and meat processor are taking actions to dispose of waste properly; a sizeable number simply dump their animal waste. Overall, about 49 percent dispose of their waste in containers which are in turn taken to landfills, and about 10 percent treat their own waste using chemical or biological treatments, or through the production of biogas. Biogas production is primarily undertaken by large abattoirs located in southern Viet Nam. While the majority of the abattoirs and meat processors dispose the bulk of their waste in an environmentally friendly

manner, about 42 percent of processors and 32 percent of abattoirs dump their waste into the surrounding environment. Free disposal of waste by abattoirs is particularly severe in the North and among small abattoirs where 42 percent and 36 percent simply dump their waste products, respectively. Although the majority of these firms operate at a relatively small scale, substantial contamination of the environment can occur when over 35 percent of the businesses in the slaughtering and processing sector dispose of their wastes freely on the streets and sewers of the city.

Low level of technology

The level of technology used in the meat processing industry is relatively low. Overall, about 80 percent of the equipment used by all meat processors and about 74 percent of the equipment used by the larger meat processors is manufactured in Viet Nam. About 14 percent of the equipment used by small processors is imported from countries with a lower overall level of technological sophistication, and about three percent from the more highly developed Asian and western European countries. By contrast about 15 percent and 12 percent of the equipment used by the larger processors was manufactured in less developed and more developed countries, respectively.

Lack of cold chains

Another important impediment to the distribution of meat and the development of the meat industry in Viet Nam is the lack of a cold chain. A cold chain is comprised of a series of cold storage and transport vehicles which allows for the refrigerated and safe movement of meat from the abattoir to the retailer. In Viet Nam, only 3.5 percent of abattoirs, 15 percent of meat processors, and nearly none of the meat traders have cold transport or storage facilities. Larger processors and abattoirs are more likely to have cold storage facilities than others, as are those located in Southern Viet Nam. The lack of a cold chain makes it particularly difficult to transport

meat over long distances without it spoiling and endangering human health. Rather, live animals of considerably more weight, bulk, and feed and water requirements, can only be transported over relatively short distances and periods. The lack of a cold chain also contributes to the need for small scale slaughtering and meat processing units in order to meet immediate local demand, and prevents the integration of markets for meat, which is also a contributing factor to the relatively higher cost of meat in Southern Viet Nam when compared to prices in the North.

Economies of scale

The animal slaughtering and meat processing industry is characterized by small, relatively inefficient operations. As shown in Table 3.41, the average daily processing capacity and total annual sales of abattoirs and meat processors are quite small, particularly for the smallest operators. Annual value of sales of abattoirs and meat processors are only about D 2.4 billion and D 809 million, respectively. Processing capacities are similarly low, with average capacities for abattoirs and processors of only about 1.4 and 0.4 tons per day, respectively. The small volume and value of sales translate into relatively low levels of profitability. By most measures of profitability, larger abattoirs and meat processors are more profitable than the smaller operators (See Table 3.42). In addition to larger absolute profits, bigger slaughtering and processing businesses have a higher return on assets and similar or better returns on sales. Labor is also used more efficiently as shown by the profits per unit labor and the labor to asset ratios. Table 3.43 shows that abattoirs in the South are more profitable than those in the North and Central regions. Processors located in the Central region, are more profitable than those in the North and the South.

3.10 Underfunded and mediocre performance of extension system

Limited budget for extension.

State budget contribution to extension is generally very low across all agricultural activities. Over the period 1996-2000 livestock extension has received between 17 and 22 percent of total state budget to extension (See Table 3.44). Contribution from the local levels increase the overall budget available to extension, yet it is still thought to be insufficient to operate an efficient system (See Table 3.45). Transportation availability is limited and so are resources to provide adequate incentives to staff to reach the majority of producers, particularly those in remote areas.

Lack of generalists

There is a lack of generalists among extension staff. The staff is mostly specialized along technical lines with little training in communication and marketing skills. The amount of resources devoted to training is insufficient. Extension focuses mostly on technical aspects rather than on providing information on marketing, regulations and credit to different types of beneficiaries (See Table 3.46).

Bias towards large farmers

As shown in Table 3.47, extension services are provided to Vietnamese rural farmers by several public and private sector organizations. The provision of these extension services, however, are skewed towards the already well established farmers (i.e. commercial farms) (See Table 3.48). Most of extension services to small farmers are focused on pigs, whereas for large producers, ducks receive more attention than other species (See Table 3.49). Government and semi-government extension agencies provide more visits per year to large farms. In contrast, mass organizations focus their extension activities on small farms (See Table 3.50).

Mediocre performance of extension service

Overall, producers consider the quality of the extension services they receive to be either adequate or poor (See Table 3.51 and Table 3.52). Although many public and private organizations provide extension services, cooperatives and private companies are cited most frequently for providing the best information to producers on breeding animals and animal nutrition, respectively, where there is choice in extension service providers. Practically no assistance is provided to livestock producers in terms of marketing related extension.

3.11 Underfunded and weak capacity of the research system

Low state budget for research

Total public expenditures for agricultural research in 1998 and 1999 were about VND 80 billion, the equivalent of 1.7 percent of public expenditures in agriculture and .08 percent of agricultural GDP. In comparison, China spends about 4 times as much and Thailand 14 times as much relatively to their own GDP (which is itself much larger than the one of Viet Nam). Therefore, by any standards, the amounts in Vietnam are very low and cannot sustain an effective research program to develop a modern agriculture. More than half of agricultural research expenditures are used to cover salaries, and current expenditures on research equipment and machinery. Spending on salaries and current expenditures for research staff for 1999 was VND 43 billion, or the equivalent of VND 10.5 million per staff per year ($750). As a result of resource constraints, research organizations engage themselves in commercial activities. Moreover, limited funding results often in poor laboratories, equipment, and few on-farm trials.

In the case of livestock sector, total funding for livestock research institute from central budget is about 14 percent of total funding (See Table 3.53). The share of total funding to livestock has

shown a slight increase over the years from 11 percent in 1993 to slightly over 15 percent in 1999. Between 50 and 60 percent of total budget is for salaries cost. For example, in 1999, the total budget for livestock and veterinary research was about 12 billion Dong ($857,000). The salary budget was 50 percent of the total, leaving only about $430,000 for actual research activities (See Table 3.54 and Table 3.55). In terms of GDP contribution by the livestock sector, the total state budget for research was less than 1 percent.

Lack of adequate training

As shown in Table 3.56 and Table 3.57, in spite of having staff with good qualifications (with more than half having obtained a B.Sc. and more than a quarter having either a Ph.D. or M.Sc) actual research skills of several of the staff are not very high. Several reasons explain this situation. First, the actual learning by doing opportunities are limited because of limited research funding. Second, an inflation of high degrees was produced in the mid-1990s based on upgrading of many staff to Ph.D. degree level. However, many of these degrees were not based on formal training and professional standards. Third, access to updated information is limited. Recent publications and literature from the rest of the world is not readily available to the research community in Viet Nam. Fourth, English skills and computer skills of the vast majority of the research staff are low, making very difficult to carry out research of good quality. Fifth, only few staff had training abroad, thus constraining their opportunity to upgrade their skills with the most updated scientific advances and analytical methods. Finally, research in livestock tends to be rather technical, with low priority given to socio-economic aspects, thus again limiting the effectiveness of research programs to meet the needs of the rural population.

Priorities in livestock research not related to importance in production

The part of the state budget to research organizations in livestock and veterinary science that is actually devoted to carry out research project is much lower than the total budget. It has been

estimated to be about 4.4 billion Dong in 1999 and is originated by national programs, ministerial programs and other studies. Of this budget, about 35 percent is devoted to pig, 32 percent to poultry, and 20 percent to cattle and buffalo (see table 3.58). The allocation to different species does not seem to reflect the importance of each species in the aggregate GDP nor the rate of growth of the subsector. From the discipline point of view (see table 3.59), most of the research is applied to breeding (about 39 percent) and veterinary research (about 26 percent). The process of priority setting in livestock research is not well defined and does not seem to be taking into account different stakeholders in the sector, such as farmers, traders, and private industry.

3.12 Conclusions

The complexity of the issues facing the livestock sector represents a challenge for any policy maker desiring to have impact on development of the sector. The complexity is the result of the fact that several and concomitant issues have to be dealt at the same time. Even though priorities could be attached to the various issues and measures to deal with those issues, it remains an important characteristics of the livestock sector that the problems require often a systemic solution. If, for example, major breakthrough is made in improving the access of farmers to improved breeds without at the same time improving the feed availability or the health and veterinary services, the progress made on one front will soon be negated by the constraints arising on another front.

The challenge, however, does not seem outside of the reach of the agricultural policy makers in Viet Nam. Because of relatively low investment and attention devoted to the sector over the years, there is ample scope to reverse a trend in policy affecting the sector. Because of the still relatively small size of the sector compared to crops, the required investments might represent a huge increase in percentage terms, but still be relatively small.

Before looking at the principles of a new strategy to deal with these issues it is necessary, however, to become even more familiar with the details of the issues and with the analysis of alternative policy options, tasks that will be carried out in the following chapters.

CHAPTER 4

LIVESTOCK PRODUCERS

Summary

Livestock production in Viet Nam is primarily undertaken on household level farms where crops and other agricultural products are also produced. Land areas and animal housing areas are relatively small, and almost all labor input is provided by the family. Almost all livestock farms undertake more than one type of livestock production, most commonly mixed poultry and pig production. Producers generally purchase inputs and breeding stock from other farmers and traders and sell their products to assemblers and wholesalers, usually at the farmgate. Credit is used by more than one third of farms, but livestock production supply contracts are extremely uncommon, especially for household level producers.

Highlights

- *Livestock production in Viet Nam is primarily undertaken on household level farms where crops and other agricultural products are also produced. The highest concentration of large scale commercial pig and poultry farms are located in the North East South region in southern Viet Nam.*
- *More than 92 percent of producers only utilized household labor in livestock production, compared to the 62 percent of producers who utilized only household labor in general agricultural production.*

- *Around 75 percent of producers with pigs have at least one crossbred or exotic pig and 65 percent of pig producers only have exotic or crossbred pigs. More than 75 percent of producers with chickens keep crossbred or exotic chickens and almost 40 percent keep only exotic or crossbred chickens. These proportions are higher in the southern regions than the northern regions. Adoption levels of exotic pigs and poultry are higher on large farms than small farms.*

- *Livestock products are predominately sold to assemblers and wholesalers at the farmgate, or (in the case of pigs) direct to small slaughterhouses. The relatively remote locations of many livestock farms means that direct sales of products to consumers are uncommon. A lack of an organized livestock marketplace infrastructure means that farmers usually deal with buyers on an individual basis.*

- *Livestock raising costs are dominated by feed costs, which account for an average of over 75 percent of total costs. Feed costs are still the dominant cost component even when household labor is valued at full cost. The relative importance of feed costs in total livestock raising cost is highest for cattle raising.*

- *There appear to be diseconomies of scale in livestock production, with profits increasing at a slower rate as inventories and revenues increase. This implies that the efficiency levels on smaller farms, based on raising local animals with low cost feedstuffs are higher than those on larger farms employing intensive high quality feed production techniques.*

- *Local pigs are fed diets consisting primarily of roughage, while crossbred pigs are usually fed roughage/concentrate diets and exotic pigs are generally fed complete feed diets. Local chickens are generally fed crude material with minimal quality*

feed input, while improved breed chickens are fed substantially higher proportions of quality feed.

- *Producers source the majority of their livestock production inputs from the private sector. Small farms are more likely to obtain breeding and meat production stocks from other farmers, while large farms (and in particular those in the southern regions) are more likely to obtain their breeding and meat production stocks from government sources. The private sector dominates the supply of feed and veterinary equipment and drugs, while the cooperative sector is dominant in the supply of veterinary services.*
- *Producers obtain price and market information from traders and other producers, credit information from banks and commercial regulation information from radio and television.*
- *The most common source of credit for producers is agricultural banks. The formal credit sector is the dominant loan sector in all regions. Funds are most commonly lent for feed purchasing purposes. The interest rates charged in the informal sector are higher than the formal sector.*
- *Only around 2 percent of producers had ever been involved in livestock supply contracts. The main reason for not being involved in contracts for livestock production was that there was no livestock contractor in the producer's area.*

4.1 Introduction

This chapter reports some data from an extensive survey of producers in Viet Nam. The sample of 2213 livestock producers was designed to include producers of pigs, chickens, ducks, cattle and water buffalo. The sample was drawn from 29 provinces covering all eight agro-ecological regions in Viet Nam and a range of farm sizes from small subsistence farms to some of the largest commercial agricultural operations in the country.

In order to provide a complete analysis, the producer data were stratified according to three criteria. These were geographic, economic and farming systems criteria.

Geographic Criteria: Producers were stratified into 8 regional groups dependent on the location of the farming operation. The regional groups are consistent with the 8 agro-ecological zones in Viet Nam. The provinces and districts that comprise these zones are defined by the Vietnamese government. Table 4.1 shows that the largest proportion of surveyed households came from the Red River Delta region and the smallest from the North West region.

Economic Criteria: The majority of farms in Viet Nam are based on the household unit and are small scale, both in terms of land area and resources and in terms of income levels. A standard classification system for stratifying Vietnamese farms based on economic criteria does not exist.

For the purposes of this analysis, the sampled livestock producers were stratified into three economic groups. These groups represent small, medium and large farms. A criteria based on

Gross Value of Agricultural Production (GVAP) of the farm was adopted for classification of farms. GVAP of the farm includes the gross value of all income from livestock, crop production and other agricultural activities. It does not include off-farm or non-agricultural activity income, but does include the value of home consumption of agricultural production from the farm.

The criteria for small, medium and large farms were based on the distribution of the values of GVAP. The lowest 70 percent of farms ranked by these criteria were classified as “small farms”, the next 20 percent as “medium farms” and the top 10 percent of farms as “large farms”.

Farming Systems Criteria: Surveyed producers were stratified according to the dominant farming system that they operate. The three classifications were “pig farm”, “poultry farm” (chicken or duck farm) and “bovine farm” (cattle or buffalo farm). Farms were classified as “pig farms” if the gross value of pig production exceeded that of either poultry or bovines. “Poultry farms” were those where the gross value of poultry production (chickens and ducks) exceeded that of either pigs or bovines. Finally, “bovine farms” were those where the value of cattle and buffalo production exceeded that of either pigs or poultry. Around 70 percent of surveyed farms were classified as pig farms, 20 percent as poultry farms and 10 percent as bovine farms.

Pig farming is the dominant farming system in all regions, accounting for more than 70 percent of surveyed producers. The level of specialization in pig farming in the North East South and Mekong River Delta regions is the highest, at over 75 percent of farms. Poultry farming is most popular in the Red River Delta and Mekong River Delta regions. Bovine farms are most common in the

Central Highlands region and were non-existent in the sample of producers in the North East South and Mekong River Delta regions.

The chapter discusses a number of issues relevant to smallholder producers of livestock. Section 4.2 discusses some demographic characteristics of the producer and household. Characteristics of labor resources utilized by the household for both livestock and non-livestock agricultural production are outlined in Section 4.3 and land resources utilized by the household are discussed in Section 4.4. Section 4.5 shows the characteristics of various livestock types kept by producers during the previous year. Sections 4.6 and 4.7 analyze respectively the characteristics of sales of livestock and procurements of livestock inputs by producers.

Section 4.8 analyzes the channels and networks of livestock marketing that are used by producers and Section 4.9 looks at the channels used by producers to source livestock inputs.

Sections 4.10 to 4.13 are concerned with crop production and marketing by producers. Production characteristics are discussed in Section 4.10, marketing channels in Section 4.11, procurement of inputs in Section 4.12 and input price levels in Section 4.13.

Transportation systems and communication methods utilized by the producers are outlined in Section 4.14, while Section 4.15 is concerned with storage and stocks of crops. Fixed assets owned and utilized by producers are discussed in Section 4.16. Credit use by producers, sources of credit and credit characteristics are discussed in Section 4.17. Profitability of livestock

production is analyzed in Section 4.18, household consumption in Section 4.19 and the characteristics of livestock supply contracts in Section 4.20. Finally, Section 4.21 concludes the chapter.

4.2 Household Characteristics

This section reports some of the demographic characteristics of the 2213 respondents to the livestock producer survey. Demographic characteristics reported include age of household head, education levels, gender of household head, size of household and the number of dependants. In addition, possible links between gender and income type are discussed.

4.2.1 Age of Household Head

The mean age of all household heads was 44.92 years, with reported ages varying between 20 and 81 years. Household head age was reasonably consistent across the 8 regions, varying between a low of 44 years in the Mekong River Delta, North Central Coast and Red River Delta to a high of 47 years in the South Central Coast Region. There was little variation between the age of household head for different farm sizes. The average age of the household heads of bovine farms (48) was higher than poultry farms (45) and pig farms (44).

4.2.2 Gender of Household Head

Female headed households make up 21.06 percent of those surveyed. This figure is lower than the reported Vietnamese average figure of 32 percent and the rural figure of 28 percent of households (GSO, 1995).

The presence of a female household head generally indicates that the woman is a widow, or that her husband is working away from the home. The history of war in Viet Nam means that adult women outnumber adult men. There are many widows in the age group 35 to 64, where women outnumber men 117 to 100 (FAO, 1997). This is the age group of the majority of farm household heads.

As the urban and semi-urban economy develops in Viet Nam, there are increasing opportunities for off-farm employment for many people in rural areas. This is particularly the case in areas peripheral to the fastest developing urban areas. Table 4.2 shows that the highest proportion of female-headed households is in the Mekong River Delta Region, where 24.31 percent of households are headed by women. The second highest level of female headed households is in the North Central Coast region, adjacent to the relatively urbanized Red River Delta. The lower levels of female headed households in relatively urbanized areas such as Red River Delta and North East South may be explained by the fact that males in these regions do not need to migrate away from their families in order to take advantage on non-farm employment opportunities. The same effect occurs in Southern China, where economic migration levels are high in provinces such as Guangxi and Guizhou which are peripheral to the high growth provinces of Guandong and Fujian. The level of economic migration of Guangdong and Fujian residents is relatively low.

A relatively high level of off-farm income could indicate that the household is female headed due to economic migration (and remittances) of the adult male family member. The average non-agricultural income of female headed households (D8.832 million per year) is around 9 percent higher than the non-agricultural income of male-headed households (D8.089 million). Table 4.3

shows that in all regions except South Central Coast, the non-agricultural income of female-headed households exceeds that of male households. This would suggest that economic migration and remittances are important rural issues in almost all regions of Viet Nam. The proportion of female-headed small farms (22.72 percent) exceeds that of large (18.54 percent). This may be because of the effect of economic incentives for small farm families to earn off-farm income.

4.2.3 Educational Level of the Household Head

The most common level of education for household heads was middle school with almost half of the respondents having completed middle school but progressed no further through the educational system. Table 4.4 shows that only 1.2 percent of household heads have not completed primary school. 82.11 percent have at least a middle school education and almost a third have at least a high school education. The mean educational attainment is constant by farm type and by gender of household head.

4.2.4 Household Size

The mean household size for all respondents is 5.06. The range of household size reported was between a low of 1 and a high of 16. The household size varied across regions between 4.7 in the Mekong River Delta and 5.9 in the Central Highlands. As would be expected, female-headed households reported a lower mean family size, due to either the death or economic migration of an adult male. The average proportion of children under 18 in the family is around 36 percent. This proportion varies between 30.11 percent in the Mekong River Delta and 43.32 percent in the Central Highlands.

4.3 Labor Resources

Labor resources available to producers include labor by family members, permanent employed labor, temporarily employed labor and inkind labor. This labor is used for livestock production and other agricultural activities.

4.3.1 Agricultural Labor

The most common type of labor used for agricultural purposes is family labor. Table 4.5 shows that over 90 percent of producers indicated that they used family labor for agricultural purposes. Temporary male and female labor were the next most common types of labor, used by 17.9 and 17.9 percent of producers respectively.

Over 99 percent of producers indicated that they used at least one form of family labor in agricultural production. More than 62 percent of producers used only family labor in agricultural production. Whilst male labor is the dominant type of family labor, female labor dominates paid and unpaid non-family agricultural labor. This may be due to the population gender imbalance or because of economic migration of male laborers to urban areas.

The average total person days worked per year per farm for all labor types is 700.82 days. This includes family labor and represents the average labor input into all agricultural activities on the farm. The average total days worked on the farm varies between a low of 496.5 in the North

Central Coast to a high of 889.9 in the North East South region (see Table 4.6). Total person days worked on the farm increases with farm size. Average per farm person days worked for large farms is 1280, compared with an average of 608 for small farms. The average number of work days per year for permanent female labor is the highest of the labor categories, at 1536 days. This represents an average of 307 work days per worker per year.

On average 83 percent of all farm labor is performed by family members. 16 percent is performed by employed labor and less than 1 percent is accounted for by in-kind labor. These proportions are consistent between regions with the exception of North West, where family labor accounts for over 92 percent of all farm labor.

Family labor utilization is relatively lower and employed labor utilization relatively higher on large farms. Household labor accounts for an average of around 72 percent of labor utilized on large farms and around 85 percent of labor utilized on large farms. Average daily price of male agricultural labor is higher than that of female labor. Average daily permanent labor costs are also higher than temporary labor costs (see Table 4.7).

The average total yearly cost of employing permanent workers is higher than the average temporary employee cost. This is because the average daily wage rate is higher (Table 4.7) and the average number of hours worked per year by permanent labor is relatively high. The average annual cost of labor by labor type (for producers who employ that type of labor) can be seen in Table 4.8. The increased amount of labor inputs and the higher proportion of employed labor working on large farms mean that total annual wage costs are much higher on large farms than small farms.

4.3.2 Livestock Labor

The proportions of producers using permanent labor for livestock raising are similar to the proportions for agricultural activities. The proportions of producers utilizing each type of family labor and temporary labor for livestock raising are lower (see Table 4.9).

Almost 99 percent of producers used some form of family labor for livestock raising and over 92 percent of producers used only family labor for livestock raising. This is much higher than the 62 percent of producers who used only family labor for agricultural production. This indicates that family labor has a much larger role in livestock raising than in general agricultural production. This is the case for the less specialized small farms and the more specialized medium and large farm sizes (Table 4.10).

Family labor accounts for an average of over 96 percent of livestock labor with employed labor only accounting for an average of around 3 percent. As was the case with agricultural labor, family labor has a relatively smaller role in livestock production on larger farms. Even on the largest farms however, family labor still accounts for over 82 percent of total livestock labor input.

The average total number of person days worked in livestock raising is 411.2, which is 61.92 percent of the average total days worked in agricultural activities. The regional average of total

person days worked in livestock raising varied between a low of 268 days in the North Central Coast to a high of 755 days in the North East South region. The use of labor for livestock raising varied in importance between 55.6 percent of total labor in North East to a high of 85.4 percent of total labor in the North East South region.

In common with agricultural labor, the daily cost of male labor in livestock is higher than that of female labor. The daily labor cost far all categories of worker is similar to that of agricultural labor except that of male temporary labor, which is relatively higher than all other categories. This may indicate that male temporary labor is only employed in livestock raising to perform relatively specialized tasks that attract higher wages. Other livestock workers may be unspecialized agricultural workers. The average cost of agricultural labor varies between D12070 per day in North West to 26920 per day in the North East South region.

The average total cost of livestock labor for all farms is D2,212,000 per year. The average total cost of labor for the 166 farms that use paid livestock labor is D29,449,000 per year.

4.4 Land Resources

Land uses reported by producers included cultivation, forestry, fisheries, pasture and animal housing. The average total area of land used by producers was 0.825 hectares. The total land area varied widely between regions with the lowest total land areas found in the fertile low-lying and delta regions and the highest in the Central Highlands region. The average cultivated area of land

was 0.44 hectares, varying between 0.28 hectares in the South Central Coast region and 0.94 hectares in the Central Highlands region (Table 4.11).

Cultivated land accounts for an average of 69.9 percent of total land area. The proportion of total land that is cultivated is highest on pig farms (70.54 percent) and lowest on bovine farms (66.28 percent). The low level of cultivated land on bovine farms is due to producers having larger areas of pasture and bovine production being concentrated in mountainous areas less suitable for cultivation. The average cultivated proportion of small farms was 72.81 percent, whilst that of large farms was 54.99 percent. The lower proportion of cultivated land on large farms reflects the relatively specialized and commercial nature of their production systems. These farms have an emphasis on animal production systems, rather than mixed farming systems. This is reflected in the regional cultivated land proportions shown in Table 4.12, where the lowest proportion of cultivated land is in the North East South region, which has the highest concentration of large farms.

The number of cultivated plots varied widely, with 348 (15.7 percent) of the producers not having any plots at all. Whilst these producers dud not have any cultivated land, they were not landless. These producers used land for purposes such as forestry, fishery and animal housing. The average total land area for the producers with no cultivated plots was 0.445 hectares and the average animal housing area for these producers was 0.032 hectares.

The average number of plots for all producers was 4.64 and the average number of plots for those producers with plots was 5.56. The average number of plots varied between 1.9 in the Mekong

River Delta to 8.6 in the North West. There are a number of possible land ownership structures that producers operate under. These include land owned[1] with title, land owned without title, land rented in, land rented out and usufruct land. The majority of land used by producers is either owned with title or owned without title. The proportion of land owned without title may be a function of the producer's ability to pay for usage rights, or it may simply reflect how advanced the land allocation and title distribution system is in a particular region.

The proportion of land owned with title varies between none and 100 percent and has an average of 56.27 percent. The proportion of land owned without title varies between zero and 100 percent with an average value of 39.9 percent. The lowest average proportion of land owned without title was 8.51 percent in North Central Coast and the highest was 57.27 percent in the North West Region (see Table 4.12).

Small farms have the lowest average proportion of land owned without title and large farms have the lowest proportion of land owned with title. This may be because most small farm households do not have the resources necessary to purchase additional land beyond the quota allocated to them by the government under the household responsibility system.

Producers rented land in for production, with an average size of rented area of 0.75 hectares. Almost 60 percent of these are in the Red River Delta or North West regions. 46 producers rented land out for production, with an average rented land area of 0.2 hectares. The Red River

[1] The government grants leases over parcels of land to households for a period of up to 50 years. This "title" allows the household usage of the land.

Delta region accounts for almost 38 percent of these transactions. Large farms have greater financial resources available to them to rent land and it is not surprising that the proportion of total land rented in is greater for large farms than either small or medium farms. However, the rented in land proportion for all farm sizes is small, ranging from 2.4 percent for medium farms to 5.9 percent for large farms.

Cultivated land can be used for a number of purposes. These are; single cropping, double cropping, triple cropping, garden plots and perennial crops. The most common type of system is double cropping. This accounts for an average of around 42 percent of cultivated land. Triple cropping is the next most common system with almost 19 percent of cultivated land (Table 4.13).

Double cropping is the dominant form of cultivation in all regions except the Mekong River Delta (extensive rice planting in this tropical area means that triple cropping is the dominant form of cultivation), North West and North East South (garden crops dominant) and the Central Highlands, where plantings of crops such as coffee mean that perennial cropping is the dominant cultivation type.

83 percent of producers have some flat cultivation land on their farm. For these producers the average flat land area is 0.42 hectares. This represents an average of almost 90 percent of the total cultivated land of these producers. The highest proportion of flat land in cultivated land is found in the deltas and coastal regions, while the lowest is in the Central Highland region. Around 65 percent of producers had irrigation on their farms (Table 4.14).

Only 19 producers had private grazing areas. These were an average size of 9.12 hectares and were located on average 905 meters from the household. 10 of the 19 private grazing areas belonged to farms classified as bovine farms. The majority of farms with private grazing areas are in the North West (10) and Central Highlands(5) regions. Almost 12 percent of producers had access to communal grazing areas.

Communal grazing areas are predominately used by bovine farms. Around 5 percent of poultry farms and 4 percent of pig farms have access to communal grazing land, compared with almost 48 percent of bovine farms. The average size of communal grazing areas is 104.37 hectares. The largest communal grazing areas are found in the upland regions of North West and Central Highlands. The communal grazing areas are located up to 15 kilometers from the household with an average distance of around 1.5 kilometers.

Communal grazing areas are shared between 2 and 1200 households. The average number of households per communal grazing area is 181. This equates to an average of 3.37 hectares of land per household. Table 4.15 shows that the number of households per communal grazing area is lowest in the Mekong River Delta region and the hectares per household are highest in the Central Highland region.

4.5 Livestock Characteristics

4.5.1 Pig Characteristics

At least one type of pig is kept by 1761 (79.6 percent) of producers surveyed. The highest inventories of pigs are kept by producers in the southern regions (Mekong River Delta and North East South). There are a number of large pig farms in these regions that have been developed to serve the Ho Chi Minh City market for pork. Crossbred pigs are the dominant type of pig in all regions except North East and North Central Coast, where local pigs are more common and North East South and Mekong River Delta regions, where exotic breeds dominate.

Pig farms have a higher proportion of crossbred and exotic pigs than poultry and bovine farms. The proportion of local pigs declines as farm size increases, while the proportion of crossbred and exotic pigs increases. This is to be expected, as higher levels of commercialization and specialization require faster growing pigs with higher lean meat proportions. The characteristics of crossbred pigs are more difficult to judge than those of exotic pigs, as the definition of crossbred pig is broad and encompasses many levels of genetic quality.

The average level of total pig inventory increased between 1998 and 1999, from 45.53 head to 60.59 head. The highest average producer inventory levels in 1999 were in the Red River Delta and Mekong River Delta regions, while the lowest was in the North East region. Average producer inventory levels declined slightly between 1998 and 1999 in Red River Delta, North East and North Central Coast. Average producer inventory levels increased in all other regions during this period (see Table 4.16).

Average inventory levels increase as farm size increases. Small farm inventories range between 1 pig and around 23 pigs with an average inventory level of around 13. Medium farms keep between 24 and 60 pigs, with an average inventory level of around 36. Large farm inventories are highly variable, with the largest commercial pig farm having inventories of almost 10,000. The average inventory of large farms is around 490. This is summarized in Table 4.17. As shown in Table 4.18, the dominant pig types in inventories are fatteners and piglets. In 1999, small and large fatteners accounted for almost 60 percent of inventory and piglets made up another 25 percent. 1998 to 1999 saw a shift in average inventory towards small fatteners and piglets, with these categories gaining an additional 6 percent of inventory share.

Local pig inventories have relatively larger proportions of piglets and sows than the average of all pig types. The proportions of boars and gilts are similar, and therefore the higher proportions of sows and piglets are balanced with lower proportions of small and large fatteners. In comparison to both local pigs and the average of all pig types, the inventory of crossbred pigs is biased heavily towards small and large fatteners. Fatteners account for an average of over 78 percent of crossbred pig inventory.

The breeding focus of exotic pigs is reflected in the distribution of pig types in exotic pig inventory. In comparison with other types of pigs, exotic pigs have a relatively high proportion of sows and piglets. These two categories account for an average of almost 65 percent of exotic pig inventory.

Nationally, almost 75 percent of producers with pigs have at least one crossbred or exotic pig. Around 65 percent only have crossbred or exotic pigs and 18.29 percent only have exotic pigs. The majority of producers in all regions except North East and North Central Coast keep only crossbred or exotic pigs. Producers with only exotic pigs are in the minority in all regions except for North East South and Mekong River Delta (Table 4.19).

Pig farms have a higher proportion of crossbred and exotic pigs than poultry farms and bovine farms. Pig farms are also more likely to have only crossbred or exotic, or only exotic pigs. A higher proportion of large farms have some crossbred or exotic pigs, all crossbred and exotic pigs or all exotic pigs than small farms.

While crossbred pig adoption has been relatively widespread amongst different farm sizes, adoption of exotic pigs has been far more widely accepted by large farms. Almost 45 percent of large farms keep exotic pigs and almost all of these have adoption rates of 100 percent. In contrast, less than 10 percent of small farms keep exotic pigs and less than 8 percent have adoption rates of 100 percent. This information is summarized in Table 4.20.

Exotic, crossbred and local pigs exhibit different reproductive characteristics. Exotic and crossbred sows have earlier average weaning ages than local sows. Parturition intervals are shorter for crossbred and exotic sows than for local sows. However, the first parturition age, number of parturitions per lifetime and the average litter size is smaller than for local sows.

Information presented in Table 4.21 shows that the expected lifetime production of weaned piglets[2] of an exotic sow is around half of that of a local sow.

The relatively poor reproductive performance of crossbred and exotic sows relative to local sows may be the result of a number of factors. Crossbred and exotic pig genetic improvement may not be matched by appropriate feeding or other management techniques. Veterinary staff may not have sufficient expertise in dealing with diseases peculiar to introduced exotic and crossbred pigs. Exotic and crossbred pigs may not be suitable for the climate in Vietnam. All of these factors could cause relatively poor reproductive performance in exotic and crossbred sows. This highlights the fact that exotic species introduction and breed improvement programs should occur as part of an integrated program. The differences in reproductive characteristics of local, crossbred and exotic sows were consistent between regions, producer types and farm sizes.

In addition to differences in reproductive performance, local, crossbred and exotic pigs also exhibit differences in fattening characteristics. The average feed cost ratio (cost per kilogram of weight gain) of exotic pigs is higher than that of crossbred or local pigs. Exotic and crossbred pigs are slaughtered at an average younger age than local pigs and at a higher slaughter weight (Table 4.22). The survival rate[3] of crossbred pigs was higher than that of either crossbred pigs or exotic pigs. However, the survival rates for all breed types are greater than 96.9 percent. A possible reasons for the slightly better performance of crossbred pigs over exotic pigs is that exotic pigs may not be as well adapted to local climatic and disease conditions as crossbred pigs. Local pig

[2] Lifetime production of weaned piglets is defined as NP*LS*WP ; where NP is the number of parturitions per lifetime, LS is the size of litter per parturition and WP is the proportion of piglets expected to survive until weaning.
[3] Percentage of animals born which lived until an adult slaughter age.

survival rates are 100 percent in all regions except South Central Coast. Producers surveyed in North East South and Mekong River Delta did not report local pig survival rates. Crossbred pig survival rates were highest in North Central Coast and lowest in Central Highlands. Exotic pig survival rates were lowest in South Central Coast and highest in Mekong River Delta. Crossbred pig survival rates were higher than exotic pig survival rates in all regions except Mekong River Delta (Table 4.23).

4.5.2 Chicken Characteristics

Almost 49 percent of producers (1078) kept at least one type of chicken. Average chicken inventories are highest in the North East South and Mekong River Delta regions. Chicken inventories are dominated by exotic chickens, which account for the majority of chickens kept by producers in all regions. Small farms have the highest proportions of local chickens, while large farms have the largest proportions of crossbred and exotic chickens.

The average per producer chicken inventory level increased between 1998 and 1999 from 255.7 head to 300.3 head. Chicken inventory increased in all regions. Highest average chicken inventories are in North East South and Mekong River Delta and the lowest average inventories are in North East (see Table 4.24). Chicken inventory levels increase with farm size, with large farms having an average inventory level of around 1628 chickens compared with the average inventory level of 90 for small farms. Medium farms have between 200 and 700 chickens with an average inventory size of around 388.

Average chicken inventories are split at around 40 percent meat chickens, 30 percent chicks, 25 percent layers and 3 percent roosters. These proportions remain relatively constant for local, crossbred and exotic chickens. (see Table 4.25)

Over 75 percent of producers recorded increases in the level of total chicken inventory between 1998 and 1999. A majority of producers recorded increases in all categories of chicken between 1998 and 1999. Almost 60 percent of producers have only local chickens, 38.31 percent have only crossbred and/or exotic and 32 percent have only exotic chickens. A higher proportion of large and medium farms and farms classified as poultry farms have only crossbred and/or exotic chickens. Table 4.26 shows that the proportion of producers with only exotic and/or crossbred chickens is higher in the southern regions than in other regions.

The table also shows that producers generally either specialize in local chickens only or specialize in crossbred/exotic chickens. The proportion of producers with both local and crossbred/exotic chickens on the same farm is very small. This proportion averages 2.6 percent nationally and varies between 0 percent in North West and South Central Coast and 4.38 percent in North East.

The reasons for the dominance of exotic chickens in Viet Nam are clear from an examination of the figures in Table 4.27. Exotic and crossbred chickens have better feed conversion ratios than local chickens and can be turned off at a much younger age with higher bodyweight.

The survival rate of exotic chickens and crossbred chickens is greater than that of local chickens by a significant amount. Almost 20 percent of local chickens born do not survive until adult slaughter age. Local chicken survival rate varies between 76.86 percent in Central Highlands to over 90 percent in North Central Coast. Central Highlands also has the lowest crossbred chicken survival rate, at 73.5 percent. Exotic chicken survival rates vary between 86.23 percent in Mekong River Delta and 95.24 percent in North Central Coast. Exotic chickens have the highest survival rate in all regions, except Mekong River Delta and North West, where crossbred chickens have the highest survival rates (Table 4.28).

4.5.3 Duck Characteristics

Only 163 producers (7.37 percent) have any type of ducks. The average inventory for all producers is 225. The highest inventories are found in the Central Highlands and Mekong River Delta regions. Lowest inventories are in North East South and North East.

As Table 4.29 shows, the average duck inventory level increased between 1998 and 1999 from 188 head to 225 head. Duck inventory increased in all regions. Highest average duck inventories are in Central Highlands and Mekong River Delta and the lowest average inventories are in North East South. Duck inventory levels increase with farm size, with large farms having an average inventory level higher than small farms.

Average producer duck inventories are split at around 30 percent meat ducks, 10 percent ducklings, 50 percent layers and 3 percent drakes. These proportions remain relatively constant

for local, crossbred and exotic ducks (Table 4.30). Over 96 percent of producers recorded increases in the level of total duck inventory between 1998 and 1999. A majority of producers recorded increases in all categories of duck between 1998 and 1999.

Local ducks are the dominant type, with almost 60 percent of producers indicating that they only had local ducks. Local ducks are dominant in all regions except Central Highlands and Mekong River Delta where crossbred/exotic ducks dominate and North East South, where all producers reported that they only kept exotic ducks. The areas with the highest proportions of exotic ducks are North East South and North East (Table 4.31).

The average production performance advantages of exotic and crossbred ducks can be seen in Table 4.32. Crossbred ducks have the best feed cost ratio and have a younger average slaughter age and slightly higher average slaughter weight than local ducks. Exotic ducks have the worst feed conversion ratio, but the lowest slaughter age and highest slaughter weight. Exotic ducks are predominately kept in large, specialized farms and intensively fed high quality rations in order to gain weight quickly.

The survival rate of local and exotic ducks is around 6 percent higher than the survival rate of crossbred ducks. In the northern regions of North East, North West and North Central Coast, exotic duck survival rates are higher than local ducks. In the southern regions of South Central Coast, Central Highlands and Mekong River Delta, crossbred or exotic duck survival rates are lower than local ducks (Table 4.33).

4.5.4 Cattle Characteristics

524 producers (23.68 percent) have at least one type of cattle with an average inventory level of 7.9 head. The inventory level varies between regions, with the lowest inventories in the Red River Delta and the Mekong River Delta regions and the highest in the Central Highlands region (Table 4.34). The average cattle inventory level increased slightly between 1998 and 1999 from 7.57 head to 7.9 head. Cattle inventory increased between 1998 and 1999 in all regions except North East and South Central Coast.

Average cattle inventory levels decrease with farm size, with large farms having an average inventory level lower than small farms. This is because very few farms classified as large specialize in cattle raising. Producers classified as specialized in cattle raising, not surprisingly have average inventory levels higher than those specialized in pig or poultry raising. These producers are mostly concentrated in the Central Highlands region.

Average cattle inventories are split at around 10 percent meat cattle, 40 percent calves and young cattle and 50 percent cows and bulls. These proportions remain relatively constant for local and crossbred cattle. A relatively smaller proportion of exotic cattle are used for meat purposes (Table 4.35). Almost 85 percent of producers recorded increases in the level of total cattle inventory between 1998 and 1999.

The majority of producers (75.19 percent) have only local cattle. Producers with only local cattle are in the majority in all regions except South Central Coast, Central Highlands, North East South

and Mekong River Delta. In these areas, the majority of producers have only crossbred or exotic cattle. The region with the highest proportion of producers with exotic cattle is North East South, where there are a number of dairy herds in the sample. While Central Highlands has the highest average inventory levels, none of the producers in that region kept herds of purely exotic cattle. The Mekong River Delta region, which has the smallest average inventory levels, is the only region where all producers have only crossbred or exotic cattle (Table 4.36).

Exotic and crossbred cattle are older at first calving than local cattle, and have longer calving intervals. This leads to a lower number of average calvings per lifetime (Table 4.37). The production performance of crossbred cattle is superior to that of local cattle. Crossbred cattle exhibit better feed cost ratios and higher slaughter weights at an average lower turn-off age (Table 4.38).

Survival rates for exotic and crossbred cattle are higher than for local cattle. The difference between survival rates is not great, with the lowest rate being over 98.8 percent. Survival rates for local, exotic and crossbred cattle are 100 percent in all regions except local cattle in Red River Delta and local and crossbred cattle in Central Highlands (Table 4.39).

4.5.5 Buffalo Characteristics

13.3 percent (296) of producers had at least one buffalo. The average inventory size for producers with buffalo was 2.7 head, with a variation of between 2 head per producer in North East South and 4 head in the Central Highlands (Table 4.40). Inventory levels were highest on small farms

and farms designated as bovine farms. All of the producers kept exclusively local buffalo, with no crossbred or exotic animals reported in use either for draught or milk.

Average buffalo inventories are split at around 20 percent meat buffalo, 26 percent calves and young buffalo and 54 percent cows and bulls (Table 4.41). Almost 90 percent of producers recorded increases in the level of total buffalo inventory between 1998 and 1999. A majority of producers recorded increases in all categories of buffalo between 1998 and 1999.

Table 4.42 shows that the reproductive performance of is slightly poorer than that of local cattle. Buffalo are older at first calving and have longer calving intervals than cattle. This means that buffalo have around one less calving per lifetime than local cattle. The productive performance of local buffalo compared to local cattle can also be seen in Table 4.43. These are based on a small number of responses, as in almost all cases the primary aim of keeping water buffalo is for draught purposes, rather than for meat production. The average buffalo survival rate is 98.83 percent. This varies between 90 percent in Red River Delta to 100 percent in Central Highlands.

4.6 Livestock Sales

4.6.1 Pig Sales

Of the 1761 producers who kept pigs, 1748 (or over 99 percent) were involved in pig sales. Annual sales by producers vary from a low of a single pig to a high of 23023 head. The average annual sales level is roughly 110 head. Average annual sales levels of exotic pigs are higher than

those of local pigs and crossbred pigs. The level of overall pig sales and local, crossbred and exotic sales on large farms is higher than on small farms. Specialized pig farms have the highest overall sales of pigs, as well as the highest average sales levels of crossbred and exotic pigs.

Pig sales levels are highest in the North East South, Mekong River Delta and Red River Delta regions. Exotic pig sales are higher than crossbred or local sales in all regions except North West and North Central Coast (where local pig sales are dominant) and North East South (crossbred sales dominant) (Table 4.44).

Annual pig sales revenue per producer varies between D280,000 and D22.4 billion. The average sales revenue was around D73 million. Sales revenue for exotic and crossbred pigs was higher than that for local pigs. Patterns of sales revenue by region, farm size and farm type are similar to that of pig sales levels. Average annual sales revenues for small farms were around D14.6 million compared with an average of D64.7 million for medium farms and an average of D557.7 million for large farms.

4.6.2 Chicken Sales

Chickens are sold by 1036 of the 1078 producers who keep chickens. Annual sales levels vary between 1 head and 150,000 head with an average level of 1559 head. Average annual sales of exotic and crossbred chickens are far greater than local chickens. Average annual sales levels on large farms are almost 10,500 head, compared with an average of 285 head for small farms.

Sales of exotic chickens are the dominant sales type in all regions except Mekong River Delta, where crossbred sales are greatest. Chicken sales increase with the size of the farm, except local chicken sales levels, which are greatest in medium farms.

Revenue from chicken sales varies between D35,000 and D1.82 billion with an average level of D31.025 million. Chicken revenue distribution amongst the regions and between farm sizes and types follow a similar pattern to that described for sales levels (Table 4.45). Average annual chicken sales revenue for small farms is around D5.9 million, compared with an average of D204.57 million for large farms.

4.6.3 Duck Sales

A lower proportion of producers with ducks is involved in selling ducks than was the case for pigs and chickens. 71.9 percent of the 163 producers with ducks made at least one sale during the year. Small farms have the lowest proportion of producers making sales (69.7 percent), followed by large farms at 71.43 percent and medium farms at 81.5 percent. A lower proportion of small farms making duck sales than sales of other animals may be explained by relatively higher levels of home consumption. Lower levels of sales on large farms are because a number of large duck farms are involved in breeding and concentrating on egg sales to hatcheries.

The number of ducks sold by producers during the year varied between 3 and 30000, with an average level of 1160.88 head. Average annual sales levels of exotic ducks are higher than either local or crossbred ducks. Although inventories of local ducks are relatively high (Section 4.5.2), these are concentrated on small farms which have relatively lower sales levels.

Sales of crossbred and exotic ducks, as well as total sales levels are greater on medium and large farms than small farms. Duck sales are almost non existent on bovine farms and are substantially larger on poultry farms than on pig farms. The average size of local duck sales in Red River Delta and South Central Coast is greater than crossbred or exotic sales. Crossbred sales have the highest level in Central Highlands. In all other regions, exotic sales are the dominant type.

Revenue from duck sales varies between D100,000 and D153 million with an average level of D11.787 million. Duck revenue distribution amongst the regions and between farm sizes and types follows a similar pattern to that described for sales levels with average sales revenues on large farms (D52.17 million) being more than ten times greater than that on small farms (D4.981 million) (see Table 4.46).

4.6.4 Cattle Sales

Only 68.5 percent of producers with cattle are involved in selling cattle. Medium sized farms have the highest proportion of sellers with 72.22 percent. Only 12 out of 18 large farms with cattle are involved in selling. As reported in Section 4.5.4, exotic cattle inventories are relatively miniscule amongst the sampled producers. This is reflected in the reported sales levels of exotic cattle, which have been reported by only four producers. This section will concentrate on sales and revenue from local and crossbred cattle.

Average sales levels of cattle are largest on medium sized farms and also on bovine farms. The highest sales inventories are in the Central Highlands area, which also has the highest sales of crossbred cattle. The Central Highlands has the only specialized cattle market in Viet Nam and as shown in Table 4.47, also has the relatively highest levels of producer cattle inventory. Cattle sales revenue follows a similar pattern to cattle sales levels between different farm types and sizes.

4.6.5 Buffalo Sales

31 percent of the 296 producers with buffalo sold at least one buffalo during the year. All of the buffalo sold were local. This is in line with the reported inventory of buffalo, which also consisted entirely of local buffalo. Sales levels varied between 1 and 5 head, with an average of 1.58 head sold. The highest annual average sales were recorded in the Central Highlands region and on medium farms and specialized bovine farms.

Revenue varied between D280,000 and D9.6 million, with an average revenue level of D2.555 million. Following the sales patterns, the highest revenues were recorded in the Central Highlands region, medium farms and bovine farms (Table 4.48).

4.7 Livestock Inputs

Total cost of livestock rearing consists of three major components. These are cost of labor, cost of livestock breeding and fattening stock purchase and cost of feeding. The average total cost level

was D54.151 million. The average level of total cost was lowest in the Central Highlands region (D15.002 million) and highest in North East South (D240.345 million) (Table 4.49).

Total cost levels increase as farm size increases. Large farms have average total cost levels more than 20 times greater than small farms (Table 4.50) Average livestock raising costs are dominated by feed costs, which account for almost 77 percent of the average cost levels. Animal stock purchase costs are around 21 percent of the total. Labor costs (which do not include household labor) make up less than 2 percent of the total level. Labor costs as a proportion of total costs increase with farm size. This is to be expected, as larger farms employ a higher proportion of paid temporary and permanent workers than smaller farms. The commercialized fattening activities commonly undertaken by large farms mean that the proportion of feed costs in total costs of large farms is also higher than small or medium farms. Animal stock inputs are a higher proportion of total costs on small farms than on large farms (Table 4.51).

Feed purchase costs as a proportion of total costs are highest in the North East South and Mekong River Delta regions, reflecting both the relatively high cost of feedstuffs in those regions and the predominance of large scale farms. Feed purchases as a proportion of total input costs are lowest in the Central Highlands region, reflecting the concentration of bovine farms in this location (Table 4.52).

As discussed in Section 4.2.2, labor is primarily provided by the producer's family. This is the case for all producer sizes, but is more pronounced in small farms. Valuing the family labor input at the same rate as paid permanent labor results in a higher average cost of livestock production. The

average value of family labor is D5.287 million, almost twice the average cost level of paid labor. Including this shadow labor value increases the average cost level to D59.432 million. The effect of inclusion of household labor on total costs has been most pronounced on small farms. Total costs for small farms including household labor are 34.41 percent higher than if household labor is not included. The relative impact on large farms is smaller, as the proportion of household labor used on large farms is lower than on small farms (Table 4.53).

The inclusion of an imputed value for household labor has increased the proportion of labor costs in total costs to 34.77 percent. As shown in Table 4.54, this change has had the largest impact on the small farm production cost levels. Labor as a proportion of total costs has increased to 42.66 percent. Large farms had the highest proportional level of paid labor costs, but have the lowest combined proportional level of paid and unpaid labor costs.

Relatively high proportions of small farms and bovine farms in the Central Highlands and North West regions mean that labor costs are a higher proportion of costs in these regions than in the rest of the country. The presence of large farms in North East South and Mekong River Delta mean that these areas are those with the highest proportional feed costs and lowest proportional labor costs (Table 4.55).

4.7.1 Pig Inputs

Local and improved pigs are kept for different purposes. Over 95 percent of producers indicated that they kept local pigs for the primary purpose of breeding or production of piglets for sale. In

contrast, over 80 percent of producers indicated that their primary purpose for keeping crossbred pigs was for fattening. Exotic pigs were kept for both fattening and breeding purposes.

The difference in end use of local and improved pigs means that the feeding systems used for local, crossbred and exotic pigs are different. Local pigs are predominately fed using only roughage, with a roughage/concentrate diet the second most common. Crossbred pigs are mostly fed on roughage/concentrates with a smaller proportion being fed only on roughage. The most common type of feeding system for exotic pigs is a diet of complete feed. The next most common is a roughage/complete feed diet.

Local and improved pigs are fed a variety of feed types, including crude materials, fodder crops and quality feeds (complete and concentrate). Types of crude material and fodder inputs for local and improved pigs are similar. The most popular crude inputs for local and improved pigs are rice bran and maize while the most popular fodder inputs are sweet potato leaves and water spinach. Local and improved pigs are fed differing types of quality feed inputs. The most popular types of quality inputs for local pigs are general complete feed and concentrated feed for breeding. Improved pigs are fed concentrated feed for commercial production and complete feed for commercial production. Average feed prices are shown in Table 4.56.

The proportional levels of feed used for both local and improved pigs are shown in Table 4.57. For both local and improved pigs, quality feed makes up the smallest proportion of total feed,

followed by fodder crops[4] and crude materials. Improved pigs are fed a higher proportion of crude material and a substantially higher proportion of quality feed than local pigs.

Crude and quality feed usage is highest in North East South and Mekong River Delta regions. Large farms and specialized pig farms have the highest crude and quality feed usage rates and the lowest fodder usage rates.

4.7.2 Chicken Inputs

The primary purpose of keeping local, crossbred and exotic chickens is most commonly for fattening. Fattening is progressively more important for crossbred and exotic chickens over local chickens. The proportion of producers keeping local chickens for fattening is just over 50 percent, but for exotic chickens is just under 70 percent.

The different end purposes and dietary requirements mean that the feeding systems employed for local, crossbred and exotic chickens are different. The most common feeding systems for local chickens are grazing and roughage followed by roughage alone. Crossbred chickens are fed on roughage and concentrate or (to a lesser extent) grazing and roughage. Exotic chickens are fed on complete feed, or on a combination of roughage and complete feed. Prices are shown in Table 4.58.

Chicken feed can consist of crude materials, fodder and quality feeds. The most common forms of crude material fed to local chickens are rice paddy and maize while improved chickens commonly

[4] The figures used in the table are fresh weight. Converting fresh fodder quantities (as specified by the producer) into a dry

eat maize and rice bran. Water spinach is the most common fodder crop for both local and improved chickens. Local chickens also commonly eat sweet potato leaves while improved chickens are fed banana stalks. Local and improved chickens use broiler feed and chick feed, with broiler feed being the most common for local chickens and chick feed the most popular for improved chickens.

Local chickens are fed mostly on crude material, with small quantities of fodder and quality feed supplementing this diet. Improved chickens are predominately fed on quality feed and crude material with only a miniscule amount of fodder. Improved chickens proportional intake of crude feed and fodder is less than that of local chickens, but intake of quality feed is substantially higher (Table 4.57).

4.7.3 Duck Inputs

Local, crossbred and improved ducks are kept for largely similar purposes. These are fattening and breeding/egg production. The similarities in end use of local, crossbred and exotic ducks means that their feeding systems are similar. Local and crossbred ducks are most commonly fed on grazing and roughage followed by grazing, roughage and concentrate. Exotic ducks are commonly fed on grazing roughage and concentrate followed by grazing and roughage.

Table 4.59 shows the feed inputs used for local and improved ducks. Local ducks are fed a diet based on crude inputs with supplementary feeding of quality feeds and a small amount of fodder. Improved ducks on average are fed proportionately less crude material and more fodder and

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matter equivalent (DM) is not possible in a consistent manner given the variety of types of forage crops used.

quality feeds. Crude material is the dominant feed type for improved ducks in all regions except North East South, where the duck ration is dominated by quality feeds with a smaller proportion of crude inputs and no fodder feeding. Average prices of duck feed inputs are shown in Table 4.57.

4.7.4 Cattle Inputs

Local cattle and improved cattle are kept predominately for breeding and draught. The diets for all both types of cattle are somewhat similar, with the most common system being grazing supplemented with roughage feeding. Prices are shown in Table 4.60. Both improved and local cattle are fed diets that consist primarily of fodder with some crude materials. The low level of commercialization of the industry means that quality feed is rarely fed, with only 6 producers indicating that they used quality feed. Crude intake for local cattle is usually rice bran or dried cassava, whilst for improved cattle, rice bran and maize are common ingredients. Fodder for improved and local cattle is predominately rice straw and sweet potato leaves.

The differences in dietary requirements between local and improved cattle can be seen from the figures in Table 4.57. Improved cattle are fed a greater proportion of crude material, relatively lower proportions of fodder and a small proportion of quality feeds.

4.7.5 Buffalo Inputs

Buffalo are kept primarily for draught purposes and are usually grazed with supplementary feeding of roughage and small amounts of crude material. Buffalo are fed sweet potato and rice bran as crude material and rice straw and sweet potato leaves as fodder. Buffalo are fed on a diet

consisting of around 7 percent crude materials and 93 percent fodder. Average prices of buffalo feed inputs are shown in Table 4.61.

4.8 Marketing of Livestock

Producers can sell animals and animal products to a wide variety of buyers, including other producers, private and government businesses and cooperatives. The buyers most often used for all products were farmers, followed by slaughterhouses. The least common buyers of products were district owned enterprises.

Table 4.62 shows the proportions of buyers of different types of livestock from producers. Farmers make up over 25 percent of purchasers for all types of livestock. State owned enterprises make up a very small proportion of purchases, and are only involved in the purchase of pigs. The most common buyers of pigs are slaughterhouses, followed by other farmers and assemblers. A relatively widespread network of pig slaughterhouses exists in Viet Nam to service the pork demand in urban centers. Producers close to these slaughterhouses can sell to them directly. Producers located further from the slaughterhouses (or who may have small lots to sell) may use assemblers. Farmers also sell slaughter and non-slaughter stock to other farmers.

Chickens are usually brought to market live and slaughtered in the marketplace upon sale or slaughtered later by the buyer. Generally only chicken destined for further processing is slaughtered in a designated slaughterhouse. Accordingly, slaughterhouses make up only around 2

percent of chicken buyers. The majority of chicken buyers (54 percent) are assemblers and wholesalers, with the remaining purchasers being largely retailers and farmers.

The pattern of buyers for ducks is largely the same as that of chickens. There is only a miniscule designated slaughterhouse system for ducks, so the proportion of sales to slaughterhouses is less than 1 percent.

Cattle are kept for draught, milk and meat. There is only one dedicated live cattle market in Viet Nam, so the proportion of sales to wholesalers is quite small. The majority of cattle sales are to farmers. These sales are largely sales of draught cattle, breeding and feeding stock. Slaughter cattle are sold to assemblers or direct to slaughterhouses.

Buffalo are kept almost exclusively for draught purposes. Accordingly, the majority of sales of buffalo are to other farmers. The proportion of buffalo sold directly to slaughterhouses is smaller than cattle, because buffalo sent to slaughter are generally only old cull animals, whereas a proportion of cattle sold to slaughter are purpose fattened.

Table 4.63 shows the average proportions of sales to buyer types by producers who sell to that type of buyer for the product. Producers who sell pigs to slaughterhouses sell an average of 75.22 percent of their pigs to slaughterhouses. Retailers have the lowest intensity levels for pig sellers, representing only 2.65 percent of sales for producers who sell to them.

Assemblers and wholesalers have the highest intensity levels for producers who sell chickens to them, with intensity levels of above 65 percent. Producers who sell chickens to slaughterhouses only sell an average of 3.02 percent of their product to the slaughterhouse.

In common with chickens, assemblers and wholesalers have the highest intensity levels for producers who sell ducks to them. Slaughterhouses have the lowest intensity levels for duck sales.

Dairy cattle sales to farmers have the highest intensity levels[5], capturing over 58 percent of sales of producers who sell to them. The intensity level for slaughterhouses is 25 percent, indicating that producers who sell to slaughterhouses only use them for a quarter of sales. This possibly represents the portion of male calves and cull cows in the total sales level. None of the intensity levels for sales of non-dairy cattle is greater than 12 percent. This indicates that producers sell a variety of products to a wide range of sellers.

The intensity level for buffalo is highest for sales to other farmers. For producers that sell to other farmers, this class represents over 75 percent of total sales. This reflect the fact that buffalo are primarily raised for draught purposes and are sold to other farmers for this purpose.

Animals and animal products can be sold at a variety of levels including at the farmgate, at market and by contract. Farmgate sales are the dominant type of sale, accounting for over 83 percent of all sales. Marketplace sales represent 13.98 percent of sales, with contracts and other types of

[5] Although the intensity level for "other" is 82 percent, it represents an amalgam of different types of buyer and hence possibly would have a lower intensity level if broken into component buyers.

sale only representing 1.98 and 0.38 percent respectively. Small farms use markets more than large farms. Large farms use contracts more frequently than small farms.

Sales to assemblers, slaughterhouses and wholesalers make up over 60 percent of total sales and the majority of these sales are made at the farmgate. This raises potential issues of lack of market information and power for small-scale producers. Farmgate sales are most common in the Central Highlands and least common in the North Central Coast region. In this region, marketplace sales are the most common (Table 4.64).

Farmgate sales are the major type of sale for all commodities except milk (mostly sold on contract). However, relatively large proportions of chickens, chicken eggs and duck eggs are sold in the marketplace. Duck eggs are also frequently sold on contract to hatcheries (Table 4.65).

The average distance to the nearest buyer for all product types was around 3.4 kilometers. Buyers for pigs were the furthest away from the producer at an average of 9.67 kilometers, while the closest were dairy cow buyers at an average of 2 kilometers. Buyers in the South Central Coast region were on average around 6.4 kilometers from producers, while in the Red River Delta the average distance was only 1.22 kilometers. Producers make between 83.6 percent and 100 percent of their market sales to the nearest buyer, depending on product type as shown in Table 4.66.

The majority of producers indicated that the nearest buyer for their product was within the same district. A number of producers indicated that their nearest buyers were outside their district,

province or even region. The largest proportion of out of district buyers was for ducks, with 9.11 percent. 1.52 percent of producers selling chickens indicated that the nearest buyer for them was outside their region. Producers selling ducks all claimed that their nearest buyer was within their region, cattle sellers all have nearest buyers within the province and buffalo sellers nearest buyers are all within the district (Table 4.67).

4.9 Procurement of Inputs

Producers can source inputs (such as breeding stock, meat production stock, feed and veterinary services) from a wide variety of sources including other farmers, traders, private business and government enterprises and agencies. The choice of input source is made on the basis of many factors including price, convenience and provision of ancillary services. Producers on average obtain the highest proportions of their inputs from private businesses and farmers.. The private sector (farmers, traders and other private business) provides an average of over 75 percent of all inputs to used by producers, with government and cooperatives only supplying an average of 15.57 percent of the inputs used by producers. Large farms are more likely than small farms to source inputs from private business and government, while small farms on average obtain a higher proportion of their inputs from farmers and trader.

Table 4.68 shows the average proportions of breeding stocks purchased from different sources by producers. The largest average proportion of pig breeding stock and cattle breeding stock is sourced from other farmers. In contrast, the largest average proportion of chicken breeding stock is obtained by producers from other private business. Only a small average proportion of breeding stock is sourced from the producer's cooperative or from MARD. These sources account for only an average of 0.2 percent of pig breeding stock, 1.76 percent of poultry breeding stock and no cattle breeding stock. In addition only a very small proportion of either pig or poultry breeding stock is sourced through government enterprises such as breeding centers.

For pig and poultry breeding stock, small farms are more reliant than large farms on other farmers for breeding stock inputs. (Table 4.69) On average, large farms obtain a higher proportion of their inputs from government enterprises, cooperatives and MARD. For cattle breeding stocks, there is little difference in the breeding stock input patterns of different size farms. Other farmers are the dominant supply source for pig breeding stock in all regions except North East South, where producers obtain on average a high proportion of breeding stock from non private sector sources (GOE, cooperative, MARD) (Table 4.70).

Government owned enterprises also provide a high average proportion of pig breeding stocks to producers in Mekong River Delta, South Central Coast and Central Highlands. Other private business is the dominant supplier of chicken breeding stocks in all areas except Red River Delta (traders) and North East South (government owned enterprises). Farmers supply the highest average proportions of cattle breeding stock inputs to producers in all areas except in North East South and Mekong River Delta, where farmers indicated that they obtained all cattle breeding stock inputs from other private business.

The sources of meat stock inputs (fattening animals) are shown in Table 4.71. Producers indicated that they obtained all stock inputs for cattle meat production from the private sector. Producers said that on average, they obtained 80 percent of their poultry meat stock and 76 percent of pig meat production stock from private sources.

Veterinary inputs are primarily obtained from private business, but the dominant source of veterinary service is the cooperative. MARD is also involved in the provision of both veterinary

inputs and veterinary services. (Table 4.72) Private business is the dominant supplier of veterinary inputs in all regions except Red River Delta and North West, where traders dominate supply. Veterinary services are predominately supplied by cooperatives, except in North East South, where private business is the largest supplier.

Traders and other private businesses are on average the major sources of feed inputs for producers, including raw feed, complete feed and feed supplements. Producers also obtain an average of almost 17 percent of raw feed inputs from other farmers. The involvement of the government and cooperatives in feed provision is almost negligible with the private sector providing an average over 95 percent of all feed inputs procured by producers. (Table 4.73) The highest average proportion of raw feed is procured from traders in the northern regions of Red River Delta, North East and North West. In the rest of the country, other private business accounts for the highest average proportion of raw feed inputs procured by producers. Small farms procure an average larger proportion of raw feed from other farmers, while large farms procure on average the highest proportions from other private business. As was the case with raw feed, producers in the northern regions procure the highest average proportion of complete feed from traders, while producers in the southern regions procure the majority of feed from other private business.

As was the case with supplies of feed, private business and traders dominate the supply of equipment to processors. (Table 4.74) The highest average proportion of equipment supply in southern regions is from other private business and the highest average proportion of equipment supply in Red River Delta and North East is from traders.

The average distance to the nearest input supplier was around 5.84 kilometers. Suppliers for veterinary services were the closest at an average of 1.78 kilometers (supply is dominated by cooperatives) and suppliers of pigmeat production stock were the furthest away at an average distance of 49.57 kilometers[6].

Suppliers in the North East South region were on average around 11.97 kilometers from producers, while in the North West the average distance was only 2.62 kilometers. Producers purchase an average of between 83.55 percent and 100 percent of their inputs from the nearest supplier, as shown in Table 4.75.

The majority of producers indicated that the nearest supplier for inputs was within the same district. A number of producers indicated that their nearest input suppliers were outside their district, province or even region. The proportions of these remote input suppliers are higher than that of remote product buyers. The largest proportion of out of district suppliers was for poultry breeding stocks, with 36.43 percent. 8.36 percent of producers indicated that the nearest supplier of poultry breeding stocks was outside their region. All cattle meat production stock suppliers were within the same region as the producer. All poultry meat stock suppliers were within the same region as the producer (Table 4.76).

4.10 Crop Production

[6] The long average distance is mostly due to 2 producers in North East South indicating that they obtained piglets from Red River Delta for fattening.

Over 70 percent of producers grow at least one type of crop in addition to producing livestock. The proportion of producers growing crops varied from a low of 22.98 percent in North East South to a high of over 88 percent in South Central Coast. Livestock producers who were classified as small farms were more likely to grow at least one form of crop than large farms.

Rice was the most commonly grown crop, with over 67 percent of livestock producers reporting that they produced at least some rice on their farm. This was over three times the producers of the next most popular crop, maize. Potato was the least common crop, only being grown by 2.17 percent of producers.

Rice was the most commonly grown crop in all regions. In the regions north of South Central Coast, rice is grown by at least 75 percent of producers. Less than 50 percent of producers in the Central Highlands region grow rice. This is hardly surprising given the relatively cooler climate and the lower levels of water and flat land availability. Rice is only grown by 15.92 percent of producers in North East South and 39.87 percent of producers in Mekong River Delta. This reflects the low proportion of producers in this region who grow any from of crop. Despite the suitability of these regions for cropping (and in particular, rice paddy), producers have found it more profitable to concentrate on livestock production systems.

Maize is the second most commonly grown crop, with over 20 percent of producers reporting growing at least some maize. The proportion of maize producers is over 13 percent in the northern and central regions and almost non-existent in North East South and Mekong River Delta. The largest proportions of maize growers are found in North East and Red River Delta. Livestock

producers in these regions are less specialized and are more likely to use their own production of maize for animal feed. More specialized producers in regions such as North East South and Mekong River Delta are likely to buy in maize for feed from specialized maize producers.

Cassava is only grown by 6.73 percent of all producers. Cassava is predominately grown in the northern regions of Red River Delta, North East and North West. Between 10 and 25 percent of producers in these regions are involved in growing cassava. The proportions of producers growing cassava in other regions are all less than 5 percent.

Sweet potato is grown by almost 20 percent of producers nationally. Apart from rice, sweet potato is the only crop that was reported to be grown by producers in all regions. The widespread production of sweet potato is reflected in the fact that sweet potato leaves are one of the most popular forms of fodder for livestock in Viet Nam. Sweet potato is more widely grown in the northern regions, with between 15 and 42 percent of producers in regions from North Central Coast north growing sweet potato. Less than 5 percent of producers in other regions are sweet potato growers.

Potato is the least commonly grown crop, with only 2.17 percent of producers reporting potato production. Potato production is most common in the Red River Delta region, and only occurs in that region, North East and North Central Coast.

Groundnut production by livestock producers is primarily a northern phenomenon, with the only southern production being 1.54 percent of South Central Coast and 0.5 percent of North East

South producers reporting groundnut production. Northern production is relatively evenly distributed, with the largest proportion of producers being in the North Central Coast region.

Soybean production by livestock producers is primarily undertaken in North East, where 13.27 percent of producers are involved in soybean production. Production in all other regions accounts for less than 5 percent of total producers.

Livestock producers in all regions except North Central Coast and North East South carry out sugarcane production. Less than 7 percent of producers in all these regions grow sugarcane except North West, where almost 29 percent of producers grow sugarcane. Regional proportions of producers growing various crops are given in Table 4.77.

Average rice production area is 0.66 hectares. Cultivated area varies from an average of 0.377 hectares in North East to 2.19 hectares in Mekong River Delta. Annual production of rice varies between 1.769 tons in North West and 10.379 tons in Mekong River Delta, with an average level of 2.84 tons. Average productivity is lowest in Mekong River Delta (3.2 tons/ha/year) and highest in Red River Delta (5.11 tons/ha/year). Average income from rice production varies between D4.026 million in South Central Coast to D17.375 million in Mekong River Delta. Average rice income is D9.549 million. Average rice price is D1840 per kilogram and varies between D1700 per kilogram in South Central Coast to D1980 per kilogram in Red River Delta.

Maize is planted on average areas between 0.14 hectares (North East) to 1.74 hectares (North East South), with an average planted area of 0.23 hectares. Average maize production per farm is

859 kilograms. Production levels vary between 410 kilograms in North West and 7 tons in North East South. Productivity is lowest in North West (3.05 tons/ha/year) and highest in South Central Coast at 5.2 tons per hectare per year. Average maize income was highest in North East South at D12.48 million per year and lowest in North West (D733,040). Average maize price was D1930 per kilogram and varied between D1460 in Central Highlands and D2625 per kilogram in Red River Delta. Details of average characteristics of rice, maize and other crop production are given in Table 4.78.

Balance sheets presented reflect average production, purchase, sale and use levels for producers who reported that activity for the product. As some commodities have different numbers of producers reporting different types of activities, the average balance figures do not necessarily cancel each other out. This is particularly relevant to sales figures, as the set of producers involved in product sales is generally smaller than the set of producers involved in production of that commodity (Table 4.79)

4.11 Marketing of Crops

Crops can be sold to a number of types of buyers, including those from the private and government sectors. Assemblers are the most common buyer of products, accounting for an average of 34.47 percent of total per producer crop sales. As discussed previously in regard to livestock products, the dominance of the assembler system raises issues of market information and availability for small farmers.

The next most common buyers are other farmers, at an average of over 21 percent of per producer sales. The government and quasi-government sector (GOE and cooperatives) account for an average of less than 4 percent of sales and feed factories account for around 0.5 percent of sales on average. This would suggest that feed factories do not deal directly with farmers and/or feed factories obtain most of their raw material inputs from specialized crop production farms.

Table 4.80 shows the proportions of different crops purchased by different types of buyers. Assemblers are the dominant type of purchaser for all products except sweet potato and sugarcane. Cooperatives are the least common buyers of crop products and only purchase rice and sugarcane.

Rice is purchased mostly by assemblers, millers, wholesalers and retailers. Rice and sugarcane are the only crops purchased by government owned enterprises and cooperatives. After assemblers, the most common purchasers of maize were farmers and wholesalers. An average of less than 5 percent of purchases were made by millers or feed factories. As discussed earlier, maize inputs used by these operations may be purchased through assemblers or from more specialized crop production operations. Cassava is purchased predominately by assemblers, farmers and millers. On average, a larger proportion of cassava is sold directly to millers than any other crop.

Sweet potato is only purchased by farmers, assemblers, wholesalers and retailers. Of these, farmers make the bulk of purchases with an average of over 67 percent of per producer sales. Sales of potato, groundnut and soybeans follow similar patterns, and are dominated by sales to

assemblers. Sugarcane is the only commodity where an average of more than 1 percent of total sales are made to the government sector. Government owned enterprises account for an average of over 32 percent of all sales. An average of nearly 10 percent of sugarcane is sold unprocessed directly to retailers, who may sell it as a snack food or recipe ingredient.

Table 4.81 shows the average size of annual sales (in kilograms) made to each type of buyer for each type of crop. Millers accounted for an average of around a quarter of sales of rice, and also purchased the largest average quantity. In addition to being on average the smallest proportion of buyers of rice, cooperatives also purchased the smallest average annual amount of 564.33 kilograms.

While accounting for an average of only around 2 percent of per producer maize sales, feed factories had by far the highest average purchase size of over 20 tons. The low proportion of maize sales to feed factories may be explained by the fact that non-specialized crop producers cannot supply sufficient quantities of maize to feed factories on a regular basis. Sales to retailers, at 3.7 kilograms annual average were the smallest.

The largest sales levels of cassava were also to feed factories. Although only accounting for 1.45 percent of total sales, the average annual level of these sales was 670 kilograms. Retailers had the smallest annual average sales level at 9.26 kilograms.

The average size of annual sweet potato sales varied between 27.32 kilograms to assemblers to 185.47 kilograms to farmers. Retailers bought the largest average quantity of potato and other

farmers bought the smallest at 14.19 kilograms. Groundnut and soybean sales followed similar patterns, with their highest level to assemblers and lowest to farmers.

Sugarcane sales were made to every type of buyer, except feed factories. The average amounts of annual sales of sugarcane were higher than those of other products and varied between 2 tons to millers and 13 tons to government owned enterprises. These sales levels are greater than other crop types because they represent sales of cane, not sugar. The yield of sugar from cane is around 10 percent.

Table 4.82 shows that there is a wide range of prices paid for crops by different buyers. In some cases this difference can be pronounced. For example, the price of sugarcane paid by retailers is five times the amount paid by cooperatives. The variability of prices is due to a number of different factors. In the case of maize, high retail prices are probably due to different end uses (including corn on the cob). For cassava, there is probably a mix between fresh cassava and cassava chips. Similarly, sugarcane retail price is high because sugarcane may be sold as a snack for children.

Crops can be sold at a variety of levels including at the farmgate, at market and by contract. Farmgate sales are the dominant type of sale, accounting for an average over 70 percent of per producer sales. Marketplace sales are the next most common, with an average of around 25 percent of sales. Contracts and other types of sale only represent an average of less than 5 percent of sales. In contrast to livestock sales, large farms make more sales at the farmgate and small farms use markets less large farms. Large farms use contracts less frequently than small

farms. The farmgate is the dominant level of sale for all commodities except sweet potato and soybeans which are on average mostly sold at the marketplace level.

Rice is the most heavily farmgate sold product, and sweet potato the least. A higher average proportion of sweet potato is sold at the marketplace than any other crop. Sugarcane has the lowest marketplace sales proportion with an average of only around 5 percent. Sugarcane is almost the only product sold on contract and by other methods (Table 4.83).

The average distance to the nearest market or buyer for all crop types was around 2.88 kilometers. Buyers for sugarcane were the furthest away from the producer at an average of 7.41 kilometers, while the closest were soybean buyers at an average of 1.75 kilometers. (Table 4.84) Buyers in the Mekong River Delta region were on average around 10.06 kilometers from producers, while in the Red River Delta the average distance was only 1.64 kilometers.(Table 4.85)

Producers make between 90 percent and 96 percent of their market sales to the nearest buyer, depending on product type. The majority of producers indicated that the nearest market or buyer for their crops was within the same district. However, a number of producers indicated that their nearest crop markets or buyers were outside their district, province or even region. Table 4.86 shows that the largest proportion of producers selling to out of district buyers was for cassava, with 20 percent. 12 percent of producers selling cassava indicated that the nearest market or buyer for them was outside their region. Producers selling maize all claimed that their nearest

market was within their province, while potato and soybean sellers all have nearest markets within their district.

4.12 Procurement of Crop Inputs

In addition to land and labor, farmers need to obtain inputs such as seeds, fertilizer and equipment for crop production. These inputs can be obtained from private sources (such as traders and other businesses) or government or quasi-government sources such as state, provincial or district owned enterprises or cooperatives.

Producers purchasing seeds obtained an average of more than 60 percent of them from government or quasi-government sources. Cooperatives are the major individual source of seeds for producers, accounting for an average of almost 36 percent of all seed input purchases. The private sector only accounts for 13.3 percent of purchases.

In contrast to seeds, the private sector is the dominant supplier of fertilizer (an average of almost 93 percent). Traders are the largest single suppliers of fertilizer. Of the government sector, cooperatives are the largest supplier, with an average of almost 4 percent of supply.

Traders are the major suppliers of equipment for businesses, with an average of almost 63 percent of equipment purchases made from them. In common with fertilizer, equipment inputs are predominately supplied by the private sector (averaging 94.62 percent of per producer

procurement). Provincial enterprises are the major government sector for equipment supplies with an average of 1.79 percent of per producer input procurement (Table 4.87).

In the northern regions of Red River Delta, North East, North West and North Central Coast, the government sector is the dominant seed supplier. In all these regions except North Central Coast, the cooperative is the dominant individual supply source. In North Central Coast, provincial owned companies are the major seed source. The supply of seeds in the southern regions of South Central Coast, Central Highlands, North East South and Mekong River Delta is dominated by unspecified "other" suppliers. These could be private (e.g. other farmers) or government (e.g. MARD). Whilst they are dominant in the north, cooperatives are not involved in the supply of seeds in Mekong River Delta.

The private sector is the dominant supplier of fertilizer inputs for plant production, accounting for an average of over 85 percent of per producer input sales in all regions. Amongst the private sector, traders are the major suppliers in Red River Delta and North West, with other private business being dominant in all other regions. The greatest use of traders is in North West, where they capture an average of almost 78 percent of purchases. Other business is most widely used in North East South, with an average of almost 86 percent of input purchases. In North East South, traders only account for 9.52 percent of fertilizer sales on average.

Equipment is mostly supplied by the private sector, except in North West, where provincial enterprises supply 100 percent of inputs. Traders are dominant suppliers in Red River Delta, North East and Central Highlands. Other businesses are the major equipment sources in South Central Coast, North East South and Mekong River Delta. In North East South, other businesses make

100 percent of equipment input sales. Traders are the dominant equipment supply source for all farm sizes. The proportion of other business sales declines as farm size increases and trader input sourcing increases with farm size.

4.13 Crop Input Prices

4.13.1 Rice

Labor costs for the 1485 rice growers averaged Đ1.59 million per farm. The largest individual component was harvesting, with an annual average cost of Đ329,000 per farm (Table 4.88). Total labor cost was highest on farms in the Mekong River Delta and lowest in the South Central Coast. (Table 4.89).

While the total labor cost on large farms is higher than that on small farms, the smaller size of harvested area on small farms means that their per hectare costs of labor are higher than medium or large farms. Average non-labor costs of rice production are D1.23 million per farm. These costs are highest on Mekong River Delta farms, while per hectare costs are highest on South Central Coast farms. Average annual fees for rice growing are D658,980 per farm.

4.13.2 Maize

Average maize related labor costs for the 452 producers involved in maize production are D603,782 per farm. The major labor costs of maize growing are weeding, harvesting and threshing (Table 4.90, Table 4.91).

Non-labor costs for maize production are D384,962 per farm. 226 producers indicated that they had to pay fees associated with maize growing. These fees average D205,199 per farm and are highest in the Central Highlands region.

4.13.3 Cassava

Average cassava production labor costs for the 149 producers involved in cassava growing were D443,782 per farm. The major labor costs are harvesting and plowing. Labor costs per farm are highest in North Central Coast (Table 4.92, Table 4.93).

Non-labor costs of cassava production average D296,590 per farm. Non-labor costs are highest in North East South. 96 producers indicated that they had to pay fees associated with cassava production. These averaged D145,204 per farm.

4.13.4 Sweet Potato

Average sweet potato production labor costs for the 423 producers involved in sweet potato growing were D264,225 per farm. The major labor costs are harvesting and seeding. Labor costs per farm are highest in Red River Delta (Table 4.94, Table 4.95).

Non-labor costs of sweet potato production average D832,427 per farm. Non-labor costs per farm are highest in Red River Delta. 54 producers indicated that they had to pay fees associated with sweet potato production. These averaged D48,635 per farm

4.13.5 Potato

Average potato production labor costs for the 48 producers involved in potato growing were D214,371 per farm. The major labor costs are seeding and harvesting. Labor costs per farm are highest in North East (Table 4.96, Table 4.97).

Non-labor costs of potato production average D248,041 per farm. Non-labor costs are highest per farm in North East. No producers indicated that they had to pay fees associated with potato production.

4.13.6 Groundnuts

Average groundnut production labor costs for the 98 producers involved in groundnut growing were D386,933 per farm. .The major labor costs are harvesting and weeding. Labor costs per farm are highest in North Central Coast (Table 4.98, Table 4.99).

Non-labor costs of groundnut production average D265,200 per farm. Non-labor costs are highest per farm in South Central Coast. 33 producers indicated that they had to pay fees associated with groundnut production. These averaged D121,053 per farm.

4.13.7 Soybeans

Average soybean production labor costs for the 98 producers involved in soybean growing were D365,867 per farm. The major labor costs are harvesting and weeding. Labor costs per farm are highest in Central Highlands (Table 4.100, Table 4.101).

Non-labor costs of soybean production average D206,624 per Non-labor costs per farm are highest in South Central Coast. 21 producers indicated that they had to pay fees associated with soybean production. These averaged D103,129 per farm.

4.13.8 Sugarcane

Average sugarcane production labor costs for the 83 producers involved in sugarcane growing were D777,024 per farm. The major labor costs are weeding and harvesting. Labor costs per farm are highest in Central Highlands (Table 4.102, Table 4.103).

Non-labor costs of sugarcane production average D930,546 per farm. Non-labor costs per farm are highest in Central Highlands 61 producers indicated that they had to pay fees associated with sugarcane production. These averaged D4.383 million per farm. Fees were highest in Mekong River Delta.

4.14 Transportation and Communication

94.17 percent of producers use some form of transport to buy or sell their products. The highest proportion of producers using transport was in North Central Coast, where almost 99 percent of producers used transport. Transport usage was lowest in Central Highlands, where 85.71 percent of producers reported that they used some form of transport (Table 4.104).

The most common form of transportation type was the motorcycle, used as the most common form of transportation by almost 43 percent of producers. The next most common form of transport was the bicycle, used by 40.91 percent of producers. Motorcycles or bicycles were the most common transportation types in all regions. Bicycles were more important in the northern regions of Red River Delta, North West, North East and North Central Coast. Motorcycles were

more widely used in the southern regions of South Central Coast, Central Highlands, North East South and Mekong River Delta. Almost 88 percent of producers owned their own transport.

Transportation can be rented for the purposes of buying or selling products. Only 12.31 percent of producers rent transport for buying and selling purposes. The proportion of producers renting vehicles for transport was greatest in Central Highlands (33.10 percent) and lowest in North Central Coast (1.08 percent) (Table 4.105)

The most frequently rented type of vehicle is "other" which was mostly specified as cong nong (agricultural engine drawing a cart) or buffalo cart. The other major rental types were truck and cart. This would indicate that producers are primarily renting larger vehicles for the sale or purchase of larger quantities of products. Small farms mostly rent buffalo carts and other types of cart. Trucks are the major form of transport rental for large farms, accounting for 42 percent of rentals.

76.98 percent of rented transport is used for transport within the same district. 7.55 percent is used for selling outside the district and 15.47 percent is used for buying from outside the district[7]. Relatively smaller proportions are used for buying and selling outside the province and region (Table 4.106).

[7] A selling trip is defined as a trip that originates within the producer's own district and terminates outside that district. A buying trip is defined as a trip that originates outside the producers' district and terminates within that district. The majority of trips of rental vehicles are within a single district and hence cannot be defined as buying or selling trips.

Not surprisingly, the motorized forms of transport (trucks, motorcycles and boats) were those with the longest average transport distances and times, heaviest average transport weights and highest average shipment costs. Trucks are used to transport goods for the longest average period and distances. Trucks also have the highest average shipment costs. Boats have the highest average weight transported (2.79 tons) (Table 4.107).

Producers obtain market and price information primarily from personal contacts, traders and Radio/TV. The reliability and availability of this type of information may not be high. Most producers sell all their products to traders who have vested interests. In addition, less than 7 percent of small producers own a television The majority of producers get commercial regulation information from radio/TV. Banks, personal contacts and radio/TV provide the majority of information on credit (Table 4.108).

4.15 Storage and Stocks

Storage facilities are used by 1643, or 74.24 percent of producers. The proportion of producers using storage facilities varies between 37.54 percent in Mekong River Delta to 97.16 percent in North Central Coast (Table 4.109).

All of the storage facilities used by producers were 100 percent owned by them. 91.22 percent of these storage facilities were houses. The highest capacity storage facility is the concrete warehouse, with an average capacity of around 85 square meters. These are only used by 1.7

percent of producers. The average capacity of the house (the most common storage facility) was 10.61 square meters (Table 4.110).

Storage facilities were mostly used for the storage of grain production (61.04 percent). The next most common use was storage of animal feeds (Table 4.111). The house is the most common storage facility used for all storage purposes. The proportion of product stored in the house ranges from 100 percent of groundnuts to 88.4 percent of animal feed (Table 4.112).

4.16 Fixed Assets

Livestock producers own a variety of fixed assets, including land, equipment and buildings. The most common type of asset owned by producers was animal housing, which was owned by 98.46 percent of producers (Table 4.113).

Almost 79 percent of producers own land, but this proportion varies widely between regions. In North West 100 percent of producers own land, while in North Central Coast only 0.35 percent of producers own land. The proportion of producers owning land also increases as farm size increases, with almost 92 percent of producers on large farms owning land.

Less than half of producers own equipment, but again this proportion varies between provinces from a high of 74.77 percent in Red River Delta to a low of 9.94 percent in Central Highlands.

Over 90 percent of producers own transport equipment. The proportions are relatively high in all regions, ranging from 67.08 percent in Central Highlands to 99.29 in North Central Coast.

Almost all producers own animal housing and this is the case across all regions with the lowest proportion of animal housing being in Mekong River Delta with 91.36 percent.

Only around 70 percent of producers own buildings, but this proportion varies between regions. Only 33.22 percent of producers in Mekong River Delta own buildings while the proportion in North Central Coast is 96.81 percent. The ownership of buildings shows a strong North-South divide with regions from North Central Coast northward having a majority of producers owning buildings and regions from South Central Coast southward having a majority of producers not owning buildings.

The average value of total fixed assets was D54.468 million, with the largest reported fixed asset value being D12.1 billion. Average total asset value was highest in North East South (D205.44 million) and lowest in Central Highland (D18.22 million). (Table 4.114) The average asset value of large farms is over ten times higher than that of small farms (Table 4.115).

As shown in Table 4.116, titled property makes up the largest proportion of total asset value, an average of almost 40 percent. Durable goods, with an average of 2.6 percent make up the lowest proportion. Buildings make up the majority of total asset value in North East and North Central Coast. In all other regions, titled property makes up the majority of total asset value. Proportional asset values for different farm sizes are shown in Table 4.117. Table 4.118 shows the

depreciation tables for producer assets. The table contains the average purchase value, current value, age, depreciation and annual depreciation level.

4.17 Credit

Over 33 percent of producers use at least one form of credit in livestock or crop production. Credit is most used in Red River Delta, where almost 42 percent of producers borrow money. Credit is only used by 18.79 percent of producers in North Central Coast (Table 4.119).

Producers seek credit for a number of purposes including purchases of animals, feed or equipment. The most common purpose for credit was the purchase of feed or raw materials for feed. This was the reason for 47.59 percent of loans. The next most popular loan purpose was to purchase live pigs for fattening, breeding or slaughter. The least popular loan purpose was for marketing purposes, which accounted for only 0.12 percent of loans. Loans for purchasing feed and raw materials were the most popular form of credit in all regions except for Central Highlands, where loans for the purchase of fertilizer or seeds are the most popular type of credit (Table 4.120).

Producers can obtain credit through many official and unofficial sources, including friends, other farmers, agricultural banks and money lenders. Agricultural banks are the most common source of credit for producers, supplying over 67 percent of loans. Other credit institutions were the next most popular credit source, at 14.32 percent of loans granted. Official lending channels (banks and credit institutions) provide a total of 84 percent of loans. This is the case for all farm sizes (Table 4.121) Official lending channels and in particular agricultural banks, provide the majority of loans

in all regions. The informal credit sector is most used in the Red River Delta region, where it accounts for 16.82 percent of loans granted. Money lenders are most used in North Central Coast and Central Highlands, where they represent 9.09 percent of loans granted (Table 4.122).

Other enterprises are the loan source with the highest average loan amount of D2 billion. The average amount borrowed from foreign banks is D2 million. Money is lent for the shortest term by other enterprises (an average of 6 months) and up to a maximum of 20.64 months from friends and relatives. The lowest average interest rates were from friends and relatives and other enterprises. Farmers and money lenders charged the highest interest rates (Table 4.123).

Investment in buildings and facilities required the largest loans, with producers borrowing an average of D16.7 million for this purpose. The smallest average loans were for pig meat purchases. Loans for labor had the longest terms at an average of almost 2.5 years. The shortest loans were for poultry meat, averaging only 4 months. These also attracted the lowest average interest rate of 0.7 percent. The highest average rate was for borrowings for poultry meat at 1.56 per month (Table 4.124). The average amount borrowed by large farms (D45.1 million) was substantially larger than the average for medium farms (D10.7 million) and small farms (D5.56 million).

Lenders often require producers to provide collateral as security for loans made to them. The most common form of collateral required by lenders is security over the producer's house. Almost 40 percent of collateralized loan transactions required the producer to mortgage their house. The next most common forms of security were mortgages over producer's land and social capital. Lenders in the formal system (banks and credit institutions) generally require security over producer's house or land, while informal lender usually do not require security or require social

capital. The exception to this is traders, who require security over producer's houses for 50 percent of loans (Table 4.125). Security over producer's house was the major form of collateral required for almost all purposes, except labor, marketing and transportation (Table 4.126).

Only 44.86 percent of the 740 producers who received credit believed that the amount borrowed provided them with sufficient credit to conduct their operations. The proportion of borrowers with sufficient credit was highest in North West and lowest in North East South, where only 32.14 percent of borrowers had enough funds to conduct operations (Table 4.127). The proportion of borrowers with sufficient credit was similar for small and large farms (around 45 percent) but lower for medium farms (37.5 percent). The average total credit requirement of borrowers with insufficient credit is D31.035 million. This ranges from an average of D12.79 million for small farms to almost D100 million for large farms. This credit is required in order to conduct operations smoothly at peak periods. Credit requirements are highest in the North East South region and on large farms (Table 4.128).

Borrowers with insufficient credit are willing to pay an average of an additional 1.196 percent interest per month in order to obtain credit. This figure is highest in Central Highlands (1.46 percent). (Table 4.128).

The most common reason for borrowers not obtaining enough credit was lack of collateral. Lack of collateral was the dominant reason for insufficient credit in all regions except Red River Delta and North East, where complicated procedures and high interest were the major factors (Table 4.129).

Around 36 percent of producers sold goods on consignment. This proportion was highest amongst producers in the North West region and lowest in the Central Highlands region. The average proportion of sales made on consignment is 49.6 percent (Table 4.130).

Only 11.97 percent of producers received payment in advance for their products. This proportion varied between 1.42 percent in North Central Coast to 25.47 percent in Central Highlands. Those producers who did receive advance payment for goods received it for an average of 64.28 percent of production (Table 4.130).

Almost 6 percent of producers lent money during the past year. This proportion varied between 1 percent in Mekong River Delta to 12.36 percent in Red River Delta. The amount of money lent by producers varied up to D100,000 with an average of D7,406. As Table 4.131 shows, money was most commonly lent for non-business purposes.

4.18 Profitability and Investment

Profits on livestock production are calculated as the difference between the total value of livestock production (animal and other livestock product sales and home consumption value) and the total cost of livestock production (labor, animal inputs and feed costs). The average profit level for all farms is D46.91 million. This represents a margin of 42.1 percent on livestock production value levels.

Profit levels are highest in the North East South and Mekong River Delta regions. In percentage terms however, these two regions have the lowest profit levels in percentage terms. In percentage terms, the highest profits are in North West and North Central Coast (Table 4.132). Average profits by farm size are shown in Table 4.133.

Animal production appears to exhibit diminishing returns to scale for the producers surveyed, both in terms of rate of profit against animal revenues and in terms of rates of profit against animal inventories. This is possibly due to small farms using relatively low cost feedstuffs and predominately non-costed household labor, while larger farms adopt more capital intensive production systems. Economies of scale of production systems can be estimated by regressing the log of size (either in terms of revenue or in terms of inventory) against the log of profits.

$$\log(\text{profit}) = a + b \log(\text{size})$$

If the industry exhibits diminishing returns to scale then the coefficient â should be positive and less than 1. If the industry exhibits increasing return to scale then the â should be positive and greater than 1. For pig and chicken production systems, all estimations of â were positive and less than 1, indicating that there are diminishing returns to scale in both pig and chicken production. The estimated coefficients are shown in Table 4.133. However it is apparent that at a higher level of analysis, the returns to scale for pig production are more complex than those for poultry production systems. At very small scale pig production appears to be uneconomic. Increasing returns to scale are evident in moving from a micro production system to a moderately sized system with 2-3 sows. After this point, further expansion appears to generate diminishing returns to scale (possibly as a result of moving from a self contained family labor, low cost feedstuff

operation to an intensive high cost feedstuff system). Increasing returns to scale are not observed again until the scale of the pig farm becomes extremely large (more than 300 sows) after which increases in inventory generate larger than proportional increases in income. This implies that while large commercial pig raising enterprises are profitable, making the transition from household farming systems to the large commercial system may be extremely difficult for most producers.

The profit levels reported above are calculated on an accounting cost basis. The major difference between this basis and calculation on an economic basis is the treatment of labor costs. As discussed in Section 4.2, the majority of livestock labor is provided by members of the family. The proportion of livestock labor provided by the family is higher on small farms than on large farms. The valuation of family labor costs at the same person-day cost as permanent labor in the analysis affects profit levels. Inclusion of fully costed household labor decreases the average profit as a proportion of livestock production value to 12.25 percent.

Duck production had the highest proportion of good profitability ratings from producers. Almost 97 percent of the producers involved in duck production rated profitability as good or fair. The product with the lowest profitability was forestry. Over 36 percent of producers involved in forestry rated profitability as poor (Table 4.135). Mekong River Delta had the highest proportion of producers rating their production activities as profitable. The lowest proportion was in North Central Coast. North Central Coast also had the highest proportion of producers rating their activities as unprofitable. Producers in Red River Delta only rated 4.84 percent of their production activities as unprofitable (Table 4.136).

There are many different reasons for profitability of production changing from year to year. The most common reason for producers' profitability changing between the previous and current year is changes in sale price. The influence of operating costs is the lowest, with only 0.3 percent of profitability changes being as a result of this factor. Changes in sale price are the major factor influencing both profitability rises and profitability falls. Changes in volumes of trade have a larger influence on profitability falls than profitability increases (Table 4.137). Changes in sale price is the major reason for change in profitability for all activities except cattle and buffalo production, where changes in trade volumes are the major reasons given for profitability change (Table 4.138).

77.1 percent of production activities had unchanged profitability between 1998 and 1999, 9.15 percent of production activities showed a rise in profitability and 13.75 percent experienced a fall in profitability. Pig production had the most unstable profitability level, with 13.22 percent of producers reporting increases in profitability and 24.97 percent of producers reporting profitability falls. Buffalo production had the most stable profitability levels, with over 96 percent of producers reporting no change in profitability. All activities reported higher proportions of falling profitability than rising profitability, except chicken and egg production (Table 4.139).

Almost one third of producers ranked pig production as the most profitable farm activity in 1999. This reflects both the high profitability of pig farming and the large numbers of producers involved in pig farming. The second most profitable activity was non-agricultural production, which was ranked as the most profitable activity by more than a quarter of producers. Not surprisingly, pig farmers ranked pig farming as the most profitable activity, poultry farmers ranked chicken production as most profitable and bovine farms ranked cattle production as most profitable. Pig

production is ranked as the most profitable activity in all regions, except North East and North Central Coast where non-agricultural production is the most profitable and Central Highlands where cropping is regarded as most profitable (Table 4.140, 4.141).

4.19 Consumption

The product with highest home produced consumption levels is rice. Rice also has the highest purchased amount and value. Total rice consumption by the household is greater than any other product. Poultry has the highest home produced consumption amount. Pork has the highest purchased amount and total consumption level (Table 4.142). Rice has the highest home production amount in all regions. Poultry is the most consumed home produced meat. Rice is also the most purchased commodity and pork the most purchased meat in all regions. Pork is the most consumed meat in all regions.

The average value of total food purchases is D4.563 million, with a maximum of D154 million. Total food purchases were on average lowest in North Central Coast and highest in North East South (D8.44 million).(Table 4.143) An average of 48 percent[8] of household food is purchased and 52 percent is produced on the farm. The highest home produced consumption proportion is in North Central Coast (76.7 percent) and the highest purchased food proportion is in North East South (86.8 percent) (Table 4.144).

[8] These proportions are by weight, not value.

The largest single household expense item outside food expenses is household repairs, with an average expense level of D10.49 million. Total average non-food expenses are 10.56 million. (Table 1.145) Household repairs were the highest average cost item in all regions. The average total non-food cost was highest in North East South (D23.429 million) and lowest in North Central Coast (D6.05 million).

The average total level of annual household expenditure is D26.379 million. This is made up of D5.0517 million of food expenditure and D21.327 million other expenditure. Food, other and total expenditure is highest in North East South. Proportional food expenditure is highest in Central Highlands, at almost 31 percent of total expenditure (Table 4.146, Table 4.147). Food, other and total expenditure levels increase with farm size. As expected, food expenditure as a proportion of total expenditure is higher on small farms and declines as farm size increases (Table 4.148).

4.20 Contracts

Only 46, or 2.08 percent of producers have ever had contracts for the production of livestock. The most common reason given for not having contracts is that contractors are not available in the area. Contractor not available in area was the primary reason for not having contracts in all regions, for all farm types and farm sizes (Table 4.149).

Two producers reported that the year of their first contract was 1977. This is the oldest contract arrangement reported. The most common year of first contract was 1997, with almost 35 percent of producers reporting that this was the first year that they first contracted. The most common length of experience in contracts was 2-3 years. Around 40 percent of producers have this length of experience. The longest length of experience was 10 years.

Of the 46 producers who have had contracts, 24 producers (52 percent) currently have contracts. Seven of these contracts are for chickens and 17 are for cattle. The contracts vary in length between 3 months and 10 years. The contracts are with state owned enterprises, provincial enterprises, foreign enterprises and cooperatives. The chicken contracts are with foreign enterprises and the cattle contracts are with state owned enterprises, provincial enterprises and cooperatives.

The chicken contracts are all based on the company paying labor and other costs for raising and fattening chickens. The cattle contracts have a number of arrangements including animals being provided free, feed provided free, other inputs provided free and the animals being purchased by the company at below market rates.

Around 74 percent of producers who currently have livestock supply contracts have had contracts on a continuous basis. The majority of producers who have not had contracts on a continuous basis said that this was because there was not enough contract business in the area to sustain continuous contract activity. Other reasons given include no capacity and incidence of animal disease.

4.21 Conclusion

Livestock production in Viet Nam is undertaken predominately at the household level, by producers who are non specialized. These households generally undertake cropping in addition to livestock raising and usually keep more than one type of livestock in a mixed raising system. This combination generally involves keeping pigs and chickens. Balanced against the household production system is a small, but rapidly developing commercial sector. This sector is concentrated in the North East South and Mekong River Delta regions and produces livestock using intensive confined rearing techniques to fatten improved breeds of pig and poultry using high quality feed.

While livestock raising appears to be a profitable activity for many households, this is largely based on the use of non-costed household labor and low cost feed products such as food scraps, household wastes and agricultural residues. Developing from a family based, largely self contained operation to a specialized livestock raising operation of moderate size (in the case of pigs for example, more than 3 sows) requires not only a change in labor use and feedstuff use, but also requires the presence of a number of crucial co-factors in order to be successful. These include access to adequate quality feed, access to superior genetics, access to a well functioning input and output market, relevant research and extension and adequate animal health and veterinary services. These factors will all be discussed in more detail in the following chapters, but will be summarized briefly here.

Small farming systems based on local breed animals rely heavily on feeding of low cost residues, scraps and own produced feed crops. Moving to a moderately sized specialized operation would require the purchase of feed grains and increasing amounts of quality complete feed and concentrates. The prices of feed grains in Viet Nam are higher than the world price, and the price

of quality feeds are well in excess of international prices. While extremely large commercial livestock operations may be able to purchase quality feeds and feed grains at discounts, or produce their own quality feeds, this would not be the case for a moderately sized specialized livestock producer.

Household producers generally source breeding stock from other farmers or traders. This breeding system is concentrated on local animals, or crossbreds of low genetic quality. While this quality animal may be suitable for household production systems, it is not adequate for moderate sized specialized operations. The state breeding center system produces high genetic level exotic animals that are suitable for large commercial operations, but has not been efficient in producing a breeding system for crossbred local-exotic animals or superior local animals. Moderately sized specialized livestock producers would demand these type of animals as the most appropriate for their production systems, but they are either not available or accessible.

Household producers procure the inputs they need from traders and other farmers and sell their outputs to traders or slaughterers. The vast majority of these transactions are made at the farmgate. Producers also gain most of their information on prices and markets from the same agents who sell them inputs and purchase their outputs. The lack of a well defined input and output market system with adequate information flows and provision of competitive forces is a constraint to the development of household production systems beyond the self contained level.

In addition to being underfunded, research and extension in livestock has tended to concentrate on technical production aspects of animal husbandry, rather than on marketing systems or socio-economic aspects of the livestock industry. The low levels of resources in the sector has led to a

system where government agencies tend to the needs of larger producers, while informal extension clubs have developed to serve the needs of the smaller producers. For households to gain benefits from any research developments, there need to be adequate links between the government systems and the informal and mass organization sector.

While extremely large commercial livestock producers can employ their own specialized veterinary staff, this is not the case for households or even for moderately sized specialized livestock raising operations. These operations are reliant on the provision of services by commune and district level veterinary services. These operations are underfunded and have low capacity in both staff and equipment. As a result the knowledge of the extent and importance of animal health problems is at extremely low levels. The importance of animal health in production systems is magnified when producers move from non specialized household systems to moderately sized specialized operations. More intensive animal production systems, greater numbers of animals and a higher proportion of exotic animals mean that the potential for animal disease outbreaks and rapid spread are higher than for household systems. Also the substantial investment in animal stocks and the monocultural nature of production means that the risk of devastating financial consequences from animal disease occurrence are high.

In the past decade, Viet Nam has witnessed a massive expansion of liveweight production and herd sizes for all animal types. This increase in production has been partially due to the development of commercial scale pig and poultry farms and the introduction of improved animal breeds. However, the major increases in liveweight production and herd sizes have been at the household level, where greater numbers of households are keeping livestock and individual household production has increased. The challenge of development of the sector is to ensure that the growth in livestock can continue on a sustainable path, while ensuring that the household

sector is included in the process of development and increased livestock production. This requires not only ensuring that technical aspects of livestock production are improved, but also that the ancillary services and requirements outlined above are adequately addressed.

CHAPTER 5

MARKETING OF LIVESTOCK PRODUCTS

Summary

In the absence of a widespread and coordinated livestock and livestock product market system, the majority of distribution and marketing of livestock products between producers and consumers is undertaken by a network of livestock assemblers, wholesalers and retailers. These marketers are predominately relatively new entrants to the industry and are usually sole traders. The network operates over a relatively wide geographic area and is generally well coordinated. Retailing has the relatively highest profits of the three levels of marketer. Many marketers at all levels procure the majority of their products from sellers within their own region. However, the participants higher up the marketing chain tend to travel furthest to procure products.

Highlights

- *Almost all marketers surveyed were specialized in the procurement and sale of products of a specific animal type rather than marketing and distributing different species. The majority of marketers surveyed were pig marketers.*
- *Marketing operations are commonly relatively new, having commenced after 1990 and are a sole trading operation or only have 1 employee. Marketers perceive that their competitors are primarily at the local level, rather than at a regional or national level. Almost half of the surveyed marketers achieved an increase in profits between 1995 and 1999.*
- *Household farms are the major source of live pigs and cattle procured by assemblers and live chickens procured by wholesalers. Other traders were relatively important sources of*

live chickens for retailers and live pigs procured by wholesalers, while slaughterhouses were a major source of pig and cattle carcasses procured by retailers and wholesalers.

- *Many marketers at all levels procure the majority of their products from sellers within their own region. However, the participants higher up the marketing chain tend to travel furthest to procure products. Assemblers travel the longest average distance to procure products from household farms, wholesalers travel relatively shorter distances to procure from farms and assemblers, while retailers almost exclusively travel within their own province to procure products from slaughterhouses and wholesalers.*

- *The majority of sales by marketers were made within their own province. Marketers were more likely to procure from outside their home province than to sell outside their province. Only a small number of marketers both procure and sell products outside their home province. Wholesalers and slaughterhouses are the major customers of assemblers, retailers are the major customers of wholesalers and retailers almost exclusively sell directly to the public.*

- *The major costs for assemblers are labor costs and transport costs. In terms of percentage of sales value, the margins achieved by retailers are higher than those achieved by assemblers or wholesalers. In addition, there appear to be diseconomies of scale in wholesaling and assembling. Retailing is the only marketing level exhibiting economies of scale. Marketers handing bovine products had an average margin percentage higher than marketers of either pig or poultry products.*

- *Around 27 percent of marketers reported that they experienced occasional restrictions on the movement of goods. The highest incidence of transport restrictions was in Red River Delta and the lowest was in North East South. As assemblers and wholesalers make more frequent and longer procurement and sales trips than retailers, it is hardly surprising that they report a far higher incidence of restrictions on transport. Almost half of*

assemblers report that they experience some form of transport restriction. The most common form of transport restriction identified by the marketers was police conduct.

- *The majority of marketers rated profitability as fair or good. Changes in trade volumes had the biggest impact on changes in profitability levels for marketers. Profits decreased during the previous year for around 6 percent of marketers and increased for around 34 percent.*

5.1 Introduction

This chapter reports discusses the marketing and distribution of live animals and animal products in Viet Nam. The discussion is based on a survey of meat and livestock marketers. The sample of meat and livestock marketers was drawn from all regions of Viet Nam in the regional proportions shown in Table 5.1. The sample of 406 meat and livestock marketers included 90 assemblers, 150 wholesalers and 166 retailers.

The chapter is divided into 11 sections. Section 5.2 discusses the characteristics of the surveyed marketers and the marketing channels that they utilize. Section 5.3 outlines the sources and channels of pig, poultry and bovine product procurement and Section 5.4 discusses sales channels for the same products. Margins made by assemblers, wholesalers and retailers are shown in Section 5.5. Section 5.6 is concerned with spatial marketing structures, while Section 5.7 discusses credit availability and use by marketers. Transportation methods used by marketers are discussed in Section 5.8. The perceived profitability levels of marketing operations are shown in Section 5.9, characteristics of the assets owned by marketers are discussed in Section 5.10 and finally, Section 5.11 concludes the chapter.

5.2 Types of Agents and Marketing Channels

Marketers can specialize in trading of pig products, chicken products, duck products, bovine products or be involved in the purchase and sale of multiple commodities. Almost 98 percent of marketers are specialized in the trading of particular animal species. Specialized pig marketers make up over 60 percent of the total.

Table 5.2 shows that the highest concentration of specialized pig marketers is found in the retailer segment. The highest concentrations of specialized chicken, cattle and buffalo marketers are found amongst the assemblers.

The average age of marketing businesses was 7 to 8 years, with the oldest business being started in 1963 and the newest business commencing operations in 1999. Over 75 percent of the businesses commenced operations after 1990. The regions with the oldest average business age were South Central Coast and North East South, with an average business commencement year of 1990. North West and North Central Coast marketers commenced business on average in 1994. Retailers had a slightly longer average business age than wholesalers or assemblers. The average commencement date of the business manager was 1992-1993, with the most experienced manager commencing duties in 1968. Over 75 percent of managers commenced their management duties with the company in the 1990s.

All marketers surveyed were private businesses. The majority of marketers were nationally registered or non-registered private companies, with only 2 being private foreign enterprises. These foreign enterprises only operated in the North East region. The highest concentration of nationally registered companies was in South Central Coast and Mekong River Delta. North Central Coast had the highest proportion of non-registered companies (Table 5.3). As shown in Table 5.4, wholesalers and retailers were predominately nationally registered private companies, whilst the majority of assemblers were non-registered.

The majority of marketers did not have any full time employees (only the marketer themselves). Of the 59 marketers who had employees, the majority only had one permanent employee, with the

maximum amount of employees being 8. (Table 5.5) The average number of employees amongst these marketers in all regions was one, except in Mekong River Delta and North East South, where the average number was three.

Marketers felt that direct competitors to them operated at all levels from local market to regional level. The most frequently cited level of competitors was at the market level and at the commune level. Only 3.2 percent of marketers felt that their direct competitors acted at the regional level. The majority of wholesalers and retailers felt that their direct competitors were at the market and commune level. The highest percentage of assemblers felt that their competitors were at the commune, town and district level. The average number of perceived competitors per marketer at the market level was higher than any other level. Marketers felt that there was an average of 12 direct competitors at this level (Table 5.6).

The average sales level of marketers increased from D4.835 billion in 1995 to D6.935 billion in 1998. The average sales revenue level for the first half of 1999 was D3.212 billion. The highest average sales revenue levels were for marketers in Central Highlands and Mekong River Delta, while the lowest were in North West (Table 5.7). Assemblers had the lowest sales revenue levels, with an average of D2.171 million, while retailers had the highest sales levels, averaging D10.217 million.

259 of the 406 marketers experienced changes in sales revenue between 1995 and 1998. The average level of sales revenue change was an increase of 44.62 percent between 1995 and 1998. Revenue change was highest in North Central Coast, where sales revenues increased by an average of 146 percent between 1995 and 1998. In contrast, sales revenues in South Central Coast

only increased by an average of 6.47 percent during the same period. Wholesalers revenue increased by an average of 60.77 percent, whilst the average change in retailer revenue was 29.4 percent for 1995-1998.

Of the 259 marketers experiencing revenue change during the 1995-1998 period, 77 experienced a revenue fall. The majority of these businesses were in Red River Delta and North East regions and were wholesalers or retailers. The average revenue decrease for these businesses was 22 percent for 1995-1998.

The remaining 182 businesses experienced revenue increases. These averaged 72.84 percent for the period and were highest in North Central Coast, where businesses experiencing revenue increases did so at an average rate of 170 percent for 1995-1998.

The percentages of first half 1999 income derived from different sources are shown in Table 5.8. The proportions for 1998 are almost identical to those for the first half of 1999. Not surprisingly, assemblers earned the majority of their income from live animals, while carcasses provided the dominant income source for both wholesalers and retailers. Wholesalers also gained income from live animals, which contributed an average of 28 percent of total income.

5.3 Procurement

All 406 marketers surveyed indicated that they had procured live animals or meat during the previous year. All of the animals and meat were procured from domestic sources, with no imports of any kind being undertaken. The most common type of products purchased by wholesalers and retailers were carcasses and the most common products for assemblers were live pigs and cattle. Chickens and ducks were almost exclusively procured as live animals, not as carcasses.

The highest value product procured was chicken carcasses at an average price of Đ25500 per kilogram while the lowest value product was cattle and buffalo calves at an average price of Đ8185 per kilogram liveweight. Average procurement prices are shown in Table 5.82, Table 5.83 and Table 5.84.

Table 5.9 shows that household farms represent the major supply source for assemblers, wholesalers and retailers. The proportion of procurement from household farms is greater for assemblers than wholesalers and retailers. Traders are relatively important sources for wholesalers, while slaughterhouses are relatively important procurement sources for retailers.

As shown in Table 5.10, household farms are the dominant source for the procurement of all live animals, except cattle/buffalo calves, of which traders are the dominant suppliers. Carcasses are predominately supplied by slaughterhouses and traders are the major suppliers of processed meat.

The household farm is the major procurement source in all regions, except North East South, where traders are dominant. North East South is also the only region where commercial farms are a significant procurement source (Table 5.11).

5.3.1 Pig Product Procurement

276 of the marketers purchased some form of pig product during the previous year. Around 57 percent of assemblers, 72 percent of wholesalers and 70.5 percent of percent of retailers procured pigs or pig products during this period. The region with the most marketers procuring pig products was Red River Delta, with 59 marketers from that region. North West had the least, with

only 14 marketers procuring pig products. 24 of the marketers procuring pig products came from Ho Chi Minh City. This is the largest contingent from an individual province.

Table 5.12 shows that pig products are procured in 27 provinces, representing all agro-ecological regions of Viet Nam. The most popular province for pig product procurement is Binh Dinh, accounting for almost 10 percent of pig product procurements.

The majority of pig products are procured in the same province as the location of the marketer. However, an average of almost 16 percent of products are procured outside the marketer's home province (Table 5.13). The average proportion of procurement from outside the marketer's home province varies widely between provinces. The highest average is for marketers from Hoa Binh, who procure an average of 64.29 percent of their pig products from outside the province. Marketers from Hai Phong and Ho Chi Minh City procure pig products from a greater number of outside provinces than marketers from any other provinces.

An average of almost 30 percent of wholesaler procurements are made outside the wholesalers province, while an average of almost 22 percent of assembler purchases are made outside their home province. In contrast, an average of less than 1 percent of retailer procurements are made outside the province. Information presented earlier in this chapter showed that assemblers primarily purchased live animals at the farm level, wholesalers purchased both animals and carcasses at farm and market and retailers usually purchased carcasses at the market level. This suggests that live pigs are purchased from farms relatively long distances from slaughtering and consumption points.

The average distance traveled by marketers to procure pig products varies between less than a kilometer to as high as 1800 kilometers. The mean distance traveled is 37.7 kilometers. If the pig products are procured in the same province as the marketer, then the distance traveled is an average of 7.47 kilometers. The purchase province with the longest distance traveled for procurement is Phu Yen, with an average of 540 kilometers (Table 5.14). This represents a assembler who traveled from Dong Nai to purchase live pigs. In contrast, average distance traveled to procure pig products in Hoa Binh is only 4 kilometers. This is a reflection of the fact that no procurements by marketers from outside the province were made in Hoa Binh.

Marketers from Ho Chi Minh City travel the furthest to procure pig products, an average of 179 kilometers. Quang Nam marketers travel the least distance, only 3 kilometers on average. This reflects the fact that Quang Nam marketers make no pig product procurements outside their province. Assemblers travel the furthest to make pig product procurements, an average of 63 kilometers. Wholesalers travel an average of 60 kilometers and retailers only travel an average of 6 kilometers.

5.3.2 Bovine Product Procurement

Bovine products were procured by 86 of the marketers during the preceding year. The region with the most marketers who procured bovine products was North East, with 31 marketers. In contrast, no marketers from North East South or Mekong River Delta procured bovine products during this period. The individual provinces with the highest number of marketers procuring bovine products were Bac Giang and Hoa Binh, with 15 and 10 marketers respectively. Bovine products were procured by 26.67 percent of assemblers, 27.33 percent of wholesalers and 12.65 percent of retailers. As shown in Table 5.15, bovine products are procured in 18 provinces. The most

popular province for bovine product procurement is Phu Tho, which represents over 10 percent of the total procurements.

Marketers reported that an average of only 16.28 percent of bovine procurement is made outside the marketers home province. In many provinces this proportion is zero, but in Bac Giang, an average of almost half of bovine procurement is made from outside the province (Table 5.16).

Assemblers had the highest proportion of out of province procurements with an average of 37.5 percent. Wholesalers made an average of 12.2 percent of procurement outside their home province. In contrast, retailers made all their procurements within their own province. As was the case with pig products, this indicates that assemblers tend to be the link in the marketing chain that moves the product from the farmgate over the longest distance.

Marketers travel an average of 37.17 kilometers to procure bovine products. The procurement distance reported by marketers varies between 0.5 and 330 kilometers. If the procurement is made within the same province, then the average distance traveled is around 17.5 kilometers. The purchase province to which marketers travel the longest distance for procurement is Cao Bang, with an average of 315 kilometers. The only reported procurements in Cao Bang are made by marketers from Bac Giang. The procurement province with the shortest distance is Quang Nam, with only local marketers procuring (Table 5.17).

Marketers from Bac Giang travel the furthest to procure bovine products, an average of 113 kilometers. In contrast, Quang Nam marketers only procure bovine products within their own province and travel an average distance of 5 kilometers. The distance traveled by assemblers for bovine product procurement is the longest at 69 kilometers. Wholesalers travel an average

distance of 35 kilometers and retailers only travel an average of 5 kilometers for bovine product procurement.

5.3.3 Chicken Product Procurement

97 of the marketers were involved in procuring chicken products. The region with the highest number of chicken procurers was Red River Delta, with 38. Ha Noi was the major individual province, with 12 marketers procuring chicken products. 40 percent of assemblers were involved in procuring chickens, compared to 20 percent of wholesalers and 18.67 percent of retailers. Chicken products were procured from 21 provinces in Viet Nam. The greatest percentage of total procurements was from Thai Binh, with 7.22 percent of the total (Table 5.18).

Almost 80 percent of chicken product procurement is from within the marketers own province. However, Table 5.19 shows that marketers from some provinces procure a substantial proportion of chicken products other provinces. These include marketers based in Thai Binh and An Giang, who procure an average of over 40 percent of their chicken products from outside the province.

Assemblers had the highest proportion of procurements outside their home province, with an average of over 30 percent of the total. In contrast with pig and bovine products, retailers on average procure a higher percentage of chicken products from outside the region than wholesalers. Wholesalers procured an average of 10 percent of their chicken products from outside their home province, while retailers procured an average of 22.58 percent of chicken products from provinces other than their own.

Marketers travel an average distance of 18.45 kilometers to procure chicken products. If chicken products are procured in the same province as the marketer, the average travel distance is 12.2 kilometers. These distances are relatively shorter than the distances for pig and bovine products. Marketers traveled the furthest to procure chicken products from Ha Tay province, an average of 31 kilometers. This distance reflects the procurements of marketers from Ha Noi, Phu Tho and Bac Giang (Table 5.20).

Marketers from Ha Noi and Hoa Binh Travel the furthest on average to procure chicken products. In common with pig and bovine products, assemblers travel relatively further than wholesalers and retailers to procure chicken products. Retailers travel an average of 12 kilometers, further than for pig or bovine products. This is because a relatively large proportion of retailers from urban regions procure chickens from the farmgate. Assemblers and wholesalers travel an average distance of 25 and 17 kilometers respectively to procure chicken products.

5.3.4 Duck Product Procurement

Only 18 of the marketers surveyed were involved in procuring ducks or duck products. These marketers were from Red River Delta, North East, North West and North Central Coast regions in the north and Mekong River Delta in the south. As shown in Table 5.21, the province with the largest number of marketers procuring duck products was An Giang, with 8 of the 18 marketers. 6.67 percent of assemblers, 2.67 percent of wholesalers and 4.82 percent of retailers were involved in duck product procurement. Marketers procured duck products from 9 provinces. The largest number of procurements was in An Giang, with almost 28 percent of total procurements.

Marketers make an average of almost 28 percent of duck product procurement from outside their home province. This average proportion is as high as 50 percent for marketers from Hoa Binh (Table 5.22). Assemblers procured an average of 16.67 percent of duck products from outside their home province. Wholesalers and retailers procured an average of 50 percent and 25 percent of duck products respectively from outside their home province.

Marketers traveled an average of 16.6 kilometers to purchase duck products. The average for in-province travel is similar, at 15.3 kilometers. Marketers traveled the furthest to procure duck products in Thanh Hoa, an average of 60 kilometers (Table 5.23). Assemblers traveled an average of 23 kilometers to procure duck products, while wholesalers traveled an average of 15 kilometers and retailers an average of 6 kilometers.

5.4 Sales

All 406 marketers surveyed indicated that they had sold live animals or meat during the previous year. All of the animals and meat were sold domestically, with no exports of any kind being undertaken. As expected the majority of sales by assemblers are live animals, while wholesalers and retailers predominately sell carcasses and meat. The highest selling price products were chicken carcasses, at an average of almost Đ26000 per kilogram. Table 5.85, Table 5.86, Table 5.87 and Table 5.88 detail the regional average sale prices per kilogram for various products.

Assemblers predominantly sell to wholesalers or slaughterhouses. Wholesalers sell to other wholesalers and to retailers. As Table 5.24 shows, retailers sell almost exclusively directly to customers, with a small proportion of product being sold to other retailers.

Live pigs and piglets are predominately sold to wholesalers and slaughterhouses. Pig carcasses and other meat products are usually sold to retailers or direct to the public. Chickens and ducks are normally sold to wholesalers and retailers, while carcasses are sold to wholesalers or direct to customers. Live cattle and buffalo are sold to wholesalers and retailers, while carcasses and meat are sold to retailers or direct to the public (Table 5.25).

Figures 5.1, 5.2 and 5.3 provide a summary of the marketing channel information provided by marketers for slaughter cattle, chickens and pigs in Viet Nam. The percentage figures attached to the flows indicate the approximate percentage of product flow from the source that is represented by that flow type.

5.4.1 Pig Sales

Live pigs or pig products were sold by 268, or 66 percent of marketers. Red River Delta was the region with the most marketers involved in pig selling, with a total of 57. Only 15 of the marketers in Central Highlands were involved in pig selling. Ben Tre was the province with the highest individual number of pig selling marketers with 20. Over 63 percent of assemblers, 62.27 percent of wholesalers and 70.48 percent of retailers were involved in sales of live pigs or pig products. The two most popular provinces for pig or pig product sales were Ho Chi Minh City and Ha Noi, with a combined total of almost 20 percent of sales (Table 5.26).

The majority of pig products are sold in the same province as the location of the marketer. However, an average of 15.7 percent of pig product sales are made to provinces outside the home province of the marketer. The average percentage of pig sales made to provinces outside the

marketer's home province varies between the provinces. The highest average percentage is 46.2 percent for marketers based in Thanh Hoa (Table 5.27).

As was the case for procurement, out of province sales are more frequently made by assemblers than either wholesalers or retailers. Assemblers make an average of 47.37 percent of their pig product sales to provinces other than their own. This figure averages 14.89 percent for wholesalers and 0.85 percent for retailers.

The distance traveled by marketers to sell pigs and pig products varies between under a kilometer and 2200 kilometers. The average distance traveled for pig or pig product sales is 79.19 kilometers. If the sale is made within the marketers own province, then the average distance traveled is only 4.14 kilometers.

Table 5.28 shows that the sale province with the longest sale distance is Dong Thap, with marketers selling in this province traveling an average of 2200 kilometers to make sales. Only one sale to Dong Thap was registered, by a wholesaler from Thai Binh. A number of provinces where pig products were sold registered average travel distances of 1 kilometer for marketers to make sales. Sales to these provinces were predominately made by marketers from within the province. Marketers based in Bac Giang and Thai Nguyen made the longest sales trips, an average of 466 and 287 kilometers respectively. In common with procurements, assemblers made longer trips for sales than either wholesalers or retailers. Assemblers traveled an average of 296 kilometers to make sales, wholesalers traveled an average of 25 kilometers and retailers only traveled an average of 2 kilometers.

5.4.2 Cattle and Buffalo Sales

Cattle and buffalo products were sold by 92 marketers, or 22.67 percent of the total. These marketers were based in the northern and central regions of Vietnam, with none based in North East South or Mekong River Delta. The province with the largest amount of cattle/buffalo marketers was Phu Tho with 12. Over 30 percent of the wholesalers, 25.56 percent of assemblers and less than 14 percent of the retailers surveyed sold cattle and buffalo products.

Cattle and buffalo products are sold by the surveyed marketers in 17 provinces. Table 5.29 shows that the most common sale province for cattle/buffalo products was Ha Tay, accounting for over 15 percent of the sales made by the surveyed marketers, followed by Ha Noi, with around 14 percent.

An average of almost 35 percent of bovine product sales were made outside the province of the marketer(Table 5.30). This over twice the proportion of out of province sales of pigs. An average of 52.17 percent of sales by assemblers were made in provinces other than their own. Wholesalers sold an average of 42.55 percent of bovine products outside their province, while all retail sales were made in the home province of the retailer.

The distance traveled to sell cattle or buffalo products varies between less than a kilometer and 1750 kilometers. The average distance is 156.61 kilometers. For sales within the marketers province, the average distance is 5.52 kilometers. The sale province with the longest average sales distance is Binh Duong, with 1750 kilometers. This represents sales by an assembler from Bac Giang. The shortest average sales distance is 1 kilometer in Binh Dinh, where all sales were made by marketers from within the region.

Marketers from Thanh Hoa make the longest sale trips, with an average of 763 kilometers. In line with the proportions of out of province sales, assemblers have the longest average sales distance at 248 kilometers. Wholesalers travel an average distance of 184 kilometers and retailers travel the shortest distance, an average of 2 kilometers.

5.4.3 Chicken Sales

Chicken products are sold by 83 marketers, based all regions except South Central Coast. Ha Noi, Thai Nguyen, Pho Tho and Bac Giang all have 9 chicken marketers. Over 31 percent of assemblers, 19.33 percent of wholesalers and 15.56 percent of retailers are involved in chicken sales.

An average of more than 20 percent of sales of chicken are made outside the province of the marketer. This proportion is as high as 66.67 percent for marketers based in Bac Giang (Table 5.33). Unlike pigs or bovines, wholesalers are the major out of province sellers of chickens. Assemblers sell an average of 25 percent of their chicken products outside their home province, wholesalers sell an average of 34.48 percent and retailers only make an average of 3.85 percent of their sales outside their home province.

The distance traveled to sell chickens varied between 1 kilometer and 170 kilometers with an average of 26.29 kilometers. The average distance for in province sales is 10.78 kilometers. The sale province with the longest average sale distance is Quang Ninh, with 140 kilometers. The distance traveled to sell chickens is relatively lower than that for either pigs or bovines (Table 5.34).

Marketers from Bac Giang travel the furthest to sell chickens, an average of 82 kilometers. Wholesalers had the highest proportion of out of province sales of chickens, and also have the highest average sales distance of 40 kilometers. Assemblers travel an average distance of 32 kilometers and retailers travel an average of 5 kilometers to make chicken product sales.

5.4.4 Duck Sales

Ducks are only sold by 14 of the 406 marketers. These marketers are located in Red River Delta, North East, North West, North Central Coast and Mekong River Delta. Duck sellers represent almost 7 percent of assemblers, less than 1 percent of wholesalers and over 4 percent of retailers. The most common sale province was An Giang, accounting for over 28 percent of total sales, followed by Nghe An, with 21.43 percent (Table 5.35).

There was only outside province sale of ducks. This was a sale of duck products in Ha Noi by an assembler from Thanh Hoa. The average distance marketers travel to sell duck products was 16.88 kilometers and varied between 1 and 170 kilometers. The average in province transport distance was 5.1 kilometers. Ha Noi had the highest average sale distance of 170 kilometers, which represents the sale from Thanh Hoa (Table 5.36). Assemblers traveled longer distances to sell duck products than either wholesalers or retailers. Average assembler sale distance was 36 kilometers. Wholesalers traveled an average of 10 kilometers and retailers traveled an average distance of 1 kilometer to sell duck products.

5.5 Margins

Average annual total labor costs for marketers are D2.599 million. The reported annual labor costs for marketers vary between zero (only non costed family labor used) and D5.76 million. Table 5.37 shows that average annual labor costs are highest in North East South and Mekong River Delta and lowest in North West. Average annual labor costs for assemblers are D4.744 million, for wholesalers are D3.669 million and for retailers the average annual labor cost is D485,783.

Table 5.38 shows that the most expensive non labor costs are renting transport (annual average D29.149 million) and storage rental (annual average D9.729 million). Fumigation has the lowest annual average cost, at Đ410,000. Relative regional levels of non labor costs follow a similar pattern to total labor costs, and are highest in North East South and Mekong River Delta and lowest in North West. Average annual total cost levels (sum of labor and non labor costs) also follow this pattern. Table 5.39 details the average annual levels of labor costs, non labor costs and total costs by region and business type.

The marketer margin can be defined as the difference between the revenue gained from selling products and the cost incurred in running the marketing operation. These costs are the cost of procuring the product, labor costs and non labor costs. The average levels of absolute values of margins are highest in North East South and lowest in North West. However, as a percentage of total sales values, average margins in North East and Central Highlands are the highest at 9.28 and 7.14 percent respectively (Table 5.40).

Average margin values of assemblers are higher than those of wholesalers and retailers. As Table 5.41 shows, despite having the lowest absolute values of margins, retailers margins are the highest in terms of percentage of sales value (5.82 percent). Assembler's margins are larger than wholesalers or retailers in all regions except Central Highlands, North East South and Mekong River Delta, where wholesaler margins are higher. Retailer margins are the highest in terms of proportion of sales values in all regions except Red River Delta, North West and Mekong River Delta. The levels of margins by region and marketer type are shown in Table 5.42. Figures in parentheses represent the average levels of margins as a percentage of marketer sales value.

Table 5.43 shows that pig assemblers, wholesalers and retailers had higher average absolute margin levels than any other animal category. Cattle assemblers and retailers had the highest average margins in terms of percentages of sales values. Duck wholesalers had the highest average wholesaler margins as a proportion of sales. Average retailer margins are higher than average assembler or wholesaler margins for all products except ducks. Average pig marketer margins are the highest in terms of absolute value and in terms of percentage of sales values in all regions except Central Highlands and North Central Coast (Table 5.44).

Economies of scale are present for retailers, but not for assemblers or wholesalers. This may be because to expand beyond a certain point as an assembler or wholesaler requires to invest in large forms of mechanized transport and storage facilities. Retailers however, may only require investment in additional floor space.

Economies of scale of marketing systems can be estimated by regressing the log of revenue against the log of profits.

$$\log(\text{revenue}) = \alpha + \beta \log(\text{profit})$$

If the marketing system exhibits diminishing returns to scale then the coefficient â should be positive and less than 1. If the marketing system exhibits increasing return to scale then the â should be positive and greater than 1. The estimates of â for assemblers and wholesalers were positive and less than 1 and for retailers were positive and greater than 1. The parameter estimates for assemblers, wholesalers and retailers are shown in Table 5.45.

5.6 Spatial Marketing Structure

This section summarizes inter provincial movements of animal products by marketers. Only one pig assembler indicated that they transported pig carcasses between regions. All other inter provincial transport of pig products by assemblers consisted of live pigs. The majority of these were improved pigs of 50 kilograms or above. The majority of inter provincial trading assemblers procured pigs in their own province for sale in outside provinces. Distances traveled (particularly for selling live pigs) can be great. Assemblers from Bac Giang (Red River Delta region) traveled over 2000 kilometers to sell improved breed piglets to buyers in Can Tho, Kien Giang and Ca Mau (Mekong River Delta region). Assemblers from Ha Tay province sell improved slaughter pigs 35 kilometers away in Ha Noi, and also transport pigs 1700 kilometers to Ho Chi Minh City for sale (Table 5.46).

The majority of pig wholesalers transport pig carcasses and (to a lesser extent) other forms of pig meat between provinces. Only small number of wholesalers transport live animals. Almost all product transported by wholesalers between provinces comes from improved animals. As

wholesalers generally transport meat, their travel distances are shorter than those undertaken by assemblers who transport live animals. Wholesalers either procure animals from their own province and sell to other provinces (this is undertaken by wholesalers from Ha Tay, Thanh Hoa and Ben Tre) or procure animals from outside their province and transport them to their own province for sale (this is done by wholesalers from Ha Noi, Hai Phong, Hoa Binh and Ho Chi Minh City). Wholesalers who transport live animals generally travel over longer distances than wholesalers transporting meat do. Wholesalers selling carcasses into Ho Chi Minh City from Bac Giang and Thanh Hoa purchased improved slaughter pigs in those regions, transported them live to Ho Chi Minh City and then slaughtered them and sold carcasses (Table 5.47).

The only reported inter provincial movements of pork by retailers are detailed in Table 5.48. A Dong Nai retailer procured improved breed pig meat in Dong Nai and transported it to Ho Chi Minh City for sale and an An Giang retailer procured improved pig carcasses in Vinh Long for sale in An Giang.

One cattle/buffalo assembler reported transporting carcasses between provinces. All other transport was of live cattle/buffalo or calves. Unlike pig assemblers, many cattle/buffalo assemblers operate outside their own provinces for both procurement and sales. Around a quarter of the reported inter provincial movements of cattle by assemblers were between two provinces that were not their home province. In some cases, these movements represent 100 percent of the assemblers transport of cattle/buffalo products. The longest movements were of live cattle/buffalo purchased in Thanh Hoa and transported 1600 kilometers to Ho Chi Minh City for sale (Table 5.49).

Cattle/Buffalo wholesalers transport both live cattle and carcasses. Table 5.50 shows that live cattle/buffalo are transported over longer distances than carcasses. Cattle/buffalo wholesalers from Bac Giang procure cattle in Tuyen Quang, Bac Can and Cao Bang for transport 1750 kilometers to Binh Duong for sale. Wholesalers predominately procure product within their own province for sale to other provinces.

Assemblers transport live local and imported chickens relatively short distances. Assemblers in Ha Noi, Hai Phong and Thai Binh procure chickens from outside their own province, while assemblers from Phu Tho, Bac Giang and Thanh Hoa procure chickens from their own province for sale in other provinces (Table 5.51).

In common with assemblers, chicken wholesalers transport live chickens. Table 5.52 shows that chickens are either procured in the wholesalers province and transported to other provinces for sale (Marketers based in Thai Binh, Phu Tho, Hoa Binh) or purchased in other provinces an sold in the wholesalers own province. Wholesalers in Ha Noi and Bac Giang purchase and sell in a variety of locations.

Chicken retailers transport both chicken carcasses and live chickens. Retailers transport chicken over shorter distances than assemblers or wholesalers. Procurement distances are generally longer than sale distances. In all but one instance, chicken products are procured outside the retailer's province for sale within the retailer's province (Table 5.53).

Inter provincial transport of ducks is limited to a Thanh Hoa assembler procuring ducks in Thanh Hoa for sale in Ha Noi and a Nghe An assembler procuring ducks in Ha Tinh for sale in Nghe An. Ducks are marketed live. An An Giang wholesaler procures ducks in Dong Thap for sale in An

Giang. Retailers in Hoa Binh and An Giang procure ducks in Lai Chau and Dong Thap for sale in their own provinces (Table 5.54).

5.7 Credit

Credit was used in 1998-1999 by 88 marketers, almost 22 percent of the total. Red River Delta was the region with the highest proportional credit usage, with one third of surveyed marketers borrowing funds. In contrast, only 8.57 percent of surveyed North East South marketers borrowed funds during the preceding year. The percentages of assemblers, wholesalers and retailers utilizing credit were similar, accounting for 23.33 percent of assemblers, 24.16 percent of wholesalers and 18.67 percent of retailers.

Loans are sought by marketers for many purposes, including purchase of animals and meat, marketing expenses or transport and labour costs. The most common credit requirement for the surveyed marketers was funds to purchase live pigs. This accounted for almost one third of loans received by surveyed marketers. Funds for purchasing live pigs were the most common credit requirement in Red River Delta, North East and North East South. In North West, North Central Coast and Central Highlands the most common loan purpose was purchasing live cattle. In South Central Coast and Mekong River Delta, pig meat purchase funds were the most common loan purpose for the surveyed marketers(Table 5.55). Surveyed assemblers and wholesalers most frequently sourced credit for purchases of live pigs and live cattle/buffalo. Surveyed retailers most commonly sourced credit for pig meat purchases.

Marketers can obtain credit through many official and unofficial sources, including friends, other farmers, agricultural banks and money lenders. As was the case with credit supplied to producers,

agricultural banks were the major suppliers of credit to marketers, accounting for over half of all loans to surveyed marketers. The informal lender segment (family, friends and money lenders) accounted for over one third of loans to marketers. This is far higher than for producers, where the informal loan proportion was less than 10 percent. Agricultural banks are the major loan source in Red River Delta, North East, North West, North Central Coast and North East South. In South Central Coast, money lenders are the dominant loan source. In Central Highlands, money lenders and agricultural banks are both responsible for one third of loans. In Mekong River Delta, loans are evenly distributed between family/friends, commercial banks, agricultural banks and other credit institutions. The informal credit sector is most important in South Central Coast and least important in North East South. Agricultural banks were the most common loan source for assemblers, retailers and wholesalers. Retailers were the largest users of the informal loan sector.

As shown in Table 5.59, the loan source with the highest average lending amount was agricultural banks, at over D11.5 million. Loans from commercial banks were for an average amount of D3.5 million. Average loan periods varied between 6 months for money lenders and 3 years for foreign banks. The lowest rates were charged by commercial banks at 1.15 percent per month. Money lenders charged the highest interest rate of 3.11 percent monthly.

Loans for marketing purposes were for the highest amount (average D32 million) and for the shortest period (4 months on average). Loans for labor purposes had the lowest average amount and loans for transport purposes were for the longest period (28 months average) (Table 5.60).

Assemblers require credit mostly for purchasing live animals. The average amount borrowed by assemblers is correspondingly greater than that of wholesalers and retailers. Retailers are more

likely to use the informal credit sector to source funds, and accordingly, the average interest rate charged to retailers is relatively higher than for assemblers or wholesalers (Table 5.61).

Table 5.62 shows that some form of collateral is required as security for 75 percent of loans made to marketers. The most common form of collateral is security over the title of the marketer's house, which is required for almost half of loans granted. The formal sector (banks and other credit institutions) require collateral of house or land title for the majority of their loans. In contrast, the informal sector (family/friends and money lenders) either do not require collateral or require some form of social capital as security for their loans.

Security over the title of the borrower's property (house or land) is the major type of collateral required for all loan purposes. Property security is also the major type of collateral for all types of marketer. Availability of sufficient credit to marketers appears to be limited in Viet Nam. Only 55.68 percent of marketers who borrowed funds indicated that they had sufficient capital to carry on their business after borrowing funds. This proportion varied between 33.33 percent in North East South to 100 percent in North West.

A higher percentage of retailer borrowers (61.29 percent) indicated that they had sufficient credit to allow them to operate than either wholesalers (50.00 percent) or assemblers (57.14 percent). This may be connected with the relatively high reliance on the informal credit sector by retailers.

Marketers that did not receive enough credit to carry on their business required between D4 million and D300 million in order to conduct their operation smoothly at the busiest periods. The average requirement by these marketers was around D33.6 million. Assemblers required an

average of D59.33 million, wholesalers required D35.17 million and retailers average credit requirement was D12.03 million.

The most common reasons for not being able to obtain sufficient credit were given as being difficulties with the bank and a lack of collateral. The most common problems for wholesalers and assemblers were lack of collateral and high interest rates, while difficulties with banks was the main problem for retailers.

Marketers indicated that they were prepared to pay between an additional 0.7 and 2.5 percent interest per month in order to obtain sufficient credit. The average additional rate that marketers were prepared to pay is 1.34 percent monthly. This is consistent across regions and business types.

Over 77 percent of marketers sold goods on consignment. This was most common amongst wholesalers (90.60 percent) and least common amongst assemblers (64.44 percent). Over 72 percent of retailers sold goods on consignment. The consignment period varied between 1 and 100 days, with an average of 43 days. Retailers had the longest average consignment period and wholesalers had the shortest. While the majority of marketers were involved in selling goods on consignment, only 8.4 percent of marketers received payment in advance for sales. This varied between 6.02 percent of retailers and 14.44 percent of assemblers.

Amongst marketers who received payments in advance, these sales types represented an average of almost 41 percent of sales. This varied between 35 percent for wholesalers and 44 percent of

sales for assemblers. Marketers received payments up to 10 days in advance, with an average of 2.47 days advance payment.

Only 7.39 percent of marketers gave credit in the preceding year. This credit was for between D1 million and D50 million with an average credit level of D9.55 million. Assemblers lent the highest amount, an average of D11 million. The majority of these funds were lent for non-business purposes (Table 5.63).

5.8 Transportation

Table 5.64 shows that over 97 percent of surveyed marketers use some form of transport to procure or sell products. In North East and South Central Coast, all surveyed marketers use transport, while in Central Highlands, almost 10 percent of marketers do not use transport.

The most common form of transportation was the motorcycle, used by over 60 percent of marketers. Bicycle was the next most common with 12.88 percent of marketers using one. Motorcycles were the most common form of transportation in all regions and for all marketer types. Motorcycles were most popular in the Red River Delta and Central Highlands regions (Table 5.66).

In many cases marketers need to rent transportation for procuring and selling products. Transportation is rented by 34.6 percent of marketers. Rentals were most frequently undertaken in Mekong River Delta, where 66.04 percent of marketers rented some form of transportation and least frequently in North East (17.72 percent). Assemblers are more likely to rent transportation than wholesalers. A higher proportion of wholesalers rent transport than retailers. This is not

surprising, as assemblers transport larger amounts of product over greater distances than either wholesalers or retailers (Table 5.67).

The most frequently rented type of transport is the truck. Other major rental types are “other” (bus or cong nong). The information in Table 5.68 indicates that marketers are predominately renting larger transport types. Assemblers and wholesalers predominately rent trucks for procuring and sales, while retailers mostly use cyclos (42.86 percent of transport rentals) or carts (25.71 percent of transport rentals).

Around 41 percent of rented transport is used for transport within the same district. 31.84 percent is used for selling outside the district and 27.93 percent is used for buying from outside the district. Relatively smaller proportions are used for buying and selling outside the province and region. Assemblers use a greater amount of rental transport for selling outside their district than either wholesalers or retailers. Wholesalers use almost 40 percent of rented transport for procuring products outside their district. Assemblers use over 40 percent of rented transportation for selling outside their district.

As Table 5.69 shows, motorized forms of transport (trucks, motorcycles, trains and boats) were those with the longest transport distances and times, heaviest transport weights and highest shipment costs. Trucks are used to transport goods for the longest average period and distances. Trucks also have the highest average shipment costs and shipped weight.

Using the transport distances, times and shipping weights summarized in Table 5.69 it is possible to derive transport cost functions for truck transport of live animals and meat. These functions are

presented in equations 5.1 and 5.2. A quadratic cost function provided the best fit for live animal transport and a linear function provided the best fit for meat transportation. This may reflect slight economies of transportation distances for animal transport that do not exist for meat transportation.

(5.1) $CT_a = 83.902 + 0.7143km - 0.0000649km^2$

(5.2) $CT_m = 71.859 + 0.1566km$

Where;

CT_a = Cost of transporting 1 ton liveweight of animals (Đ'000)

CT_m = Cost of transporting 1 ton of meat (Đ'000)

km = distance (kilometers)

Around 27 percent of marketers reported that they experienced occasional restrictions on the movement of goods. The highest incidence of transport restrictions was in Red River Delta and the lowest was in North East South. As assemblers and wholesalers make more frequent and longer procurement and sales trips than retailers, it is hardly surprising that they report a far higher incidence of restrictions on transport (Table 5.70). The most common form of transport restriction identified by the marketers was police conduct. This was responsible for more than 70 percent of restrictions on movements of goods. Police conduct was the major form of transportation restriction in all regions except South Central Coast (Inter Provincial barriers) and Mekong River Delta (police conduct and tolls). Police conduct was also the major form of barrier reported by all types of marketer (Table 5.70, Table 5.71).

5.9 Profitability

Profitability of marketing activities was rated as good or very good by around 23 percent of marketers. The majority (67.25 percent) rated profitability in 1999 as fair. Red River Delta and South Central Coast had the highest proportions of marketers rating profitability as good. Profitability appears to be the most variable in North East, which had the highest proportion of marketers rating profitability as poor and also had the highest proportion rating it as very good (Table 5.72).

Profitability levels change from year to year for many different reasons. The most common reason for change in profitability for marketers was changes in trade volumes. This was the major reason for change in profitability in all regions. Changes in labor and other non labor costs have the least influence on profitability levels. Changes in trade volumes were the major factor influencing profitability change for assemblers, wholesalers and retailers. Changes in product purchase price and competition levels also had significant impacts upon assembler profitability. Table 5.73 shows that wholesaler and retailer profitability were also affected by changes in sale prices.

The effects of these changes on marketer profitability were overwhelmingly negative, with only 13.04 percent of marketers responding that factor changes had had a positive effect on profitability. Factor changes had a more positive effect on profitability of wholesalers than assemblers or retailers. A small proportion of marketers reported that changes in sale price, purchase price and trade volume had a positive effect on profitability. Changes in interest rates, labor costs, other non labor costs and competition level have a universally negative effect on profitability levels.

Profitability levels remained constant between 1998 and 199 for almost 60 percent of marketers. Profitability increased for 34 percent of marketers and only decreased for 6.2 percent. As shown in Table 5.74, the highest proportion of increased profitability was in North West, where half of the marketers reported increases in profits. 9.09 percent of marketers in North East South reported profitability falls. Profitability was most consistent in South Central Coast and least consistent in North West. Assemblers' profitability remained relatively constant, wholesalers had a high proportion of falling profitability and a relatively high proportion of retailers recorded profitability increases (Table 5.75).

5.10 Assets

Marketers own many different types of assets, including land, equipment and buildings. The most commonly owned asset was transportation equipment, which was owned by almost 90 percent of marketers.

Land was owned by over 40 percent of marketers. This proportion varied between 11.54 percent of marketers in North Central Coast and over 67 percent of marketers in North East. Over 52 percent of assemblers own land, while the figure for retailers is around 30 percent.

Equipment is owned by around 57 percent of marketers, but this proportion varies widely between regions, with only 22.86 percent of North East South marketers owning equipment compared to 83.33 percent of Red River Delta marketers. Retailers are the most likely to own equipment, with over 62 percent owning some form.

Transport equipment is owned by over 90 percent of marketers in all regions except North West, South Central Coast, North East South and Mekong River Delta. The lowest proportion of transport ownership was in Mekong River Delta, with 74 percent. Wholesalers were slightly more likely to own transport equipment than retailers or assemblers.

The percentage of marketers owning animal housing varies between 23.53 percent in South Central Coast and 48.1 percent in North West. As would be expected, higher proportions of assemblers and wholesalers own animal housing than retailers.

Less than one third of marketers own buildings, but this varies between 13.46 percent in North Central Coast to over 67 percent in North East. Wholesalers are more likely to own buildings than either retailers or assemblers.

The average value of fixed assets of the marketer was D36.779 million, ranging from D40,000 to D295.11 million. Total asset value was highest in Central Highlands (D34.176 million) and lowest in Red River Delta (22.276 million). Total asset values of retailers (D30.961 million) were greater than those of wholesalers (D26.66 million) or assemblers (D22.09 million). Transport assets make up the largest proportion of marketer assets, at almost 66 percent of total asset value. Buildings assets make up 17.01 percent of total asset value, titled property makes up15.97 percent of value and 1.03 percent of value is contributed by durable asset value. As shown in Table 5.76, transport assets make up the majority of asset values for marketers in all regions. Transport assets are also the major asset type for assemblers, wholesalers and retailers (Table 5.77).

5.11 Conclusion

The lack of a system of defined live animal markets in Viet Nam means that the majority of marketing and distribution of live animals and animal products is undertaken through a network of marketers operating in informal groupings and often undertaking exchanges on a face to face basis.

Market integration between various parts of Viet Nam remains low, largely because of the difficulty of transporting livestock and meat products over long distances. The overwhelming majority of marketers surveyed operated almost exclusively within their own district. Only a small proportion of assemblers and wholesalers made lengthy journeys either to procure or sell livestock products. This is partly due to poor transport infrastructure and also partly due to restrictions on transport, which were experienced by almost half of surveyed assemblers and around 35 percent of wholesalers. These restrictions were predominately identified as being associated with police conduct. While infrastructure and information systems remain at low levels and the unpredictable nature of transport restrictions continues, the scope for integrations of markets in different regions remains limited.

The development of the marketing system in the previous ten years means that there are now many layers between producers of livestock products and the end consumers of those products. The lack of an organized system of markets for livestock has had two major effects on producers.

First, the lack of direct links with a large number of market participants on a regular basis means that there may be very little reliable information flow between consumers and producers.

Producers have may have very little incentive to change production habits and very little reliable information on which to base such a change.

Second, the lack of a competitive environment such as that provided by a livestock market system means that farmers market power is very low compared to that of assemblers and wholesalers. In addition to better market information, wholesalers and assemblers have more economic power than producers and are able to heavily influence the procurement price for livestock products in many cases. As discussed previously, the major market and price information source for producers was assemblers and other traders. This indicates the lack of market power of producers.

While the distribution system that has evolved in Viet Nam to link producers and consumers of livestock products may be efficient in an economic sense, and certainly profitable for the participants, the structure of the system is such that producer market power is low. Possible solutions to this are formation of co-operative selling associations by farmers, the development of local and regional livestock markets and increased information provision to producers. Any effective strategy will have to include all of these measures to some extent.

CHAPTER 6

SLAUGHTERING AND MEAT PROCESSING

Summary

This chapter examines the current structure and constraints facing the animal slaughtering and meat processing industries in Viet Nam. Drawing on a survey of abattoirs and meat processing businesses, the chapter examines the structure of the industry's businesses, their purchasing, processing, and distribution channels, and their use and access to transportation, storage, information, and credit. In particular, the chapter looks at the low level of technology and the poor hygiene conditions used in the industry, which further contribute to the low quality of the meat and processed products sold to consumers. Lastly, the investment behavior and the overall profitability of the industry are reviewed.

Highlights

- *In most high-income countries, consumers demand high quality, disease free, and hygienically processed meat and meat products. The availability of safe food products are regulated through stringent health standards and laws. Hazard Analysis and Critical Control Point (HAACP) systems are increasingly being adopted throughout the world to improve food safety. At present, the meat and processed meat products produced in Viet Nam generally fail to meet the stringent health standards and fickle consumer preferences in world markets.*
- *While the industry has seem some sizeable investments in slaughtering and processing operations in the past, animal slaughtering and meat processing operations in Viet Nam are generally small scale operations, using low levels of technology, to produce an*

unhygienic product of low quality, which contributes to the endangerment of public health through the consumption of contaminated food products and the unsanitary disposal of waste products.

- *Productivity and the quality of meat are low. Local and improved pig carcass yield average around 68.5 and 72.2 percent respectively. Internationally, carcass yields are on the order of 72 to 80 percent. In terms of quality, the percentage lean meat of local and improved pigs in Viet Nam is on average about 34.5 and 42.6 percent, respectively, while in more productive centers, the percentage lean meat is on the order of 55 to 60 percent.*
- *The sale prices of pig carcass and lean meat prices are higher in Southern Viet Nam, relative to North and Central Viet Nam. Over the period from July 1998 through September 1999, the overall trend in pork product prices has been upward. Prices of pig carcasses have been increasing at a rate of 0.25 percent per quarter, and lean meat prices by about 1.3 percent per quarter.*
- *Many factors retard the development of the industry including low – though rapidly growing – demand, the poor quality of animals and meat, limited inspection and enforcement of sanitary regulations, an underdeveloped cold chain, and a low level of infrastructure.*
- *As described previously, the relatively high incidence and effect of disease, affects animal health, which in turn affects productivity and the safety of the meat to consumers. In addition, the low level of technology used in the industry, the lack of a cold chain, and unhygienic conditions throughout the production process contribute to the rapid deterioration and spoilage of meat and processed meat products.*
- *The lack of a cool/cold distribution chain impedes the distribution of meat and the development of the meat industry in Viet Nam. Live animals are difficult to transport over long distances without frequent and costly feeding and watering stops, or without*

suffering significant weight losses and animal deaths. Few abattoirs, meat processors, and traders have cold transport or storage facilities, making it difficult to transport meat, meat products, and other perishable goods over long distances without it spoiling and endangering human health. Consequently, industry development evolves into small scale slaughtering and processing operations for immediate local consumption, rather than into integrated and efficient operations that meet international product safety and quality standards, and which offer the opportunity for enhanced local and export market development.

- *Poor sanitary conditions at all levels of the production and distribution of meat and processed products contribute to the low quality of meat. Little regard is often taken for maintaining safe hygienic surfaces and preventing the contamination of meat, particularly at informal slaughtering sites. Animal and processing waste is often disposed of improperly. Over 35 percent of processors and abattoirs simply dump their waste products in the streets. Health and veterinary inspections are infrequent and of varying quality for the maintenance of hygienic environments. Over 33 and 46 percent of abattoirs and processors have not had an inspection for their adherence to sanitary inspections.*

Introduction

Animal slaughtering for meat and its transformation into processed meat products is at a relatively rudimentary level in Viet Nam. Although Viet Nam has a handful of large commercial slaughterhouses, most are underutilized and a number have closed or are idle. The majority of animal slaughtering is small scale, often done under a tree by the side of the road where an animal can be hoisted for skinning, eviscerated, and its waste left to drain into storm sewers or ditches. Meat processing is also a relatively small scale activity in Viet Nam. Only a handful of processors have capacities of over 10,000 mt per year. Most meat (about 70%) is consumed or sold as fresh meat. The remaining 30 percent of the meat receives some amount of processing into a limited range of products such as meat pies, roasted meats, canned meats, and some western products like sausages and smoked meats. The overall underdevelopment and poor state of the industry is in part the result of poor hygienic conditions and limited inspections, poor enforcement of sanitary regulations, an underdeveloped cold chain, and small economies of scale. Drawing on a sample of abattoirs and meat processors, this chapter will examine the current structure and the constraints affecting the animal slaughtering and meat processing industries in Viet Nam and suggest policy options for government reforms to develop the meat processing industry by increasing domestic market demand through improved hygiene and better meat quality.

The chapter is organized into 13 sections. Section 6.1 briefly describes some of the characteristics of the abattoirs and meat processors in the sample, and Section 6.2 examines the characteristics of their labor force. The procurement and distribution networks for animals, carcasses, and meat are discussed in Sections 6.3 and 6.4. Trends in carcass and meat prices are briefly discussed in Section 6.5. Sections 6.6, 6.7, and 6.8 examine the use of transportation, information, and storage, respectively. Next, investment activity and credit availability are discussed in Sections 6.9 and 6.10. The structure of the businesses operating costs and their overall profitability are discussed in

Sections 6.11 and 6.12, respectively. Lastly, a number of conclusions are drawn and presented in Section 6.13.

6.1 Abattoir and meat processor characteristics

In order to examine the structure of the slaughtering and meat processing industry in Viet Nam, a survey of abattoirs and meat processors was undertaken. The survey sample includes 123 abattoirs and 72 meat processors. The businesses in the sample are grouped into two main categories for analysis: 1) by region (North, Central, and South Viet Nam), and 2) by the gross value of their production, GVP (small and large). The GVP includes the gross value of all slaughtering and/or processing activities, plus any income derived from other activities that the business may be involved in. The small and large GVP categories were based on the distribution of the GVP. The cutoff points between small and large businesses approximately coincide with GVPs of D 2.1 billion for abattoirs and D 650 million for meat processors.

Forty-five percent of the abattoirs in the sample are located in Northern Viet Nam, 33 percent in the Center, and 22 percent in Southern Viet Nam. Most abattoirs in the sample are registered with the government. About 89 percent are registered private companies, while only 7 percent are private non-registered businesses. The other 3 percent of the abattoirs in the sample are government owned companies (GOEs) or foreign companies. On average, the abattoirs in the South began their operations in 1989, and are typically 2 to 3 years older than those in the North and Center. Their competitors are primarily local businesses. About 75 percent of the abattoirs undertake their activities for distribution at a single location, be it at a local market, village, commune, or district town. Of the small abattoirs, 85 percent operate at the district town or lower level, while about 1 percent operate at the province or region level. By contrast, 16 percent of large abattoirs operate at a provincial or regional level and 39 percent operate at a district town or

smaller level. The number of direct competitors to the abattoirs has grown rapidly, albeit concurrently with the growth in meat demand. As shown in Table 6.1.1, the percentage of abattoirs that are competing against more than 20 businesses has nearly tripled between 1997 and 1999.

The number of animals slaughtered at abattoirs has changed dramatically since 1995. As shown in Figure 6.1.1, the number of animals slaughtered annually by the average pig abattoir has increased from about 2213 in1995 to 8214 in 1998. For 1999 however, the projected number of pigs slaughtered was projected to be only about 63 percent of the level in 1998, perhaps due to the increased number of competitors and an overall decline in profitability. For chicken by contrast, the period from 1995 through 1997 saw an overall decline in the annual number of animals slaughtered. Increased investment in the period since 1998 and perhaps a reduction in prices vis-à-vis pork prices has led to a rebound in the average number of chickens slaughtered annually. Figure 6.1.2 shows that the average number of cattle slaughtered has remained fairly constant over the 1995 to 1999 period, while buffalo slaughtering has fallen from a high of 1112 in 1995 to a low of 592 in 1999 on average.

For the average abattoir, the majority of their income comes from the sale of animal carcasses. Overall, about 86 percent of their income comes from carcass sales (See Table 6.1.2). Relatively few abattoirs slaughter animals for a fee. Overall, only 1 percent of the abattoirs income comes from providing slaughtering services for a fee, and about 1 percent comes from the sale of live animals. Only about 6 percent of the abattoirs slaughter animals for a fee, of which 71 percent are large slaughterhouses. Of those that slaughter for a fee, 18 percent of their income comes from the provision of slaughtering services, on average. The remaining 11 percent of the average abattoirs income is derived from various other activities.

The distribution of meat processors in the sample is similar to abattoirs. Overall, about 46 percent of the meat processors are located in the North, 31 percent in the Center, and 24 percent in the South. Nearly all of the businesses process pork. Most are privately run and have their businesses registered with the government. Nearly 80 percent of the processors are private registered businesses, while seventeen percent are non-registered private businesses. All of the processors in the South are registered private businesses. However, 32 and 15 percent of the processors in the Center and North, respectively, are also not registered.

Overall, most meat processors in Viet Nam operate within their local markets. About 80 percent of the small processors operate within a market, village, commune, or district town. By contrast, 55 percent of large processors operate at a provincial, regional or national level. As shown in Table 6.1.1, the number of direct competitors in the pork processing sector increased between 1997 and 1999, albeit less quickly then among abattoirs. Average pork processing capacity has remained relatively constant over the 1995 to 1999 period however, at about 7.7 mt per annum for small processors, and 71.2 mt per year for large firms.

The sources of income for meat processors are somewhat more diversified when compared to abattoirs (See Table 6.1.2). Overall, about 77 percent of the average meat processors income comes from the sale of processed meat and egg products. Over 22 percent of their incomes are from a variety of other sources. This is particularly true for processors located in Central and Northern Viet Nam, who earn about 34 and 20 percent of their income from various other activities, respectively.

6.2 Labor

Labor is an important component in the slaughtering of animals and processing of meat. The average abattoir in Viet Nam has 4.9 employees, who work nearly 6 days per week, and receive a wage of about D 21900 per day. As shown in Table 6.2.1, abattoirs in the North have the largest number of workers on average and pay the lowest wages. Abattoirs in the South by contrast tend to pay higher wages. On average larger abattoirs have 11.2 workers while smaller abattoirs have about 2.8. The wages paid by larger abattoirs are not substantially higher than those paid by small abattoirs.

Nearly all of the abattoirs are owned and operated by family members. On average, 2.2 family members work 5.6 days per week in the abattoir. Twenty-six percent of the abattoirs also hired skilled workers. On average, abattoirs have 1.6 permanent skilled employees working 5.4 days per week, and earning about D 23400 per day. In addition, 20 and 11 percent of the abattoirs also hire permanent unskilled employees and temporary workers, respectively. Temporary workers receive slightly hire wages than unskilled permanent employees, but they only work about 2 days per week in comparison to over 6 days per week worked by the unskilled permanent workers.

As shown in Table 6.2.3, relatively few employees of abattoirs and meat processors have more than a high school level of education. Only about five percent of abattoir work force and seven percent of processor employees have more than a high school education. Abattoirs and processors located in Southern Viet Nam are more likely to have employees with at least a high school level of education, as are the large-scale businesses. Relatively few abattoirs and processors send their employees to training. Overall, about two percent of abattoirs and three percent of processors send employees for technical or management oriented training. On average, these businesses send 1.5 employees for training on two week training courses during a given year. Most of the training is technical oriented, although some workers obtain managerial related training. Training for meat

processor employees is primarily provided by the Department of Veterinary Services, while slaughterhouse employees more often obtain training from research institutes or universities.

6.3 Production, Procurement and Supply Channels

As shown in Table 6.3.1, pig abattoirs on average purchased over VND 2.4 billion of live pigs during the period from July 1999 through June 2000; equivalent to about 0.5 million mt of live weight. Pig slaughterhouses in the North and South, where the main consumption areas are located, handle substantially more weight than slaughterhouses in Central Viet Nam. The average small pig abattoir processes about 73800 mt of liveweight, or about two-fifths that processed by the typical large pig slaughterhouse. In value terms, purchases by large abattoirs are nearly 10 times greater than that of small slaughterhouses. Overall, approximately 82 percent of live weight purchases are from household farms and 15 percent from traders. In comparison to small scale slaughterhouses, large scale pig abattoirs purchase a larger share (33 percent) of their animals from traders. Large scale and Southern abattoirs also purchase nearly eight percent of their pigs from commercial pig producers.

Poultry abattoirs primarily operate on a smaller scale than businesses that specialize in pig slaughtering. The average poultry slaughterhouse processes about 22.5 mt of poultry, with a value of about D 370 million. Over 90 percent of the birds are obtained from household farms with the remainder purchased from traders.

Cattle and buffalo slaughtering is primarily located in Northern and Central Viet Nam. The average cattle / buffalo slaughterhouse processed over 141500 mt of liveweight during a given year, with a value of about D 1.1 billion. Approximately 58 percent of the cattle and buffalo are obtained from small household farms. A small portion, about two percent, is purchased from commercial farms, with the remaining 40 percent purchased from traders. As with the case of pig

abattoirs, large cattle and buffalo abattoirs obtain a larger share of their animals from traders than their smaller competitors, about 58 percent compared to 36 percent.

Meat processing operations generally operate on a smaller scale than abattoirs (See Table 6.3.2). The average pork processor processes about 22600 mt of meat during a year, with a value of nearly D 0.7 billion. Like pig abattoirs, large processors process nearly 10 times more meat than small processors. Processors in Central and Southern Viet Nam also tend to be larger than those located in the North. In value terms, approximately 11 percent of the meat processed is obtained from household farms. The meat obtained through this channel is often still liveweight, which the meat processor first slaughters before transforming the carcass into processed products. Nearly 18 percent of the meat purchased by large abattoirs is obtained through this channel, while small scale slaughterhouses purchase only about 8 percent of their meat directly from farm households. The relatively large share of meat obtained from other sources is largely from the processing businesses own pig raising and slaughtering operations. The majority of the meat used by processors (65 percent) is purchased directly from slaughterhouses, and about 21 percent is purchased from traders. The buying behavior of large scale processors, processors located in Southern Viet Nam, and to a lesser extent those based in Central Viet Nam, differ from small scale and Northern processors. As shown in Table 6.4.2, small scale and Northern pork product processors obtain a relatively large share of their meat directly from slaughterhouses, and relatively little from traders. By contrast, large scale and southern pork processors obtain most of their meat from traders and a relatively small share from slaughterhouses.

Abattoirs and processors obtain their animals and meat primarily from local sources. As shown in Table 6.3.3, approximately 89 percent of the purchases of pigs by abattoirs are obtained from suppliers located in the province where the slaughterhouse is based. On average, the abattoirs travel about 8 km to purchase pigs for their operations. A further eight percent of pig purchases

by abattoirs are made outside of the province but within the region. Only about three percent of purchases are made outside of the region, with the animals traveling about 460 km on average to the slaughterhouse. Purchases outside of the province are much more prevalent among abattoirs located in the North and the South (about 15 percent). Large-scale abattoirs also obtain a larger proportion of their pigs outside of the province. Overall, large scale abattoirs purchased over 25 percent of their pigs outside of the province and seven percent outside of the region where they operate, whereas, small scale slaughterhouses purchase nearly 95 percent of their animals within the province. Chicken abattoirs, and pork and chicken product processors purchase nearly all of their animals and meat within the province (See Table 6.3.4 and 6.3.5). Like pig abattoirs, cattle and buffalo slaughterhouses, purchase about 88 percent of their animals within the province, and slaughterhouses in the South make nearly all of their purchases from outside the region (See Table 6.3.6 and 6.3.7).

6.4 Sales and Distribution Channels

As shown in Table 6.4.1, the average pig, poultry, and ruminant abattoirs had sales of D 2.9 billion, D 0.4 billion, and D 1.3 billion over the year from July 1998 through June 1999. The typical pig abattoirs located in the South handles a larger throughput of animals and generates more revenue than abattoirs located in Northern and Central Viet Nam. As one would expect, large scale abattoirs have higher sales revenue than their smaller scale competitors. The marketing network of abattoirs also differ based on scale. As shown in Table 6.4.1, although small scale pig abattoirs earn over a third of their revenue from sales to retailers, the majority of their sales revenue comes from direct sales to customers. By contrast, large scale pig abattoirs generate nearly 58 percent of their revenue from retailers, and next to nothing from direct sales to customers. Unlike pig abattoirs that earn about 22 percent of their revenue from sales to wholesalers, poultry abattoirs earn the majority of their revenue from sales to retailers (58

percent) and to customers (42 percent). Cattle and buffalo slaughterhouses earn about 52 percent of their revenue from retailers. Large scale ruminant abattoirs generate a larger share of their revenue from sales to wholesalers than small scale abattoirs that earn nearly a quarter of their sales revenue through direct sales to customers.

As shown in Table 6.4.2, the average pork product processor generated nearly D 0.9 billion in sales during the year from July 1998 through June 1999. Small scale processing business earn the majority of their revenue (74 percent) through direct sales to customers. Large scale processors have a more diversified sales network, and earn the largest share of their revenue from sales to retailers.

As shown in Tables 6.4.3, abattoirs sell nearly 90 percent of their carcasses and meat within the province where they are located. This is especially true for smaller abattoirs. Large scale slaughtering operations by contrast typically sell about 20 percent of their products outside their province but within their region. Processors by contrast often have the opportunity to seek marketing opportunities and sell their products further a field through the transformation of the fresh meat they purchase into products such as canned or cry-o-vac luncheon meats that have substantially longer shelf lives. In a number of cases, some processors ship their meat products over 1500 km to market (See Table 6.4.4).

In comparison to other countries, the capacity of Viet Nam's meat processing sector is small, and operates at production levels substantially below actual capacity. Most of the processed meat products use pork as the main ingredient, although a number of products are made from chicken or duck. Popular processed meat products in Viet Nam include Chinese style sausages, local ham, pork meat pies, meat rolls, and European style sliced meats, sausages, and bacon. Of the

processors in the sample, the four most widely produced processed meat products were Gio, Cha, Nem, and roasted pig. As shown in Table 6.4.5, although average plant production is substantially larger in the South, prices for these pork products are generally higher in the South than in the North. Except in the case of Gio, large processor, who are mainly located in the South and Center, charge higher prices than smaller processors. The higher price charged by larger processors may reflect their ability to better guarantee a consistent supply of product to retailers, the greater demand for processed meat products in Southern Viet Nam, and the lack of a cold distribution chain which effectively prevents processors in the North from selling their meat products in the South.

Selling products by consignment is often used by both abattoirs and meat processors. In the absence of formal sales contracts, abattoirs in particular use consignment sales to sell their animal products. Nearly 90 percent of abattoirs sell carcasses, meat and offals on consignment, accounting for about 52 percent of sales revenue with an average consignment period of over two weeks (See Table 6.4.5). In Southern Viet Nam about 93 percent of abattoirs utilize consignment sales, generating about 65 percent of their sales revenue. By contrast in Northern Viet Nam, although nearly all abattoirs sell goods on consignment, only about 42 percent of their total sales revenue is generated this way. The consignment period is much longer in the North than the South. In the North the consignment period is nearly three weeks, whereas in the South it is a little over one week. The average consignment period for both small and large abattoirs is a little over two weeks. Large abattoirs generate over two-thirds of their sales revenue through consignment sales. Small slaughterhouse, by contrast, make about 47 percent of their sales through consignment sales.

Unlike abattoirs, which generate a relatively large share of their sales revenue through consignment sales, processors use consignment sales less frequently. Overall, about 74 percent of

processors make sales on consignment. Of the processors that sell on consignment, about one third of their sales revenue is through consignment sales, with a consignment period of about 16 days. Fewer large processors sell on consignment than small processors. In the North, although nearly 94 percent of processors sell products on consignment, only about 31 percent of their sales revenue is on consignment. By contrast, fewer processors in the South sell on consignment, although a larger share of their sales revenue comes from consignment sales (about 41 percent).

6.5 Prices

Table 6.5.1 summarizes the price of various types of pig by-products sold by the abattoirs in the sample over the period from July 1998 through June 1999. Sale prices of most pork products are generally higher in South Vietnam than in North and Central Viet Nam. Similarly, the sale prices of pork products sold by the large abattoirs in the sample – mainly located in the South – are also higher than those charged by small slaughterhouses. Overall, pig carcass prices were 14 percent higher in the South than in the North, and lean meat prices were 32 percent higher. Over the period from July 1998 through September 1999, the overall trend in pork product prices has been upward (See Table 6.5.2). Prices of pig carcasses have been increasing at a rate of 0.25 percent per quarter, and lean meat prices by about 1.3 percent per quarter. While the price of separated offal products has increased, the sale price of non-separated offal products declined by 0.37 percent per quarter. Prices for most pork products are relatively stable, although the prices for a number of offal products such as kidneys, lungs, and livers are relatively unstable as shown by the high values of the index of price instability. The instability of many of the offal products is due to a number of factors including the lack of and the thinness of markets for separated offal products.

6.6 Quality, Technology, and Sanitary Conditions

Overall, the quality of meat and meat products is generally low. As discussed in Chapter 4, one of the main reasons for this is due to the poor health of animals. Apart from the relatively high incidence and effect of disease, a number of factors contribute to the spoilage of meat and meat products. In particular, the low level of technology in the slaughtering and processing industries, the lack of a cold chain, and unhygienic conditions throughout the production process contribute to the rapid deterioration and spoilage of meat and processed meat products. Without proper and continuous care, meat can spoil rather quickly. Signs of spoilage include meat discoloration, microbial activity, and rancidity. Such spoilage can be caused by a number of factors including the physical condition of the animal immediately before slaughter, the skill and care taken in slaughtering and dressing operations, hygienic conditions throughout the slaughtering and meat processing process, protection of meat from microbial activity, and maintenance of suitably low ambient temperatures and correct humidity (Fenn 1977).

Carcass percentage and percent lean meat are useful indicators of measuring livestock productivity and meat quality. In comparison to many other countries, carcass percentage in Viet Nam are relatively low. On average, the carcass percentage of local pigs are about 68.5 percent and about 72.2 percent for improved breeds. Local and improved pig carcass percentage are somewhat higher among slaughterhouses located in Southern Viet Nam (68.8 and 73.3 percent) and among large-scale abattoirs (69.5 and 72.7 percent) respectively, who often have better access to more commercially oriented, high quality feed fed livestock. For comparison purposes, carcass percentage are of the order of 72 to 80 percent among in international markets. The percentage lean meat is a useful indicator to measure meat quality. On average the percentage of lean meat from local pigs is only 34.5 percent. Improved breeds such as crossbred and exotic pigs yield about 42.6 percent lean meat. Similarly in the case of cattle, deboned meat from local cattle

is also low at about 36.6 percent. By contrast, the percentage lean meat in the world is on the order of 55 to 60 percent.

The low quality of meat in Viet Nam is also affected by poor storage facilities, underdeveloped slaughtering and processing technologies, and the paying of insufficient attention to the maintenance of hygienic slaughtering and processing facilities and conditions. A number of state of the art slaughtering and processing facilities use advanced technology from European, North American, and South-east Asian countries. Most facilities however use technology of a much lower level. For example about 80 percent of the equipment used by meat processors and about 74 percent of the equipment used by the large meat processors is manufactured in Viet Nam. About 14 percent of the equipment used by small processors is imported from countries with a lower overall level of technological sophistication, and about three percent from the more highly developed Asian and western European countries. By contrast, about 15 and 12 percent of the equipment used by the large processors were manufactured in less developed and more developed countries, respectively.

Another important impediment to the distribution of meat and the development of the meat industry in Viet Nam is the lack of a cool/cold distribution chain. A cold chain is comprised of a series of cold storage and transport vehicles, which allows for the refrigerated and safe movement of meat from the abattoir to the retailer. In Viet Nam, only 3.5 percent of abattoirs, 15 percent of meat processors, and nearly none of the meat traders have cold transport or storage facilities. Larger processors and abattoirs are more likely to have cold storage facilities than others, as are those located in Southern Viet Nam. The lack of a cold chain makes it particularly difficult to transport meat over long distances without it spoiling and endangering human health. Rather, live animals of considerably more weight, bulk, and feed and water requirements, can largely only be profitably transported over relatively short distances and periods without suffering significant

weight losses and animal deaths. The lack of a cold chain also contributes to the need for small scale slaughtering and meat processing units in order to meet immediate local demand, and prevents the integration of markets for meat, which is also a contributing factor to the relatively higher cost of meat in Southern Viet Nam when compared to prices in the North.

Although most traders, abattoirs and processors do not participate in the cold distribution chain, consumers in urban areas are increasingly purchasing refrigerators and freezers to store perishable commodities at home. Overall, about 42 percent of households in and around Hanoi and about 57 percent of the households in and around HCMC own a refrigerator. As shown in Table 6.6.1, refrigerator ownership is higher within the city than in suburban areas. Refrigerator ownership is also proportional to household income level. Wealthier households are more likely to own refrigerators than middle and poorer households. Consequently, even though most Vietnamese households currently have a preference for fresh meat, the large and growing number of households owning refrigerators, indicates that as income increases and the availability of shopping time decreases, that consumers will increasingly use refrigerators to store frozen and chilled meats and meat products.

Contributing to the low quality of meat is the poor sanitary conditions used in the slaughtering and processing of animals. The slaughter of animals for meat occurs at both slaughterhouses and at smaller slaughter sites often located outdoors by the side of the road. At many of these sites, particularly the informal sites, little regard is taken for maintaining safe hygienic surfaces and forestalling the contamination of meat. The industry itself recognizes the poor state of its animal slaughtering facilities. While over 75 percent of the abattoirs in Central and Southern Viet Nam and over 90 percent of large slaughterhouses maintain a high level of sanitary cleanliness, about 37 percent of small and Northern Vietnamese slaughterhouse keep only a fair level of sanitary cleanliness. More effort needs to be made to improve the sanitary conditions of these abattoirs.

The situation may be somewhat better for meat processors, where only about 15 percent indicated that they maintain only a fair level of sanitary cleanliness.

In order to ensure that a sanitary environment exists for the slaughter and distribution of meat, slaughtering and processing businesses are supposed to be inspected periodically. Inspections for quality, animal health and hygienic conditions of slaughtering and processing plants are supposed to be carried out by veterinarians and inspectors from regional animal health centers. Overall, however, about 33 percent of abattoirs and 46 percent of processors have not had a sanitary condition inspection to ensure that regulations are followed and that waste is disposed of properly. Overall, large-scale abattoirs and processors are the most likely to be visited periodically, while small scale operations are inspected least often. Although the quality of an inspection is difficult to measure, sanitary and waste inspections appear to be treated more seriously in Southern Viet Nam, where over 95 percent of the slaughterhouses and processors are inspected periodically. By contrast, only about 55 percent of abattoirs and 42 percent of meat processors located in the North are inspected regularly.

In addition to the maintenance of a sanitary environment, more efforts need to be taken to improve waste disposal at slaughterhouses and processing facilities. Overall, only about half of the slaughterhouses and meat processor are taking actions to dispose of waste properly; a sizeable number simply dump their animal waste. About 49 percent of the businesses dispose of their waste in containers which are in turn taken to landfills, and about 10 percent treat their own waste using chemical or biological treatments, or through the utilization of waste material in fish ponds of for biogas production. While the majority of the abattoirs and meat processors dispose the bulk of their waste in an environmentally friendly manner, about 42 percent of processors and 32 percent of abattoirs dump their waste into the surrounding environment. Free disposal of waste by abattoirs is particularly severe in the North and among small abattoirs where 42 percent and 36

percent simply dump their waste products, respectively. Although the majority of these firms operate at a relatively small scale, substantial contamination of the environment can occur when over 35 percent of the businesses in the slaughtering and processing sector dispose of their wastes freely through the streets and sewers of the city.

Inspectors appear to be increasingly targeting cleanliness and waste treatment during their inspections. Overall, approximately 50 percent of the abattoirs took remedial action to make health related improvements to their facilities after an inspection. Of the abattoirs that took remedial action, over 64 percent took measures to improve the cleanliness of their slaughterhouses, and 33 percent made improvements to their waste treatment facilities. In Northern Viet Nam, where improper waste disposal is a relatively larger problem, 86 percent of the abattoirs who took remedial action made improvements in their waste treatment facilities. Conversely, in Central and Southern Viet Nam, the emphasis is on improving sanitary conditions of the abattoir (about 69 percent). Large abattoirs also take more efforts to improve the sanitary conditions of their slaughterhouses.

When visited, not all abattoirs and slaughterhouses take measures to meet government regulations however. Overall, about six percent of the abattoirs and eleven percent of meat processors in Viet Nam are fined for violating waste and sanitary condition regulations during a given year. The average fine levied is about D 486000 for abattoirs and D 687500 for meat processors.

In general, fines and regular inspections appear to help induce slaughterhouses and meat processors to improve their sanitary conditions. Nevertheless, more vigilant inspections and improved enforcement of existing regulations, also appear to be necessary. For example, of the abattoirs in the sample who dispose of their waste in public streets and sewers and who were recently inspected, only 17 percent took remedial steps to make improvements to their waste

treatment facilities. Of the rest, 25 percent took measures to improve the cleanliness of their abattoir, while the remaining 58 percent took no measures at all. Similarly for the meat processors, only six percent took measures to improve waste treatment facilities and none were fined, while 75 percent did not take any remedial action what so ever. Clearly, even if abattoirs and processors comply with the law, inspectors need to be more vigilant in enforcing government regulations for proper waste disposal and maintaining sanitary meat contact environments, if public health is to be improved.

In addition, the Vietnamese government should examine introducing an Hazard Analysis and Critical Control Point (HACCP) system for improving food safety in Viet Nam. HACCP systems are increasingly being adopted throughout the world to improve food safety. Instead of a system based on carcass-by-carcass inspection, HACCP uses a science-based risk assessment and prevention system to reduce the incidence of pathogens and to conduct periodic tests for microbial pathogens. HACCP seeks to improve food safety cost-effectively using market and regulatory incentives. Indicators are used to test for pathogens. While no single indicator can evaluate the safety of products, testing raw meat products for salmonella is often used to verify standards for microbial pathogens are being met, and testing carcasses for E.coli is often used to verify the process control for fecal contamination. For the private sector, the benefits of reducing the prevalence of pathogens and improved food safety include improvements in shelf life, access to new export markets, retention of customers, and reduced product liability. Such a system can also help to open export market opportunities. Shipping to markets in Asia, Europe, and America require extended shelf life and assuring buyers of the highest level of food safety. Costs of technologies are in the range of 3 to 20 cents per pig carcass, with an optimal combination of technologies having a cost of about 47 cents per carcass (Jensen and Unnevehr 2000).

6.7 Transportation and Storage

The method of transportation, its costs, the level of transport infrastructure, and restrictions on the movement of animals and meat can significantly affect the structure and performance of the marketing system. Transport is important for the operation of the animal slaughtering and meat processing industry in Viet Nam. Overall, 96 percent of abattoirs and processors use transportation. Motorbikes are the main form of transport used by nearly 75 percent of all abattoirs and processors. As shown in Table 6.7.1 and 6.7.2, motorbikes are the primary means of transport for small abattoirs and processors and those located in the North and Central regions. By contrast, large firms and those located in the South more often use trucks, tuk tuks, and carts, as well as motorbikes to transport animals and meat. Use of refrigerated trucks to transport fresh or frozen meat is still limited. Overall, less than one percent of abattoirs and about five percent of processors transport meat or processed products in refrigerated trucks, again primarily by larger businesses. Relatively few of the businesses own transport used in their business other than motorbikes. While over 95 percent of the businesses own motorbikes, only about 23 percent of the abattoirs and nearly zero percent of the processors own their own trucks. Rather these businesses, rent trucks if needed or rent the services of a transport company (See Tables 6.7.3 and 6.7.4).

Overall, about 38 and 13 percent of abattoirs and processors use the services of a transport company. While about 30 percent of the abattoirs in Northern and Central Viet Nam used transport services, two-thirds of the abattoirs in the South rented the services of a transport company. Most abattoirs and processors have had relatively few problems with the services provided by the transport companies. Overall, only six percent of the abattoirs that used a transport company indicated that they have had problems. These abattoirs are mainly large (12.5

percent) and located in the North (18.8 percent), and are primarily related to the overloading of vehicles.

Restrictions on the movement of goods are often a problem in Viet Nam as well, particularly for abattoirs. Over 30 percent of the abattoirs indicated that restrictions on the movement of goods affect the operations of their businesses. Overall, 46 and 41 percent of abattoirs of these businesses indicated that police conduct and tolls negatively affected their business, while 16 and 24 percent of the abattoirs indicated that veterinary inspections and inter-district road blocks restricted the movement of animals and meat.

For the most part, restrictions on the movement of animals and meat, while a factor, are not the main impediment to the movement of animals and meat. As shown previously, prices of carcasses and lean meat are higher in the South than in the North, yet there is little trade in animals or meat from North to South. Consumer preferences for fresh meat aside, little refrigerated transport exists to move meat within Viet Nam. Moreover, while unrefrigerated transport can easily be used for two-way hauling, it is more difficult to fill refrigerated transport for the return journey unless the route is between two large commercial centers where it may be possible to transport fruit, vegetables, or other perishable foods on the return trip. The movement of animals over long distances is also not without its problems. For long distance hauling of 30 hours or more, it is generally necessary to have an interim rest stop along the way for feeding and watering the animals. Without such a stop the loss in live weight and the quality of the meat can be considerable. For example, a journey of 950 kms taking about 50 hours in Nigeria was shown to lead to a loss in cattle weight of about 5 percent (Werhahn 1964). Coupled with a mortality rate of 0.5 percent and considering the low deboned meat to carcass ratio for cattle and pigs in Viet Nam, even a small loss in live weight can significantly affect profitability. In addition, nervous tension, physical strain, and poor feeding and watering over a prolonged period can lead to fat

losses which affect the texture of the meat and lead to impaired bleeding and internal bacterial contamination during slaughter which adversely affects the color and texture of the meat, and the time it can be kept before spoiling (Fenn 1977).

Use of storage for meat and processed meat products is relatively limited in Viet Nam. Overall, 46 percent of abattoirs have space for animals and meat. Nearly 32 percent of abattoirs or about 70 percent have covered storage for their animals. On average, each abattoir has about 17 square meters of space for their animals. In addition, about seven and three percent of abattoirs have enclosed sheds or an open penned-in area for animals, respectively. While a large number of abattoirs have space available for the animals that are to be slaughtered, relatively few have facilities to store meat. Chilled and frozen storage is used by only one and two percent of the abattoirs, respectively. These abattoirs are usually large slaughterhouses with over 55 mt of meat chilled and frozen storage capacity on average.

Overall, 29 percent of processors store meat. Large processing businesses (57 percent) and those located in Central (40 percent) and Southern (50 percent) Viet Nam are more likely to store meat than other processors. Most of the processors that store meat either store it at home or at their store. Only about four percent of processors have chilled or frozen storage. These processors are typically larger processing businesses with about 100 mt of storage capacity. While actual storage capacity is large, these processors typically have about 6 mt of processed meat on hand which is usually sold in a little over a week.

6.8 Communication and Information

One of the main elements of marketing success is access to information. Access to technology, such as telephones, facsimile machines and computers, is necessary for obtaining information and

conducting business. Over the recent past, access to telecommunications technology has improved. In 1992, there were only about 100000 telephone lines in the country. By 1997, there were about 1.4 million telephone lines or about 1.7 lines per 100 people, and a number of cellular telephone and pager networks. By 2000, it has been projected that the number of phone lines will increase to about 5 lines per 100 people. Overall, 46 percent of abattoirs and 51 percent of processors have a telephone that they use to obtain information (See Tables 6.8.1 and 6.8.2). While relatively low, 89 and 94 percent of the abattoirs and processors that do not have a telephone, respectively, have access to a telephone for use by their business. Telephone ownership is highest among the larger businesses and those located in the South. Use of facsimile machines is not currently widespread in Viet Nam. Only about three percent of the processors and abattoirs own a fax machine. Despite the rapid growth in computer ownership from about 10000 personal computers in the entire country in 1992, to the sale of over 300000 computers annually in 1997, computer and email usage remains relatively low. About 6 percent of the abattoirs and processors use a computer in the operations of their business, of which less than 20 percent use email to pursue business opportunities. Use of computers and email is restricted to primarily the largest businesses.

Information on animal and meat prices, new market opportunities, the actions of competitors, and changes in the government policy and regulations are necessary for a firm to operate competitively, efficiently, and develop and expand into new markets. Personal contacts and other traders are the main sources of information on prices and marketing opportunities for abattoirs and processors (See Table 6.8.3 and 6.8.4). In the South, intermediaries and market information services are also an important source of price and market information for abattoirs. Processors, particularly those in the South, rely primarily on intermediaries to provide them with information on prices and marketing opportunities. Information on regulatory change is disseminated by a different method (See Tables 6.8.5 and 6.8.6). The primary source for this type of information is

the media. Small businesses and those located in the North also rely on personal contacts to obtain information on regulations. Credit related information comes primarily from banks, and to a lesser extent through personal contacts and the media. As shown in Tables 6.8.7 and 6.8.8, smaller businesses and those located in the North, rely more extensively on the media for credit related information then their larger and Southern brethren.

6.9 Investments

Slaughterhouses and meat processors own a variety of assets, including transportation, buildings and storage facilities, equipment for the slaughtering and production of processed meat products, as well as miscellaneous office equipment and other assets. The typical abattoir has about D 65.5 million in assets. On average about 34 percent of the assets are buildings, 29 percent is invested in land, and 27 percent is comprised of transport. Overall, less than one half of one percent of the typical abattoirs assets is invested in slaughtering related equipment (See Table 6.9.1). Abattoirs in the South and North typically have accumulated more assets than those located in Central Viet Nam. Abattoirs in the South have over 50 percent of their assets invested in buildings and relatively less invested in transport. Abattoirs in the North have relatively more invested in transportation than those located in the South, where rented transport is used more often.

As shown in Figure 6.9.1, real annual investment in abattoir facilities was less than VND 500 million during the late 1980s. With the liberalization of the sector, investment in new and the upgrading of abattoirs received a boost in 1990, with real average annual investment jumping to about VND 1.7 million. The resultant overcapacity led to a dramatic decline in investment in 1991. With the introduction of the new investment law in 1991, the trend in real investment has been increasing over the 1990s, reaching over VND 1.8 million on average by 1998. The increase in investment in recent years in part reflects improvements in sanitation systems such as waste

holding tanks and reservoirs, and the construction of government mandated concentrated abattoirs in cities, which appears to be reducing the number of informal slaughter sites and improving the ability of veterinarians to conduct inspections, both of which are contributing positively to improvements in public health and safety.

As shown in Table 6.9.2, processors have nearly twice as much invested in business related assets as abattoirs. As with abattoirs, most of the assets are in the form of buildings and land, with only about one percent invested in processing equipment. Processors in Southern and Central Viet Nam, which are among the largest in the sample, have more invested in productive assets than those located in the North.

Figure 6.9.2 illustrates the trend in real annual investment in new and upgraded meat processing facilities over the 1990s. Excluding the huge investments in new processing facilities by government owned enterprises in 1990, average annual real investment in the sector has been relatively low. The trend over the 1990s has been increasing from a low of about VND 500 million in 1991 to about VND 1.5 billion by 1998. A sizeable jump in investment occurred in 1994, when a few larger private sector processors opened up new meat processing facilities in Southern Viet Nam.

6.10 Credit

Access to credit is often a key determinant in investment opportunities for a firm. In the sample, 27 percent of the abattoirs and 22 percent of the processors received credit during the period from July 1998 through June 1999. Over the period, more loans were taken out in the North than in the Center or South (about 37 percent). About 62 percent of the loans were from the Agricultural bank, 12 percent from family and friends, and 10 percent from commercial banks. Over 84

percent of the loans from the Agricultural bank were secured using collateral such as buildings and land or another hard asset. All of the loans through informal credit organizations relied either on social capital or had no collateral requirements. As shown in Table 6.10.1, loans from informal lenders and from the Agricultural bank were of similar size, although informal loans tend to be for a shorter period and at a lower or zero interest rate. Loans from other formal credit lending institutions such as commercial or foreign banks are typically for larger amounts, although the loan period and interest rate are competitive with the market rates offered by the Agricultural bank.

Most of the loans were taken out to purchase raw materials. Over 90 percent of the loans to abattoirs and about 95 percent of the loans to processors were for the purchase of animals for slaughter and/or meat for processing. As shown in Table 6.10.2, loans to purchase raw materials to small abattoirs and processors tend to be smaller, for a longer period, and at a lower interest rate than loans to larger businesses.

Another form of credit received by abattoirs and processors is through advance payment by customers. Overall, 12 percent of abattoirs received payment from their customers in advance of delivery. Of these abattoirs, nearly 40 percent of their sales were through this method, with payment received on average 9 days before delivery. As shown in table 6.10.3, advance payment as a form of credit was accepted more frequently by large abattoirs and abattoirs located in Central Viet Nam. Processors also use advanced payment as a means of obtaining short-term credit. Overall, over 15 percent of processors obtained advanced payment for their products. Small processors and processors in the North more often used this method of finance. Overall, about 32 percent of sales of the processors were from advanced payment made on average about 4 days before delivery.

In general, abattoirs and processors did not provide credit in order to obtain or secure raw material inputs. Overall, about seven percent of abattoirs and four percent of processors lent money during the period. Of the loans given by abattoirs and processors, about 40 percent were given for non-business related purposes'; the remaining loans were largely short to medium term loans given to distributors.

6.11 Operating Costs

Annual operating costs for abattoirs in the sample average about D 120 million. As shown in Table 6.11.1, transport related costs are responsible for nearly 34 percent of the average abattoirs operating costs. Other large components of total operating costs for abattoirs are taxes (17.2 %), utilities (11.6 %), and hired labor (9.1 %). Operating costs in North and South Viet Nam are substantially higher than abattoirs located in Central Viet Nam. While total operating costs are at similar levels for abattoirs located in North and South Viet Nam, the composition of the cost factors differs. For example, taxes, hired labor, and storage and equipment rental costs are higher as a percentage of total operating costs in the South than in the North. By contrast, transport and utilities are a larger share of total operating costs of Northern abattoirs than those located in the South. Total operating costs for large abattoirs are over 17 times higher than those of small abattoirs. The largest difference in operating costs between small and large abattoirs is that utilities are a relatively larger share of operating costs for small slaughterhouses and hired labor is a relatively larger for large abattoirs.

By contrast to abattoirs, operating costs for meat processors are substantially larger for processors located in Central Viet Nam than those in North and South Viet Nam. In particular, transport and utility related costs are much higher in Central Viet Nam where the cost of energy and the cost of moving meat products to larger markets such as those in and around Hanoi and HCMC add to the

cost of processing the meat (See Table 6.11.2). Although operating costs of large processors are over 21 times larger than for small meat processing businesses, as shown in Table 6.11.2, with the exception of hired labor related costs, the overall cost structure for small and large processors is similar.

6.12 Profitability

Overall, abattoirs generate nearly D 2.4 billion in sales annually, constituting over 98 percent of the businesses total revenue. On average, raw materials for slaughtering account for nearly 96 percent of the businesses total costs, or about D 2.0 billion. With average annual overall profits of D 321 million, the profit share for the typical slaughterhouse is about 13 percent of sales. As shown in Table 6.12.1, the profit share is similar across the scale of operations, although the profits of slaughterhouses in the South are slightly higher than those located in the North or Center. Despite the high cost of hired labor, profits per unit labor are higher for southern and large abattoirs.

Overall, about 64 percent of abattoirs rated their profits for the current year as fair and 24 percent as good or very good. As shown by the profitability measures above, large abattoirs and those located in the South more often rated their profits during the current year as good than smaller abattoirs and those located in the North and Center. Profitability was however lower when compared to the previous year when about 49 percent of abattoir indicated that profits were good. The principal reasons for the reduction in profitability cited by slaughterhouses was the increase in competition, which in turn contributed to a decline in the volume of carcasses traded by the abattoirs, and a reduction in carcass sale prices.

In comparison to the abattoirs in the sample, revenues and profits for meat processors are even lower. All though low, profit as a share of total sales is about 14 percent overall, while large processors and those located in Central Viet Nam have returns on sales of over 16 percent. Another measure of profitability is profit per unit of labor. By this measure, processor profits are generally lower than for abattoirs, although larger processors have slightly higher returns on labor than smaller processors. Revenue generation by processors is also a little more diversified with about 93 percent of their revenue from meat processing activities, particularly for larger processing businesses who earn about 91 percent of their revenue from their processing activities whereas small processors earn nearly 100 percent of their revenue from meat processing.

As with abattoirs, processors also indicate that their profits have fallen. For example, in 1998, 51 percent of processors indicated that their profits were good whereas in 1999 only 24 percent had good profits. The main reason for the decline in profitability was again greater competition as well as lower sale prices and small trade volumes. In particular, nearly 57 percent of the small processors whose profitability declined indicated that it was due to increased competition and reduced trade volumes, whereas larger processors more often cited falling trade volumes and price pressures.

Profitability in the future will depend on a number of factors, many of which the abattoirs and processors will have little or no control over. The abattoirs in the sample identified four main constraints to the development of their business. Nearly 63 percent of the abattoirs in the sample identified the lack of consumer demand as hampering the development of their business. Since consumer preferences are only slowly changing, demand for chilled and processed meat will remain low over the near to medium term. In addition to consumer demand, strong competition, poor raw material quality, and high taxes were identified by 52, 43, and 42 percent of abattoirs, as impeding the development of their slaughtering activities. A further 29 and 22 percent identified

high raw material prices and seasonal raw material supply constraints as affecting their business. As for processors, over 83 percent indicated that the lack of consumer demand was the main problem hampering the development of their business. In addition, 60 and 53 percent of the processors identified the high level of competition and the poor quality of meat as impeding the development of their industry and individual business.

Characterized by small scale production, the profitability and efficient development of the Vietnamese livestock industry is also impeded by its inability to effectively capture the efficiencies of economies of scale. Production capacities are low, averaging only 1.4 and 0.4 tons per day for abattoirs and processors, respectively, and as shown by most profitability measures, economies of scale exist in the industry. Yet, because of consumer preferences and the lack of a cold distribution chain, most Vietnamese abattoirs and processors do not have the incentive at present to expand production and capacity in order to more effectively capture the economies of scale in the industry.

6.13 Conclusions

Animal slaughtering and meat processing in Viet Nam suffer from a number of problems. In most highly developed and other ASEAN countries consumers generally have high expectations about the quality of the meat they consume, and governments have established stringent health standards and laws. At present, the meat available in Viet Nam generally fails to meet these standards, which in turn limits export market opportunities and endangers the food supply and public health of the local population.

The problems for the development of the livestock sector are many and include animal health related issues, poor quality of livestock, low slaughterhouse and processing standards, unhygienic

conditions throughout the animal production, slaughtering and processing system, and inadequate chilled processing and distribution facilities. The causes and prescription for resolving the various animal health related issues and improving livestock carcass percentage and the quality of meat are covered more thoroughly in Chapters 4 and 9. As well as improving the availability and quality of veterinary services, animal breeds and the percentage of carcass and lean meat, action in this area needs to be taken at the farm level where the animals are raised. Farmers need access to better and more suitable higher meat yielding breeds and need to obtain training in effective and efficient livestock raising techniques, and the maintenance of animal and public health.

Unhygienic conditions through the animal slaughtering, meat processing, and distribution system is another major problem. As described previously the problems arise from the arrival of poor quality and damaged animals at the slaughterhouse door, through the recurrent contamination of meat as it moves from the slaughterhouse, to the processor, to the retailer, and finally to the consumer. Much of the blame for the recurrent contamination of meat is due to poor practices at and between each level. Part of the problem revolves around the low level of infrastructure. For example, limited clean fresh water supplies and poor sanitation affect the quality of water, which has a direct correlation between disease and mortality rates. It has been estimated that nearly 20 percent of child deaths in Viet Nam are a result of dysentery from water-borne sources. Clean water plays a critical role in maintaining the cleanliness of meat cutting and handling surfaces. Investments by government to provide access to clean water supplies, to proper drainage and control of waste and flood waters, and effective treatment of waste water are necessary. Without basic infrastructure and facilities that can provide necessities like clean water, the goal of raising the hygienic state and quality of meat to improve public health and eventually export processed meat products will be difficult to achieve.

In addition to establishing an environment conducive to maintaining a sanitary slaughtering and processing industry, government has an important role to play in helping to ensure that sanitary conditions are achieved. Chief among these aspects is the establishment and enforcement of standards and regulations, and the provision of training. As well as improving standards and the enforcement of regulations using the existing system, the government, together with industry, should examine introducing an HACCP system for improving food safety in Viet Nam. The adoption of such a system, over the medium term, would help to raise the quality of Vietnamese meat and meat products, improve their shelf-life, and help to open up export market .

Improved education also plays an important role in improving food safety, management, and profitability at slaughtering and processing facilities. As noted previously in this chapter, the education levels of the industries workers are generally low and most businesses do not send their workers to upgrade their skill through technical and managerial training programs. The government along with industry representatives have an important role to play in establishing and designing appropriate technical, managerial, and marketing training programs for industry employees, and encouraging businesses, managers and employees to take part in such training programs to upgrade the knowledge and skills of their workforces. Where necessary, government and industry may wish to help subsidize the cost for employees to take part in these specialized training and business oriented education programs.

Although there exist numerous regulations and standards on the industry imposed by various levels of government and their agencies, the meat available in Viet Nam has a deservedly poor reputation for quality and hygiene. In order to begin to reverse this reputation, the various levels of government and their agencies need to take action. First, the government should review existing standard and regulations for raising healthy livestock, maintaining sanitary conditions at slaughterhouses and meat processing facilities, and for safely disposing of and treating facility

waste. The goal of the review would be to improve the design and enforcement of the regulations and standards, as well as to bring them in line with their international equivalent. Second, better enforcement of regulations and standards is necessary. As noted previously, many abattoirs and processors have not received health inspections, and many also do not dispose of waste properly. Both government and industry should undertake efforts to follow, and where not followed, implement regulations and standards to improve the hygienic conditions of abattoirs, processors, and transporters. Regular inspections by both government and industry representatives should help enforce compliance with regulations. When necessary, businesses that repeatedly fail to bring their facilities in line should be closed. Third, the government together with industry, and intermediate and final consumers of meat and meat products should review and establish appropriate standards for a livestock and meat grading system. Such a system should reflect expected carcass characteristics and the market value of the meat. Carcass characteristics of economic importance may include such factors as weight, gender, maturity, fat tissue, muscular development, marbling, and color of muscle and fat tissue (Fenn 1977). Such a grading system for livestock and meat is important in order to help form prices, promote more efficient production, reduce inspection and product assessment time, help consumers to better determine what they are paying for, and eventually be the standards through which Viet Nam can freely export animals, meat, and processed products. Once established, government and industry have a role to play in educating producers, processors, and consumers of animals and meat to understand, and where market needs and conditions warrant, adopt the standards to improve the efficiency of marketing.

In addition, the establishment of an effective cold chain for the storage and distribution of meat can help reduce spoilage and maintain hygienic conditions of meat. An effective cold chain can …create incentives for rewarding quality of carcasses and meat. Despite the large and growing proportion of household owning refrigerators in major cities, development of a cold chain has

been limited. Among other factors, consumers prefer fresh meat. Freezing and thawing of meat can induce changes in texture and appearance, and may cause some loss of flavor. In addition, cold storage and transport increases overhead costs, requires a reliable power supply, and need regular and good equipment maintenance. Furthermore, if consumers doubt the effectiveness and efficiency of the cold chain, they are even less willing to purchase chilled and frozen meat.

The lack of a cold chain also impedes the greater development of an efficient animal slaughtering and meat processing industry. With out a cold distribution chain, meat can not be transported over large distances from inexpensive surplus areas to expensive deficit areas. Similarly, because of the prohibitively expensive cost in terms of both time, money, and meat quality, of resting, feeding, and watering livestock when they are transported over large distances, or the costly loss of live weight when not cared for properly, little long distance livestock trade occurs in Viet Nam. Consequently, the industry is principally characterized by small scale slaughtering and processing businesses which use small local markets to purchase and sell their limited throughput. While small businesses with little invested in fixed equipment can be flexible in their operations, large businesses with high overhead costs and larger labor forces by contrast, have more difficulty in securing a stable daily, weekly, and seasonal supply of livestock and meat to maintain a high utilization rate, nor can they offer a steady supply of product for other large intermediate user, wholesalers or retailers. Furthermore, even though economies of scale exist in both slaughtering and processing, without sufficient and secure supplies of livestock and meat markets, the industry cannot readily capture scale economies. Over time however, as the disposable income of households increases, the availability of locally produced meat and meat products expands, and the time consumers have available for grocery and meat shopping declines, consumer preferences could quickly change in favor of the consumption of chilled and frozen meats, and lead to the rapid development of an effective and efficient cold distribution chain, and expansion and consolidation within the slaughtering and meat processing industries.

CHAPTER 7

FEED INDUSTRY

Summary

This chapter examines the current structure and constraints facing the high quality feed industry in Viet Nam. Drawing on a survey of local feed producers and with particular reference to the ownership and scale of production of the different feed processing businesses, the chapter examines the structure of the industry's businesses, their purchasing, processing, and distribution channels, and their use and access to transportation, storage, information, and credit. Lastly, the chapter examines the investment behavior, operating costs, and profitability of the various types of feed processors.

Highlights

- *Encouraged by Doi Moi and investment law reform, substantial domestic and foreign investments in new feed production capacity have been made in the Vietnamese feed industry. At the same time, commercial feed production and use have grown rapidly. For example, commercial feed use climbed at an average of 23 percent each year between 1988 and 1998. While commercial feed use accounted for just 0.28 percent of total feed consumption in 1988-93, by 1998 it accounted for over 7 percent. With the proportion of commercial feed use internationally near 48 percent, there appears to be considerable future growth potential for the industry.*
- *The price of feed in Viet Nam is high by international standards. Prices for high protein raw materials such as maize and soybeans are more than twice as expensive in Viet Nam than on international markets. Contributing to the high cost of high protein raw materials are limited local production, low yields – maize yields in Viet Nam average approximately 2.6 mt/ha,*

whereas in the USA the average is nearly 8.4 mt/ha, and high import duties – about 10 % on maize. Encouragingly, the trend in feed prices has been downward over the past year.

- *Since the passage of the new investment law of 1994, large domestic and foreign private sector investments have been made in new feed production capacity. Domestic production increased to nearly 1.5 million tons in 1998. Economies of scale are clearly evident in Viet Nam's feed industry. By most profitability measures, such as profit per ton, profit share, and return on assets, larger mills are substantially more profitable than smaller mills. Because of economies of scale and perhaps better access to credit, local private and government owned mills may be too small to be competitive with the foreign feed companies. The five larges foreign mills produce about 62 percent of the commercial feed produced in Viet Nam, whereas the five largest domestic mills only about19 percent. For local private and government owned mills to be competitive with foreign mills and feed imports, they will need to consolidate in order to grow their share of the local feed market.*
- *The type, content and quality of feed varies considerably depending on the manufacturer. Foreign and large mills primarily produce concentrated feed, while domestic and smaller mills mainly make complete feed. Similar feeds sold by foreign mills generally have higher protein content levels and are more expensive than local private mills. Since feed nutrient characteristics vary so widely, producers do not know what they are getting for their money, and whether the feed is even appropriate for their particular livestockraising system. Some type of labeling system appears to be called for.*

Introduction

The feed industry in Viet Nam is a relatively new development. Before the 1960s, no feed industry existed in Viet Nam per se. It was only with the introduction of exotic animal breeds during the 1960s that interest in using concentrated animal feed began to take off. Development of a local feed industry was slow however. Despite the establishment of a number of mills during the late 1960s and 1970s, most commercial animal feed was imported. The industry suffered set backs during the late 1980s, when a number of large mills closed due to a reduction in subsidies and insufficient local supply of raw materials. As a result of Doi Moi, however, new domestic and foreign investment have been made in the feed sector. While feed production has grown considerably, a number of constraints hamper efficient development and operation of the feed industry. Drawing on a sample of feed mills, this chapter will examine the current structure and the constraints affecting the feed industry in Viet Nam and suggest policy options for government reforms to increase the efficiency of the mills and improve the availability of feed to producers.

The chapter is organized into 13 sections. Section 7.1 briefly describes some of the characteristics of the abattoirs and meat processors in the sample, and Section 7.2 examines the characteristics of their labor force. The procurement and distribution networks for animals, carcasses, and meat are discussed in Sections 7.3 and 7.4. Trends in carcass and meat prices are briefly discussed in Section 7.5. Sections 7.6, 7.7, and 7.8 examine the use of transportation, information, and storage, respectively. Next, investment activity and credit availability are discussed in Sections 7.9 and 7.10. The structure of the businesses operating costs and their overall profitability are discussed in Sections 7.11 and 7.12, respectively. Lastly, a number of conclusions are drawn and presented in Section 7.13.

7.1 Feed Industry Characteristics

By the end of 1999, there were 105 feed mills in Viet Nam with a total capacity of 2.8 million metric tons (mmt) per annum. Of these 105 feed mills, 62 percent are privately owned, 22 percent are state

run, 12 percent are foreign owned or joint ventures, and 5 percent are run by cooperatives. Most feed mills are relatively small. Forty-five percent of the mills have capacities of under 5000 metric tons (mt) per year, while less than 10 percent have capacities of over 50,000 mt per year (See Table 7.1.1).

In order to examine the structure of the industry, a sample of the feed mills was chosen. Despite the small number of mills interviewed, the sample tracks the structure of the feed industry fairly well. Of the 35 feed mills interviewed, 71 percent are privately owned or cooperatives, 23 percent are government owned enterprises (GOE), and 11 percent are foreign owned or joint ventures. Fifty-four percent of the sample produced less than 5000 mt of feed in 1999, 31 percent produced between 5000 and 50000 mt of feed, and 14 percent produced over 50000 mt of feed.

Two principle types of commercial feed are produced in Viet Nam: complete feed and concentrated feed. Complete and concentrated feed, and raw materials such as maize, rice and rice bran, cassava, etc. make up the bulk of the material fed to pigs, poultry and cattle in Viet Nam. Concentrated feed and raw materials comprise about 27 percent of the total feed and raw materials consumed by animals. Commercial animal feed makes up only about 7 percent of the feed and raw materials fed to animals (See Table 7.1.2). Overall, nearly 89 percent of the feed mills produced complete feed, and 40 percent produced concentrated feed. Concentrated feed production is more likely to occur in large and foreign feed mills.

In order to examine the structure of the feed industry in Viet Nam, the mills are grouped into two categories: 1) by ownership (GOE, private/cooperative, and foreign/joint venture), and 2) by gross value of production, GVP (small, medium, and large). The GVP includes the gross value of all feed income plus income derived from any other activities that the feed mill may have been involved in. The criteria of small, medium, and large were based on the distribution of the GVP (See Table 7.1.3). The GVP very closely tracks the quantity of feed produced by the mill. The cutoff points approximately coincide with GVP of D 20 billion and D 50 billion.

The mills in the sample are relatively new. The median mill in the sample was constructed in 1995. Twenty-six percent of the mills in the sample were constructed within the last three years, and 89 percent are less than ten years old. The GOE mills are among the oldest, with the median mill constructed in 1984. Foreign and private mills are much newer, with median mill construction in 1993 and 1996, respectively.

The mills for the most part operate in three distinct competitive levels. Fifty-seven percent operate primarily at the province level, 29 percent operate regionally, and 23 percent operate countrywide. Of the foreign-owned mills, 75 percent operate nationally, while only 13 percent and 17 percent of the GOE and private mills, respectively, operate at the national level. Rather GOE mills operate primarily at the regional level, while private mills operate mainly at the provincial level. As one would expect with mill size, the largest firms operate primarily countrywide, whereas the medium and small size firms operate more often at the regional and province level, respectively. Although it does not reflect on their level of experience, managers have worked at their particular mill on average for 4 years. Mills have on average 74 employees, of which approximately 73.5 percent are directly involved in feed production, while the other 26.5 percent are employed in such tasks as management, administration, security, etc. Private mills have on average 36.2 employees, while GOE and foreign mills have about 52.6 and 335.8 employees, respectively.

Land for the feed mill and storage space both current and future are important to the mills. Mills have on average 3.2 ha of land, of which 73 percent is currently being used, and the other 27 percent is available for future development. Seventy-one percent of the mills own their land, while 26 percent rent it. Excluding the foreign mills, all of whom rent the land that they use, over 80 percent of the mills own the land where their mill is located. Average land prices vary by region from about D 2 billion per hectare in the NCC to D 4.5 billion per hectare in the MRD.

Of the feed mills in operation in 1999, approximately 90.8 percent of their income was obtained from feed related sales, an additional 4.5 percent was derived from raw material sales, and the remaining

4.8 percent from other non-feed related activities. Of the feed produced, over 80 percent was complete feed and just under 20 percent was concentrated feed. No mills in our sample produced supplemental feeds. Foreign mills derived nearly all of their income from feed sales, while GOE earned about 76 percent of their income from feed sales. In addition to feed sales, GOE obtained about 13 percent of their income from raw material sales, and 11 percent from non-feed related activities. Private mills earned nearly 95 percent of their income from feed sales, 2 percent from raw material sales, and 3 percent from various non-feed related activities.

7.2 Labor

Feed processors employ a wide variety of labor including family labor, permanent workers, and temporary laborers. The average feed mill in Viet Nam, has 80 employees, who work about 272 days per year, at a wage rate of D 26400 per day. As seen in Table 7.2.1, the average foreign mill has over six times as many employees as GOE and private processors, and pays higher wages. Similarly, large feed processors have substantially more employees and pay more than small and medium size mills.

About 49 percent of the mills employee family labor – all of them private. On average, these private mills employee 2.3 family members. Permanent employees make up the bulk of the average feed mills workforce. The permanent labor workforce, however, can be further disaggregated into skilled and unskilled labor categories. Overall, 63 percent of the mills employ skilled permanent labor and 69 percent employ unskilled permanent labor. All of the foreign, GOE, and large mills have skilled labor working for them. Overall, between 61 and 65 percent of the work force of GOE, foreign, and large feed processors is skilled labor. For the other feed producers, about 30 to 38 percent of the labor is skilled. Wages for skilled permanent labor are highest in foreign and large feed companies. Wages for unskilled permanent labor is highest in foreign and large feed mills as well, but the premium above the average wage is substantially lower. For example, unskilled labor wages in foreign feed companies are about 27 percent above the feed mill average, whereas wages for skilled labor are over 77 percent above the industry skilled labor average. Permanent unskilled workers make up the largest

portion of the work force of private, medium, and small feed companies (around 46 percent). Overall, private mills have the largest share of employees with less than a high school education and the lowest share of workers in the industry who have a University level of education or higher (See Table 7.2.2). By contrast, in the foreign, GOE, and large feed processing mill, about 24 percent of the workforce has a University degree or higher level of education. Taken together, more than 80 percent of these workers have at a minimum a high school degree.

Temporary labor is also widely used in the Vietnamese feed industry. Small mills, and to a lesser extent private and medium size millers, rely on temporary laborers for up to 20 percent of their workers. In order to obtain the labor they need, these small and medium scale, and private feed processors have to pay similar or slightly higher wages in order to attract the workers they need for their operations on short notice. Where temporary labor is less in demand and makes up a smaller proportion of the work force, temporary laborer wages in these companies, are lower than those paid to unskilled workers. Nevertheless, although the wages paid by these feed producers are relatively lower for temporary labor, they are however higher than the overall feed industry average wage for temporary workers.

Table 7.2.3 further disaggregates the workers employed in the feed industry by gender. Overall, women workers are paid less than male workers in all of the labor categories. Typically female employees receive about 90 percent of the wage of their male counterparts. The only exception is among foreign feed mills who pay the same relative wage to all of their temporary and unskilled permanent employees, and the temporary workers of large feed mills, regardless of gender.

Increasing and upgrading the skills of a feed firms workforce can help a company improve its productivity as their new skills are employed to find and introduce ways for the firm to increase its output and more efficiently produce. Besides the basic level of education, expanding and upgrading skills of workers can be highly beneficial to a business. Recognizing this, feed processors send a number of their staff each year for training to expand and upgrade their skills. During the period from

July 1998 to June 1999, 40 percent of the feed producers in the sample sent employees on training courses. Investments in human capital are particularly important to foreign, large, and GOE feed mills. One hundred percent of the foreign feed mills, 83 percent of the large companies, and 75 percent of the GOE mills sent workers on training courses. Relatively few of the private (17 percent) and the small (25 percent) mills sent employees for training, probably for financial, availability, or insufficient time reasons.

Overall, 31 percent of the mills sent employees on short courses from one day to less than a month. Again, all of the foreign, and most of the large and GOE mills sent workers to undertake short training courses. The courses cover a wide variety of topics including technical, management, and marketing training. Foreign milling companies sent the majority of their staff for marketing related training. GOE and private mills sent their workers primarily for technical training, and to a lesser extent for training in the areas of management, marketing, and security. Taken as a group, workers at each of these mills received over 700 person days of training through short term studies. In addition, about 20 percent of the mills, mainly GOEs, sent employees on long term training programs from anywhere from one month to up to 3 years. The majority of the workers participating in these long term training programs undertook studies in technical or management related areas.

A variety of institutions provide technical, management, marketing, and security training in Viet Nam. Universities play a particularly important role in providing this type of training. Overall, 50 percent of the training courses taken by mill employees were undertaken at universities. Over 77 percent of the management courses, 57 percent of the marketing courses, and 44 percent of the technical training courses were held at Universities. In addition to the Universities, GOE and Research Institutes play an important role in providing technical training, while foreign companies and consultants also provide marketing training (See Table 7.2.4). For their employee training needs, GOE mills rely primarily on the Universities. About 74 percent of the training courses that they participated in were organized by Universities. Local private feed producers obtain training for their staff from a number of institutions including universities, associations, and research institutes (See Table 7.2.5). The foreign owned feed

companies rely largely on training offered by GOEs, universities, and foreign businesses. Overall, the staff of small feed mills obtain their training from a wide variety of training organizations. Staff of medium and large feed companies rely primarily on universities and foreign businesses.

7.3 Scale and Technology

The level of technology used in the mill plays an important role in the expansion and efficiency of its operations. The equipment used in feed mills have a variety of functions including weighing equipment, drying equipment to reduce the moisture in raw materials such as maize and brans, steaming equipment to rehydrate raw materials such as dried cassava, grinding and mixing equipment to help make a uniform, balanced feed mash, laboratory equipment to help ensure the creation of a nutritious and high quality feed, and pelleting equipment to convert the mash into a longer lasting, more digestible pelletized animal feed, as well as storage buildings and other equipment.

At current values, each mill has about D 1.8 billion invested in feed production related equipment on average. Excluding all other assets, foreign feed mills have over D 7.2 billion invested in feed production equipment. GOE mills, who generally use older more inferior technology, have just under D 800 million invested in such equipment, and private feed mills about D 1.2 billion, on average. The current value of feed equipment of the large feed processing companies is just under D 9.0 billion, while the value of equipment of small and medium size feed processors is about D 550 – 600 million, on average.

As noted previously, GOE mills are generally older than private and foreign feed processors in Viet Nam. This is also true of the equipment they use to produce feed. Nevertheless, GOE mills upgraded some of the equipment used at their mills to replace worn out equipment and help keep up with growing feed demand. About 35 percent of the investments made by GOE feed processors were made during the period from 1989 to 1994, and 44 percent during the period from 1995 to 1999. The bulk of

the investments in new equipment in private and foreign feed mills took place during the latter period (See Table 7.3.1).

Much of this investment has been directed into the establishment of new, large mills, and to replace and upgrade the capacity of existing equipment. As shown in Table 7.3.2, the capacity of the equipment at foreign feed mills is substantially larger than at GOE and private millers. The country of origin of the equipment is also often an indicator of its level of technology, efficiency, durability, and the quality of the product produced. Using this measure of the level of technology employed at the mills in Viet Nam, about 85 percent of private mills and about 60 percent of GOE mills invested in equipment manufactured in Viet Nam or from less developed Asian countries (See Table 7.3.3). Only about 17 percent of foreign mill equipment investments were Vietnamese or less developed Asian manufactured. By contrast, about 80 of equipment investments by foreign firms were for equipment manufactured in areas where the overall use and adoption of technology and advanced manufacturing techniques is higher, such as American, Western European, or Developed Asian countries. Similarly, the technology most often employed in small and medium size mills from less technologically advanced regions, than that used in the larger mills.

7.4 Procurement and Supply Channels

The feed processors use a wide variety of materials in the production of their animal feeds. These include grains and legumes such as maize, rice, cassava, and soybeans, processed bran products from the production of rice and flour, groundnut and soybean cakes from the manufacture of vegetable oils, various animal byproducts such as bone meal, fish meal, and feather meal, and a number of mineral, vitamin, and amino acid additives. As shown in Table 7.4.1, nearly all of the mills in Viet Nam use maize, cassava, soybeans, rice bran, and/or soybean cake in the production of their animal feeds. Relatively few mills import their raw materials. Overall, about 11 percent imported maize, 14 percent soybean cake, and 11 percent fish meal. About 9 percent of the mills imported feed additives, such as mineral and vitamin premixes, and amino acids.

Table 7.4.2 shows the average quantity of the various raw materials used in feed production and the percentage from own production, local procurement, and imports. By far, the main product used in the production of feed is maize, followed by rice bran and soybean cake. Nearly all of the maize used by GOE and private mills is purchased domestically, while over 20 percent of the maize used by foreign mills and 15 percent of the maize used by large mills is imported. Nearly all rice bran is purchased from local sources, with the exception of a few GOE feed mills who obtain some of their rice bran from their own production. Soybean cake used by private and GOE mills is procured almost exclusively domestically, while over 70 percent of the soybean cake purchased by foreign mills is imported. The case is similar for nutrient supplements such as fish and bone meals, mineral and vitamin premixes, and amino acids which are nearly exclusively domestically prepared and procured by GOE and private feed mills, and by foreign sources for the foreign owned mills, and the large (usually foreign) mills.

In terms of value, over 21 percent of the feed raw material costs are for the purchase of maize, followed by rice bran (20 percent) and soybean cake (11 percent) (See Table 7.4.3). Nearly 27 percent of raw material costs used in feed production is for nutrient supplements such as fish, vitamins and minerals, and amino acids.

Table 7.4.4 shows the average procurement price of selected raw materials and nutrient supplements. Although prices are competitive, private and medium size mills are able to obtain somewhat better domestic prices for grains and legumes, and nutrient supplements such as fish meal and vegetable oil used in feed production. Conversely, purchase prices of processing byproducts such as soybean cake, wheat bran and maize bran, are generally lower for large mills and foreign firms. It is also interesting to note, that while relatively few millers purchase imported maize, the import price of maize is lower and the fish meal price is higher than the domestic procurement price for all sizes and mill ownership categories.

The majority of the inputs used in feed production are purchased by the mills from traders. Over 60 percent of the local grains and legumes, and 55 percent of the different types of brans and cakes used in feed production are purchased from traders (See Table 7.4.5). Small and medium size feed mills and private processors purchase a larger share of the grains and legumes that they buy directly from farmers than the other types of mills. By contrast, foreign and large mills purchase a larger share of these commodities from private processing businesses than their counterparts. Nutrient supplements come from a number of additional sources. While all of the foreign and large mills buy their locally purchased additives from traders, approximately 35 percent of the other mills purchase their locally produced additives from either private processing businesses or GOEs. Other nutrient supplements such as fish and bone meal and vegetable oil also come from a broad group of organizations. Overall, 22 percent purchase these nutrient supplements from private processing business and 18 percent from GOEs. With the exception of maize, all of the mills purchased their imported inputs directly from foreign feed businesses. None of the mills went through licensed private or government importers. While foreign feed mills purchased all of their maize from foreign feed businesses, GOE purchased nearly all of their imported maize through local private importers.

7.5 Sales and Distribution Channels

Although small, the feed industry in Viet Nam produces a wide variety of animal feeds. Feed for pigs, includes feeds specially developed to provide the appropriate level and type of nutrients, metabolizable energy, protein, amino acids, and vitamins and minerals for the diets of lactating sows, piglets, growing pigs, and fattening pigs. Similarly, for poultry, specialized feeds are produced for laying hens, developing chicks and ducklings, growing chickens and ducks, and poultry soon to be ready for slaughter. Cattle feed is less specialized in Viet Nam. The only specialized feed most widely available is for dairy cattle. Specialized feed for fish and shrimp culture is only slowly developing. Commercial aquaculture feed is limited to about 60 mt per annum. In addition, two primary types of feed are produced in Viet Nam: concentrated and complete feed. Complete feed is a nutritionally balanced feed prepared for producers to feed to animals directly. Concentrated feed by contrast is high

in protein content and metabolizable energy, and is designed to be mixed with various types of grains and brans by the livestock producer to produce a complete feed for their animals.

The feed mills in the sample sold around 20.5 thousand metric tons of animal feed during the period from July 1998 through June 1999. Foreign mills sold about 110.6 thousand metric tons of feed during the period, while local private and GOE processors sold nearly 10.3 thousand metric tons and over 4.7 thousand metric tons, respectively. On average, small feed processing mills sold only about 2.6 thousand metric tons of feed over the period, while medium mills sold over five times as much (13.4 thousand metric tons), and large processors sold over 40 times more (104.2 thousand metric tons). In terms of value, the average feed mill has annual sales of about D 74.5 billion (See Table 7.5.1). Average sales of large and foreign feed mills are substantially larger than those of private, GOE, and smaller mills. Overall, about 70 percent of the sales of the feed mills are to various types of traders, 22 percent is sold directly to producers, and about 8 percent is used for the firms own livestock production. Use for own production is largest for GOE and small feed mills, while direct sales to producers is a relatively larger share of the total sales of foreign and medium size processors.

As shown in Table 7.5.2, the average feed mill produces nearly 3 times more pig feed than chicken feed. On average, the feed mills in the sample earned over D 50 billion from the sale of pig feed, and nearly D 17 billion and D 5 billion from the sale of poultry and cattle feed, respectively. Overall, pig, poultry and cattle sales, correspond to approximately 68, 25, and 7 percent of total feed sales, respectively (See Table 7.5.3). The share of sales to traders and to producers is approximately the same for both pig and poultry feeds, although a somewhat larger percentage of pig feed than poultry feed is sold to traders, while a larger share of poultry feed is sold directly to producers. About 10 percent of the cattle feed sold is used by the mill's cattle related production units, of which nearly all these mills are private or small-scale processors.

As noted previously, mills produce a variety of complete and concentrated pig and poultry feeds. In terms of both quantity and revenue, pig feed is a mill's largest seller. About 68 percent of the sales

revenue of the average feed processor is from pig feed, while about 25 percent is from poultry feed (See Table 7.5.4 and Table 7.5.5). The largest share of revenue comes from the sale of growth, starter and concentrated pig feeds, which comprise about 22, 14, and 13 percent of the processors total sales of feed. For poultry feed, the majority of the sales revenue comes from the sale of growth, poultry, and concentrated feeds. Although the majority of the feed sold is complete feed, concentrated feed generates more revenue for the average mill. Overa**l**, about 78 percent of the pig and poultry feed sold is complete feed, 16 percent is concentrated feed, and 12 percent is cattle or other types of feed. Although concentrated feed accounts for only about 16 percent of sales in quantity terms, it generates almost 28 percent of the sales revenue, while complete feed is responsible for about 61 percent of total feed sales revenue.

Table 7.5.5 also breaks down the sales of the various types of feeds to different customers. Overall, between 60 and 70 percent of the pig feed sold by the processors is sold to traders, and about 30 percent is sold to producers. In particular, starter, non-pregnant sow, concentrated pig, and fattening feeds are mainly sold to producers through trader networks and own consumption by feed mill company related livestock production units. Sales of pig feed by foreign and large scale feed processors, by contrast, are mainly through direct sales to producers. For example, nearly 100 percent of the lactating sow, 83 percent of starter, 74 percent of growth, and 64 percent of the concentrated pig feed sold by the foreign feed mills is through direct sales to producers. Although poultry feed distribution is done primarily through traders, a larger share of sales is through direct sales to producers. For example, while 86 and 68 percent of the concentrated and poultry feeds, respectively are sold to producers through traders, 59 and 48 percent of layer and growth feed, respectively, are sold directly to producers, again primarily by foreign and large feed processors. Lastly, with respect to cattle feed, most dairy cattle feed is sold to traders, while other, non-dairy, cattle feed is sold directly to producers.

7.6 Prices and feed quality

Table 7.6.1 summarizes the price of the various types of animal feed sold in Viet Nam over the period from July 1998 through June 1999. In comparison to other types of feed, concentrated and starter feeds for both pigs and poultry have relatively higher prices. While pig fattening feed sold for D 2450 per kg over the period, concentrated pig feed costs 116 % more and starter feed costs 36 percent more, on average. Similarly, the price of concentrated poultry and poultry starter feeds are 71 and 8 percent more expensive. Generally, the feed produced by the foreign feed processors is more expensive than that produced by GOE mills, which is in turn more expensive than the feed produced by the local private feed millers. Large scale mill feed prices are also generally higher than those of small and medium size feed processors. There is relatively little difference in the price of feed during the Tet holiday period. At most feed prices are between 0 and 2 percent higher during this period than at other times of the year.

Over the period from July 1998 through September 1999, the overall trend in feed prices has been downward. As shown in Table 7.6.2, concentrated pig and grower feeds have been declining at a rate of about 0.45 percent per quarter. Pig starter and fattening have been falling at a faster rate of 1.4 and 0.8 percent per quarter, respectively. In comparison to pig feeds, processor sale prices of poultry feed have been dropping at a slower rate of between 0.1 and 0.4 percent per quarter, depending on the type of feed. Lastly, dairy cattle feed has been falling at a relatively faster pace of 0.65 percent per quarter over the period. Comparing price changes of different types of feed, the decline in feed prices has been relatively stable over the period. The most volatile prices were for pig starter and poultry feeds, with index of instability of 1.8 and 2.4, respectively[1].

The differences in sale prices between the different types of feeds and by the feed producer, in part reflect differences in the quality and the composition of the feed products. Using the proximate principle, feed is composed of moisture, dry matter, protein, fat, carbohydrates, and fiber.

[1] Trend corrected coefficient of variation in percent, calculated as $I_x = CV \quad (1 - Rbar^2)$ where I_x is the index of instability, CV is the coefficient $Rbar^2$ is the adjusted coefficient of determination of the linear trend regression (Cuddy and Della Valle 1978).

Metabolizable energy for the animal comes from three main sources in the feed, protein, carbohydrates and fat. Feed companies add a number of supplements to their feed as well. The most common additives to feed include amino acids such as lysine, methiomine, and systine, as well as various vitamins and minerals, for the proper development and growth of the animals. Antibiotics to keep the animal health and oxidizers to aid in digestion, are also often added.

In Table 7.6.3, we examine a number of these measures of feed quality. Concentrated pig feed is low in metabolizable energy and moisture content, and has relatively high levels of crude protein than complete pig feeds. These high levels of crude protein in a concentrated pig feed is partly responsible for its higher price. Pig starter feed, the more expensive of the pig feeds, is high in metabolizable energy (usually 2900 to 3000 kcal/kg) and protein (16 to 17 percent). Pig grower feed has about 2800 kcal/kg of energy and about 14 to 15 percent protein. Fattening feed for pigs should be relatively high in energy and low in protein, at about 2900 to 3000 kcal/kg and 14 to 15 percent, respectively. Notice also from Table 7.6.3 that for each of these types of pig feed, the composition of the foreign and the large processors more closely follow the desired characteristics of the feed. For example in the case of concentrated feed, the feed from the foreign and large processors has the lowest levels of metabolizable energy, and some of the highest levels of crude protein, which helps to explain the relatively higher sale prices charged by these firms in comparison to the GOE, private, and smaller feed processors. Table 7.6.4 shows which firms add various additives to their feeds. All foreign firms, and nearly all large mills add amino acids, vitamins and minerals, antibiotics and oxidizers to the various feeds that they produce. Although nearly all feed processors add amino acids, vitamins and minerals to their feed, far fewer add antibiotics and oxidizers, particularly GOE and medium size mills.

7.7 Transportation and storage

The method of transportation, its cost, and restrictions on the movement of goods can significantly affect the structure and performance of the marketing system for animal feed and their raw materials.

Overall, 91 percent of the feed mills use some form of transport. Trucks are the main method for the movement of goods. Motorbikes and boats are also used by about 19 and 13 percent of the millers, respectively. A few mills also use cars to move goods on occasion. Of those mills that use trucks, about 71 percent of their goods are transported by trucks that they own and 29 percent by trucks that they rent. Only 20 percent of the feed mills own their own boat - nearly all of which are used by mills located in the MRD.

In addition to owning transport, 53 percent of the feed mills use the services of a transport company. In the sample, all foreign mills used rented transport services, while 75 and 35 percent of the GOE and private mills rented transport services. These transport companies primarily used trucks and boats to move the goods. Since shipping cost are lower for boats (D 0.35 /mt/km) then for trucks (D 2.53 /mt/km), boats are used most efficiently and effectively to transport larger quantities over farther distances than trucks, when feasible. As shown in Table 7.7.1, foreign mills most effectively use the services of transport companies to ship larger quantities of raw materials and feed over longer distances at lower cost than private mills, whom in turn had lower transport service costs than their GOE counterparts.

For the most parts, feed mills are satisfied with the quality of the services that they receive from these transport service companies. While only 17 percent indicated that they had problems with these companies, all of the companies affected were small milling companies. The primary problems with the transport of goods were overloaded vehicles and poor road infrastructure indicated by 67 percent of the mills, as well as unreliable deliveries, seasonal transport bottlenecks, and demurrage indicated by 17 percent of the mills.

Restrictions on the movement of goods continue to be a problem in Viet Nam. Over 25 percent of the feed millers indicated that they have had difficulty in transporting goods on occasion. The main impediment to the movement of goods, indicated by 20 percent of the millers, was police conduct. In

addition to the actions of the police, 11 percent of millers indicated that inter-provincial movement restrictions and tolls affected their ability to move goods effectively and efficiently.

Feed mills in Viet Nam use a variety of means of storage. The most widely used forms of shelter are warehouses and enclosed sheds (74 percent), followed by open shelters (29 percent), frozen storage (17 percent), and retail outlets (17 percent). Nearly all of the storage space is fumigated, usually two or three times per year. The average warehouse and enclosed shed covers about 6400 square meters and can hold up to 8000 metric tons of feed. For the mills that sell out of a store, the storage space at their retail outlet is only about 275 square meters on average. As shown in Table 7.7.2, 97 percent of the mills store raw materials, and 74 percent store feed. On average, the mills keep about 3.2 thousand tons of raw materials on hand, equivalent to about three months of supply, with peak storage levels reaching up to 4.5 thousand tons. By contrast, only about a week's supply of feed is kept in storage at any one time, due to the relatively rapid degradation and perishability of the product. On average, approximately 120 tons of feed is in storage, with a maximum of 156 tons in storage during peak periods.

7.8 Communication and information

One of the main elements of marketing success is access to information. Access to technology, such as telephones, facsimile machines and computers, is necessary for obtaining information and conducting business. All mills in the sample have telephones, and 54 percent have fax machines. Computers and email are also used by 46 percent and 17 percent of the mills, respectively. Use of fax machines, computers, and email is greatest among foreign and the large processing businesses. Use of email to communicate and obtain information on market conditions is relatively rare among state and private owned Vietnamese milling firms (See Table 7.8.1)

Information on raw material and feed prices, new market opportunities, the actions of competitors, and changes in the government policy and regulations are necessary for a firm to operate

competitively, efficiently, and develop and expand into new markets. Although personal contacts continue to play a role in the dissemination of information, millers are also obtaining information from traders and the media (See Table 7.8.2). For information on prices and markets, feed millers turn primarily to traders and personal contacts. While these are the most important sources for local Vietnamese mills, foreign feed mills also turn to the media to obtain price and market information. Information on regulatory change is disseminated by a different method. The primary sources for this type of information are the media and letters from the regulating agencies. Credit related information comes primarily from banks, and to a lesser extent from personal contacts.

7.9 Investments

Feed processors own a variety of assets, including transportation, buildings and storage facilities, equipment for the production of animal feed, as well as miscellaneous office equipment and other assets. While most processors own some form of transport or equipment, only 74 percent own land. Those without land are primarily foreign owned feed companies who have arrangements to lease the land upon which their mills are located, but are ineligible to own. As shown in Table 7.9.1 and Table 7.9.2, average investment over the 1994 to 1999 period is more than triple the investment made over comparable 1988 to 1993 period. Real investments in feed production equipment have more than quintupled, investments in new transport have quadrupled, and expansion and new investments in building and storage facilities more than tripled. The bulk of the investment have been made by the foreign and large feed processors. GOE mills have made considerable investments in new mills and to upgrade and increase capacity of the older feed production facilities. Investments by local private processors of all types rose substantially during the later period.

As shown in table 7.9.3, the average feed processor in Viet Nam has net assets of approximately D 12 billion. About 73 percent of these assets are invested in buildings. Only about three percent of the value of the building is invested in transport related vehicles, and about 12 percent of the buildings

value is invested in land. Based on the current value of the feed company assets, foreign and large feed processors are the wealthiest, and the local private millers the poorest.

7.10 Credit

As in the case of the value of assets, scale and ownership have effects on access to credit. During the period from July 1998 through June 1999, 51 percent of the feed mills used credit. Nearly all the loans were for the purchase of raw materials, although 20 percent of the loans to the private mills and 67 percent of the loans to medium sized mills were for feed marketing purposes. In addition, 38 percent of the loans to foreign mills and 33 percent of the loans to the large mills were for use as operating capital.

There are indications that private mills may be having difficulty accessing credit, particularly in comparison to the GOE mills. First, while 88 percent of GOE mills used credit over the period, only 35 percent of the private mills used credit (See Table 7.10.1). Second, of those mills that received credit, 86 percent of the GOE mills received enough credit to fund their operations, while only 38 percent of the private mills received enough credit. Insufficient credit to fund their operations was also a problem for foreign mills (33 percent). Third, half the loans to private mills were through the informal sector (moneylenders, friends, or family), whereas the majority of the loans to the GOE mills were through the banking sector, particularly the agricultural bank. Lastly, of those mills that did not obtain enough funds for their operations, the private processors identified a lack of collateral, a lack of having the right connections, and complicated banking procedures as the main reason for their not obtaining sufficient credit. None of these factors were important to the GOE mills.

Even at the level of feed mills, social capital is important in obtaining loans[2]. While 51 percent of the loans made during the period used buildings or land as collateral, 46 percent of the loans relied on

[2] Social capita can be defined as a 'stock' of trust and an emotional attachment to a group or society at large that facilitate the provision of public goods, or as an individual asset that benefits a single individual or firm that

social capital. Private mills and smaller mills rely on social capital much more than foreign and large mills (See Table 7.10.2). Overall, 91 percent of the loans from commercial banks and 71 percent of the loans from the agricultural bank were secured with pledges of hard assets as collateral. By contrast, over 83 percent of the loans by foreign banks, and 100 percent of the loans from friends, family and moneylenders relied on social capital as collateral. Social capital appears to work in these situations, partially because each lender appears to know the particular customer well and to be secure that the risk of default is low. Thus, although only 29 percent of the loans by the agricultural bank to the feed mills used social capital as collateral, all of these loans went to GOE mills. Similarly, 100 percent of the foreign bank loans in the feed milling sector that used social capital as collateral went to foreign owned feed mills.

The majority of the loans made were used to purchase raw materials for feed production. Only about six percent of the loans went to help finance marketing activities, and the rest of the loans were used for a variety of purposes including loans for other purposes such as for operating capital. Overall, the typical loan to a feed processor was for D 5.0 billion taken out for 9 months at an interest rate of 1.2 percent per month. As shown in Table 7.10.3, the average loan to a small processing business was about one-twentieth the size, and for a shorter period and higher interest rate than loans to large feed mills. Similarly, loans to private millers were small and carried a relatively high interest rate.

Feed processors take out a variety of loans from informal sources, such as family and friends, and money lenders, as well as from formal credit lending institutions, such as commercial, agricultural, and foreign banks. Generally, loans taken out from informal lenders tend to be smaller, carry a higher interest rate and have a longer repayment period than formal lending institutions (See Table 7.10.4). Similarly, loans taken out by the private sector are on average are fairly small and carry a relatively large interest rate. Loans taken out by GOE and foreign mills through the formal sector are generally

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derives benefits from knowing others with whom they form networks of interconnected agents (Fafchamps and Minten 1998).

for similar amounts, repayment periods, and interest rates. No foreign feed processors in the sample took out a loan through the informal sector.

Another form of credit received by the mills is through advance payment by customers for feed. Overall, 23 percent of the mills occasionally received payment for their feed in advance. Of the mills that receive advance payments, over 39 percent of their sales use this method, with payment received 2.8 days before delivery, on average. The practice of advanced payment for feed is more prevalent for foreign and GOE mills, as well as for larger mills. As seen in Table 7.10.5, 57 percent of the sales of these foreign mills and 61 percent of the sales of these large mills use advance payments.

The feed mills in the sample do not lend money to any of their customers. Instead, loans are sometimes made in the form of consignment sales, where the product is given to customers and repaid after the product is sold or after a prescribed period. Overall, 69 percent of the mills in the sample sold feed to customers on consignment, regardless of the relative size of the operation (See Table 7.10.6). All of the foreign mills, 88 percent of the GOE mills, and 57 percent of the private mills used this method to sell feed. Nearly 59 percent of the sales of these mills were by consignment, with full payment made about 40 days after the product was delivered, on average. The repayment period for consignment sales of foreign and GOE mills are substantially less than those for private and medium size mills.

7.11 Operating costs

Table 7.11.1 shows variable operating costs for the various types of feed processors. As one might expect, average operating costs for foreign and large mills are considerably higher than for small, medium size, private, and GOE processors. Overall, the largest variable operating costs for the mills are bag costs (17 percent of total variable operating cost), transportation (17 percent), hired labor (15 percent), financial costs such as credit and depreciation (14 percent), and taxes and duties (10 percent). Comparing each type of operating cost across the feed processor size and ownership, the

relative cost of transport, energy, health inspection, communication, marketing, and taxes are lower for foreign and large mills. The largest portion of operating costs for these mills are depreciation and credit, which correspond to 46 and 32 percent of the operating costs of the foreign and large feed companies, respectively. If we exclude the large influence of the finance related costs for a moment, we notice that in comparison to the GOE mills, foreign feed companies have lower transport, energy, management, and marketing costs as a share of their total operating cost (See Table 7.11.2). GOE mills, by contrast, have lower labor, and tax related costs. As a percentage of total operating cost, hired labor costs for GOE mills are about half of those of the foreign mills. As for the local private milling companies, although their overall costs are low, transportation, hired labor and bagging costs comprise a relatively large share.

Table 7.11.3 examines the operating cost per metric ton of feed produced. Local private feed companies have the lowest operating costs on a per metric ton basis. Average per ton operating costs are about half of that of the foreign feed companies, and 42 percent of those of the GOE mills. Hired labor, bagging, transportation, and taxes are the largest components of their operating costs. GOE mills have the highest per ton operating costs, overall, and are the least energy efficient. Over 16 percent of their operating costs are for electricity and fuel alone, more than double the energy costs of the foreign and private mills. Marketing and management cost are also relatively high, comprising over 15 and 10 percent of their operating costs, respectively, well above the seven and three percent of total operating costs spent by their foreign competitors. Financial costs continue to be the largest cost for the foreign feed companies. Even on a per metric ton basis, over 40 percent of their operating costs is to cover credit and depreciation.

Looking at the scale of the feed processing operations, medium size companies have the lowest per ton operating costs. Overall, transport, hired labor, communication, and tax costs as a share of total operating costs fall as feed mill size increase. If financial costs such as depreciation and credit related costs are removed from the analysis, foreign and local private mills have similar per metric ton operating costs (See Table 7.11.4). Operating costs for GOE mills are more than double their private

sector competitors. Overall, transport, water, quality control, fumigation, labor, communication, maintenance, and tax costs decline as mill size increases. Conversely, bagging, management, and marketing costs tend to rise as the scale of the milling operation increases.

7.12 Profitability

Table 7.12.1 shows the average sales, purchases, operating costs, and profits of the various types of feed companies on a per metric ton basis. Overall, the feed mills had about D 77 billion in sales during the period from July 1998 through June 1999 on average, and D 17 billion in profits. On average, mills earn about D 300 thousand per ton of feed produced, on sales of D 3.1 million and total costs of D 2.8 million per ton. Profits are highest for the foreign milling companies (D0.9 m/ton), followed by the GOE mills (D 0.5 m/ton). Profits per ton are the lowest for the private milling companies. As also shown in Table 7.12.1, profitability improves as the scale of the mill increases. Small mills earn about D 0.2 m/ton, while large mills earn nearly D0.8 m/ton.

Table 7.12.2 further examines the profitability of the feed businesses. By most measures, foreign and large feed companies earn the largest profits from their investment and efficiency of operations. Based on the share of profits in total revenue and the return on investment, foreign and large mills are earning the largest profits from their mill operations. Part of the profitability is due to higher utilization of the mills feed production capacity. Large and medium size mills are operating at over 65 percent of capacity, while capacity utilization in the small mills is only about 33 percent. Capacity utilization in foreign mills, although under 50 percent, is 33 percent higher than for GOE mills. Profits per unit labor are also highest for foreign feed companies than GOE mills, despite having larger workforces and paying higher wages on average. The large mills also have higher profits per unit labor, which decline as the size of the mills operations fall.

A major determinant of mill performance over time is reflected in the changes in their level of profitability. Since no data was available on past profitability, we asked the feed processors about

their perceptions about their level of profits during 1999, and the previous year. As well, millers were also asked about their expected profitability in 2000. Overall, about 65 percent of the mills indicated that their profit level in 1999 was fair (See Table 7.12.3). Only 23 percent of the millers indicated that their profits were good or very good. About 50 percent of the large and foreign feed companies in the sample indicated that their profits were good or very good, while less than 25 percent of the other types of mills said their profits were good. While foreign and large feed companies had the largest proportion of mills who had good profits, they also have the largest proportion of mills who indicated that their profits were poor.

Changes in volume, prices and the level of competition were the main factors for changes in profitability between 1998 and 1999 (See Table 7.12.4). Somewhat surprisingly, none of the foreign or large mills had higher profits in 1999 than the previous year. Profit levels for these firms were either flat or dropped. Of the other feed factories, the majority credited higher sale prices and volume expansion for their increase in profits. Over 57 percent of the mills that had higher profits attributed the increase in their profits to an expansion in the volume of feed they sold. Changes in volume were also a factor for the mills who's profits declined. Over 36 percent attributed their reduction in profits to changes in their volume of sales. An additional 18 percent indicated the role of higher raw material costs and 27 percent noted other factors (See Table 7.12.5).

7.13 Conclusions

The feed industry in Viet Nam has seen remarkable growth since 1994. As a result of Doi Moi, new domestic and foreign investment have been made in the sector. Commercial feed production has increased at a rate of over 23 percent over the period from 1988 through 1998 and its share of commercial feed consumption and total feed consumption has grown from about one and 0.25 percent to about 27 and seven percent, respectively. While commercial feed quality, supply, and demand are increasing and prices are falling, the industry is affected by a number of problems that are

constraining the development of a healthy, profitable feed industry and affecting the adoption of commercial feed by producers.

Prices for feed in Viet Nam are high by international standards. Although the demand for feed is relatively low, the high cost of the raw materials used in feed production in Viet Nam is an important factor. Prices for high protein raw materials such as maize and soybeans are more than twice as expensive in Viet Nam than on international markets. Contributing to the high cost of high protein raw materials are limited local production, low yields, and high import duties. If the cost of high-protein raw materials used in feed production is to be reduced, measures that increase productivity and liberalize trade need to be taken. Some measures that the government may wish to evaluate and consider include, relaxation of restrictions for rice lands to enable farmers to plant the crops that are most profitable for them be it rice or maize or soybeans, fund research for the development of higher yielding modern varieties of maize, soybeans, and other high-protein raw materials suitable for Vietnam's various agro-climatic areas, and a reduction in import duties of high-protein raw materials used in feed production.

Since the passage of the new investment law of 1994, investment in the feed industry has increased. The large increase in investment has been mainly undertaken by the private sector, both domestic and foreign, which in turn has led to a dramatic increase in feed production and capacity. Although it is still early in the development of the feed industry in Viet Nam, the local private companies may be too small to be competitive over the long term. For example, the five largest domestic companies process about 19 percent of the commercial feed produced in Viet Nam, the five largest foreign mills produce about 62 percent. Part of the difference in the size of the local and foreign mills may be due to insufficient access to credit. Construction and expansion by local feed mills is largely self-financed, while foreign mills more often use credit. Consequently, insufficient access to credit, may force local feed companies to build smaller less efficient mills. If the local private feed industry is to be competitive with the foreign owned mills and feed imports over the long term, it will need to consolidate in order to grow its share of the local feed market. In this area, government has a role to

play in order to ensure equal access to credit and not impede the future consolidation of the local feed industry.

Feed produced by foreign, local private, and state run mills differ in a number of respects including the type, quality, and price of the product. Foreign and large newer mills appear to be targeting the production and sale of concentrated feed, whereas most local private and state-owned mills mainly produce complete feed. Feed sold by foreign mills has a higher level of protein and higher price then the same type of feed produced by local private mills. Coupled with generally higher rates of capacity utilitization, it appears that local private mills are for the most part targeting the lower end of the market by selling a higher volume of lower quality less expensive feed to livestock producers. While this strategy may be the most appropriate for the local private mills at the present time under current market conditions, as the demand for high quality feed increases, local private feed processors run the risk of either targeting a smaller, shrinking niche market for cheaper, low quality feed, or they will need to substantially increase their investment in order to successfully compete with the large feed producers. As the market for feed adapts to changing supply and demand conditions and as the quality of feed becomes increasingly important to producers, the government in partnership with the private feed industry should establish a “Truth in Labeling” program for animal feed. In support of this, the government should introduce regulations to require the accurate labeling of the nutrient content of animal feeds following livestock diet requirements, and monitor compliance through regular random government sampling and testing program, perhaps financed through a modest industry funded fee.

CHAPTER 8

FEED MARKETING

Summary

This chapter examines the current structure and constraints facing traders of feed in Viet Nam. Drawing on a survey of assemblers, wholesalers, and retailers of high and low quality feed, the chapter examines the structure of the industry's businesses, their purchasing and distribution channels, and their use and access to transportation, storage, information, and credit. Lastly, the chapter examines the investment behavior, operating costs, and profitability of the feed traders.

Highlights

- *Like animal, meat and processed meat product traders, traders of feed operate primarily at the local level – only a few wholesalers operate at a larger regional or national level. Generally, the most profitable traders are the bigger traders who move large volumes of feed and raw materials. Where local feed markets are underdeveloped, feed traders have a more diversified source of income.*
- *Greater demand for animal feed, coupled with greater supplies and growing competition, have led to a decline in feed prices, particularly poultry feed prices. Since feed constitutes about 70 percent of the average producers costs for raising livestock, the continued decline in prices can lead to lower production costs for producers, and a greater volume of trade and higher profits for traders. Feed demand however remains low. Larger traders and traders that have been able to grow their businesses are better situated to whether increasing competition and maintain their profitability.*
- *Government restrictions do not appear to be a major impediment to the development of the feed trading sector. Nevertheless, impediments exist, primarily in the form of random*

roadside checks by police and complicated banking procedures, which increase traders' costs in terms of both money and time.

Introduction

As discussed in the previous chapter, feed and raw material traders are important to the feed industry for the procurement of raw materials and the distribution of their feed products. While a great many traders have entered the market to procure and sell feed and raw materials, a number of constraints hamper efficient development and operation of the traders' businesses. Drawing on a sample of feed and raw material trader, this chapter will examine the current structure and the constraints affecting the operations of feed traders in Viet Nam and suggest policy options for government reforms to increase the efficiency of the feed trading operations and improve the availability of feed to producers.

The chapter is organized into 12 sections. Section 8.1 briefly describes some of the characteristics of the traders in the sample, and Section 8.2 examines the characteristics of their labor force. The price, and procurement and sale of high and low quality feed are discussed in Sections 8.3 and 8.4. Sections 8.5, 8.6 and 8.7 examine the use by the marketers of transportation, information, and storage, respectively. Next, investment activity and credit availability are discussed in Sections 8.8 and 8.9. The structure of the businesses operating costs and their overall profitability are discussed in Sections 8.10 and 8.11, respectively. Lastly, a number of conclusions are drawn and presented in Section 8.12.

8.1 Trader Characteristics

The sample is comprised of 162 traders covering all 8 Vietnamese agro-climatic regions. Overall, 14 percent of the traders in the sample are primarily assemblers, 42 percent wholesalers, and 44 percent retailers. Table 8.1.1 details the breakdown of the different types of traders in the sample by region. Gross value of operations (GVO) is used as an indicator of the scale of the traders operations. The GVO includes the gross value of all income from the trading of feed and raw materials plus income derived from any other trading and non-trading activities that the trader may be involved in. The criteria of small, medium, and large GVO categories are based on the distribution of the GVO, with fifty-three percent of the traders in the small scale category, 28 percent medium scale operators, and 19 percent large scale traders. These small, medium and large categories correspond to GVO's of less

than one billion Dong, one to five billion Dong, and over five billion Dong, respectively. Table 8.1.2 shows the distribution of the different types of traders by the scale of their operations.

For the most part, the traders in the sample began their trading operations over the past 10 years. Based on the sample, 1994 was a watershed year for the entry of feed and raw material traders into the market. Overall, 60 percent of the traders in the sample began their operations in 1994 or later, and ninety-four percent started their trading business during the 1990s. Entry of assemblers into trading was most prevalent during the period from 1994 through 1996, with 54 percent of the sample beginning their operations. Entry of wholesalers and retailers by contrast continues to be strong through the end of the 1990s.

Overall, 90 percent of the feed traders in the sample are registered private domestic business, about seven percent are not registered, and the remainder either government enterprises or registered foreign businesses. As one would expect, the non-registered businesses are primarily smaller trading operations, predominantly retailers, and are mainly located in the NES, SCC, and MRD.

The feed traders for the most part operate at three different levels. Seventy-three percent of assemblers operate primarily within their district or district town. By contrast, sixty-five percent of retailers operate at the commune or district town level. The main competitors for wholesalers operate primarily at the district or province level (78 percent), while only 4 percent of the wholesalers operate at a region wide level. As one would expect, smaller traders operate at the more local commune and district level, whereas larger traders tend to operate at a larger district and province level.

The traders in the sample earn the majority of their income from the sale of pig and poultry, complete and concentrated feeds, and various grains, brans, and cakes for animal consumption. Overall, feed and raw materials trading was responsible for 58 and 25 percent of their income, respectively. Other, non-feed related activities correspond to about 17 percent of their income, on average. As shown in Table 8.1.3, traders in the regions from SCC southwards, earn between 71 to 75 percent of their

income from the trading of complete and concentrated feeds, and between 14 and 21 from raw material trading. In the northern regions of the RRD and the NE, about 50 to 54 percent of the traders income comes from feed trading and 28 to 30 percent from raw material sales. Composition of the income sources of traders also differs by the scale of their operations. In comparison to larger traders, small traders tend to have a more diversified trading operation, earning a larger share of their income from raw material trading and other non-feed related activities than large traders who earn the majority of their income from the sale of complete and concentrated feeds (See Table 8.1.4).

8.2 Labor

Traders may employee a number of different types of labor, including family members, skilled and unskilled permanent labor, and temporary laborers. Overall, 98 percent of traders employee some type of family labor. More than 50 percent of the traders use only family labor in running their business, while less than 2 percent do not use any family labor. Table 8.2.1 breaks down the labor employed by traders by the different types of businesses and by gender. About 87 percent of the traders use female family members, while only 79 percent use male family labor. On average, each trading business employees 1.9 family members, of which 1 worker is female and 0.9 is male. Female family members work about 310 days per year (approximately 6 days per week), while male family laborers work about 242 days per year (nearly 5 days per week). Male family members are more often employed in assembler firms, while female family members are more likely to be employed in retailing operations.

In addition to family labor, 19 percent, 24 percent, and 23 percent of the traders employee permanent skilled, permanent unskilled, and temporary labor, respectively (See Table 8.2.2). Although traders only employee 0.4 skilled workers on average, skilled workers are more often employed in wholesale and large trading businesses, and work nearly every day. Traders also typically employee one unskilled permanent workers and 0.6 temporary laborers. The unskilled permanent workers usually work over 300 days per year, while temporary laborers are only employed on an as needed basis for about 88 days per year.

As one would expect, permanent skilled employees receive higher daily wages than unskilled and temporary workers. On average, permanent workers receive D 24200 per day, while unskilled permanent workers and temporary laborers receive a daily wage of about D 18700 and D 22300, respectively (See Table 8.2.2). Presumably, temporary workers receive higher daily wages because employers can pay somewhat lower wages to workers who are steadily employed, they do not need to pay benefits to and taxes on temporary workers, and because of the need to attract labor on short notice for day-to-day requirements. While large trading businesses pay the highest wages for unskilled and temporary labor, small business pay the highest wages to skilled permanent workers on average, presumably to attract highly skilled people to otherwise small scale operations with limited opportunities for advancement.

While women are highly regarded and numerous women are employed in the trading sector, women generally receive lower wages than men in similar skill categories. Overall, the daily wage received by female permanent employees is about 85 percent of that received by their male counterparts. For temporary laborers the disparity is even larger, with female workers receiving 42 percent less per day than temporary male laborers. As can be seen in Table 8.2.1, this pattern of lower daily wages for female workers holds for nearly all skill and employer categories. To some extent the lower daily wage rate paid to females is offset by the fact that women tend to work more days during the year, such that their salary at the end of the month is comparable to that received by their male counterparts.

Table 8.2.3 breaks down labor use and costs by region. Overall, traders in the MRD and the RRD have the most employees (family, permanent, and temporary), on average. Wage rates in the NCC and the SCC are somewhat lower (about D 17000 per day), than in the other regions (about D 22000 per day) on average. Permanent skilled employees are most often employed by traders in the NES and the MRD. Traders in these regions typically employee 0.7 and 1.3 skilled workers respectively, well above the national average of 0.4. Daily wages for skilled labor are however highest in the regions of the RRD and the NE, perhaps indicating a shortness in supply in these regions of these skilled

workers. Unskilled permanent employees are also most often employed by traders in the NES and the MRD (37 and 52 percent, respectively). Firms in these two regions employee 1.1 and 3.5 unskilled laborers on average. Wages for this type of labor are lowest in the NCC, and highest in the NES and the MRD. Lastly, traders in the RRD and the NCC use temporary laborers most often to supplement their regular work force. Wages for temporary work are highest in the regions of the NES and the RRD.

8.3 Procurement and Sales

Feed traders buy and sell a wide variety of complete and concentrated animal feeds for pig, poultry, and cattle, and raw feed materials including grains such as maize, dried cassava and soybeans, fish meal, and rice, maize and wheat brans. As shown in Table 8.3.1, the size of the trading operations and the value of their sales varies considerably across regions. The largest traders are located in the MRD, with GVOs of D 4.4 billion during the period from July 1998 through June 1999, with the total value of feed and raw material sales of about D 3.3 billion or 85 percent of GVO, on average. Trader operations tend to be smallest in the regions of the NW and SCC. In the sample, small traders have GVOs of D 408 million, while large traders have GVOs on the order of D 8.9 billion (See Table 8.3.2). The businesses of large traders also tend to be more specialized in their feed trading operations than small traders, who have a larger proportion of their total sales from non-feed and raw materials related trade (See Table 8.3.3). Similarly, wholesalers have a larger proportion of their total sales from feed and raw materials, than retailers and assemblers.

In the overall sample, traders purchase over D2.5 billion worth of feed and raw materials, on average during the period from June 1998 to July 1999. All of the traders in the sample sold pig feed and 83 percent sold poultry feed. Only six percent of traders sold cattle feed. Various grains, brans and meals were purchased by 75, 64, and 21 percent of the traders, respectively. Only about nine percent of the traders sold feed additives. As shown in table 8.3.3, about 48 percent of the trader's purchases are of pig feed and 21 percent poultry feed. Cattle feed comprises less than one percent of total purchases,

while raw materials accounts for about 26 percent, on average. As a proportion of total purchases, raw material purchases tend to be a larger percentage of the total purchases for smaller traders than for larger traders. Of the different types of feed purchased and sold by the traders, concentrated pig feed is purchased in the largest quantities and sold by over 88 percent of traders. About 65 percent of traders also sell starter and fattening feeds for pigs. With respect to poultry feed, about 65 percent of traders sell concentrated, starter and grower feed. Cattle feed is sold by only about 3 percent of traders.

There is also considerable variation in feed purchase patterns in different regions. As shown in Table 8.3.4, the value of pig feed purchases in total feed and raw material purchases tends to be large in the NES and the CHs. The share of poultry feed in total purchases is larger in the NE, NW, and RRD than the other regions on average. Raw material purchases are a higher proportion in the NCC than in other regions.

The feeds sold by feed traders in Viet Nam are purchased solely from local Vietnamese sources. None of the feed traders in the sample import feed or raw materials. Rather about 51 percent of the feed they sold is purchased from other local traders, 20 percent from local foreign feed mills, and 18 percent from local private feed mills (See Table 8.3.5). Small traders purchase a larger share of their feed from local traders, where as large traders more often purchase from joint venture and local private feed mills. Similarly, retailers and assemblers purchase the majority of their feed from local traders, while wholesalers purchase the feed they sell primarily from local foreign and private feed mills. As one would expect, retailers and assemblers sell nearly all of their feed directly to producers. Wholesalers, by contrast sell about three-quarters of the feed that they purchase to retailers and about 25 percent directly to livestock producers.

Raw materials sold by traders in Viet Nam are almost solely purchased from local Vietnamese sources as well. Only one of the 162 traders in the sample imports grains into Viet Nam. Over 71 percent of the raw materials purchases by traders are bought from other traders, while about 13 and 11 percent

are purchased from farmers and private processing businesses, respectively. Assemblers are the largest purchaser of raw materials from farmers, principally rice (52 percent), soybeans (36 percent), and maize (22 percent). Retailers and small traders are the main purchasers of raw materials from private processing businesses. On the sales side, relatively little of the raw material purchases are sold to other traders – only about 25 percent. The remainder is either sold directly to consumers, or to feed processors. Most of the traders in the sample sell their products solely within their own province. Only about two percent of wholesalers sell raw materials outside of the province where their business is located. By contrast, about 13 percent of assemblers travel on average about 160 km to sell their raw materials to customers in other provinces.

On average, traders travel over 80 km to purchase feed. In the NES, NW, RRD, and the NCC, purchased pig feed is transported between 30 and 42 km to the traders shop, while in the SCC and CH purchased pig feed is transported over 200 km on average. Overall, 88 percent of traders purchase feed from within their own province. For purchases made within their own province, pig feed is transported 17 km on average from the point of purchase to the primary business site.

8.4 Prices

Table 8.4.1 and 8.4.2 summarize the average quarterly price of various types of feed and raw materials sold by traders. As shown in Table 8.4.3, pig starter feed, which contains high levels of protein, is substantially more expensive than the other types of complete pig feed. Concentrated pig and poultry feeds are nearly double the price of complete feeds. For the most part large traders are able to sell feed at lower prices than small and medium size traders, presumably because they purchase feed in larger volumes at lower prices from feed mills and other traders, which they then pass on to their customers. Assemblers, who for the most part do not specialize in the sale of feed, sell a more limited variety of feed at higher prices. As one would expect, the sale price of concentrated feed and fattening feed for pigs and chicken are lower when purchased from wholesalers than from retailers.

Table 8.4.4 examines the price of the different types of feed by region. Concentrated pig and poultry feeds tend to be more expensive in the regions of the North than in the South. Overall, complete feed sale prices are higher in the Northern regions of the RRD, NE, NW, and NCC, than in the south, particularly in comparison to prices in the NES and the MRD. Generally higher feed prices in the North are largely due to the concentration of the feed industry in the southern regions of the NES and the MRD, and the relatively high cost of transporting feed long distances.

Over the period from July 1998 through September 1999, the overall trend in poultry feed prices has been downward. As shown in Table 8.4.5, poultry feed prices have been declining at a rate of about 1 percent per quarter. As indicated by the index of instability, price fluctuations of poultry feed around the trend are remarkably stable over the period. The trend in pig feed is not universal. The sale prices for lactating sow, fattening, and concentrated pig feeds have declined over the period, while the sale prices of grower, non-pregnant sow, and pig starter feeds have risen somewhat over the period. Lactating sow, grower and fattening feeds for pigs also show relatively large price fluctuations around their overall price trend. Lastly, dairy cattle feed prices, while relatively low in comparison to pig and poultry feed, have been increasing at a rate of over 0.65 percent per quarter over the period.

Unlike feed prices, raw material prices were much more unstable over the period from July 1998 through September 1999 (See Table 8.4.6). In particular, the sale prices of the mineral and vitamin premixes were very volatile over the period. The price of maize, rice bran, and bone meal were also quite volatile. Overall, commodity prices declined over the period. Rice, maize, and wheat brans, and groundnut cake prices declined by between 2 and 3 percent per quarter over the period, as did the sale prices of maize, dried cassava, and soybeans. The major exception to the general decline in raw material prices was rice, whose price rose at an average rate of over 2.5 percent per quarter during the period.

8.5 Transportation

Use of transport is vital to the operations of traders. As shown in Table 8.5.1, over 85 percent of traders used some form of transport in their operations. All wholesalers and nearly all large traders use transportation in their trading operations. Trucks and motorbikes are the primary means of picking up feed and raw materials from suppliers, and for delivery to customers. Wholesalers, assemblers, and large traders rely much more on trucks to transport their products than retailers, while small and medium sized traders rely more on motorbikes. Of those who use trucks to transport feed and raw materials, only 40 percent of the traders own their own truck, while about 60 percent rent. By contrast, of the traders who use motorbikes, over 98 percent own them. Over 50 percent of traders also rent transport services. Wholesalers and large trading operations are more likely to rent the services of a transport company than small traders and retailers. About 11 percent of traders – all of them wholesalers - who rented the services of a transport company had problems with the transporters. The most common problems are associated with informal rents (4.3 percent), overloaded vehicles (2.9 percent), and unreliable drivers and deliveries (2.9 percent).

Table 8.5.2 examines the use of transportation in different regions. Over 50 percent of traders in the CH, RRD, NES, NE, and MRD use trucks to transport feed and raw materials. Use of trucks is lowest in the NW, NCC, and SCC, where only about 20 to 25 percent of traders use truck transport. In these three regions, motorbikes, cong nongs, and bus transport are more frequently used to move their goods.

As can be seen above, traders use a variety of vehicles to pickup raw materials and feeds from suppliers and deliver them to customers, including trucks, cong nong, motorbikes, and boats. For long distance travel, traders use trucks most often. As shown in Table 8.5.3, trucks transport about 6 mt of feed and raw materials a distance of 136 km at a cost of D 1250 per mt per km, on average. Shipping costs are lower for assemblers, and medium and large traders who generally ship a larger quantity of feed and raw materials a further distance than do wholesalers, retailers, and small traders. Like trucks, boats are a relatively inexpensive means of transporting goods over both long and short distances. In

the sample, boat use was limited to only a few traders located in the MRD. At a cost of D 1225 per mt per km, costs are quite competitive with trucks, albeit where waterway infrastructure exists. For shorter distances, cong nongs and motorbikes are used most often by traders. Cong nongs are more commonly used in rural areas, while motorbikes are more prevalent in urban areas. Costs per mt per km are approximately twice as high for goods transported by cong nong than by truck due in large part to the smaller quantities and the shorter distances traveled.

Of the traders who use transport in their trading operations, 27 percent indicate that they occasionally have problems with restrictions on the movement of their goods. The problems are most severe in the RRD, and to a lesser extent in the MRD, CH, NE, and NW (See Table 8.5.4). Frequent random police roadside check points are by far the most common impediment o the transport of goods in these regions. Other frequent impediments in certain areas include tolls in the MRD, and inter-provincial restrictions on the movement of goods in the NE and the NW. As shown in Table 8.5.5, wholesalers, assemblers, and large traders are most affected by these movement restrictions, again, largely because of the larger quantities moved and longer distances traveled. While the conduct of police is the most frequent restriction to the movement of goods and is a cost to businesses in terms of both time and money, other factors such as inter-provincial blocks and tolls are also common, particularly for assemblers and larger traders.

8.6 Information and communication

Traders require a variety of information to operate their business effectively, efficiently, and profitably. On markets and prices, other traders are by far the most important source of information, followed by personal contacts and feed mills (See Table 8.6.1). For assemblers and retailers, other traders are the main source of price information, while for wholesalers, feed mills are their main source of price information. Traders do not rely on the press or other media for information on markets and prices, in general, because of the delay between the time of the data collection and the time when the prices are reported.

Changes in government regulations affecting the operations of the feed industry and marketing activities can have a dramatic effect on the behavior of feed and raw material traders. Here the media plays an important role in the dissemination of information on new and changing regulations. Overall, 92 percent of traders rely on the media for regulation information. Other important sources of information on regulatory changes include correspondence from Ministries and Agencies, as well as personal contacts, which are particularly important in the Northern regions.

Information on credit opportunities and availability can come from a variety of sources. By far the most important source for such information are banks (72 percent), followed by personal contacts (47 percent). Personal contacts are more often relied upon by assemblers and small and medium size traders, than by large traders.

Besides direct discussion with other traders and personal contacts and through the media, technology plays only a limited role in the dissemination of information. The telephone is by far the most important means of exchanging information. Overall, 76 percent of traders have a telephone and nearly all have at the very least access to a telephone for their trading operations. Telephone ownership is lowest in the NW (44 percent), and among small traders (See Table 8.6.2). Less than 1 percent of traders have use of a fax machine. Use of fax machines is highest among assemblers (5 percent), and large traders (3 percent). Despite their wide use in many industries and countries, feed and raw material traders do not intensively use computers for the exchange of information. Overall, only about 3 percent of traders use a computer in their trading operations, and less than one percent use email and the internet to obtain information.

8.7 Storage

Feed and raw material trader use a variety of storage methods in their trading operations. Overall, over 96 percent of traders have some type of storage facilities for their feed and raw materials. Nearly 72

percent of the traders keep the feed and raw materials that they buy and sell at their store (See Table 8.7.1). Twenty-four percent of the traders also use their house to store the commodities they sell. Retailers are somewhat more likely to use their homes as a storage site, then wholesalers and assemblers. In addition, approximately 10 percent of the traders store their feed and raw materials off site in warehouses or other storage locations. Over 22 percent of assemblers and 11 percent of wholesalers store a portion of the commodities they sell at such off site locations. Use of other storage is particularly high in the MRD, where nearly 30 percent of traders store some of their feed and raw materials offsite. Of these offsite storage locations, warehouses and covered sheds are most commonly used by about 5 percent and 3 percent of the traders, respectively. In particular, over 18 percent of assemblers use warehouses to store their commodities. Offsite storage is used most widely in the MRD, and to a lesser extent in the CH and SCC regions (See Table 8.7.2).

Although storage is used, fumigation for pests and insects is sporadic. Overall, nearly 90 percent of the warehouses but only 37 percent of the stores and houses where feed and raw materials are stored are fumigated. In addition to pests, these storage facilities are also often poorly ventilated, which could lead to the spoilage of feed due to high temperatures. Of the building that are fumigated, warehouse are usually fumigated on a quarterly to monthly basis, depending on the need. House and stores by contrast are fumigated less often, usually every 3 or 4 months.

Actual storage capacity for the traders is relatively small. On average, the capacity of the storage space available to the trader at their shop is about 18 mt. Onsite storage capacity for assemblers and wholesalers is about double that of retailers. Storage capacity in the homes and warehouses of the traders is about 21 and 180 mt, respectively. On average, assemblers and large trader have the largest storage capacity, while small traders and retailers have the smallest (See Table 8.7.3).

Overall, 86 percent of the traders in the sample store feed. As shown in Table 8.7.4, traders usually keep about 4.3 mt of feed on hand, with about 8.4 mt during peak periods. Turn over is relatively fast however, as the average storage period is a little over one week, reflecting the perishability of the

feed. Of the assemblers who trade feed, they keep only about 2 days worth of feed on hand, suggesting that these assemblers only purchase sufficient quantities of feed for which they already have confirmed sales. By contrast, wholesalers and retailers, keep about 8 to 9 days worth of feed in stock at any one time. As one would expect, large traders keep a larger quantity of feed in stock then small and medium size traders. Large traders however also turn over the feed in about 5 days, while smaller traders have about 8 or 9 days of feed in stock.

Approximately 57 percent of the traders in the sample also store raw materials. On average, traders keep about 11 mt of raw materials in storage at any one time, which they turn over in a little over 15 days. Assemblers keep nearly 50 mt of raw materials in storage, with peak quantities in storage of up to 189 mt on average during post harvest periods. This quantity in storage corresponds to about a 30 day supply of raw materials. Raw material traders in the CH and the MRD keep substantially larger quantities of raw materials in storage during the year, in comparison to the other regions. While average quantities are relatively large, turnover is short at less than a week (See Table 8.7.5). By contrast, raw material traders in the more isolated regions of the NCC and the SCC have sufficient supplies of raw materials on hand for about one month on average.

Relatively few traders rent storage space. Overall, 85 percent of traders own their storage space, 12 percent rent, and 3 percent do not use any storage. As shown in Table 8.7.6, the average warehouse space rented has a capacity of 368 square meters and is rented for a period of 12 months at a cost of about D 4000 per month per square meter. The store where the trader operates is typically rented for a longer period at somewhat higher cost on a square meter basis.

8.8 Investments

Besides storage facilities, feed and raw material traders own a variety of fixed assets, including land, buildings, transportation and equipment. Over 82 percent of the traders in the sample own buildings such as a store, house, warehouse, or shed, and 77 percent own some type of transport like a truck,

motorbike, cong nong, or car. Only about 55 percent own land, however, be it their house, store, or warehouse. The low level of land ownership may in part be the result of the slow pace of the transfer of land titles from the government to citizens following the land law of 1992. The majority of investments in buildings and transport have been made since the passage of the foreign investment law of 1994, which has helped bring about a dramatic increase in feed production in Viet Nam. As shown in Tables 8.8.1 and 8.8.2, the average real investment made by traders has more than doubled during the later period. Real investments in transport have nearly quintupled and investments in buildings more than doubled in the period since 1994. Wholesalers in particular have invested heavily in land, buildings, and transportation, as have large traders.

Table 8.8.3 shows the annual real investment made by traders in different regions since 1994. Traders in the NE in particular have made large real investments of over D 19.6 million annually. Traders in the MRD, CH, and the NES have also invested heavily during this period. Nearly 46 percent of the real investment made by traders was transportation related, and about 32 percent was targeted for new buildings. Transportation investments were particularly large for traders located in the NES, where the majority of the feed mills in Viet Nam are located. As a percentage of total investments, traders in the regions of the NW, CH, and the NCC also invested a large proportion of their total investment over the period for new transport. In both absolute and relative terms, traders in the MRD made the largest investments for new and expanded buildings and storage facilities.

As shown in Table 8.8.4, the average trader has net assets of approximately D 138 million. About 40 percent of these assets are invested in buildings, 36 percent in transportation, and 20 percent in land. Based on the current value, wholesalers and large traders are the wealthiest and hold a large proportion of their fixed assets in the form of land and buildings. Similarly, traders located in the MRD, SCC, and the NE have the most invested in land and buildings. Traders in the NW, CH, and the NCC have a larger share of their assets invested in transportation. Overall, traders in the NES are the wealthiest, with assets valued at over D 245 million. Traders located in the NW are by far the poorest, with net assets of only D 27 million. (See Table 8.8.5).

8.9 Credit.

Over 45 percent of traders use credit to finance their feed and raw material trading operations. Credit is most widely used in the CH and the RRD, where 70 and 68 percent of traders borrowed money, respectively. By contrast only 19 percent of traders in the SCC use credit (See Table 8.9.1). As shown in Table 8.9.2, 57 percent of wholesalers use credit. Of these wholesalers, 59 percent indicate that the credit they receive is enough to fund their operations. For those wholesalers who did not receive sufficient funds to conduct their trading operations smoothly during peak periods, over 56 percent indicated that it is due to complicated banking procedures. While most wholesalers appear to have sufficient access to credit, assemblers seem to be having more difficulty. Overall, nearly 55 percent of assemblers use credit. However, only about 25 percent of the assemblers in the sample indicate that the funds they receive are enough for their trading activities. The reason for the insufficient level of funding are many, including complicated banking procedures, insufficient collateral, and a lack of the right connections.

Size also has an effect on access to sufficient credit. As shown in Table 8.9.2, medium and large traders use credit and receive sufficient funds for their trading operations more often than small traders. Only 43 percent of small traders indicate that they can borrow enough funds for their trading activities. The most common problem identified by the small trader is complicated banking procedures (41 percent), although insufficient collateral and a lack of the right connections are also factors. Problems with banking procedures are particularly acute in the regions of the NCC and the NES, while problems with insufficient collateral are more prevalent in the regions of the CH, MRD, and SCC (See Table 8.9.1).

Overall, about 42 percent of the loans taken out by feed and raw material traders are from the agricultural bank. Less than 7 percent of the loans are from commercial or foreign banks. In addition to loans from the formal banking sector, 29 percent of the loans are from friends and relatives, and 10

percent are from local money lenders. In order to obtain credit, over 55 percent of the loans are secured by pledges of buildings and loans. While hard assets are most often used to secure loans, over 41 percent of the loans in the sample rely on social capital as collateral. Although 94 percent of loans from financial institutions rely on hard assets for collateral, and 88 percent of the loans from informal institutions rely on social capital for collateral (See Table 8.9.3), social capital is used as collateral by about 38 percent of traders regardless of size or main trading activity (See Table 8.9.4).

The majority of the loans made (78 percent) are to help the trader to purchase the feed and raw materials that they sell. A further 13 percent of the loans are to help finance the sale of other inputs. Only 7 percent of the loans taken out by traders are used to assist them in their marketing. Overall, the typical trader who received a loan, borrowed D 48 million for a period of 14 months at an interest rate of 1.3 percent per month. As shown in Table 8.9.5, loans to small traders were about one-fifth the size, and taken out for a longer period at a lower interest rate than loans given to large traders. In addition to not receiving enough loans to fund their trading operations, the terms of the loans to assemblers are less advantageous than to other traders. Loans to assemblers are typically relatively small (in comparison to wholesalers) and made for a shorter duration at a higher interest rate. Borrowing costs also differ substantially by region. Loans in the MRD and the NES charge higher interest rates on average than those in other regions. Interest rates are typically lowest in the regions of SCC, NCC, and the NW (See Table 8.9.6).

Informal credit lending institutions are quite active and well developed in Viet Nam. Traders access loans from a variety of informal sources including money lenders and friends and family, as well as from formal credit lending institutions such as agricultural and commercial banks. With the exception of small traders, loans made by informal credit, typically are for longer duration and a higher interest rate than loans made by formal credit lending (See Table 8.9.7). Also, with the exception of large traders who receive relatively large loans, the average amount lent by informal institutions is comparable to the average amount lent by formal institutions.

Besides loans received from formal and informal credit lending institutions, 12 percent of the traders in the sample used advance payment from their customers to purchase feed and raw materials from suppliers. With this form of credit, traders are better able to reduce risk, finance purchases, and buy in larger quantities. Overall, over 30 percent of the sales of traders who accept advanced payment for goods are made using this method. On average, payments are typically received about 11 days before the product is delivered to the customer. As shown in Table 8.9.8, none of the assemblers in the sample received advance payment for the raw materials that they sell to customers. Of the retailers who accept advance payment for the goods they sell, a relatively large proportion (31 percent) of their sales are done this way, with payment typically made about 18 days before. Although only 13 percent of wholesalers receive advance payment for delivery, about 27 percent of the sales of these wholesalers are made using this payment method. In comparing traders of different sizes, small traders typically obtain a larger share of their sales through this form of credit, with payments received about two weeks before delivery. By contrast, approximately 18 percent of the sales of large traders are in advance, with delivery made about 3 days after the initial payment.

As a form of credit, the use of advance payments differs considerably across regions. In the SCC, nearly 44 percent of traders in the region use advance payment to finance their feed and raw material purchases. By contrast, in the NW and NCC regions, none of the traders in the sample receive advanced payment for their sales (See Table 8.9.7). Of the traders who received advanced payment, 60 percent of the sales of traders in the MRD and 30 percent of the sales of traders in the NE and the SCC were through the advanced payment by customers.

Traders do not typically lend money to customers to finance their purchases of feed and raw materials. Overall, less than four percent of the traders lent any money at all. The main use of these funds were for non-business related loans, typically made to friends and family. Only one of the traders in the sample made a very short-term loan of less than a month to a customer to finance a purchase. Instead of cash loans, traders more often sell on consignment, where they receive payment from the customer for the products they purchase only after the customer has received or sold the product. Overall,

nearly 93 percent of the traders sold feed and raw materials by consignment. Of the traders that sold goods on consignment, nearly 53 percent of their sales were by this method of payment. Repayments for consignment sales are received in about 36 days on average, with repayment periods longest in NES (61 days) and shortest in CH (21 days). The share of consignment sales is highest in the southern regions of CH, MRD, and the NES, and lowest in the regions of the NCC and NW (See Table 8.9.10). Comparing traders of different sizes, large traders sell a larger share of their feed and raw materials on consignment than small traders (62 percent versus 46 percent). The repayment period is also about half that of the 42 days typical of small traders (See Table 8.9.11). Similarly to large traders, a larger share of the sales of wholesalers is by consignment (60 percent) than for assemblers and retailers. The repayment period for assemblers is relatively short at only 15 days, while for retailers it is about 52 days on average.

8.10 Operating costs

Table 8.10.1 presents total operating costs for each type of trader. The largest single operating cost for traders is transportation. Together own and hired transportation are responsible for 29 percent of the average traders operating costs. The other major cost components for traders are financial costs such as credit and depreciation (14 percent), taxes and duties (12 percent), communication related expenses (11 percent), and electricity and fuel (9 percent). Hired labor costs are only about 6 percent of the total operating costs of the trader. Wholesalers have the highest operating costs. On average, the total operating cost for a wholesaler is about D 135 million. The largest single component of the operating costs of wholesalers is transportation (44 percent), followed by financial costs (14 percent) and taxes and duties (8 percent). Operating costs for assemblers are about 18 percent lower than wholesalers. Operating costs for wholesalers and assemblers are similar, albeit with a few large differences. Transport costs for assemblers are about three-quarters lower than for wholesalers (D 77 million). Bag costs (5 percent) and hired labor costs (7 percent) associated with picking up and packaging raw materials for resale are higher for assemblers. Operating costs for retailers, by contrast, are about one tenth that of wholesalers and assemblers, or about D 13 million, on average. The largest components

of total operating costs for retailers are financial costs (15 percent), transportation (15 percent), communication expenses (15 percent), taxes and duties (14 percent), and electricity and fuel (12 percent).

The size of the traders business also has a significant impact on its operating cost structure. On average, large traders have very high operating costs (D 265 million), of which own and rented transport are responsible for over 50 percent of the total operating cost. Hired labor (11 percent) and financial costs (10 percent) are also large components of the costs of large traders. As small businesses primarily employee family members, their hired labor costs are relatively small in comparison. Total operating costs for small traders are about D 12 million, on average. The largest components of their operating cost are transport (20 percent), financial costs (14 percent), communication (14 percent), taxes and duties (14 percent), and electricity and fuel costs (11 percent).

As shown in Table 8.10.2, operating costs for traders differ considerably across regions. Traders in the CH and the MRD have operating cost more than double the national average, while the operating costs of traders in the NW, NCC, and SCC are less than half the national average. The large variation is due to a number of factors. Long transport distances drive up transport costs of traders in the CH, while high labor costs and taxes and duties increase the cost of operations in the MRD. In the NW, NCC, and SCC, relatively little long distance trading coupled with the small scale trading operations in these regions help to keep operating costs low.

8.11 Profitability

As shown in Table 8.11.1 and 8.11.2, the feed and raw material costs are the largest share of total costs, on the order of 95 percent. Operating costs, by contrast, are only about three percent of the total costs of the trading business. The remaining two percent is profits. On average, feed costs account for about 79 percent of the trader's costs, although for assemblers, nearly 82 percent of their cost is for raw materials and for wholesalers about 90 percent of their costs are for feed purchases. Overall,

operating costs are generally higher for assemblers and lowest for retailers. The scale of the trading business does not have a significant effect on the share of operating costs in total costs. Operating costs for small, medium, and large traders are nearly uniformly 2.9 percent of total costs. Looking at the structure of costs and profits across regions (See Table 8.11.3), raw materials are a larger share of total costs for traders located in the regions of NCC and NW. Feed is a larger share of total cost of the average trader in the NE, NES, and the SCC. Operating costs are highest for traders located in the CH, NW, and SCC.

As shown in Table 8.11.4, assemblers and large traders earn the largest profits. As a proportion of total sales, however, large trading firms do less well. Profit shares of Vietnamese feed and raw material traders are low and on the order of one to three percent per year. Profit shares are highest for assemblers and retailers who earn about D 35,000 in profit for every D 1,000,000 in sales. By contrast, wholesaler profits are about two-thirds less. Investments in trading operations can be quite profitable however, even over the short term. Retailers, and medium and large trading business have relatively high returns on assets. Analysis of the profit to labor ratio indicates that small scale retailing businesses are more labor intensive than that of the usually larger wholesaling and assembling operations. As one would expect, for the relatively low capital investment needed for retailing operations, the profit to capital ratio for retailers is higher than that for wholesalers and assemblers. Interestingly, the profit to asset ratio for medium and large scale traders is nearly double that of small trading businesses. Despite the relatively low profit share, aking the return on assets, the profit to labor ratio, and the profit to assets ratio together, investment and growing the trading business to a larger scale can be quite profitable, if circumstances warrant.

Table 8.11.5 displays various profit measures of feed and raw material traders in Viet Nam's various agro-climatic regions. Overall, traders located in the NE and SCC are the least profitable by all of the various profitability measures shown. Small underdeveloped markets, high transport costs to major market centers, and relatively poorer infrastructure may all play a role in limiting the marketing and profitability of trading business located in these regions. The most profitable traders, based on most of

the measures examined, are those located in the NW, followed by the firms located in the RRD and the MRD. To some extent, the profitability of trading businesses in these regions may be due to their proximity to larger and growing demand for feed and raw materials.

A major determinant of a trader performance over time is reflected in the changes in their level of profitability. Since no data was available on past profitability, we asked traders about their perceptions about their level of profits during 1999, and the previous year. As well, traders were also asked about their expected profitability in 2000. Approximately 39 percent of traders categorized their profit levels in 1998 as good, and 60 percent as fair. In 1999, by contrast, only 26 percent of the traders indicated that their profits were good, while about 10 percent indicated that their profitability was poor. As shown in Table 8.11.6, 18 percent of assemblers and 10 percent of wholesalers indicated that their profits were poor. A larger share of medium size businesses said that their profits were poor. Profitability in 1999 was good for traders located in the SCC and the CH. The largest share of traders that indicated that their profits were poor in 1999 were located in NE, RRD, and SCC (See Table 8.11.7). Overall, 54 percent of traders indicated that their profitability had changed between 1998 and 1999, of which 65 percent felt that their profits had declined and 35 percent that they had improved. The overwhelming reason cited for both the increase and decrease in profitability for the trader was changes in their volume of trade (74 percent), followed by changes in the number of direct competitors (26 percent).

8.12 Conclusions

Like the feed processing sector, the feed trader sector has seen dynamic changes and rapid growth since the mid 1990s. The quantity of feed traded has increased and investment by traders have more than doubled in the later half of the 1990s, particularly for new transport equipment where it has more than quadrupled. New traders have also entered the feed marketing sector, which in turn has led to an increase in competition and contributed to a general reduction in the price of animal feed. Competition is growing rapidly. Over the last two years alone, the number of direct competitors to

each trader has increased by about 50 percent, and is expected to continue to become more severe and cut throat over the next few years. Since feed constitutes about 70 percent of the average producers costs for raising livestock, the decline in prices is beneficial to producers as their feed related costs decline, and traders who can do a larger volume of business as farmer demand increases. While increasing competition has many benefits in terms of lowering feed costs for animal producers and improving the marketing efficiency of the industry, the increasing level of competition is cited by more than 80 percent of traders as a problem for the future profitability of their business.

Although traders complain about the level of competition, scale appears to be an important determinant in maintaining and enhancing a trader's profitability. For those traders that have been able to grow their business by increasing the quantity of feed that they trade, their profits have more often than not either improved or stayed constant even though the level of competition has increase. The effect is even more pronounced for larger traders that have been able to expand their trading volumes. In general, the larger trading business are able to structure their operations such that they have lower operating costs on a per unit basis, pay higher wages to their employees, sell feed at or below the average trader price, and invest proportionately more in productive assets. In this area, government regulations, principally by local government, should be reviewed to identify and remove restrictions that affect the ability of traders to expand and grow their trading businesses.

Although many firms are able to mitigate the affect of increasing competition by growing their business, many trading businesses are not. While many factors are at work, over 63 percent of traders cite the current and future slow growth in livestock producer demand for feed as a limitation on the development of their business. Even though feed trading may be their most profitable activity, small traders and traders in smaller regional markets compensate by diversifying their sources of income. In order to stimulate demand for feed and lower livestock producer costs, the price of high quality feed needs to be lower. In support, government can help to lower the price of high protein raw materials by reducing tariffs, and funding research, development, and adoption by farmers of high yielding modern varieties.

Compared to their problems related to the high level of competition and the lack of consumer demand, few traders site the effect of government restrictions, regulations, and bureaucracy as a major impediment to their trading operations. For the most part, liberalization has been good for feed traders, and other than perhaps investments in infrastructure, their appears to be little desire among traders for government intervention in the sector. Nevertheless, a number of problems exist, particularly for large trading businesses. Since larger traders transport goods over longer distances and across many district and provincial borders, random roadside checks by police increase the cost of transporting feed in terms of both time and money. With respect to credit markets, small and medium size traders have more difficulty obtaining loans because of insufficient collateral, and large traders because of complicated banking procedures. Connections are also important for obtaining loans. Small traders, who lack the appropriate connections, have more difficulty obtaining loans, while larger traders are able to use their connections to obtain loans using only social capital for collateral. The government should seek to measures to streamline the transport of goods and banking procedures.

CHAPTER 9

VETERINARY SERVICES

Summary

Effective veterinary service provision in Viet Nam is hampered by a lack of resources and a lack of coordination between various levels of veterinary service. Producers tend to have a low level of knowledge about disease impacts upon their herd. Commune, district and provincial level veterinary officials frequently do not have consistent views of the major disease problems affecting animals in their regions. Effectiveness of veterinary treatments and programs is restricted by low levels of training and expertise amongst staff of veterinary service, low levels of equipment quality and relatively low levels of effectiveness of veterinary medicines and vaccines. Veterinary services utilized by producers are predominately prescriptive, while the extent of preventative veterinary service provision is restricted to vaccination programs.

Highlights

- *Producers reported the occurrence of disease within their herd or flock during the previous year. Apart from "unknown disease", the most commonly reported pig disease was salmonella, the most commonly reported duck disease was avian pasteurellosis and the most commonly reported disease in cattle and buffalo was bovine pasteurellosis. The most commonly reported chicken disease was avian pasteurellosis.*

- *The pig diseases most commonly reported by commune level veterinary services were swine pasteurellosis and salmonellosis. The most commonly reported poultry diseases were avian pasteurellosis, fowl pox and duck plague. The most common reported bovine diseases were bovine pasteurellosis and internal parasitism.*
- *While only a small number of producer and commune pig disease reports were of swine fever, the highest proportion of provincial and district veterinary officials rated swine fever as the most common pig disease in their area. While Newcastle Disease was the fifth most commonly reported disease by producers, the majority of provincial and district officials ranked Newcastle Disease as the most frequent poultry disease in their area.*
- *Producers were asked to specify the proportion of animals affected by particular diseases that died as a result of that disease. The diseases with the highest proportion of animals dying as a result of its effects was Newcastle Disease. The lowest reported proportions of deaths were for foot and mouth disease, leptospirosis and blackleg.*
- *Regular stock examinations are performed on less than one percent of farms. Veterinary services utilized by producers are predominately prescriptive, while the extent of preventative veterinary service provision is restricted to vaccination programs.*
- *The proportions of graduate and postgraduate staff in the district and provincial veterinary service units are much higher than in commune level veterinary service units. The vast majority of staff in commune level veterinary service units are technicians and village level agents with relatively low levels of training.*

- *Almost 92 percent of district and provincial level veterinary service units charge farmers for the vaccines used in government vaccination programs. Farmers do not have to pay for vaccines from some veterinary service units in Red River Delta, North East and Central Highlands. Over 97 percent of the units charge farmers for the application of the vaccination by a veterinarian. Only some units in Central Highlands and North East South do not charge producers for vaccination application.*
- *Veterinary treatments were reported by producers to be effective in around 76 percent of cases. Treatment effectiveness levels were highest in North Central Coast and lowest in North West, where almost 40 percent of veterinary treatments were reported as not being effective. Amongst the diseases with the lowest levels of reported effective treatment are Swine Fever, mineral deficiency and Newcastle Disease. Treatments of disease are not reported as effective for many reasons. Producers nominated incorrect diagnosis, incorrect treatment and other factors (including untimely treatment and lack of skill of the veterinarian) as the major reasons for lack of effective treatment.*

9.1 Introduction

This chapter reports on the status of animal disease in Viet Nam and the provision, effectiveness and cost of veterinary services. The chapter is based on responses from producers in regard to provision of services to them and also on results from a survey of commune level veterinary service providers and district and provincial level veterinary service unit officials. The survey of commune, district and provincial level officials covered topics including service provision, service cost, equipment levels, staffing levels, budgets and cost of procuring veterinary drugs.

Section 9.2 outlines the major pig and poultry diseases reported in Viet Nam. Section 9.2.1 details the diseases reported by producers, Section 9.2.2 outlines the common diseases reported by commune level veterinary officials and Section 9.2.3 discusses the diseases reported by district and provincial level officials as being the most prevalent in their area.

Service provision to producers is discussed in Section 9.3, including the types of service provided (Section 9.3.1) and the agencies providing services (Section 9.3.2). Section 9.4 outlines the costs of services provided by veterinary units to producers and Section 9.5 discusses the quality of services provided, both in terms of producers perception of effectiveness of veterinary treatments and in terms of veterinarians perception of the standard of infrastructure and the effectiveness of veterinary drugs and vaccines. Finally Section 9.6 concludes the chapter.

9.2 Main Diseases

Livestock farmers, commune and provincial officials reported that livestock in their farm or area suffered from a wide variety of diseases. It must be noted that these reports are non-confirmed reports based on clinical examination or perceptions only, and are in almost all cases not confirmed by laboratory testing. The figures for disease prevalence[1] reported in this section should be read taking this into consideration.

9.2.1 Diseases Reported by Producers

Producers were asked to report which diseases had affected animals in their herd/flock in the period from July 1998 to June 1999. Producers specified which type of animal was affected by the disease and whether the animals were local breed, crossbred or exotic. Table 9.1 to Table 9.5 report the percentages of total disease reports accounted for by each disease type. For pigs, ducks, cattle and buffalo, the most commonly reported disease type was “unknown disease”. The most commonly reported chicken disease was avian pasteurellosis.

After “unknown disease”, the most commonly reported pig disease was salmonella, the most commonly reported duck disease was avian pasteurellosis and the most commonly reported disease in cattle and buffalo was bovine pasteurellosis. (Table 9.1).

[1] Disease prevalence refers to the number of animals which have a disease at any one time. Disease incidence refers to the number of animals that are infected with a disease over a particular time period.

As Table 9.2 shows, after “unknown disease” the most commonly reported diseases for local pigs, crossbred pigs and exotic pigs were salmonella and pasteurellosis. A smaller percentage of disease reports for local pigs indicated salmonella than for crossbred or exotic pigs.

The most commonly reported disease of local chickens was avian pasteurellosis, while for crossbred chickens the most frequently reported diseases after “unknown” were gumboro and picoplasmas. The most commonly reported disease of exotic chickens after “unknown” was picoplasmas. (Table 9.3).

Table 9.4 shows that unknown diseases are the most frequently reported disease type for local, crossbred and exotic ducks. Avian pasteurellosis is the most commonly reported “identified” disease for local and crossbred ducks, while for exotic ducks, it is duck plague.

All exotic cattle diseases reported by producers were in the “unknown diseases” category. After “unknown disease” , the most commonly reported disease of local and crossbred cattle was bovine pasteurellosis (Table 9.5).

Producers were asked to specify the proportion of animals affected by particular diseases during 1998-1999 that died as a result of that disease. The diseases with the highest proportion of animals dying as a result of its effects was Newcastle Disease (79.33 percent). The lowest reported proportions of deaths were for foot and mouth disease, leptospirosis and blackleg (Table 9.6).

9.2.2 Diseases Reported by Commune Level Veterinary Services

Commune level veterinary services were asked to report which diseases had affected animals in their commune during the period from July 1998 to June 1999. Commune veterinary services specified which type of animal was affected by the disease. The pig diseases most commonly reported by commune level veterinary services were swine pasteurellosis and salmonellosis. The most commonly reported poultry diseases were avian pasteurellosis, fowl pox and duck plague. The most common bovine diseases were bovine pasteurellosis and internal parasitism. Pig, poultry and bovine disease incidences are similar across regional boundaries. This is shown in Table 9.7, Table 9.8 and Table 9.9.

Commune level veterinary services were asked to indicate the number of animals affected by diseases between July 1998 and June 1999 and the number of animals that died as a result of the disease during the same period. Table 9.10, Table 9.11 and Table 9.12 show the percentage of affected animals that commune officials reported as dying as a result of each disease between July 1998 and June 1999. The highest reported rates of animals dying as a result of disease were for swine fever, Newcastle disease and Duck Plague. All of these diseases had a reported rate of above 50 percent. The highest rate for bovine disease was for blackleg, with a reported rate of 33.33 percent.

9.2.3 Diseases Reported by District and Provincial Level Officials

District and provincial level veterinary officials were asked to identify the most frequent diseases of pigs, poultry and bovines encountered for all farms (including commercial farms) in their

province or district. The officials were also asked to identify the most frequent disease affecting small households, medium households and large households for each animal type.

While only 6.42 percent of producer pig disease reports and 9.44 percent of commune pig disease reports were of swine fever, almost 36 percent of provincial and district veterinary officials rated swine fever as the most common pig disease in their area. Salmonellosis and pasteurellosis were the most common pig diseases reported by producers and commune level veterinary services. 31 percent of provincial and district officials felt that pasteurellosis was the most common pig disease in their area and 11.94 percent of provincial and district officials ranked salmonellosis as the most frequent disease in their area.

As Table 9.13 shows, the largest percentage of district and provincial officials in Red River Delta, North East, North West, North Central Coast and Central Highlands ranked Swine Pasteurellosis as the most common pig disease in their area. The pig disease with the highest proportion of rankings as the most frequent disease in South Central Coast and North East is Swine Fever. The largest proportion of officials in North East South and Mekong River Delta identified E.Coli infection as the most common disease of pigs in their region. As shown in Table 9.14, the largest percentages of district and provincial officials rank swine fever and swine pasteurellosis as the most common diseases of pigs in small, medium and large households in their area.

While Newcastle Disease was the fifth most commonly reported disease by producers, almost 53 percent of provincial and district officials ranked Newcastle Disease as the most frequent poultry disease in their area. The largest percentage of disease reports by producers was for Avian

Pasteurellosis, but only 11 percent of provincial or district officials ranked pasteurellosis as the most frequent disease.

Newcastle Disease was ranked as the most frequent chicken disease by the majority of provincial and district officials in Red River Delta, North East, North West, North Central Coast and Central Highlands. Gumboro was ranked as the most frequent chicken disease by a majority of officials in South Central Coast, North East South and Mekong River Delta (Table 9.15).

The largest proportion of district and provincial veterinary officials reported that Newcastle Disease is the most common poultry disease affecting small and medium households. More than 50 percent of district and provincial officials reported that Gumboro is the most common poultry disease affecting large households (Table 9.16).

As Table 9.17 shows, in all regions except North Central Coast, “other bovine diseases” was reported by the largest proportion of district and provincial officials as the most frequent disease type. The highest percentage for a specific disease was for bovine pasteurellosis. in all regions except Red River Delta, North West and Central Highlands. More than 25 percent of district and provincial veterinary officials reported that bovine pasteurellosis was the most frequent bovine disease affecting small, medium and large households (Table 9.18).

9.3 Provision to Farmers

9.3.1 Types of Service Provided

Table 9.19 shows the percentages of producers receiving various veterinary services by region. More than 86 percent of producers had at least some of their animals vaccinated during the preceding year. This percentage varied between around 76 percent in South Central Coast and over 95 percent in North East South.

Around 47 percent of producers had at least some of their animals treated for internal parasites during the preceding year. In South Central Coast this percentage was only 15.44 percent, while in Red River Delta it was more than 64 percent. Around 43 percent of producers utilized veterinary services to perform castrations. The lowest percentage was in Central Highlands, with 19.88 percent and the highest was in North Central Coast, where castration was performed on over 68 percent of farms. Clinical assessments were only made on 20.15 percent of farms. Only 1.77 percent of farms in North Central Coast had clinical assessments done.

Disinfection is only performed on 20.29 percent of farms. Farms in Red River Delta were most likely to have disinfection performed and those in South Central Coast were least likely. Around one third of farms had artificial insemination performed in the preceding year. The percentage of farms where artificial insemination was performed was highest in North East South, at 56.93 percent and lowest in North West, at 13.48 percent. Regular stock examinations are performed on less than one percent of farms. The highest proportion was in Red River Delta, with 2.47 percent of farms. It is obvious that preventative veterinary services are limited to vaccination programs, and do not include regular stock examinations.

Around 9.17 percent of farms have other veterinary services performed. These services are most commonly natural mating services. The highest concentration of these services is in North Central Coast, where almost 30 percent of farms utilize them.

Table 9.20 shows the various veterinary services provided to producers as a percentage of the total treatments identified by producers for each animal type. The highest percentage of services for animal types were vaccinations. Almost 44 percent of services provided to producers for pigs were vaccinations, whilst almost 90 percent of buffalo veterinary services were vaccinations.

Various veterinary services as a percentage of total veterinary services provided to local, crossbred and exotic pigs, chickens, ducks and cattle are shown in Table 9.21, Table 9.22, Table 9.23 and Table 9.24.

Vaccinations as a percentage of total services are higher for exotic pigs than for local and crossbred. Internal parasitism and castration percentages for crossbred pigs are higher than for the other two categories. Artificial insemination accounts for a higher percentage of total veterinary services used on local pigs than for either crossbred or exotic pigs.

The percentages of veterinary services accounted for by various services for local, crossbred and exotic poultry are very similar, with vaccination accounting for at least 73 percent of services for each category. The types of veterinary services provided to local cattle to those provided to

crossbred and exotic cattle, except that a higher proportion of services provided to local cattle are vaccinations and lower percentage are artificial insemination.

The number of animals treated on farm is greatest for disinfection and for vaccinations. The smallest average number of animals treated on farm over the course of the year is for artificial insemination with around 10 per year. Disinfection and vaccination also had the smallest average numbers of total treatments per year. The animal types with the highest average number of animals treated on the farm are chickens and ducks. This is hardly surprising, as animal inventories on poultry farms are greater than on pig or bovine farms. Disinfection and vaccination were the treatments with the greatest numbers of animals treated on farm (Table 9.25).

9.3.2 Service Providers

There are many levels of veterinary service units within provinces that combine to provide veterinary services to producers. The major veterinary service unit levels are at the commune level, district level and province levels. Districts contain an average of around 7 district level veterinary service units and provinces contain an average of around 16 province level veterinary service units. Red River Delta had the largest average number of district level veterinary service units and Central Highlands and North East South had the largest number of provincial level veterinary service units (Table 9.26).

Commune level veterinary service units began operations on average in 1986, with the oldest commencing operations in 1960. Around 40 percent of commune level veterinary service units commenced operations in the 1990s. District and provincial level veterinary service units began

operations on average in the early 1980s with the oldest units starting operations in 1956-1957 (Table 9.27).

The budgets of veterinary service units increase as the administrative level rises. The average annual budget of provincial level veterinary service units is almost 1000 times higher than that of commune level veterinary service units. Average commune level veterinary service unit budgets are highest in Central Highlands. District and province veterinary service unit budgets are highest in North East South (Table 9.28).

Commune level veterinary services can access producers in villages by a number of methods, including by vehicle, motorcycle and boat. An average of over 90 percent of villages is accessible by vehicle and more than 99 percent by motorcycle. Only around 18 percent of villages are accessible by boat. Villages are accessible for an average of around 11 months per year. As Table 9.29 shows, vehicle access to villages is lowest in South Central Coast. Motorcycle access is 100 percent in all regions except South Central Coast and Mekong River Delta. Boat access to villages is generally confined to the Mekong River Delta region.

Table 9.30 shows the average percentages of the population of animal types that commune level, district level and provincial level veterinary service units estimate have been vaccinated against various diseases. For most animals and disease types, commune level veterinary service units estimate that vaccination percentages are higher than those estimated by district and provincial level veterinary service units. Table 9.31 shows the average percentages of animals that commune

level veterinary service units estimate are vaccinated against disease in their commune herd, by region.

Officials in commune level veterinary service units spend an average of 24.54 days in the field per month. During this period they spend 158 hours in the field work. They travel an average of around 353 kilometers to make 124 farm visits and travel around 3.2 kilometers to visit each producer. Officials of veterinary service units in Central Highlands on average travel the longest distances and see the most number of producers each month (Table 9.32).

The average annual levels of veterinary service provision for different animals at commune, district and province level veterinary service unit levels are shown in Table 9.33, Table 9.34 and Table 9.35. The numbers of animals treated by each veterinary service unit increase as the administrative level of the units get higher. Table 9.36 shows that commune level veterinary service units provide services to private producers and businesses. The majority of time is allocated to providing services to small and medium farms. On average only around 3 percent of commune veterinary service unit time is allocated to providing services to large private businesses. Small farms are the major customers of commune veterinary service units in all regions. The highest proportion of medium farms as customers are found in North East South and Mekong River Delta.

In addition to providing preventative and remedial veterinary services to producers, district and provincial level veterinary service units also conduct a number of different types of inspection services. The inspection services most frequently performed by district and provincial veterinary services are domestic carcass inspections and regular inspections (Table 9.37).

Some of these inspections take a number of hours and others require a number of daily visits over a period of weeks, or even months. Inspections are often carried out by more than one inspector. If an inspection takes one day or less, then the number of person days required to undertake the inspection is the number of inspectors multiplied by the time taken to perform the inspection. If the inspection period is longer than one day, the person days taken to perform the inspection is defined as the number of inspectors multiplied by the number of visits undertaken to perform the inspection. As shown in Table 9.38, transmissible disease inspections take the greatest number of person days.

The number of person days allocated for inspection by provincial level veterinary service units is far greater than that of district level units . However, the proportion of total staff time devoted to performing inspections is greater for district level units than for provincial level units. Inspection fees as a proportion of 1999 budget levels are higher for district level veterinary service units than for province level veterinary service units. Inspection fees at both the provincial and district levels represent a lower proportion of annual budget than the proportion of person-days devoted to inspections (Table 9.39).

The average number of businesses inspected annually by veterinary service units varies between 14.25 for restaurants and over 191 live animal transportation operations. Compliance rates varied between 74 percent for animal health inspections to 100 percent for food vehicles. An average of 12.14 percent of businesses were penalized as a result of inspections (Table 9.40).

9.4 Cost of Services

Artificial insemination and "other" treatments (generally natural mating) are most expensive in terms of veterinary fees and drug costs (including semen for artificial insemination). The average annual total cost of artificial insemination treatment per producer is Đ37,050. The average annual per animal cost of artificial insemination is around Đ17,000 (Table 9.41).

The average annual cost for all veterinary treatments per producer is Đ42,912. This is made up of veterinary costs of Đ22,074 and drug costs of Đ20,838. Veterinary costs, drug costs and total costs per producer were highest in North East South, with average levels far in excess of any other region, due to the high proportions of large farms in that region (Table 9.42).

Almost 92 percent of district and provincial level veterinary service units charge farmers for the vaccines used in government vaccination programs. Farmers do not have to pay for vaccines from some veterinary service units in Red River Delta, North East and Central Highlands. Over 97 percent of the units charge farmers for the application of the vaccination by a veterinarian. Only some units in Central Highlands and North East South do not charge producers for vaccination application. Table 9.43 outlines the purchase and sale prices of single vaccine doses by district and provincial level veterinary service units.

Provincial and district level veterinary service units charge fees for performing inspections on various businesses related to livestock. Table 9.45 shows that the most expensive service is live animal transportation inspection, which has an average fee of D52,000.

Except for inspection of live animal transportation and slaughterhouses, provincial level veterinary service units on average charge higher fees than district level veterinary service units (Table 9.46).

9.5 Quality of Service

Veterinary treatments were reported by producers to be effective in around 76 percent of cases. Treatment effectiveness levels were highest in North Central Coast and lowest in North West, where almost 40 percent of veterinary treatments were reported as not being effective (Table 9.47).

As shown in Table 9.48, reported treatment effectiveness for many diseases is 100 percent. Amongst the diseases with the lowest levels of reported effective treatment are Swine Fever, mineral deficiency and Newcastle Disease.

Treatments of disease are not reported as effective for many reasons. Producers nominated incorrect diagnosis, incorrect treatment and other factors (including untimely treatment and lack of

skill of the Veterinarian) as the major reasons for lack of effective treatment. These reasons for lack of effective treatments are consistent across different regions (Table 9.49).

A number of factors can affect the quality of service provision by veterinary service units. These include; the quality and number of staff, the availability and quality of infrastructure and the effectiveness of vaccines and drugs used.

Table 9.50 shows the proportions of veterinary staff by training categories for commune, district and provincial veterinary service units. The proportions of graduate and postgraduate staff in the district and provincial veterinary service units are much higher than in commune level veterinary service units. The vast majority of staff in commune level veterinary service units are technicians and village level agents with relatively low levels of training.

Table 9.51 to Table 9.53 show the levels of infrastructure at commune, district and provincial level veterinary service units. The inventory levels tend to increase at higher level veterinary service units. District and provincial level veterinary service units also have more technical equipment (autoclaves, microscopes etc.) than commune level veterinary service units. The inventory per staff member for most types of equipment is greater at the commune level than at the district or provincial level. This may be because of higher levels of support and administrative staff at these veterinary service units.

The working proportions of commune level equipment and “low tech” equipment in district and provincial level veterinary service units are high. The working proportions of “high tech” equipment at district and provincial level veterinary service units are much lower than the “low tech” equipment in those laboratories.

Over 83 percent of provincial level veterinary service units had diagnostic laboratories. These laboratories were able to perform a number of different tests. The most frequently performed tests are parisitology and bacteriology tests. Less than 2 percent of district level veterinary service units had diagnostic laboratories. These laboratories only performed parisitology tests (Table 9.54).

As shown in Table 9.55, commune level veterinary service unit officials rated less than 75 percent of vaccines used as having good or very good effectiveness. Vaccines procured from private businesses achieved a higher proportion of very good or good effectiveness ratings than did vaccines from district level veterinary service units. The major reasons quoted by commune level veterinary service units for lack of effectiveness of vaccines were poor quality of vaccine and poor storage conditions.

Roughly 75 percent of veterinary drugs used by commune officials were ranked as having very good or good effectiveness. Only one batch of drugs were ranked as having very poor effectiveness. This was due to poor quality of drugs. The effectiveness levels of drugs procured from private businesses and from district level veterinary service units are similar (Table 9.56).

9.6 Conclusion

While the reported disease occurrence in pigs and poultry appears to be relatively consistent between producers and commune level veterinary officials, there appears to be a lack of communication between these levels and district and provincial officials regarding the relative importance of disease. This is important because resources may be devoted to minimizing a disease problem that is relatively unimportant, while diverting resources away from potentially more serious problems. This can be seen by comparing the reports of pig and poultry diseases by producers and commune level officials with the rankings of diseases importance by district and commune level officials.

While only 6.42 percent of producer pig disease reports and 9.44 percent of commune pig disease reports were of swine fever, almost 36 percent of provincial and district veterinary officials rated swine fever as the most common pig disease in their area. While Newcastle Disease was the fifth most commonly reported disease by producers, almost 53 percent of provincial and district officials ranked Newcastle Disease as the most frequent poultry disease in their area. The largest percentage of disease reports by producers was for Avian Pasteurellosis, but only 11 percent of provincial or district officials ranked pasteurellosis as the most frequent disease.

More than 86 percent of producers had at least some of their animals vaccinated during the preceding year. Around 47 percent of producers had at least some of their animals treated for internal parasites during the preceding year. Around 43 percent of producers utilized veterinary services to perform castrations. Clinical assessments were only made on 20.15 percent of farms. Disinfection is only performed on 20.29 percent of farms and artificial insemination is only

performed on around one third of farms. Regular stock examinations are performed on less than one percent of farms. It is obvious that preventative veterinary services are limited to vaccination programs, and do not include regular stock examinations.

Veterinary treatments were reported by producers to be effective in around 76 percent of cases. Treatment effectiveness levels were highest in North Central Coast and lowest in North West, where almost 40 percent of veterinary treatments were reported as not being effective. Amongst the diseases with the lowest levels of reported effective treatment are Swine Fever, mineral deficiency and Newcastle Disease. Treatments of disease are not reported as effective for many reasons. Producers nominated incorrect diagnosis, incorrect treatment and other factors (including untimely treatment and lack of skill of the Veterinarian) as the major reasons for lack of effective treatment.

A number of factors have an effect on the effectiveness of treatments provided by veterinary service units. These include; the quality and number of staff, the availability and quality of infrastructure and the effectiveness of vaccines and drugs used. The proportions of graduate and postgraduate staff in the district and provincial veterinary service units are much higher than in commune level veterinary service units. The vast majority of staff in commune level veterinary service units are technicians and village level agents with relatively low levels of training. District and provincial level veterinary service units also have more technical equipment than commune level veterinary service units. Commune level veterinary service unit officials rated less than 75 percent of vaccines used as having good or very good effectiveness. Roughly 75 percent of veterinary drugs used by commune officials were ranked as having very good or good effectiveness. Improvements in all of these areas could have a positive impact on treatment effectiveness.

CHAPTER 10

EXTENSION SERVICES

Summary

Extension services are provided to producers in Viet Nam by a number of different sources. Less than 30 percent of surveyed producers obtained extension services during the previous year. Amongst this small proportion of producers, private companies and the Extension Services Department were the major providers of extension services. Producers who have been exposed to extension activities are more likely to adopt exotic breeds of pigs and chickens on their farms than producers who have not received extension provision. Extension provision has no significant impact on the intensity of exotic breed adoption. It is likely that the effect of extension on exotic breed adoption is less than the impact of the ratio of exotic to local animal prices in the area.

Highlights

- *Although over 80 percent of producers received either veterinary or extension services, only 629 (28.42 percent) producers received extension services.*
- *Private companies and Government Extension Services are the dominant suppliers of extension services to producers. Private companies are the dominant providers of animal nutrition and marketing extension advice. The extension services department is the major supplier of crop management and animal husbandry extension. Government Owned Enterprises and cooperatives are the major providers of breeding extension services.*
- *Price and market information is mostly obtained by producers from personal contacts and traders. Radio and television are also an important information source about market conditions. The major source for information on the regulatory environment was the radio or television. The next most common information source was extension agents. Not*

surprisingly, banks were the major sources of information about credit availability and conditions. Producers also obtained credit information from personal contacts and radio and television. Extension agents were only sources of information for less than 10 percent of producers.

- *The majority of live animal and meat traders obtain their market and price information from a network of other traders. Almost 80 percent of animal and meat traders indicated that other traders and personal contacts were their main sources of market information. Electronic and print media account for the main regulatory information source for almost 80 percent of animal and meat traders. The majority of animal and meat traders get their credit information from banks, personal contacts and radio and television. Extension agents only account for less than one percent of market and credit information sources and less than 3 percent of regulatory information sources.*

- *Feed mills obtain market information from personal contacts and electronic media, regulatory information from electronic and print media, personal contacts and other feed mills and all credit information from banks. Feed mills do not obtain any market, regulatory or credit information from extension agents.*

- *Over 90 percent of feed traders obtain their information about markets and prices from a network of other traders, feed mills and personal contacts. Electronic and print media are the major sources of regulatory information and banks and personal contacts supply the majority of credit information to feed traders. Extension agents are only used as sources of regulatory information.*

- *Producers who have received extension services during the year are more likely to have adopted exotic breeds of pigs and chickens than producers who did not receive any extension services. However, price ratios of exotic to local breeds have a significant and positive effect on adoption. Extension Services are no more successful than any other*

extension provider in promoting exotic pigs, and are relatively less successful than private companies in promoting adoption of exotic chickens.

10.1 Introduction

This chapter studies the provision and impact of livestock extension services to producers, traders, feed millers and communes. Section 10.2 details the channels of extension provision to industry participants. Section 10.3 analyzes the impact of extension service provision on the adoption of exotic breeds using an ordinal probit model of technology adoption. Section 10.4 presents the results of the adoption model and Section 10.5 concludes the chapter.

10.2 Extension Provision

10.2.1 Extension Provision to Communes

Producers and other market participants within a commune are able to obtain extension services from a number of different sources. These sources include government organizations, quasi government organizations and the private sector. The most commonly available sources for extension services within communes were Department of Veterinary Services, Extension Services and producer cooperatives.

The Extension Services was the extension service provider utilized by the highest percentage of surveyed communes in North East, North Central Coast and North East South. Cooperatives were utilized by the largest percentage of communes in Red River Delta, North West, South Central Coast and Central Highlands while the Department of Veterinary Services provided extension services to the largest percentage of communes in the Mekong River Delta region. The Women's Union and Farmer's Union provide extension services to a significant percentage of communes in

North Central Coast and North East South. Private companies only play a significant role in provision of extension services to communes in Central Highlands and the Mekong River Delta (Table 10.1).

Commune officials were asked to rate each provider of extension services to the commune during the year on a five point scale, ranging from “very poor” to “very good”. Over half of all extension providers are rated as providing good service. Less than half a percent of extension providers had service rated as poor or very poor. However, less than 2 percent of extension service providers were rated as very good by commune officials. Extension service providers only achieved a very good rating in Mekong River Delta. Central Highlands was the only region where extension providers received a poor or very poor rating, with 3.33 percent of the providers to the surveyed communes receiving each rating. In Mekong River Delta, North East, North West and Central Highlands the majority of extension agents providing services to the communes achieved a good or better rating. In South Central Coast, North Central Coast, North East South and Mekong River Delta the majority of extension providers only achieved an average or poorer rating (Table 10.2).

The only extension services to achieve a poor or very poor rating were Department of Veterinary Services and cooperatives. Extension Services, Department of Veterinary Services, cooperatives and research centers were the only extension providers to achieve a very good rating for service quality. The most highly rated service providers were research centers, which were only rated as either good or very good service providers by the commune officials.

10.2.2 Extension Provision to Producers

Only 629 (28.42 percent) producers received extension services. These were defined as the provision of information or assistance with breeding, animal nutrition, marketing, crop management or animal husbandry. This proportion is highest in North Central Coast and lowest in North East. (Table 10.4) A slightly higher proportion of large farms received extension services than small farms.

Private companies and government Extension Services are the dominant suppliers of extension services. Private companies are the dominant providers of animal nutrition and marketing extension advice. The extension services department is the major supplier of crop management and animal husbandry extension. Government owned enterprises and cooperatives provide breeding extension services (Table 10.5) .

As shown in Table 10.6, private companies are the major providers of pig, chicken and duck extension services, while cattle extension is provided predominately by the extension services department. Buffalo extension is largely supplied by cooperatives.

Extension service providers were mostly rated “good” or above by producers. Veterinary Associations, Women’s Unions and Informal Extension Clubs achieved the highest proportions of “fair” ratings. (Table 10.7)

The majority of producers were not willing to identify which organization provided the best extension services. Table 10.8 shows that the largest proportion of the 44 percent of producers

willing to rate extension service providers identified private companies as the best extension services providers. The majority of producers were unwilling to nominate the best provider of breeding, marketing, crop management or animal husbandry services. However, almost 70 percent of producers regarded private companies as the best providers of animal nutrition services.

Producers can obtain information to assist their production decisions from many sources. In addition to extension agents, these sources include private companies, government agencies and electronic and print media. Extension agents are not a major source of information on markets, regulatory environments or credit availability (Table 10.9).

Price and market information is mostly obtained from personal contacts and traders. Radio and television are also an important information source about market conditions. The major source for information on the regulatory environment was the radio or television. The next most common information source was extension agents.

Not surprisingly, banks were the major sources of information about credit availability and conditions. Producers also obtained credit information from personal contacts and radio and television.

As shown in Table 10.10, personal contacts are the major source of market and price information in Red River Delta, North East, South Central Coast and Central Highlands. In all other areas, traders provide the majority of market and price information to producers. Extension agents have the largest influence in market information provision in South Central Coast. Producers in North

West and North Central Coast do not obtain any information on markets and prices from extension agents.

The most common source of regulatory information for producers in all regions is radio and television. In North East South and Mekong River Delta print media also play an important role in dissemination of regulatory information. Extension agents are relatively more important in providing information about regulatory environments than they are in providing information about market and price conditions. Extension agents are most important in information provision in North East and Mekong River Delta (Table 10.11).

Banks are the major source of credit information in all regions. Personal contacts and electronic media are also important sources in all regions. Extension agents are minor sources of credit information in all regions except North West. Extension agents have the greatest influence in North East, where they make up almost 5 percent of credit information sources (Table 10.12).

10.2.3 Extension Provision to Animal and Meat Traders

Animal and meat traders can gain information about markets, regulations and credit from many sources. In addition to extension agents, information can be obtained from government and quasi-government organizations and private companies and individuals.

The majority of live animal and meat traders obtain their market and price information from a network of other traders. Almost 80 percent of animal and meat traders indicated that other traders and personal contacts were their main sources of market information. Electronic and print

media account for the main regulatory information source for almost 80 percent of animal and meat traders. The majority of animal and meat traders get their credit information from banks, personal contacts and radio and television. Extension agents only account for less than one percent of market and credit information sources and less than 3 percent of regulatory information (Table 10.13).

The majority of animal and meat traders obtain their market information from other traders in Red River Delta, North East, North West, North Central Coast and North East South. In Central Highlands and Mekong River Delta personal contacts are the major information sources. In all areas, over 80 percent of information sources in all regions are a combination of traders, personal contacts and intermediaries. Extension agents are only a market information source in the Red River Delta area (Table 10.14).

As Table 10.15 shows, electronic media are the major regulatory information sources for animal and meat traders in all regions. Personal contacts also play an important role in Red River Delta, North West and Central Highlands. Extension agents provide regulatory information in all regions except North West, North Central Coast and Central Highlands. The most important province for extension agents is North East South, where they account for almost 12 percent of information sources.

Banks and personal contacts are the major sources of credit information for animal and meat traders in all regions (Table 10.16). Extension agents only provided credit information in North Central Coast.

10.2.4 Extension Provision to Feed Processors

Feed mills obtain market information from personal contacts and electronic media, regulatory information from electronic and print media, personal contacts and other feed mills and all credit information from banks. Feed mills do not obtain any market, regulatory or credit information from extension agents.(Table 10.17)

All of the feed mills surveyed in North Central Coast obtain all their market information needs from radio and television. In Red River Delta, feed mills obtain information from personal contacts and other sources. All of the surveyed Mekong River Delta feed mills obtain market information from other sources (Table 10.18).

Feed mills in Red River Delta obtain regulatory information from radio/television, personal contacts and other feed mills. North Central Coast feed mills obtain regulatory information from the press and Mekong River Delta mills obtain all regulatory information from other sources (Table 10.19).

10.2.5 Extension Provision to Feed Traders

Table 10.20 shows that over 90 percent of feed traders obtain their information about markets and prices from a network of other traders, feed mills and personal contacts. Electronic and print media are the major sources of regulatory information and banks and personal contacts supply the majority of credit information to feed traders. Extension agents are only used as sources of regulatory information.

A network of traders, feed mills, personal contacts and personal contacts provides the majority of market information in all regions. Feed mill associations are only sources of market information in North West (Table 10.21).

Table 10.22 shows that radio and television are the major sources of regulatory information in all regions. In the southern regions of Central Highlands, North East South and Mekong River Delta, print media is also an important source of information.

Banks are the major sources of credit information for feed traders in all regions except North Central Coast, where personal contacts are the major information source (Table 10.23).

10.3 Impact of Extension Services

One of the major aims of extension services in Vietnam is the promotion of exotic breeds. This section models the impact of extension services on the adoption of exotic breeds by producers. Adoption of exotic breeds of pigs and chicken by producers can be quantified in two ways. Firstly, adoption of exotic breed technology by producers can be specified by a binary variable that takes the value 1 if the technology was adopted and takes the value 0 if the technology is not adopted. The threshold for the binary variable defining adoption of exotic breeds can be specified in many ways. Adoption could be defined as having at least one exotic animal in the herd, having 100 percent exotic animals in the herd, or having at least a prespecified proportion of exotic animals in the herd.

Adoption of exotic breed types can also be defined in terms of the adoption intensity of exotic breeds. The adoption intensity ratio varies between zero (no adoption) and 1 (100 percent of animals in herd are exotic). The adoption intensity ratio for exotic livestock is defined as:

(10.1) $$A_i = \frac{E_i}{T_i}$$

Where;

A_i = Adoption Intensity

E_i = Number of Exotic Animals in Herd

T_i = Total Number of Animals in Herd

Many factors affect both the decision to adopt technology and also the adoption intensity level of that technology. Kaliba et al (1997) identify three major types of factor influencing producer's adoption of livestock technology. These are farm and farmer attributes, technology attributes and the farming objective.

The model linking the producer's decision to adopt exotic breed pigs and chickens with exogenous characteristics is defined as follows:

(10.2) $$EP_a = f(X_p, X_f, X_i, EXT_p)$$

(10.3) $$EPA_i = f(X_p, X_f, X_i, EXT_p)$$

(10.4) $$EC_a = f(X_p, X_f, X_i, EXT_c)$$

(10.5) $$ECA_i = f(X_p, X_f, X_i, EXT_c)$$

Where:

EP_a is a binary endogenous variable representing adoption of exotic pig breeds by the producer.

EPA_i is a continuous endogenous variable representing the adoption intensity of exotic pig breeds by the producer.

EC_a is a binary endogenous variable representing adoption of exotic chicken breeds by the producer.

ECA_i is a continuous endogenous variable representing the adoption intensity of exotic chicken breeds by the producer.

X_p are exogenous binary or continuous variables related to the characteristics of the producer.

X_f are exogenous binary or continuous variables related to the characteristics of the farm.

X_i are binary exogenous variables related to the level of on farm investment

EXT_p is a variable representing the exposure of the producer to extension activities related to pigs.

EXT_c is a variable representing the exposure of the producer to extension activities related to chickens.

Data from the survey of producers were used to construct variables to estimate equations (10.1) to (10.5). The binary endogenous variables (EP_a and EC_a) indicate whether the producer has at least one exotic animal in their herd. The variables are coded 0 for no adoption and 1 indicating that adoption has occurred. The continuous endogenous variables (EPA_i and ECA_i) represent the adoption intensity ratios for exotic pigs and chickens. The values range between 0 for no adoption and 1 for 100 percent adoption.

Farms are categorised into small, medium and large size based on the level of their value of agricultural production. Farm size is defined by two binary variables, SMFARM and LGFARM. SMFARM takes the value 1 if the farm is a small farm. LGFARM takes the value 1 if the farm is a large farm. If SMFARM and LGFARM are both zero then the farm is medium sized.

The farm location within the eight agro-ecological regions of Viet Nam is defined by seven binary variables. These take the value 1 if the farm is located in the region and zero if it is not. The binary variables define the regions Red River Delta, North East, North Central Coast, South Central Coast, Central Highlands, North East South and Mekong River Delta. If all the binary variables take the value 0 then the farm is located in North West.

Other farm characteristics defined by continuous variables include farm area in hectares (TAREA_TL) and the total person days worked in livestock (LTDW). Producer characteristics included in the models were a continuous variable representing the age of the household head (HHAGE), a binary variable representing the gender of the household head (HHGENDER) and a series of binary variables representing the educational attainment of the household head. These represent completion of primary school, attendance at high school, completion of high school, completion of technical training, attendance at university and completion of university. If all educational variables are zero then the producer did not complete primary schooling. Exposure to pig extension (PGEX) or chicken extension (CHEX) is defined by binary variables. These take the value 1 if the producer had received extension advice (defined as pertaining to breeding, nutrition or marketing) related to the relevant animal type in the previous year.

Three binary exogenous variables indicate whether the producer has made substantive investments in transport, equipment or buildings. The variables are coded 0 for no investment and 1 indicating that investment has been made.

Substantive transportation investment was defined as investing in a motorized form of transport. Substantive building investment was defined as investment in farm buildings excluding farm house or cottage. Substantive equipment investment was defined as investment in motorized or electrical equipment for use in livestock or crop production.

The effect of exotic and local pig and chicken prices on adoption were modeled by including the ratio of the average district price for exotic piglets/chicks to the average district price for local piglets/chicks. Descriptive statistics of the exogenous variables are given in Table 10.24.

The models for pigs and chickens were estimated separately using two-stage procedures. The first stage is to estimate the random utility maximization model for the adoption of technology. The model is specified as:

(10.6) If $X_k \beta + \varepsilon_{jk} > h$, then $Y_k = 1$

(10.7) If $X_k \beta + \varepsilon_k \leq h$, then $Y_k = 0$

Where;

X_k are the exogenous variables described above,

β is the vector of parameters for the variables

ε_k is the error term

h is the threshold level of zero exotic animals in the herd

Y_k is the endogenous binary variable (EP_a or EC_a)

The asymptotically efficient parameters for the β vector that maximizes the log-likelihood function are estimated using the binomial probit model.

The second stage of the procedure is to estimate the intensity of adoption model. The existence of adoption intensity is dependent on the adoption of the technology. In order to estimate the adoption intensity model correctly, the model must be based on a non-random sub-sample of producers which is defined as the set of producers who have a value of 1 for the binary technology adoption variable. The two-stage procedure is expressed in the following set of equations:

(10.8) $Y_{1k} = X_1 \beta_1 + \varepsilon_1$

and

(10.9) $Y_{1k} = 1$ if $X_1 \beta_1 + \varepsilon_1 > h$

(10.10) $Y_{1k} = 0$ if $X_1 \beta_1 + \varepsilon_1 \leq h$

(10.11) $Y_{2k} = X_2 \beta_2$ if $Y_{1k} = 1$

(10.12) $\text{var}(\varepsilon_1) = 1$

(10.13) $\text{var}(\varepsilon_2) = \sigma^2$

(10.14) $\text{corr}(\varepsilon_1, \varepsilon_2) = \rho$

where:

Y_{2k} is the continuous endogenous variable representing technology adoption intensity (EPA_i and ECA_i). The second stage equation is only estimated on the sub-sample of producers who have adopted exotic breeds of pigs or chickens. As the dependent variable in the second stage equation is continuous, OLS estimation is used to model the adoption intensity level.

Supplementary probit regressions were performed using exotic pig and chicken adoption as the dependent variable to determine the possible impacts of on and off farm extension and the relative importance of extension services provided by different public and private organizations. The probit equations were re-estimated, replacing the binary extension contact variable with a series of binary variables representing extension provision by various sources, a continuous variable representing number of visits to farm during the year and a binary variable taking the value 1 if extension activities were carried out on-farm and zero otherwise.

10.4 Results of Adoption Model

The results from the model of extension impact reveal that the provision of extension services to pig and poultry producers has had a significant and positive effect on the levels of adoption of exotic breeds.

10.4.1 Adoption of Exotic Pig Breeds

The χ^2 for the log-likelihood test of the hypothesis that the regressors included in the model have no influence on exotic pig breed adoption was significant at the 1 percent level. Therefore the hypothesis that the variables have no explanatory power was rejected. Results of the regression are shown in Table 10.25.

The characteristics of the producer included in the model (age, gender and education level) did not have a significant effect on the decision to adopt exotic pigs on the farm. None of the coefficients were significant at either the 10 percent or 5 percent level.

The total area of the farm had a significant and negative impact on the probability of adoption of exotic pig breeds. As discussed earlier, larger farm areas tend to be associated with producers with larger numbers of bovines, rather than pigs.

The variables for Red River Delta, North East, North Central Coast, South Central Coast, Central Highlands, North East South and Mekong River Delta are all significant at the 5 percent level and positive. This indicates that (ceteris paribus) producers in all of these regions are more likely than producers in North West to adopt exotic breeds of pigs.

The small farm and large farm variables are significant at the 5 percent level. The small farm variable is negative and the large farm variable is positive. This indicates that farm size has a significant impact upon exotic pig adoption. Small farms are less likely to have exotic pigs than medium farms, while large farms are more likely.

Farms with substantive building investments are less likely to adopt exotic pig technology than other farms. Farms with substantive equipment investments are more likely than other farms to adopt exotic pigs. Producers who have been exposed to pig related extension activities are substantially more likely than other producers to adopt exotic pigs. The exotic/local price ratio for

piglets has a significant and positive impact on the adoption of exotic pig breeds. Farmers in districts with higher price ratios are more likely to adopt exotic pig breeds.

The Extension Services Department, Veterinary Services Department, Research Centers, Private Companies, Joint Ventures and others provide extension services for pigs. None of the coefficients for these providers is significant (Table 10.26). This implies that while contact with extension relating to pigs has a significant positive impact on exotic pig adoption (see Table 10.25), there is no significant difference between adoption levels resulting from contact with individual providers.

Producers who have received extension services on-farm are significantly more likely to adopt exotic pigs than producers who have not been visited by extension workers. However, exotic pig adoption is no more likely to occur as the number of visits to the farm by extension workers increases past one per year.

The location and farm characteristic variables follow the same pattern as for the previous probit estimation.

10.4.2 Exotic Pig Adoption Intensity

The R^2 value for the exotic pig adoption intensity index regression indicates that 59.42 percent of the variation in adoption intensity is explained by the regression equation. The F-statistic testing the hypothesis that the model variables have no effect on the adoption intensity was rejected at the 1 percent level.

As shown in Table 10.27, producer characteristics (age, gender and education level) have no significant impact on the adoption intensity level. The producer location in Red River Delta, South Central Coast, Central Highlands, North East South and Mekong River Delta has an impact on the intensity of adoption. Producers in all of these regions have higher intensity levels than producers in North West. The increase in intensity varies between 32 percent in Red River Delta and 78 percent in North East South.

Large farms have intensity levels 5 percent lower than medium farms and producers who have made substantive transport investments have intensity levels around 5.5 percent higher than producers who have not. Producer exposure to extension services for pigs does not have a significant impact on the level of intensity. The price ratio of exotic to local piglets does not have a significant impact on the intensity level.

10.4.3 Exotic Chicken Adoption

The χ^2 for the log-likelihood test of the hypothesis that the regressors included in the model have no influence on exotic chicken breed adoption was significant at the 1 percent level. Therefore the hypothesis that the variables have no explanatory power was rejected (Table 10.28).

The gender and age of the producer have a significant impact on the probability of adopting exotic chicken breeds. Men have a lower probability of adopting exotic chicken breeds and the probability of adopting exotic chicken breeds increases with the age of the producer.

Education levels also have a significant impact on the adoption of exotic chicken breeds. Attendance at primary or high school does not increase the probability of exotic chicken adoption over producers who did not attend school. However, attendance at technical school or university has a significant and positive effect on the probability of exotic chicken adoption.

The total area of the farm had a significant and negative impact on the probability of adoption of exotic chicken breeds. As is the case for exotic pig adoption, larger farm areas tend to be associated with producers with larger numbers of bovines, rather than chickens.

The variables for Red River Delta, North East, North Central Coast, South Central Coast, Central Highlands, North East South and Mekong River Delta are all significant at the 5 percent level and positive. This indicates that (ceteris paribus) producers in all of these regions are more likely than producers in North West to adopt exotic breeds of chickens.

The small farm variables is negative and significant at the 5 percent level. The large farm variable is not significant. This indicates that farm size has a significant impact upon exotic pig adoption. Small farms are less likely to have exotic chickens than medium farms, while large farms are no more or less likely to have exotic chickens than medium farms.

Farms with substantive building and equipment investments are less likely to adopt exotic chicken technology than other farms. Farms with substantive transport investments are more likely than other farms to adopt exotic chickens.

Producers who have been exposed to chicken related extension activities are substantially more likely than other producers to adopt exotic chickens. The ratio of prices of exotic chicks to local chicks in the district did not have a significant impact on the decision to adopt exotic breeds.

Table 10.29 shows that the presence of on-farm extension activities or the number of visits to farms by extension workers has no significant impact on the level of exotic chicken adoption. Producers who received extension services from private companies are significantly more likely to adopt exotic chickens than those who did not. The coefficients for other service providers are not significant. The location and farm characteristic variables follow the same pattern as in the previous regression.

10.4.4 Exotic Chicken Adoption Intensity

The R^2 value for the exotic chicken adoption intensity regression indicates that 7.5 percent of the variation in adoption intensity is explained by the regression equation. The F-statistic testing the hypothesis that the model variables have no effect on the adoption intensity was not rejected at the 10 percent level.

As shown in Table 10.30, the only variables that were significant in the regression were age of the household head, and the existence of substantive transportation investment and the price ratio. An additional year of age of the household head is predicted to cause a decline of 0.2 percent in the adoption intensity level, while producers who have made substantive investments in transport equipment are predicted to have intensity levels 2.5 percent lower than those of producers who have not made transportation investments. While the ratio of exotic to local chick prices did not have a significant impact on producers decisions to adopt exotic breeds, it does have a significant

and positive effect on the intensity of exotic breed adoption, with producers in district with higher exotic/local price ratios having higher adoption intensity levels.

10.5 Conclusions

The model results indicate that extension services, whether provided by government Extension Services, Veterinary Services Department, Research Centers, mass organizations or private operations, have a degree of effectiveness at promoting the adoption of technology by livestock farmers. These results should be treated with some caution however, as they could merely be a reflection of a tendency of extension services to target large farms who have already adopted exotic breeds. Also, in the case of pigs (and to a lesser degree in the case of chickens) the ratio of exotic animal prices to local prices in the region has a significant and substantially positive effect on the level of exotic animal adoption. It is likely that in many cases this is the catalyst promoting adoption, rather than the activities of extension services.

Government extension Services has focused its activities on promotion of exotic breeds, however the results from the model show that provision of extension from this source is no more likely to affect pig adoption levels than provision from any other source. In the case of chickens, adoption of exotic breeds is more likely to be undertaken by producers who have received extension services from private companies than from government sources.

The key factor hampering more effective provision of extension services to producers is most likely to be a lack of resources on the part of extension services. These may include personnel, equipment and knowledge of extension techniques and agricultural technologies.

A number of policies could be introduced to increase the effectiveness of the livestock extension system. These include the introduction of mechanisms that promote the involvement of small scale livestock producers in the development of extension programs and the refocusing of extension staff training towards more generalist and market based skills, rather than a narrow production oriented approach. Other possible policies are to increase the amount of resources available to district level extension staff, strengthen the links between research and extension and integration of the work of the district extension services with other providers of extension, particularly the mass organizations.

Finally, extension budgets should be determined as an integral part of development projects and programs initiated by MARD and Provincial Departments of Agriculture. The current focus of programs involving livestock development is on production and breeding aspects and the majority of budget is committed to importation and maintenance of breeding stocks. Given the government's commitment to development of the livestock sector, the commitment of less than 8 percent of extension budget to pig extension seems low.

CHAPTER 11

LIVESTOCK BREEDING CENTERS

Summary

The system of pig and poultry breeding centers in Viet Nam has undergone dramatic changes in the past 10 years. This includes the closure of government run district level centers, the removal of many government subsidies for breeding center operation and the increased involvement of the private sector in the maintenance and distribution of exotic breeding stocks. Central and provincial level pig and poultry breeding centers still receive government subsidies that in many cases make up a high proportion of their annual revenue. Whilst the supporters of these subsidies argue that they are necessary in order to ensure the maintenance of exotic genetic stocks in Viet Nam, there is evidence that many breeding centers focus on commercial activities that provide the majority of their profits, rather than the less profitable activities of supporting the stock of exotic genetics.

Highlights

- *The network of government breeding centers was set up to provide a co-ordinated system of importation, maintenance and distribution of exotic animal genetics with each level of the breeding center system (including the now defunct district level breeding centers) occupying a distinct area of the breeding pyramid system. Under the doi moi process this co-ordinated system has largely disappeared and almost all breeding centers operate relatively independently of one another.*
- *Private breeding farms have developed in Viet Nam during the last decade, both as foreign or joint venture breeding centers at the top of the breeding pyramid and a large*

number of private farms at the lower end of the pyramid specializing in maintaining parent and commercial stock and providing pigs and poultry for fattening.

- *The major cost component for central and provincial level pig and poultry breeding centers is animal feed, accounting for an average of at least half of total annual costs.*
- *Commercial piglet sales were the dominant form of revenue for the majority of central and provincial level pig breeding centers, accounting for an average of at least half of total annual revenue. Sales of chicks were the dominant revenue source for 5 of the 7 surveyed central level chicken breeding centers.*
- *Government subsidies account for an average of 18 percent of central level pig breeding center income, 25.4 percent of provincial pig breeding center income and 15.8 percent of central chicken breeding center income. The average contribution of government subsidies to breeding center income levels has fallen for pig breeding centers and increased for chicken breeding centers.*
- *Profitability levels of breeding centers were highly variable. Not including breeding stock and infrastructure expenditure as annual costs, three of the nine central pig breeding centers, six of the twelve provincial pig breeding centers and four of the seven central level chicken breeding centers made positive profits without government subsidies in 1999. With government subsidies included as income, positive profits were made by seven of the nine central pig breeding centers, nine of the twelve provincial pig breeding centers and five of the seven central level chicken breeding centers.*
- *Household farms are the major customers for gilts, barrows and commercial piglets produced by central and provincial pig breeding farms. An average of almost 20 percent of commercial piglets produced by pig breeding centers are sold to commercial farms.*

Household farms are also the major customers for pullets, broilers and day old chicks and eggs produced by central level chicken breeding farms.

- *Breeding herds in central level pig breeding centers are predominately GP stock, whilst in provincial pig breeding centers and central chicken breeding centers, the herd structure is predominately PS stock.*

11.1 Introduction

A survey of central and provincial level pig and chicken breeding centers was undertaken between September and November 2000. During this period, 4 central level and 5 provincial level breeding centers were visited personally and an additional 9 central level pig farms, 7 central level chicken breeding farms and 12 provincial level pig breeding farms returned mail survey forms.

The main objectives of the personal visits and the postal survey were to;

a) quantify the various aspects of production costs incurred by the breeding centers;

b) quantify the revenue gained by the centers from various sources;

c) identify the types and levels of government subsidies provided to the breeding centers;

d) use the information on costs and revenues to analyze the profit levels of the centers;

e) identify the customers for the various products of the centers; and

f) identify the types and proportions of different types of breeding animals kept by the centers.

This chapter presents a discussion of issues surrounding the pig and poultry breeding center system and also details some of the information obtained in the breeding center mail survey.

Section 11.2 gives an overview of the state and private livestock breeding center system as it currently exists in Viet Nam. Section 11.3 discusses the breakdown of production costs and Section 11.4 concentrates on sources of sales revenue. Section 11.5 discusses the sources, uses and quantities of government subsidy received by breeding centers and Section 11.6 analyses the level of annual profits achieved by breeding centers under a number of different systems of

calculating revenue and costs. Section 11.7 concentrates on the major customer types for central and provincial breeding centers. Section 11.8 discusses the characteristics of breeding herds and flocks in government breeding centers and finally Section 11.9 provides a conclusion to the chapter.

11.2 Livestock Breeding Center System

The pig and chicken breeding systems in Viet Nam consist of a number of interrelated sectors. These are the central level breeding farms, provincial level breeding farms, artificial insemination stations, foreign owned breeding farms and private breeding farms. The purpose of these interrelated sectors within the breeding systems is to maintain stocks of exotic bloodline pigs and chickens and diffuse these exotic bloodlines to commercial and smallholder farms through exotic and crossbred breeding and commercial stock. Figures 11.1 and 11.2 give an idealized representation of the breeding pyramid method of increasing improved genetics in the general livestock population.

11.2.1 Central Level Breeding Centers

There are 12 dedicated pig breeding farms and 10 dedicated chicken breeding farms at the central level in Viet Nam. In addition, Binh Thang Livestock Development Center is involved in breeding of both pigs and chickens.

Of the central level breeding farms, five farms in the North of Viet Nam are under the control of the National Institute of Animal Husbandry and one farm in the South is under the control of the Southern Institute of Animal Science. The remaining sixteen centers are controlled by AMASCO,

one of the fifteen subsidiary units of VINALIVESCO (Viet Nam Livestock Import and Export Company).

The central level centers were originally set up to occupy the position at the top of the breeding pyramid for exotic animals. Central level breeding centers were to import selected exotic animals and maintain stocks of exotic line Great Grandparent (GGP) stock. Grandparent (GP) was to be sent to the provincial breeding centers. While nominally under central government control, almost all decisions regarding operational policies of the centers have now been devolved to the Institutes and to VINALIVESCO.

11.2.2 *Provincial Level Breeding Centers*

In addition to the central level pig and chicken breeding farm system, many provinces also have pig and chicken breeding centers under the control of the provincial Departments of Agriculture and Rural Development. Policy for these centers is set by the centers themselves under the control of the provincial Departments of Agriculture and Rural Development.

Provincial breeding centers were originally set up to occupy the space in the exotic animal breeding pyramid below the central breeding centers. Provincial breeding centers were to maintain GP stock (obtained from the central level breeding centers) and produce parent stock (PS) and semen for dispersal to farmers for breeding purposes in order to increase the proportion of exotic bloodlines in Vietnamese animal stocks. However, there is currently very little coordination between the development, production or marketing activities of the individual provincial centers and the activities of the central centers or the activities of centers in other provinces.

Prior to 1989, all government breeding centers operated under a system of heavy government subsidization. During this period, many districts also had district level breeding centers for pigs and chicken that operated under government subsidized programs. Under the doi moi process, many of the government subsidies for breeding center operations were removed, and by 1994, all of the district level breeding centers had ceased operating.

11.2.3 Artificial Insemination Centers

Artificial insemination centers are controlled by provincial, district or local governments. Their function is to provide exotic or crossbred semen produced by breeding centers to commercial and smallholder farmers. The farmers will inseminate local sows with this semen and produce crossbred pigs for fattening.

11.2.4 Foreign Owned Breeding Farms

Foreign owned pig breeding farms have been a recent development in Viet Nam. These commercial enterprises have been set up either as one facet of an agricultural development strategy by multi-enterprise agro-industrial firms (CP, Cargill), as part of an integrated feed/livestock strategy by smaller foreign investors (Taiwan Tea Corporation) or as stand-alone operations by dedicated pig breeding companies (PIC). The size of foreign invested breeding farms tends to be relatively small and their impact in terms of diffusion of genetics into the wider animal population has been minimal so far.

11.2.5 Private Breeding Farms

Prior to the mid 1990's, almost all specialized livestock farms were involved in both breeding and fattening, or purely involved in fattening. Very few livestock farms were involved purely in breeding animals for sale to other farmers for fattening. Since that time the number of small and large private farms specializing purely in animal breeding has expanded rapidly. The value of output from specialized breed farms has grown at an annual average rate of 4.4 percent during the past 5 years. According to MARD, by 1999 almost 10 percent of livestock farms were specialized in animal breeding. Of these, 45 percent were pig breeding farms and a further 26 percent were poultry breeding farms.

11.3 Production Costs in Breeding Centers

Production costs for breeding centers are classified as;

a) breeding cost – the cost of purchasing breeding stocks or semen;

b) feed costs – the cost of purchase or production of animal feed;

c) infrastructure costs – the costs of maintaining existing infrastructure and construction of new infrastructure;

d) veterinary service costs;

e) management costs;

f) labor (non-management) costs; and

g) all other costs.

The breeding centers provided information on production costs in all categories for 1997, 1998 and 1999. Average total production costs for central level pig and chicken breeding centers and provincial pig breeding centers increased between 1997 and 1999. Average annual production costs in central and provincial level breeding centers are shown in Table 11.1.

11.3.1 Central Level Pig Breeding Centers

The average level of total production costs for central level pig breeding centers increased by 12.7 percent between 1997 and 1999. Average production costs declined by between 5 and 27 percent in four of the nine surveyed centers. In the other five centers, average production costs increased by between 4 and 77 percent.

The average levels of all cost categories increased between 1997 and 1999, except the category of "other costs" , the average level of which declined by almost 19 percent over the 3 years. Breeding stock purchase costs increased in 3 of the 7 centers that provided information, feeding costs increased in 4 of the 9 centers, infrastructure costs and veterinary costs increased in 7 of the 9 centers, management costs increased in 6 of the 9 centers, labor costs increased in 6 of the 9 centers and "other costs" increased in 5 of the 9 centers.

The major production cost component for central level pig breeding centers is feed costs, accounting for an average of almost 60 percent of total annual costs in 1999. The second largest cost component was purchase of breeding animals, averaging almost 14 percent of annual costs. Management and labor costs account for an average of around 13 percent of the annual cost level. These proportions have remained relatively constant between 1997 and 1999.

Feed costs were the largest individual cost item for all surveyed central pig breeding centers, varying in proportion between 39 and 75 percent of total costs. Breeding centers with lower proportions of costs accounted for by feed costs generally had relatively higher proportions of costs attributed to purchases of breeding stocks.

If breeding stock purchases and infrastructure construction are considered as investment expenditure, rather than production costs then the feed costs average almost 75 percent of annual production costs and make up between 63 and 89 percent of annual costs in all centers. Management and labor costs account for between 8 and 30 percent of costs in all centers.

11.3.2 Provincial Level Pig Breeding Centers

Average total production cost levels in the 12 surveyed provincial pig breeding farms increased by 4.4 percent between 1997 and 1998 and then increased by a further 20.8 percent between 1999 and 1999. Annual operating costs increased between 1997 and 1999 in 10 of the 12 surveyed provincial breeding centers. Costs in all categories for all provincial pig breeding centers show the same general trend between 1997 and 1999.

As was the case for the central level, the major production cost item for provincial pig breeding centers is animal feed, accounting for an average of over 63 percent of annual costs in 1999. The second largest component was management and labor costs, an average of around 15 percent in 1999, followed by breeding stock purchases, accounting for an average of 7.5 percent of annual costs. Labor costs as a proportion of total costs increased slightly on average between 1997 and 1999, while feed costs as a proportion of total costs declined on average over the same period.

Feed costs were the largest individual cost item for all surveyed provincial pig breeding centers, varying in proportion between 33 and 75 percent of total costs. Breeding centers with lower proportions of costs accounted for by feed costs generally had relatively higher proportions of costs attributed to purchases of breeding stocks.

When the cost of breeding stock purchase and infrastructure construction is taken out of the annual cost figures, feed costs make up an average of 71 percent of total costs and account for between 50 and 85 percent of annual costs in all centers. Management and labor costs account for between 6 and 36 percent of annual costs in all centers.

11.3.3 Central Level Chicken Breeding Centers

The average level of production costs for central level chicken breeding centers increased by 9.34 percent between 1997 and 1999. Average production costs declined by between 10 and 30 percent in 3 of the 7 centers from 1997 to 1999. Costs increased by between 10 and 55 percent in the other centers during the same period. Excluding breeding stock purchases and infrastructure construction, costs increased by an average of 4.5 percent between 1997 and 1999. Costs in almost all categories for most breeding centers showed an increase between 1997 and 1999.

As was the case with pig breeding centers, the major production cost item for central level chicken breeding centers is feed, accounting for an average of almost 49 percent of total costs. The second largest cost component is breeding stock purchase costs, an average of 22 percent of total costs. This is larger than the proportion for pig breeding centers. Management and labor costs accounted for an average of around 13 percent of total costs in 1999. Proportional cost

levels in central level chicken breeding centers remained relatively constant between 1997 and 1999.

Feed costs were the largest cost component for 5 of the 7 central level chicken farms surveyed, accounting for between 24 and 70 percent of total costs. Breeding cost purchases were the largest cost component in 2 of the 7 surveyed centers. When running costs only are considered (total cost net of breeding stock purchase and infrastructure investment), feed costs are the largest cost component for all centers, accounting for between 45 and 83 percent of annual costs.

11.4 Sales Revenue

Pig breeding centers receive sales revenue from a number of sources, including;

a) sales of barrows;

b) sales of gilts;

c) sales of commercial piglets;

d) sales of fatteners

e) sales of semen; and

f) sales of manure.

Chicken breeding centers gain revenue from;

a) sales of breeding chicks;

b) sales of pullets;

c) sales of hens;

d) sales of breeding eggs;

e) sales of commercial eggs; and

f) sales of broilers.

Table 11.2 summarizes the average annual revenues of livestock breeding centers between 1997 and 1999.

11.4.1 Central Pig Breeding Centers

The average total revenue for central pig breeding farms in 1999 was around Đ1.455 billion, an increase of almost 79 percent over the 1997 level. Total sales revenue increased between 19997 and 1999 in 8 of the 9 central pig breeding farms surveyed. The increase in revenue can be largely attributed to an increase in average sales levels of 84.5 percent between 1997 and 1999. During this time, sales levels increased in 6 of the 9 surveyed breeding farms. Price movements were erratic during this time period, with no consistent trend evident either within individual breeding centers or product types. The total revenue level in 1999 varied widely between the breeding farms, from a minimum of Đ234 million to a maximum of Đ4.785 billion.

Sales of commercial piglets provide the largest share of total revenues of central level pig breeding stations, accounting for an average of 61.1 percent in 1999. This percentage has increased from 50.4 in 1997 and 48.4 in 1998.

Commercial piglet sales were the dominant revenue source for 6 of the 9 central pig breeding centers surveyed. Sales of piglets accounted for more than 80 percent of total revenue for 5 of the

9 centers surveyed. Only one central level pig breeding center did not gain any revenue from pig sales. This center only gained sales revenues from barrow, semen and manure sales.

11.4.2 Provincial Pig Breeding Centers

The average total annual revenue for provincial pig breeding farms was Đ3.754 billion in 1999, which was 53 percent higher than the 1997 average level. Total revenue levels in 1999 for provincial pig breeding farms varied widely, with a minimum of around Đ110 million and a maximum of more than Đ17.8 billion. Total sales revenue increased between 1997 and 1999 in 10 of the 12 provincial pig breeding farms surveyed. As was the case with central level pig breeding centers, this revenue increase can be partially attributed to increases in prices of livestock products and also to changes in sales levels, which increased by an average of 22 percent during the period. Increases in sales were recorded in 11 of the 12 provincial pig breeding centers surveyed.

As was the case with the central level pig breeding stations, commercial piglet sales provide the largest percentage of total revenue, an average of 49 percent in 1999. This is an increase from the 1997 level of 41.3 percent and the 1998 level of 34.2 percent. Commercial piglet sales are the major revenue source for 7 of the 12 surveyed provincial level pig breeding centers. A further center obtains a combined 96.5 percent of its revenue from sales of commercial piglets and commercial fatteners. Table 11.4 summarizes the total selling quantities and the average selling price of livestock product from central and provincial pig breeding centers.

11.4.3 Central Chicken Breeding Centers

Average total revenue in 1999 for central chicken breeding centers was Đ2.566 billion, a 3.4 percent increase from 1997 levels. Revenue levels in 1999 varied between breeding centers, from a minimum of Đ169 million to a maximum of Đ8.17 billion. Revenues increased by more than 65 percent between 1997 and 1999 in 3 of the 7 surveyed chicken breeding centers. In the remaining 4 centers, revenues decreased by more than 30 percent between 1997 and 1999.

Changes in total revenues of chicken breeding centers were mostly caused by changes in sales levels, with all centers recording decreases in revenue between 1997 and 1999 also experiencing falls in sales levels. All centers recording revenue increases over the period also had increased levels of sales. Selling prices of most commodities remained quite stable between 1997 and 1999.

Sales of chicks provide the largest share of sales revenue for central level chicken breeding centers, an average of 45.1 percent in 1999. The second largest revenue source was breeding eggs, accounting for an average of 23.8 percent of total revenue on average in 1999. This is the reverse of the position in 1997, where breeding eggs were dominant, with an average of 34.6 percent of revenue compared to chicks, with an average of 22 percent of revenue. Chicks are the major revenue source for 5 of the 7 surveyed central chicken breeding centers, while breeding eggs are the major revenue item for the remaining 2 centers. Two of the centers were involved in chick sales in 1999, but not in 1997 or 1998 and another 2 centers sold pullets only in 1999. Table 11.5 shows the total selling quantities and average selling prices of the main products sold be central chicken breeding centers.

11.5 Government Subsidies

All of the surveyed breeding centers at both central and provincial levels received subsidies from various levels of government in order to assist them in operating. The only exception was one provincial chicken breeding center, which reported that it did not receive any government subsidies between 1997 and 1999. Government subsidies to breeding centers fall into the following categories;

a) breeding stock maintenance subsidy;

b) infrastructure investment subsidy; and

c) subsidy for purchase of imported animals.

The breeding stock maintenance subsidy for pig breeding centers is paid as an annual amount for each exotic sow of GGP or GP level kept by the center. Chicken breeding centers are paid a subsidy for a proportion of the exotic breeding hens that they keep. The aim of the payment is to meet some of the costs of feeding and housing exotic females in order to encourage centers to maintain stocks. Infrastructure investment subsidies are paid by central and local governments in order to support specific infrastructure development projects undertaken by the breeding centers. Imported animal subsidies are paid by either the central government in order to support the importation of pure line exotic breeding stock by breeding centers. These subsidies are not paid for all imports, and approval for subsidies of this kind are given on an ad hoc basis. Table 11.3 summarizes the level of government subsidies for breeding centers between 1997 and 1999.

11.5.1 Central Pig Breeding Centers

All the surveyed central pig breeding centers received subsidies in 1997, 1998 and 1999. These subsidies averaged Đ294.06 million in 1997, Đ398.43 million in 1998 and Đ301.67 million in 1999. The relatively high average in 1998 is due to an infrastructure subsidy of Đ846.15 million given to one of the breeding centers.

All surveyed centers received breeding subsidies in each year, one center received an infrastructure investment subsidy in 1997, one center received infrastructure investment subsidies in 1998 and 1999 and one center received an exotic stock purchase subsidy in 1997. The average level of breeding maintenance subsidy was Đ253.39 million in 1999, a decrease from the 1997 level of Đ294.06 million and the 1998 level of Đ304.41 million.

Over the 1997-1999 period, breeding maintenance subsidies accounted for the majority of subsidy funds received by central pig breeding centers, an average of more than 83 percent. Breeding maintenance subsidies were the only form of subsidy received by 7 of the 9 breeding centers.

Government subsidies make a substantial contribution to central pig breeding center incomes, an average of 18 percent in 1999, a fall from 26.2 percent in 1997. The contribution of subsidies to surveyed central pig breeding center income in 1999 varied between 8.5 percent and 35.8 percent.

11.5.2 Provincial Pig Breeding Centers

All of the surveyed provincial pig breeding centers received some form of government subsidy in 1999. Two of the 12 surveyed centers did not receive any subsidies in 1998 and one of the 12 surveyed centers did not receive any subsidies in 1997. Total government subsidies averaged Đ364.58 million in 1999, a decrease from the average level of Đ477.3 million in 1997 and Đ452.7 million in 1998.

Ten of the 12 surveyed provincial pig breeding centers received breeding maintenance subsidies in each year. The average level of breeding subsidy declined from Đ363.55 million in 1997 to Đ205.43 million in 1999. The level of subsidy increased slightly between 1997 and 1999 in 4 of the 10 centers receiving subsidies but declined substantially in the other 6 centers.

Three centers in 1997, three centers in 1998 and four centers in 1999 received infrastructure investment subsidies. The average amount of infrastructure investment subsidies increased over the 1997-1999 period from Đ402.7 million to Đ552.4 million. One center received Đ2.018 billion in infrastructure investment subsidies over the three year period. Three centers received subsidies for purchases of breeding stock in 1997, while only one of these centers received this subsidy in 1999.

Breeding maintenance subsidies were the dominant form of government subsidy provided to provincial pig breeding centers over the three year period. Breeding maintenance subsidies accounted for an average of 62.17 percent of all subsidies provided during this period. In 7 of the 12 surveyed centers, breeding maintenance subsidies were the dominant form of subsidy and in 6 of those centers were the only form of government subsidy provided. In the other five centers,

infrastructure investment subsidies provided the majority of subsidy inputs over the three year period.

Government subsidies make an even more substantial contribution to provincial pig breeding center incomes than to central pig breeding center incomes, an average of 25.4 percent in 1999, a fall from 38.6 percent in 1997. The contribution of subsidies to surveyed central pig breeding center income in 1999 varied between 0.4 percent and 68.4 percent.

11.5.3 Central Chicken Breeding Centers

The average level of government subsidy provided to chicken breeding centers in 1999 was Đ339.5 million, an increase from Đ325.8 million in 1997 and Đ262.97 million in 1999. Six of the 7 surveyed centers received some form of subsidy between 1997 and 1999. The level of subsidy deceased between 1997 and 199 in 4 of the centers and increased in the other 2. The reason for these increases was a substantial increase in infrastructure investment subsidies for these two centers.

Breeding maintenance subsidies were received by 6 centers in 1997, 5 centers in 1998 and 6 centers in 1999. The average amount of breeding maintenance subsidy declined between 1997 and 1999 from Đ192.42 million to Đ95.5 million. The level of breeding maintenance subsidy declined between 1997 and 1999 in all six centers receiving the subsidy. Infrastructure investment subsidies were received by one center in 1997 and two centers in 1998 and 1999. The amount of these subsidies is substantial, averaging Đ700 million in 1997, Đ317.66 million in 1998 and Đ714.5 million in 1999. This amount is far in excess of the breeding maintenance subsidies received by the centers during these years. Infrastructure investment subsidies account for 49.64

percent of the funds provided by the government as subsidies to central chicken breeding centers during the three year period. This is slightly higher than funds provided for breeding maintenance subsidies, which accounted for 47.94 percent of subsidy funds between 1997 and 1999. However, these infrastructure investment subsidies are concentrated, with only two centers receiving the subsidies between 1997 and 1999. In the four other subsidized centers, breeding maintenance subsidies provide the only form of government subsidy.

Government subsidies made an average contribution to central chicken breeding center incomes of 15.8 percent in 1999, an increase from 11 percent in 1997. The contribution of subsidies to surveyed central chicken breeding center income in 1999 varied between zero percent and 43.6 percent.

11.6 Breeding Center Profits

Breeding center profits are calculated on four bases. These are;

a) Including infrastructure investment and breeding stock purchases as annual operating costs and not including government subsidies as income.

b) Including infrastructure investment and breeding stock purchases as annual operating costs and including government subsidies as income.

c) Excluding infrastructure investment and breeding stock purchases from annual operating costs and not including government subsidies as income.

d) Excluding infrastructure investment and breeding stock purchases from annual operating costs and including government subsidies as income.

Table 11.6 shows the average profit levels of breeding centers calculated on these four bases.

11.6.1 Central Pig Breeding Centers

When profits were calculated including investment and breeding stock purchases as annual operating costs and not including government subsidies as income, none of the surveyed central pig breeding centers made positive profits in 1997, 1998 or 1999. Annual losses in 1999 varied between Đ114 million and Đ1.565 billion. Losses in 1999 ranged between 9 and 111 percent of gross revenue levels. Losses decreased between 1997 and 1999 in 5 of the 9 surveyed central pig breeding centers.

Including infrastructure investment and breeding stock purchases as annual operating costs and also including government subsidies as income reduced the level of losses compared to the previous method of profit calculation. Under this accounting method, one pig breeding center made positive profits in 1997 and two centers made positive profits in 1998 and 1999. Annual profits in 1999 varied between –Đ1.07 billion and Đ451.5 million. This is equivalent to a range of –67 percent to 22 percent of gross income.

When infrastructure investment and breeding stock purchases were not included as annual operating costs and government subsidies were not included as income no centers made profits in 1997 or 1998, but 3 centers made profits in 1999. Profits increased (or losses decreased) for 6 of the 9 centers between 1997 and 1999. Profits in 1999 varied between –Đ1.105 billion and Đ548 million. This is equivalent to a range of –77 percent to 32 percent of gross income.

Excluding infrastructure investment and breeding stock purchases from annual operating costs but including government subsidies as income gives the highest relative profit levels for all centers. Under this accounting method, six centers made positive profits in 1997, 4 made positive profits in 1998 and 7 made positive profits in 1999. Profits increased (or losses decreased) in 5 of the 9 centers between 1997 and 1999. Profits in 1999 ranged between –Đ610 million and Đ727 million (-24 percent of gross income to 59 percent of gross income).

11.6.2 Provincial Pig Breeding Centers

When profits were calculated including investment and breeding stock purchases as annual operating costs and not including government subsidies as income, only two of the surveyed provincial pig breeding centers made positive profits in 1997 and 1998. Three breeding centers made positive profits in 1999. Annual profits in 1999 varied between –Đ2.9 billion and Đ3.76 billion. Losses decreased between 1997 and 1999 in 9 of the 12 surveyed provincial pig breeding centers.

Including infrastructure investment and breeding stock purchases as annual operating costs and also including government subsidies as income reduced the level of losses compared to the previous method of profit calculation. Under this accounting method, five pig breeding center made positive profits in 1997, four centers made positive profits in 1998 and two centers made positive profits in 1999. Annual profits in 1999 varied between –Đ2.58 billion and Đ4.19 billion.

When infrastructure investment and breeding stock purchases were not included as annual operating costs and government subsidies were not included as income one center made profits in

1997, three centers made profits in 1998 and six centers made profits in 1999. Profits increased (or losses decreased) for 8 of the 12 centers between 1997 and 1999. Profits in 1999 varied between –Đ2.691 billion and Đ3.94 billion.

Excluding infrastructure investment and breeding stock purchases from annual operating costs but including government subsidies as income gives the highest relative profit levels for all centers. Under this accounting method, seven centers made positive profits in 1997, six made positive profits in 1998 and nine made positive profits in 1999. Profits increased (or losses decreased) in 8 of the 12 centers between 1997 and 1999. Profits in 1999 ranged between –Đ2.35 billion and Đ4.37 billion.

11.6.3 Central Chicken Breeding Centers

When profits were calculated including investment and breeding stock purchases as annual operating costs and not including government subsidies as income, three of the surveyed central chicken breeding centers made positive profits in 1997. Only one breeding center made positive profits in 1998 and 1999. Annual profits in 1999 varied between –Đ3.25 billion and Đ274 million. Losses increased between 1997 and 1999 in 6 of the 7 surveyed central chicken breeding centers.

Including infrastructure investment and breeding stock purchases as annual operating costs and also including government subsidies as income reduced the level of losses compared to the previous method of profit calculation. Under this accounting method, four pig breeding center made positive profits in 1997, three centers made positive profits in 1998 and four centers made positive profits in 1999. Annual profits in 1999 varied between –Đ3.14 billion and Đ674 million.

When infrastructure investment and breeding stock purchases were not included as annual operating costs and government subsidies were not included as income four centers made profits in 1997, four centers made profits in 1998 and five centers made profits in 1999. Profits increased (or losses decreased) for 3 of the 7 centers between 1997 and 1999. Profits in 1999 varied between –Đ704 million and Đ651 million.

Excluding infrastructure investment and breeding stock purchases from annual operating costs but including government subsidies as income gives the highest relative profit levels for all centers. Under this accounting method, five centers made positive profits in 1997, six made positive profits in 1998 and five made positive profits in 1999. Profits increased (or losses decreased) in 2 of the 7 centers between 1997 and 1999. Profits in 1999 ranged between –Đ704 million and Đ1.58 billion.

11.7 Customers

11.7.1 Central Pig Breeding Centers

Central pig breeding centers provide livestock products to households, commercial farms, central and provincial breeding centers and artificial insemination stations.

The major customers for barrows produced by central pig breeding centers are household farms, purchasing an average of almost 60 percent of total barrows sold during 1999. Household farms were the major barrow customers for 5 of the 9 surveyed central breeding centers. The second

most important customer for barrows produced by central pig breeding centers is AI stations, which take an average of 26.5 percent of total barrow sales. Other central breeding farms and provincial farms purchase an average of 9.8 percent of barrows produced by central pig breeding centers. It is probable that the 35 percent of barrows sold to breeding centers and AI stations represent the higher quality barrows produced by the centers, while the almost 60 percent sold to household farms represent the lower genetic quality animals.

Household farms are also the major customers for gilts produced by central pig breeding centers, purchasing an average of 57.1 percent of output in 1999. Household farms were the major gilt customers for 5 of the 9 surveyed central breeding centers. The second most important customer for gilts produced by central pig breeding centers is provincial breeding centers, which take an average of 25.8 percent of total gilt sales. Other central breeding purchase an average of 6.3 percent of gilts produced by central pig breeding centers. As was the case with barrow sales, it is probable that the highest quality gilts are purchased by breeding centers and the lower quality gilts (almost 60 percent) are sold to household farms.

The major customers for commercial piglets produced by central pig breeding centers are household farms, which account for an average of 45 percent of all sales of piglets. An average of almost 20 percent of commercial piglets are sold to commercial farms. In almost all cases these piglets are used for fattening as most breeding centers spay or castrate the piglets before sale. Interestingly, an average of more than 25 percent of commercial piglet sales made from central breeding centers are made to other central or provincial pig breeding centers. Two of the centers sold the majority of their piglets to other breeding centers, while two sold the majority of their stock to commercial farms. Only one central pig breeding center produced semen for sale, and all of this was sold to AI stations. Customers of central pig breeding centers are shown in Table 11.7.

11.7.2 Provincial Pig Breeding Centers

Provincial pig breeding centers provide livestock products to households, commercial farms, central and provincial breeding centers and artificial insemination stations.

The major customers for barrows produced by provincial pig breeding centers are household farms, purchasing an average of 57.9 percent of total barrows sold during 1999. Household farms were the major barrow customers for 5 of the 12 surveyed provincial breeding centers. The second most important customer for barrows produced by provincial pig breeding centers is other provincial breeding centers, which take an average of 16.6 percent of total barrow sales. It is probable that the barrows sold to breeding centers represent the higher quality barrows produced by the centers, while the almost 60 percent sold to household farms represent the lower genetic quality animals.

Household farms are also the major customers for gilts produced by provincial pig breeding centers, purchasing an average of 64.5 percent of output in 1999. Household farms were the major gilt customers for 8 of the 12 surveyed provincial breeding centers. The second most important customer for gilts produced by provincial pig breeding centers is other provincial centers, which take an average of 13.5 percent of total gilt sales. Central breeding centers purchase an average of 8.1 percent of gilts produced by provincial pig breeding centers. As was the case with barrow sales, it is probable that the highest quality gilts are purchased by breeding centers and the lower quality gilts are sold to household farms.

The major customers for commercial piglets produced by provincial pig breeding centers are household farms, which account for an average of 68 percent of all sales of piglets. An average of 16 percent of commercial piglets are sold to commercial farms. In contrast to the situation for central pig breeding centers, an average of only 1.6 percent of commercial piglet sales were made to other central or provincial pig breeding centers. One center sold the majority of their piglets to other breeding centers, while two sold the majority of their stock to commercial farms. The remainder sold the majority of commercial piglet stock to household farmers.

Seven provincial pig breeding centers produced semen for sale. Five of these sold the majority of their semen to household farms, while the remainder sold mostly to commercial farms. Average proportions of major products sold by provincial pig breeding centers to various customers are shown in Table 11.8.

11.7.3 Central Chicken Breeding Centers

The major customers for day-old chicks produced by central chicken breeding centers are household farms, purchasing an average of 54.5 percent of total chicks sold during 1999. Household farms were the major day-old chick customers for 5 of the 7 surveyed central breeding centers. The second most important customer for day-old chicks produced by central chicken breeding centers is commercial farms, which take an average of 16.6 percent of total day-old chick sales. Central and provincial breeding centers purchase a combined average of almost 24 percent of the day-old chicks produced by central chicken breeding centers. It is probable that the day-old chicks sold to breeding centers represent the higher quality chicks produced by the centers, while the chicks sold to household farms represent the lower genetic quality animals.

Household farms and commercial farms are the main customers for pullets produced by central chicken breeding centers. Sales of pullets to these two categories of customer average more than 85 percent of total pullet sales. The only other major customer category is provincial breeding centers, which average 11.2 percent of total sales. Household farms are also the major customers for broilers produced by provincial pig breeding centers, purchasing an average of 55 percent of output in 1999. The only other noteworthy customer category was “other” with an average of around 43 percent of sales. Household farms were the major broiler customers for 5 of the 7 surveyed provincial breeding centers.

Breeding eggs were purchased by a wide range of customers. An average of around 50 percent of sales were made to household and commercial farms, whilst around 30 percent of sales were made to provincial and central chicken breeding centers.

The major customers for commercial eggs produced by central chicken breeding centers are household farms, which account for an average of more than 66 percent of all sales of commercial eggs. No commercial eggs were reported as being sold to commercial farms. An average of only 2.1 percent of commercial egg sales were made to other breeding centers. The only other significant buyer category was “other” which accounted for an average of 31.3 percent of commercial egg sales. The major customers of products produced by central level chicken breeding centers are shown in Table 11.9

11.8 Characteristics of Breeding Herds and Flocks

11.8.1 Central Pig Breeding Herds

Breeding herds in central pig breeding centers have an average size of 742 head. This consists of an average of 294 sows, 15 boars, 215 gilts and 158 barrows. Central breeding centers stocks of sows are predominately GP stock, averaging almost 70 percent of total sow numbers. All central breeding centers keep GP sows. In addition, 4 keep GGP sows and 4 keep PS sows. Stocks of boars are also predominately GP stock, accounting for an average of around 74 percent of boar numbers. All central breeding centers keep GP boars, while 3 also keep GGP stock and 3 also keep PS stock. All central breeding centers keep young pig breeding stock. These are predominately gilts, an average of more than 81 percent. Yorkshire and Landrace are the most common breeds of sows and boars kept by the central breeding centers. The herd breed characteristics are shown in Table 11.10 and genetic characteristics are summarized in Table 11.13. Table 11.4 shows the gender proportions of young breeding stock.

11.8.2 Provincial Pig Breeding Herds

Breeding herd size in provincial pig breeding centers is smaller than that of central pig breeding centers, an average of 562 head. An average herd contains 356 sows, 16 boars, 294 gilts and 112 barrows. Unlike central breeding centers, provincial breeding centers stocks of sows have a high proportion of PS stock, averaging over 45 percent of total sow numbers. Eight of the 12 provincial breeding centers keep PS sows. In addition, 2 keep GGP sows and 7 keep GP sows. Stocks of boars are also predominately GP stock, accounting for an average of around 41.1 percent of boar numbers. Seven of the 12 provincial breeding centers keep GP boars, while 2 also keep GGP stock and 6 also keep PS stock. Ten of the 12 provincial breeding centers keep young

pig breeding stock. These are predominately gilts, an average of almost 79 percent. Breed characteristics are shown in Table 11.11 and genetic characteristics are shown in Table 11.13. Table 11.4 shows the gender proportions of young breeding stock.

11.8.3 Central Chicken Breeding Stocks

Breeding flocks in central chicken breeding centers have an average size of 29092 birds. This consists of an average of 12415 hens, 1041 roosters and 12170 pullets. Central breeding centers stocks of hens and roosters are predominately PS stock, averaging around 67 percent of total hen and rooster numbers. Five of the seven central breeding centers keep PS hens. In addition, 3 keep GGP hens and one keeps GP hens. Six of the 7 central breeding centers keep PS roosters, while 2 also keep GGP stock and 2 also keep GP stock. All central breeding centers keep pullets. These are predominately female, an average of more than 87 percent. Breed characteristics are shown in Table 11.12 and genetic characteristics are shown in Table 11.13. Table 11.4 shows the gender proportions of young breeding stock.

11.9 Conclusions

The network of government breeding centers was set up to provide a co-ordinated system of importation, maintenance and distribution of exotic animal genetics with each level of the breeding center system (including the now defunct district level breeding centers) occupying a distinct area of the breeding pyramid system. Under the doi moi process this co-ordinated system has largely disappeared and almost all breeding centers operate relatively independently of one another. This has led to the lack of a focused national effort in domestic breed preservation, exotic breed introduction, cross breed development and genetic stock maintenance.

Devolution of control of breeding centers has led to widespread instances of replication of breed importation and development systems, even amongst centers which are relatively close geographically. The breakdown of the co-ordinated system means that central breeding centers no longer necessarily occupy the position at the top of the breeding pyramid. Provincial centers also no longer necessarily occupy a lower position on the pyramid, and no longer obtain the bulk of their breeding animals from the central level breeding centers.

Under deregulation, breeding centers have increasingly concentrated on commercial production activities in addition to breed development in order to raise revenue. Commercial piglet sales were the dominant form of revenue for the majority of central and provincial level pig breeding centers, accounting for an average of at least half of total annual revenue. Sales of chicks were the dominant revenue source for 5 of the 7 surveyed central level chicken breeding centers.

Breeding centers at both the central and provincial level are concentrating on farms as the major customers of their products, in contrast to the situation 10 years ago where provincial breeding centers were the dominant customer type for central level breeding centers. Household farms are the major customers for gilts, barrows and commercial piglets produced by central and provincial pig breeding farms. An average of almost 20 percent of commercial piglets produced by pig breeding centers are sold to commercial farms. Household farms are also the major customers for pullets, broilers and day old chicks and eggs produced by central level chicken breeding farms.

Government subsidies account for an average of 18 percent of central level pig breeding center income, 25.4 percent of provincial pig breeding center income and 15.8 percent of central chicken breeding center income.

Not including breeding stock and infrastructure expenditure as annual costs, three of the nine central pig breeding centers, six of the twelve provincial pig breeding centers and four of the seven central level chicken breeding centers made positive profits without government subsidies in 1999. With government subsidies included as income, positive profits were made by seven of the nine central pig breeding centers, nine of the twelve provincial pig breeding centers and five of the seven central level chicken breeding centers. Whilst some centers are likely not to survive if government subsidies are removed, other centers would almost certainly be able to continue operations without government subsidies. Cost savings associated with lower levels of government control of operations could, in many cases, more than outweigh the lower revenue as a result of decreased government subsidies. Also, as is the case with almost all livestock farming operations in Viet Nam, animal feed accounts for the majority of the costs of breeding farms. If feed cost savings could be made, either through changed policies or increased feeding efficiency, then the majority of breeding farms could potentially make profits under a no-subsidy policy.

Many factors need to be targeted in order to overcome the current situation. These include improving the marketing chain between consumers and producers in order to ensure that price signals are transmitted efficiently, rationalizing the needs for numbers of breeding centers at each level and the functions of those breeding centers, utilizing government program funds for purposes other than pure exotic breed import and maintenance and adopting a holistic approach to the transition from local to lean meat pig varieties.

Effective policies to achieve these goals could include;

Consolidating pure line breeding stock (imported and GGP) in a small number of selected central level breeding farms. These farms could be identified as the farms that are currently under the

control of SAIS and NIAH. Provide subsidies and other forms of incentive to ensure concentration of activities at the top of the breeding pyramid. Staff with expertise in breeding technology should also be concentrated in these centers.

Remaining central and provincial breeding centers should have government subsidies reduced and the focus of activities should be determined by market forces. As demand for lean meat animals develops in the future, these centers could become part of a breed dispersal program.

Efforts should be made at a national level to coordinate the importation and maintenance of breeding stock at the top level of the breeding pyramid. This could be done through the formation of National Breed Improvement Boards. The activities of these boards would be made more effective under a system of consolidation of top level breeding stock.

Delivery of services (both AI and breeding stock) to smallholders could be made effective through a widespread system of centers at district level, able to provide timely and appropriate responses to local demands for improved genetics. Information flows from these centers to the central level breeding centers should be encouraged in order to ensure that national level developments match the needs expressed at the grassroots level. This would include the provision of appropriate breeds of high quality local pig breeds in addition to exotic bloodlines.

As the inefficiencies with the current breeding system can largely be classed as an example of market failure, policies to ensure the development of an efficient marketing structure with adequate information flows and market power for smallholders is a prerequisite for effective reform of the breeding center system.

Government funding for breed improvement should include adequate funding for extension activities (both production and marketing oriented) in addition to the funds targeted at stock importation and breeding center subsidy.

In addition to the breeding of exotic and high exotic bloodline level crossbred pigs, the activities of centers in areas where the dominant production system is smallholder based complementary production should concentrate more on the development of improved local breeds through the infusion of high quality Mong Cai bloodlines.

CHAPTER 12
URBAN CONSUMPTION

Summary

Households in Ho Chi Minh City and Ha Noi were surveyed in order to gather data on their livestock product consumption habits. Consumption patterns of livestock products follow a similar pattern to consumption of most food products, with greater levels of consumption being recorded by higher income groups and urban groups. Households in Ho Chi Minh City also consumed larger quantities of livestock products than their counterparts in Ha Noi. Larger household sizes in Ho Chin Minh City mean that for some commodities, the annual per capita consumption level in Ho Chi Minh City is lower than for Ha Noi. Expenditure and own-price and cross price elasticities of demand for pork, chicken and beef are calculated using the LA-AIDS method. Expenditure elasticities calculated for all meat products were positive and similar for low, medium and high income groups.

Highlights

- *The major non-food expenditure items amongst surveyed households were utilities and education. The major expenditure on non-livestock food item was rice, accounting for an average of almost 40 percent of total non-livestock food product expenditure.*
- *Fresh livestock products, including fresh pork, fresh chicken and fresh beef make up the majority of expenditure on livestock food products for households in all income groups, locations and regions. Fresh livestock products account for an average of around 80 percent of household expenditure on livestock food products. Households in Ho Chi Minh*

City, high income households and urban households consume the highest average annual quantities of livestock food products.

- *As income levels increase, the proportion of expenditure allocated to fresh pork and chicken declines, while the proportion of expenditure on processed meat products, fresh beef and milk and dairy products increases.*
- *Prices of almost all fresh and processed livestock food products were higher in Ho Chi Minh City than Ha Noi and higher in urban regions than suburban regions. Consumers in higher income levels paid higher prices for almost all livestock products. This could indicate price discrimination on the part of retailers, or that higher income consumers are purchasing higher quality products.*
- *Expenditure elasticities calculated for all meat products were positive and similar for low, medium and high income groups, indicating that meat consumption will rise at a similar rate as incomes increase for most households in Viet Nam. Own price elasticities calculated for all meats are negative, but are highly variable between income groups.*

12.1 Introduction

This chapter reports the results of a survey of livestock food product consumption patterns of urban and suburban households. The sample of 485 households was drawn from urban and suburban regions of Hanoi and Ho Chi Minh City. The households surveyed were classified into three income categories based on the total level of household assets, number of people employed and estimated household income level. Table 12.1 shows the number of urban and suburban households by income group in Hanoi and Table 12.2 presents the same information for Ho Chi Minh City.

The sampled households in Ho Chi Minh City had significantly more family members that those in Hanoi. In both Hanoi and Ho Chi Minh City, suburban families have significantly larger average family sizes than urban families. However, in both cities, there is no significant difference in average household size between the three income groups. Table 12.3 summarizes the average household sizes for different income and locations. Table 12.4 summarizes some of the major characteristics of household members.

The majority of household heads are male, aged between 19 and 65 with at least a middle school education. The most common activities of the household head were government employment and farming. In the suburban areas of both Ho Chi Minh City and Hanoi, the most common occupation was farming. In the urban areas of Hanoi, more than 60 percent of the household heads surveyed were involved in government employment. In Ho Chi Minh City, relatively large proportions of urban household heads were involved in government employment, trade and service activities. Various characteristics of the household heads are shown in Table 12.5.

Section 12.2 of this chapter reports on the shares of household budget allocated to non-food and food consumption, while Section 12.3 discusses the non-food and food consumption habits of surveyed households. Section 12.4 analyzes the nutritional aspects of household food consumption levels. Section 12.5 outlines factors that affect the demand for livestock products and Section 12.6 develops an LA-AIDS model of livestock product demand. Finally, Section 12.7 concludes the chapter.

12.2 Budget Shares

Total expenditure and the level of expenditure on non-food items, food items and livestock food items is greater in Ho Chi Minh City than Ha Noi, greater for urban than suburban residents and increases as income levels increase.

In both Ha Noi and Ho Chi Minh City, non-food expenditure accounted for around 50 percent of total monthly expenditure. Non-livestock food product expenditure accounted for around 28 percent of monthly expenditure and livestock product expenditure averaged around 22 percent of expenditure in both Ha Noi and Ho Chi Minh City.

The proportion of monthly expenditure allocated to food consumption decreases as household income levels increase. This effect is more pronounced amongst the sampled households in Ha Noi than those in Ho Chi Minh City. In Ha Noi, the proportion of household income allocated to livestock product consumption increases as the household income level increases. However, in Ho Chi Minh City the proportion of income allocated to livestock product consumption decreases as household income levels increase. This is shown in Table 12.6.

Urban households in both Ha Noi and Ho Chi Minh City allocated lower proportions of household income to food expenditure than suburban households in either region. Table 12.8 shows that was little difference in the proportion of expenditure on livestock products between urban and suburban residents of Ho Chi Minh City. In Ha Noi however, urban residents allocated a significantly larger proportion of monthly expenditure to livestock product consumption than suburban residents.

12.3 Consumption Habits

12.3.1 Non-Food Items

Expenditure on non-food items by households increases as household income levels increase and is higher amongst households in Ho Chi Minh City than Ha Noi and also is higher amongst urban households than suburban households.

The largest proportion of household non-food expenditure amongst surveyed households was allocated to utilities (26 percent) , followed by education (21 percent). There is no significant difference in this consumption pattern between households in both Ha Noi and Ho Chi Minh City. Consumption patterns are also similar between urban and suburban residents in both regions. The proportion of non-food item expenditure allocated to various consumption types are consistent between the three household income levels. This is shown in Tables 12.10 to 12.12.

12.3.2 Non-Livestock Food Items

The level of expenditure on all non-livestock food items (except sugar) increases as income levels increase. Households in Ho Chi Minh City have a higher expenditure level for all non-livestock food commodities than households in Ha Noi. Urban households spend a higher amount on all non-livestock food commodities than suburban households, with the exception of rice. (Table 12.13- Table 12.15)

As Table 12.13 shows, the largest single item of major non-livestock food product purchases is rice, which accounts for an average of 38.6 percent of non-livestock food expenditure. This is the case for households in both Ha Noi and Ho Chi Minh City. However, the second largest expenditure item in Ha Noi is vegetables, while in Ho Chi Minh City it is fish.

The proportion of non-livestock food items accounted for by rice is significantly less for urban households than suburban households. Urban households allocate a higher proportion of expenditure to all other non-livestock food items than suburban households. (Table 12.14) The proportion of non-livestock food expenditure allocated to rice decreases as household income levels increase, as does the proportion of expenditure allocated to vegetables, fish and sugar. As income levels increase, the proportion of expenditure allocated to other non-livestock food products decreases. (Table 12.15)

12.3.3 Livestock Products

The largest share of livestock product expenditure by households is allocated to the purchase of fresh products, including fresh pork (41.25 percent), fresh chicken (16.28 percent) and fresh beef (12.03 percent). This dominant share of fresh meat products in livestock product expenditure is

consistent between Ha Noi and Ho Chi Minh City and also between urban and suburban households and across income levels.

The proportionate expenditure of Ho Chi Minh City and Ha Noi households on fresh pork is similar, but Ho Chi Minh City households allocate a smaller proportion of livestock product expenditure to fresh chicken and a higher proportion to fresh beef consumption. (Table 12.16) Urban households allocate smaller proportions of expenditure to fresh pork and fresh chicken consumption than suburban households in both Ha Noi and Ho Chi Minh City. The proportion of expenditure allocated to processed meat product and beef consumption is greater for urban households than for suburban households. (Table 12.17)

Table 12.18 shows that as income levels increase, the proportion of expenditure allocated to fresh pork and chicken declines, while the proportion of expenditure on processed meat products, fresh beef and milk and dairy products increases.

12.3.4 Meal Consumption

Household heads consumed an average of over 4 meals per week outside the home. The most common meal eaten outside the home is breakfast, an average of more than 3 times per week. The least common meal eaten outside the home is dinner. As shown in Table 12.19, household heads in Ho Chi Minh City eat breakfast, lunch and dinner more frequently outside the home than do their counterparts in Ha Noi.

Suburban household heads eat all meals less frequently outside the home than urban household heads. (Table 12.20) As household incomes increase, the numbers of breakfasts and lunches eaten by the household head increase, while the numbers of dinners eaten outside the home decrease slightly (Table 12.21).

The average cost of all meals is higher in Ho Chi Minh City than in Ha Noi. Urban households also pay higher prices for meals eaten outside the home than suburban households. As household income levels increase, the price paid for meals eaten outside the home also increases. This is particularly evident in the case of dinner, with an average expenditure of almost Đ12,000 for rich households compared to Đ6,400 for medium income households. (Table 12.22 – Table 12.24)

12.4 Nutrition

Households consume an average of over 123 kilograms of non-livestock food products per month. The major items consumed are rice (59.81 kg per month), vegetables (29.95 kg) and fruit (11.74 kg). Households in Ho Chi Minh City consume more of all non-livestock food types than households in Ha Noi, with the exception of vegetables, where there was no significant difference in consumption levels between the two regions. As Table 12.25 shows, the average monthly non-livestock food consumption level in Ho Chi Minh City is 140.43kg compared to 103.41kg in Ha Noi.

Households in suburban areas consumed a greater total amount of non-livestock food products than households in urban areas. This is because suburban household consumption of rice (84.11 kg/month) is more than double the urban consumption level (38.23 kg). The consumption of all

other non-livestock food products does not show a significant difference between urban and suburban households. (Table 12.26)

Household non-livestock food consumption levels increase as household incomes rise. High income households consume an average of 138.11 kilograms of non-livestock food products per month, while low income households consume an average of 104.17 kilograms per month. Consumption of all non-livestock food types increases with income levels, except bread, biscuits, cakes and vegetables, where there was no significant difference in consumption levels between the income groups. (Table 12.27)

Households consume an average of almost 40 kilograms of livestock food products per month. Of this, an average of 20.11 kilograms is accounted for by meat and meat products. Fresh meat consumed inside the home accounted for 11.71 kilograms per month. The major items consumed are fresh pork, fresh chicken, fresh beef, fresh eggs and fresh milk. As shown in Table 12.28, households in Ho Chi Minh City consume more of all livestock food types per month than households in Ha Noi, with the exception of fresh chicken and eggs and beef consumed outside the home, where the level of consumption by Ha Noi households was greater than that of households in Ho Chi Minh City. The average household monthly livestock food consumption level in Ho Chi Minh City is 42.14kg compared to 31.48kg in Ha Noi.

Households in urban areas consumed a greater total amount of livestock food products than households in suburban areas (Table 12.29). Consumption levels for almost all commodities are not significantly different between urban and suburban households, with the exception of fresh

beef and fresh milk. In the case of fresh milk the average urban household consumption level (13.05 kg) is substantially greater than the suburban level (5.66kg).

Household livestock food consumption levels increase as household incomes rise. High income households consume an average of 43.07 kilograms of livestock food products per month, medium income households consume an average of 37.77 kilograms per month and low income households consume an average of 29.92 kilograms per month. As summarized in Table 12.30, consumption of all livestock food types increases with income levels except dairy products, where there was no significant difference in consumption levels between the income groups.

Table 12.31 summarizes the figures for per capita annual consumption of major meat products derived from the household survey data. Per capita consumption of all products increases as household income levels increase. Slightly larger average household sizes in Ho Chi Minh City relative to Hanoi mean that per capita annual consumption of some meat products is slightly higher in Ha Noi than Ho Chi Minh City despite the fact that average income levels in Ho Chi Minh City are greater than Ha Noi. Fresh meat products make up around two thirds on annual per capita consumption of meat products for all income groups in both Ha Noi and Ho Chi Minh City.

12.5 Demand Parameters

The demand for livestock products by households is dependant on many factors. These include the price of the product, income of the household, price of other livestock commodities, location of household, non-income wealth of the family, access to products and other demographic

characteristics. These characteristics not only influence the quantity of livestock products consumed, but also influence the quality of products and the type of livestock product consumed.

12.5.1 Prices of Livestock Products

The average prices of livestock products vary between Đ10,250 per kilogram for pork fat and Đ75,500 per kilogram for dried beef. The price for processed products is higher than the price of the equivalent fresh products. Of the fresh meats, pork bones and fat are the least expensive, duck, chicken and lean pork are similarly priced at almost Đ30,000 per kilogram and beef and buffalo meat are the most expensive, at more than Đ30,000 per kilogram. This is shown in Table 12.32.

Prices of almost all fresh meat products are higher in Ho Chi Minh City than in Ha Noi. The exceptions to this are pork fat and mixed pork products. Prices of most processed products are also higher in Ho Chi Minh City than in Ha Noi, with the exception of roasted and broiled chickens and ducks which are more expensive in Ha Noi.

The average price of all livestock food products was higher in urban areas than in suburban areas, except mixed pork, whole fresh duck and beef spam, which were higher priced in suburban areas.(Table 12.33) Table 12.34 shows that the prices paid by consumers for almost all livestock food products increased as income levels increased. This could indicate that high income consumers are purchasing higher quality products or that retailers are practicing price discrimination.

12.5.2 Household Wealth

The average total household current asset value is Đ330.933 million. The average current asset value of urban households is higher than the average, at Đ370.559 million, while that of suburban households is lower than the average, at Đ286.823 million. As expected, total current asset value of the household increases as the income level of the household increases. The average current asset value for medium income households is over three times the asset value of low income households. The current asset value of high income households is more than three times that of medium income households.

Average asset values of households in Ho Chi Minh City are greater than those in Ha Noi. However, amongst urban households, those from Ha Noi have a greater current asset value than those from Ho Chi Minh City. In contrast, suburban households in Ho Chi Minh City have an average current asset value almost six times greater than the Ha Noi counterparts. The average current asset value of low income households in Ha Noi is greater than that of low income Ho Chi Minh City households. For medium and high income households, the average value of current assets of Ho Chi Minh City households is greater than that of Ha Noi households. (Table 12.35)

12.5.3 Access to Meat Products

More than 95 percent of households indicated that they did the majority of their shopping for meat products in the main local market. This shopping pattern was consistent between households in Ha Noi and Ho Chi Minh City, urban and suburban households and across all three income groupings. (Table 12.36 – Table 12.38)

Household members traveled an average distance of 762.86 meters to purchase meat products. Households from Ho Chi Minh City had to travel a longer average distance (883.52 meters) than those from Ha Noi (586.81 meters). Urban households in both Ha Noi and Ho Chi Minh City had to travel a substantially shorter distance to purchase meat products than suburban consumers. (Table 12.39)

Whilst the distance traveled by Ho Chi Minh City households to purchase meats was less than that of Ha Noi households, the average time taken to purchase meat products by Ho Chi Minh City households was significantly less than that of Ha Noi households, across locational groups and income groups. This implies that although Ha Noi consumers have easier access to markets, the availability of suitable meat products at those markets may be less than that in Ho Chi Minh City. As income levels increase in both Ho Chi Minh City and Ha Noi, the time taken to purchase meat products increases. (Table 12.40) This implies that in both regions, the availability of suitable meat products for higher income consumers may be less than that for lower income consumers.

12.6 A Linear-Approximate Almost Ideal Demand System Model of Meat Demand

In order to estimate elasticities of demand for meat by consumers in Viet Nam a linear-approximate almost ideal demand system (LA-AIDS) model will be developed. This model is based on the AIDS model developed by Deaton and Muellbauer (1980) with a linear approximation of the non-linear price index being utilized for computational simplicity. Expenditure, own-price and cross-price elasticities of demand will be estimated using the equations specified by Green and Alston (1980). The LA-AIDS model satisfies the axioms of

choice exactly, aggregates individual demands to market demands and does not impose additive preferences (Cai et al, 1998). This type of model is useful for deriving elasticity estimates from cross-sectional data.

The model expresses demand for meat products in terms of budget share. Budget share is defined as a function of price levels and real expenditure on the product group.

(12.1) $w_{im} = a_i + \sum_i g_{ij} \log p_i + b_i \log(Y_m / P)$

Where:

Wim is the budget share of the ith commodity (pork, chicken or beef) for income group m (low, middle or high income).

Pi are prices of commodities

Ym is total expenditure for all commodities in the product group by income group

P is the index of prices of the commodities.

P is a function of commodity prices.

(12.2) $\log P = a_i + \sum_i a_i \log p_i + \frac{1}{2} \sum_i \sum_j g_{ij} \log p_i \log p_j$

This price index introduces non-linearity into the model. The LA-AIDS model introduces an approximation of the price index as suggested by Stone (1953).

(12.3) $\log P' = \sum_i w_i \log p_i$

P' is used in place of P in estimating the LA-AIDS model. The model is estimated for all households and for three income groups and three commodities using Zellner's Iterative Seemingly Unrelated Regression procedure. As the system is expressed as a budget share, one equation (beef demand) is omitted from each income group estimation. The estimated parameters for beef demand can be recovered by additive procedure from the estimated parameters for pork and chicken. Therefore eight equations are estimated consisting of two commodities for each of all households, low income, middle income and high income groups.

The parameter estimates from the LA-AIDS model can be used to derive elasticity estimates using the procedure outlined by Green and Alston (1990).

(12.4) (expenditure elasticity) $\eta_e = 1 + \frac{\beta_1}{w_1}$

(12.5) (own-price elasticity) $\varepsilon_{ii} = -1 + \frac{\gamma_{ii}}{w_i} - \beta_1$

(12.6) (cross-price elasticity) $\varepsilon_{ij} = \frac{\gamma_{ij}}{w_i} - \beta_1 * \frac{w_j}{w_i}$

Where the wi and wj terms are aggregate expenditure weights for all households within an income group.

Parameter estimates for the entire sample and for each income grouping were obtained using the Zellner's Iterative Seemingly Unrelated Regression technique and are presented in the table below. For each income category, pork and chicken equations were estimated and parameters for

beef demand were retrieved using the adding up conditions. These parameter estimates are shown in Table 12.41.

Table 12.42 shows the expenditure and own-price elasticity estimates estimated using equations (12.4) and (12.5) for the entire sample and low, medium and high income households. Cross Price elasticities between various meat types are shown in Table 12.43.

12.7 Conclusion

Fresh livestock products, including fresh pork, fresh chicken and fresh beef make up the majority of expenditure on livestock food products for households in all income groups, locations and regions. Fresh livestock products account for an average of around 80 percent of household expenditure on livestock food products. Households in Ho Chi Minh City, high income households and urban households consume the highest average annual quantities of livestock food products. While this is case at the current relatively low average income levels in Viet Nam, it is highly likely that as income levels increase in the future, the proportion of expenditure dedicated to fresh products will decline and the relative expenditure on preserved and processed meat products will increase. This can easily be seen in an analysis of the current survey data, which show that higher income households allocate a relatively lower proportion expenditure to fresh pork and chicken consumption, and a relatively higher proportion of expenditure on processed meat products, fresh beef and milk and dairy products.

All the expenditure elasticities calculated using the LA-AIDS model have a positive sign as expected, implying that as incomes increase for all groups, consumption of all three meat

products will increase. Expenditure elasticities for each meat product are reasonably similar for all income groups. This suggests that as incomes rise, meat purchases will rise at similar rates for all consumers. Expenditure elasticities for chicken are close to or over 1 for all income groups, implying that (of the meats examined) chicken could be considered to be the closest to being a luxury good. The expenditure elasticity for beef is higher for high income households than for medium or low income households. This is reasonable given the relatively high price of beef compared to chicken or pork.

The own price elasticities for the various meat products all have the expected signs. All are negative in line with economic theory. There is a lot of variability between the elasticity levels for different income levels and commodities. Elasticity levels for beef are substantially higher than for pork or chicken and are greater than one for all income groups. This implies that demand for beef in Viet Nam is highly price elastic.

CHAPTER 13
STRATEGY AND POLICY OPTIONS

13.1 Introduction

The objective of this chapter is to provide a discussion of a strategy for development of the livestock sector in Viet Nam and an analysis of alternative policy options for implementing the strategy. The discussion relies heavily on the empirical evidence presented in the previous chapters and will combine analytical methods with insights gained by time series and historical evidence.

The chapter is organized into six main sections, including this introduction. Section 2 discusses the future challenges facing the livestock sector. Section 3 proposes a strategy for the development of the sector. Section 4 presents several policy recommendations, based on the analysis of constraints in the previous chapters. Section 5 gives policy priorities over the short, medium, and long run. The section uses a model of the livestock sector to assess the relative priorities of various breeding, marketing, feeding, and animal health and veterinary services interventions. Section 6 concludes the chapter.

13.2 Future Challenges

Looking at the past performance of the livestock sector in Viet Nam, there is a natural tendency toward complacency. The sector growth performance has been relatively good, with little policy distortions, a strong presence of the private sector in production, distribution and input supplies, and a sustained domestic demand. When looking at the future, one could easily think that nothing much should be done by the government. The past suggests that a minimum role of the state in the sector is not inconsistent with growth.

That view is correct, if the role of the government is thought of in terms of intervention in commercial activities. These activities are best if left to the private sector, with the government focusing on the provision of public goods that are undersupplied by the private sector. However, one could also easily point to several issues that, if left unresolved, risk creating serious problems to the sector in terms of three main dimensions, namely sustainability, acceleration, and participation of growth. These three dimensions are the three main challenges for the future. They can be formulated as three questions.

Challenge #1: Can past growth of the livestock sector be sustained in the future?

The past growth of the livestock sector has been mainly the result of herd size increase and improvement in offtakes (measured as liveweight divided by herd size) due to better breeds and feeding practices. The herd size effect has been stronger than the productivity effect. There is not enough evidence to show that the animal health situation has improved during this period. At the same time, there is plenty of evidence that shows that hygiene and sanitary conditions in slaughterhouses, food processing and food distribution are quite poor. Food borne diseases might be on the rise as bigger quantities of meat are in the distribution system without complying with the necessary sanitary and public health standards. As urban demand for meat has increased, the production and processing of meat in urban and peri-urban areas has also increased, but without a parallel increase in health and sanitary requirements. As a result, environmental pollution of urban sewage systems through wastes and residues of animal production and animal product processing is reaching critical conditions.

In the next 10 years, if past rates of growth in liveweight are sustained, the stress on an already weak system will be intensified, as liveweight volumes will double from the current 1.8 million

tons to 3.6 million tons. Several regulatory policies related to production, slaughtering, and processing of animal products will have to be set in place and enforced, the alternative being the rising of widespread animal disease and the negative effects on human health through contaminated water, food borne diseases, and animal transmitted diseases.

Challenge #2: Can current growth of the livestock sector be accelerated in the future?

Over the past 10 years, total liveweight grew at 6.6 percent while total GDP grew at 7.7 percent. Recent estimates of income elasticity of demand for meat in Viet Nam (as in many other countries at similar level of income) suggest a value of about 1, implying that more than 1 percent additional growth in potential meat demand might have been lost on average over the past 10 years.

The missed potential of increasing growth of the livestock sector is particularly worrisome since it is not due to lack of demand, but rather to lack of the necessary productivity and marketing improvements necessary to meet this demand.

On the productivity side, breed improvement could have been faster if a better breeding system was in place and appropriate investments in research and extension were made. On the marketing side, the lack of an organized system of markets for livestock has reduced the flow of information between consumers and producers and, at the same time, reduced the power of producers vis à vis other participants in the marketing chain. High marketing margins have thus penalized both producers and consumers, with negative effects on aggregate and sector income.

The acceleration of growth of the livestock sector is not just a desirable outcome for the future. It is also an important need in an agricultural system and rural economy where other sources of

growth are becoming less important. While in the past most of the growth of agriculture in Viet Nam has been due to crops and, within crops, to rice, this is not going to be the case in the future, as rice demand growth will lower considerably and similar outcome will affect even high value commodities like coffee. There are two main reasons that explain why rice demand growth will lower considerably in the future. First, domestic demand will be slow, at a rate not much different from population growth that is around 1.8-2.0 percent. Second, demand for export will be limited by a slow growth of world trade for rice and the fact that Viet Nam has already reached a very large market share in the world market. Differently from rice and other similar exportable commodities, livestock growth could rely upon a strong domestic demand. Therefore, the acceleration of growth of livestock sector might be necessary just to avoid current growth of agriculture to reduce.

Challenge #3: Can growth in the livestock sector be participated by the poor?

Appropriate policies might resolve the two first challenges above, namely the sustainability and acceleration of growth. The third challenge, however, is even more difficult than the previous two. As the livestock sector develops, there is no guarantee that it will benefit the poorest segments of the rural population. The development of the sector requires the commercialization of the livestock production system, including improved genetic material, better feeding, adequate animal health and veterinary services. In all these activities there is a strong bias of the service providers, both in the private and public sector, to target the richest and largest producers first. This targeting is not appropriate from a social point of view. The question is whether or not this targeting makes sense from an economic point of view.

In the case of the feed industry, there is strong survey data evidence of economies of scale. The largest mills do better in terms of quality of products, efficiency of operations, and higher profits

than their smaller counterparts. Even in the case of slaughtering and processing industry there is some evidence of economies of scale. If the same situation of economies of scale occurs in livestock production, then the case for targeting the small scale or poor producers is rather weak. If economies of scale in production occur, then, from an economic point of view, it would be better to promote the growth of the large producers.

If livestock production exhibits economies of scale, then the opportunity for small livestock producers to benefit from increasing growth is limited, as there will be a tendency for consolidation and investment in large commercial operations. However, if there are no economies of scale (or, on the contrary, there are diseconomies of scale) there is a scope for small producers to be involved in commercial production. Moreover, their involvement is not only justified by social equity considerations, but also in terms of economic efficiency. An active support of the small producers will improve the income of the sector. Of course, to be either small or large does not guarantee that economic opportunities will be taken. In the case of small producers, once they have the necessary information, market access, and credit, then their being small is not an impediment to obtaining higher profits ratios than their largest colleagues.

This study shows a lack of evidence for increasing returns to scale. In the case of poultry, there seems to be evidence of decreasing returns to scale. In the case of pig, increasing returns to scale take place only at very low scales of production, suggesting that very low scales of production are not efficient. However, for most of production scales in pig production, there also seem to be decreasing returns. This evidence suggests that a set of measures that help the small scale producers to have access to technology, markets, and credit seems warranted both on social ground and on economic terms. By pursuing this broad-based growth strategy, the overall sector might benefit more than just by promoting the large producers.

The absence of scale economies in livestock production does not mean that only one type of scale is optimal. Optimal scale depends on many different factors related to local conditions of infrastructure, marketing, access to technology, and environmental conditions. The industry might in fact benefit from different scales of production, as they are suitable to different local conditions. As the conditions change over time, the optimal scale of production changes. The important point here is that both small and large specialized and commercial producers can contribute to growth and efficiency of the sector. State organizations will then be wrong to target only large-scale producers. Given the greater constraints facing small producers, the higher benefit of government targeting would occur if small producers were the focus of the interventions.

Of course, there is another angle to the issue of growth participation. This other angle refers to the integration of the activities of small-scale producers with large feed mills, breeding operations, and large processors. In the long term, it is this integration that might guarantee access to even higher value products both in domestic and international markets than currently is the case. So far, very little contract arrangements are practiced in Viet Nam agriculture. The problem seems to be mainly with the lack of knowledge and availability of these contracts in various parts of Viet Nam. As the sector develops and more information is made available, then this type of arrangements is also likely to become more common.

13.3 Strategy for livestock sector

The overall goal of livestock development can be expressed as follows.

Livestock Development Strategy Goal

To accelerate growth of the value added generated by the livestock sector through sustainable improvements in productivity, quality, and health of animals and livestock products, and participation of growth by the largest number of producers in order to meet the requirements of an increasing domestic demand.

In particular, the strategy should be appropriate to address the three main challenges for the future, namely sustainability, acceleration, and participation of growth. In order to achieve sustainability of growth, a number of regulations of the livestock production and slaughtering, animal products processing, and distribution should be set in place to minimize the risk of disease and environmental problems associated to growth of the livestock sector.

In order to accelerate growth, measures at increasing productivity and improving marketing will be required to move the livestock sector on a new path growth that is based on intensive use of modern science and technology and adherence to the market economy.

In order to ensure maximum participation in growth, appropriate institutions should be designed and made effective to ensure that the growth benefits are shared among the largest number of producers and consumers, and particularly among those who are most disadvantaged.

The government's key role should be in providing services that would otherwise be undersupplied by the private sector. If the private sector can undertake an activity profitably and without affecting public health and the environment negatively, it should be allowed to do so without state intervention. Development of the sector will depend upon a liberalized market,

supported by appropriate institutions, and regulated by laws to protect animal and consumer health.

In order to achieve this goal, the livestock sector strategy advocated in this study consists in:

- Ensuring a regulatory framework and implementation capacity for the production of healthy livestock and livestock products and for dealing with environmental problems related to commercial livestock production.
- Creating a competitive market environment in which farmers will increase investment in ways to improve productivity in the livestock sector and both private and public sector will supply services and medicines, livestock feed, and improved breeds.
- Providing sufficient funding for the conduct of relevant livestock research and effective information dissemination with participation of stakeholders and integration of livestock with farming systems.
- Building participatory institutions of collective action for small-scale producers that allow them to be vertically integrated with input suppliers and livestock processors, market their products efficiently, and provide an effective feedback to state-funded initiatives such as breeding programs, extension activities, and investment and credit plans.
- Providing transitional support to address areas of market failure in the sector, such as those related to the reorganization of the breeding system, the lack of organized markets, and the establishment of standards.

A key feature of this strategy is that it is tailored to improve the capacity of the system to meet domestic demand by improving the marketing, health, and environmental aspects associated with the livestock sector. As such, the strategy does not pursue an active export orientation. This is not

to deny that exports in the medium or long term might be an important aspect of growth in the sector. However, exports have not been a major source of growth in the past and are not likely to be so in the short to medium term mainly because of lack of competitiveness and lack of meat of adequate quality and sanitary conditions acceptable in international markets.

International markets for pork and poultry have grown over the past few decades at rates that are comparable to the growth of domestic demand in Viet Nam. However, over the past decade, the growth of the international market for pork meat has been negative both in volume and in value (see table 13.1). Even if Viet Nam were able to export non-marginal quantities of meat, it would be a very risky strategy in the medium term. Over the past ten years, exports of meat from Viet Nam have been negligible and quite unstable (see table 13.2). Once Viet Nam lost its government-to-government trade relations with the Soviet Bloc, very little commercial export have taken place partly because of lack of competitiveness, and partly because of lack of adequate quality and sanitary standards. Exports have been erratic and hardly could be the basis for an export strategy. Before Viet Nam could seriously consider meat exports as a viable option, several improvements on the domestic markets have to be done. Until then, if some exporters from Viet Nam can successfully export, this is a positive movement that needs to be appreciated. However, there is no reason to support a strategy for export promotion using subsidies or other incentives, given that the contribution to overall GDP of the sector and the majority of the producers would be negligible and not stable.

Fortunately, the lack of an export orientation of this strategy for the medium term should not be seen as an impediment to growth. Differently from crops, the domestic demand for animal products is very sustained and its growth is likely to continue as long as the overall income of the country grows. Together with the increasing income, there are other two reasons why the growth in domestic demand for meat is expected to be robust. On one side, Viet Nam is becoming

increasingly urbanized and that movement will be accompanied by a changed diet pattern away from staples towards higher-value foods such as meat and animal products. Second, the next decade is expected to contribute to increasing income growth in rural areas of Viet Nam relatively to the previous decade, as a consequence of reduced poverty and a more active overall socioeconomic development strategy of the Government of Viet Nam. That will imply a tremendous change in meat demand stimulated by higher income growth in rural areas compared to the previous decade.

Therefore, the priorities for development of the sector should take into account a rapidly growing and huge domestic market rather than a slow growing and small export market. By improving the conditions of domestic market, the strategy will also set the conditions for access to international markets in the long-term and ensure a more broad-based growth of the sector.

13.4 Policy Recommendations

This section provides a set of policy recommendations consistent with the strategy described above. The policies are organized into a matrix framework (see table 13.3). The columns of the matrix represent the elements of the strategy, namely regulation, competitive environment, science and technology institutions, participatory institutions, and transitional support to address market failure. The rows represent different set of policies related to breeding, marketing, animal health and veterinary services, and feed and animal nutrition. For each set of policies, the following text provides the key facts, the key issues, the proposed solutions, and the discussion of the role of the state.

Policies related to Breeding

Breeding: The Facts

- Overall genetic improvement is slow.
- There is lack of overall organization that is responsible for coordination of livestock production, including coordination of breeding centers (both public and private) at different levels (central, provincial, and district).
- Quality of breeding stock varies enormously by center. Producers cannot rely upon a system of breeding stock quality inspection.
- Small farmer needs for improved breeds are not adequately addressed.
- Breeding centers seem to address mainly the needs of commercial farmers, thus specializing in the breeding of exotic stock or stock with very high percentage of exotic blood that only a very small percentage of producers demand.
- Current breeding centers are involved in both breeding and commercial operations. They often sell high quality breeding stock as commercial stock.
- In spite of subsidies many centers seem to be making losses.
- Private and foreign breeding centers are on the rise.
- There are too few and not adequately resourced AI centers. For example, there is not at least one AI in each district of Viet Nam.
- By law, any organization could import breeding stock (subject to certain technical requirements) but there is lack of transparency.

Breeding: The Issues

- How could the current breeding system be transformed into a system that accelerates the adoption of improved breeds by the majority of producers in Viet Nam thus contributing to increase in productivity?
- Is the maintenance of exotic pure lines, GGP, GP, and PS a public good that needs to be funded by the state?
- What is the main role of the state in the breeding system?

Breeding: The Proposed Solutions

- Establish an overall coordination unit for livestock production in Viet Nam, possibly in the form of a Department of Livestock Production at MARD. The Department could take a leading role in regulation, monitoring, inspection, coordination for the livestock sector, leaving other organizations to focus on their main mandates (for example extension or research).
- Review roles, activities, and performance of breeding centers in Viet Nam, both state, private, and foreign.
- Establish a National Breed Improvement Board for each species to coordinate and oversee a national strategy for breed improvement and exotic breed introduction. The Board would consist of representatives of all main breeding centers (both state and private), representatives of research centers, representatives from private sector (including feed and processing industry) and farmers, and representatives for animal health department and veterinarian profession.
- Establish a system of certification and inspection of breeding stock obtained by different centers. The system should allow a grading system of breeds that could be used to assess

performance of the centers. The grading system and the periodic evaluation of centers should be made available to all communes in Viet Nam.

- Reorganize the state breeding centers, classifying into three categories: those that are making profit most of the time, those that are making losses most of the times, and those that are commercially viable but sometimes making losses and sometimes making profit. Equitize the ones that are making profit most of the time. Of the remaining centers, give the option of equitization, closure, or consolidation into three main state centers in the north, center, and south.
- The three main state centers should be at the apex of the breeding pyramid, focusing entirely on breeding activities of GGP and GP. Their main clients will be breeding centers (state and private) producing GP and PS. The second tier breeding centers will then sell to AI centers, lower tier breeding centers, and commercial farmers.
- In order to facilitate the reorganization of the system, medium-term commercial credit (5 years) might be targeted to the breeding system. No subsidies should be given. As the quality of the breeds produced by system improves, as the demand for improved breeds increases, prices of breeds should also adjust to cover costs. If the maintenance of pure lines results into loss making operations, then more appropriate lines should be selected and bred by the centers. There is no reason to subsidize exotic lines that are demanded by producers.
- Considerable increase in support to research centers breeding activities should be considered in order to test new breeds and cross-breeds appropriate to the improvement of the genetic pool in Viet Nam.
- Considerable improvement in the system of AI centers should be attained by investment in creating a system of AI centers in almost each district of Viet Nam with adequate facilities, equipment, and trained staff. After initial investment in AI centers, targeted

credit at commercial terms should be made available to the centers for the medium term (5 years). During and after this period no subsidies or other types of support should be considered.

- Considerable increase in support to extension activities that disseminate information about new breeds, feeding practices, and animal health requirements.

Breeding: The Role of the State

- To provide coordination role among different stakeholders involved in breeding
- Facilitate inspection system and dissemination of evaluation process
- Investment in research and extension
- Initial investment in AI centers and phasing-out targeted credit on commercial basis.
- Facilitate restructuring of breeding system into breeding pyramid able to produce improved breeds needed by the majority of the producers.
- Provide commercial credit to breeding centers (private and public)
- It is not the role of the state to subsidize the maintenance of exotic breeds in state breeding centers. As the initial investments in facilities and also animal stock in state breeding centers has already been done, the current priority is to reorganize the system to improve its performance, creating a demand through AI centers, and provide commercial medium-term credit.

Policies Related to Marketing

Marketing: The Facts

- Highly variable prices and marketing margins among different regions and within each region.

- Producers selling at farm gate with limited market information
- Meat mostly consumed as fresh meat and lack of cold storage chain.
- Increasing consumption of processed meat in urban areas.
- Increasing preference for lean meat in urban areas.
- Poor conditions of processing/slaughtering units.

Marketing: The Issues

- How to reduce marketing margins to reflect marketing costs rather than market imperfections?
- How to ensure that information flows smoothly from consumers to producers?
- How to promote the development of a marketing system that could meet the demands of a higher-income population?

Marketing: The Proposed Solutions

- Promote the establishment of provincial and district livestock market places.
- Establish a livestock and animal products market information system to be publicly available at commune level.
- Implement market promotion for animal products.
- Expand commercial credit to marketers and processors of animal products.
- Establish system of meat grading and standards.

Marketing: The Role of the State

- Investment in market places
- Collection, dissemination of market information
- Grades, standards, and inspection

Animal Health and Veterinary Services

Animal Health and Veterinary Services: The Facts

- Lack of information about animal disease.
- Low vaccination rates and high animal mortality.
- Low effectiveness of vaccines, drugs, and treatment.
- Low level of training of animal health providers at commune level.
- Low number of qualified professionals at district level in relation to animal population.
- Poor facilities for diagnostics and treatment.
- Weak inspection system for animal disease, processing facilities, meat transportation and storage, market places.

Animal Health and Veterinary Services: The Issues

- How to improve animal health so to ensure sustainability of growth?
- How to improve veterinary services to meet demands of an increasingly commercialized production system?
- How to regulate the livestock sector to improve health without slowing down growth?

Animal Health and Veterinary Services: The Solutions

- Improve monitoring of animal diseases and assessment of economically important ones.
- Improve staff capacity and facilities of diagnostic centers.
- Strengthen reporting system from commune to higher levels.
- Promote formation of private veterinarian profession regulated by professional association under control of DAH.
- Zoning regulations for slaughterhouses and meat processing facilities.

- Establish strict health inspection systems at slaughterhouses.

Animal Health and Veterinary Services: The Role of the State

- Regulatory
- Capacity Building
- Information provider
- Surveillance

Policy Recommendations for Feed and Animal Nutrition

Feed and Animal Nutrition: The Facts

- High prices of feed.
- Moderate import duties.
- Absence of quality inspection.
- High importation of protein feed and ingredients.
- Industry dominated by private and foreign sector.
- Economies of scale in the industry.
- Rapid growth of investment and production of commercial feed.
- Low productivity of raw materials.

Feed and Animal Nutrition: The Issues

- How to reduce the cost of feed in total cost of production?
- How to improve access of high quality feed to majority of producers?

Feed and Animal Nutrition: The Solutions

- Eliminate tariff rates on raw materials and ingredients used in the production of high quality commercial feed.
- Improve the performance of the seed multiplication system in order to achieve rapid growth in productivity of feed grains.
- Further liberalize hybrid seed distribution in order to increase farmer access to high quality hybrid maize seeds.
- Support research programs to develop high yielding varieties for maize and high protein raw materials used in feed production.
- In partnership with the private feed industry, establish a 'truth in labeling' program for animal feed and monitor compliance with an effective testing and inspection system.
- Provide support to research and extension of improved animal nutrition management methods appropriate to the needs and conditions of small size producers.

Feed and Animal Nutrition: The Role of the State

- Trade and marketing policy liberalization
- Support to research and extension
- Regulatory role in seed system
- Regulatory role in feed quality

13.5 Policy Priorities

The set of policies mentioned in the previous section is consistent with the objectives and content of the strategy for development of the livestock sector. However, further policy analysis of these policies is necessary in order to identify the priorities among these policies. Priorities will be

based upon the expected effects of alternative policies on indicators such as income, prices, trade, production, and consumption.

To this purpose, we have built a model to study alternative policy options for the development of the livestock sector. The specification of the model is contained in the appendix to this chapter. It should be made clear since the outset that specification of the model relies upon several assumptions related to various parameters and functional forms that require further study and probing. Nevertheless, the model can provide some useful insights to the issue of establishing priorities among alternative set of policies.

Policy options

The model studies three policy options related to the set of policies on breeding, marketing, and feed and animal nutrition mentioned in the previous section. The model is not used to study the effects of improvement in health and veterinary services. The analysis in chapter 9 shows the high cost of animal mortality. Moreover, it also shows the benefit-cost ratio for disease eradication interventions. The analysis of chapter 9 did not show the cost of animal morbidity nor the cost of food borne disease and animal-transmitted disease. In all these cases, the costs might be even higher than the animal mortality cost alone. Even though a detailed analysis of these costs is not possible at this moment given the lack of reliable data on these aspects of livestock sector in Viet Nam, the experience of other countries suggests that these costs are going to be increasingly high in the years to come, as Viet Nam livestock sector develops and meat consumption increases beyond its current low levels.

The first policy option is related to breeding. We simulate the effects of a set of interventions such as those described in the previous section that could lead to an improvement in the genetic pool of the animal stock of Viet Nam. The improvement considered in this simulation is of a 20

percent productivity increase in offtakes. To put the simulation in perspective we should note that during the 1990s the average increase in offtakes for pig was about 2 percent per year. The 20 percent increase envisaged here could be the result of improved organization in the breeding system, investment in research and extension, investment in AI centers etc. that should take place in much less than a decade. Improvement in breeding will also necessarily be accompanied by improvement in feeding and animal nutrition, reflected partly in a better feed conversion ratio. The simulation assumes an improvement in feed conversion ratios of 10 percent.

The second policy option is related to marketing. We simulate the effects of a set of interventions such as those described in the previous section that is expected to lead to lower marketing margins. The marketing margins simulated in this option are lowered by 20 percent. For example, the baseline for marketing margins for pork meat is assumed to be 15 percent of retail price. The simulation in this case would consider the effects of reducing the margins to 12 percent. This reduction in margin could be achieved through better market information, market places, and credit to marketing agents.

The third policy option is related to feed and animal nutrition. We simulate the effect of eliminating tariffs on imported feed and of increasing yield of feed crops (other than rice) by 50 percent. Given the low level of yield in all feedcrops other than rice, this case is not farfetched. Good research in new seeds and planting materials and adequate dissemination could produce the increase in yield envisaged here.

Results of simulations

The aggregate results of the three policy simulations are reported in table 13.4. The set of policies related to breeding improvement has the greatest effect on aggregate income. With an increase in real income of 2.4 percent it outranks improvements in both marketing and productivity of feed

crops. All the policy simulations considered here have the effect of lowering the general price level. In terms of effects on livestock producers, the breeding improvement again has the strongest effect, while improvement in feed crop productivity has barely any effect. The reason for the latter result is that improvements in feed crop productivity are not transmitted to the livestock sector, since the economy is in an open trade regime. That implies that lower crop prices induced by increased crop productivity will result in added incentives to exporting the crops rather than using them for feed. Basically, the livestock sector will be using the feed crops at international parity prices; their greater production will not imply necessarily greater availability. This point is borne also by the policy simulation (not reported here) that studies the effect of eliminating tariffs on feed imports. The absence of strong policy restrictions on trade of feed crops implies that full liberalization of the tariff system or improvement in crop productivity has only negligible effects on the livestock sector. Since the tariff levels are already very low and the livestock sector has still a relatively low demand for these crops, the elimination of tariffs does not give rise to any large effect.

Implications for short, medium, and long-term priorities

The analysis of policy options together with the analysis of cost and benefits of animal health interventions suggests a strong role for improvements in breeding, marketing, and animal health. The improvements in feed crop productivity are important, but they will benefit primarily the crop producers, since the trade system for feed crops and ingredients is already largely liberalized. As such, the priorities for the strategy to develop the livestock sector are mainly related to breeding, marketing, and animal health and veterinary services. That does not imply that improvements in feed and animal nutrition should not be pursued both in terms of liberalization policy and in terms of research and extension activities. It however suggests that the main role for policy has to do with removing the many constraints still facing the breeding system, the marketing system, and the animal health and veterinary services system.

As the overall strategy is mostly focused on meeting the requirements of an increasing and changing domestic demand, the first priority will be to increase productivity to meet the rapid growth of domestic demand for meat and animal products. The productivity focus in the short term (next 5 years) will create the basis for an acceleration of growth and will require the reorganization of the breeding system, additional investment in AI stations, and expanded commercial credit targeted to breeding. At the same time, a considerable expansion of investment in capacity and facilities of the research and extension system will be needed to support the institutions required to promote the generation and dissemination of improved breeds appropriate to the needs of small farmers.

The second priority to be taken into account in the short term is to provide adequate incentives to the participants in the livestock system. That will imply maintaining market orientation while at the same time fostering a more competitive environment, a liberalized trade system, and supporting marketing institutions and facilities. Investment in improving market information and setting up appropriate market places will increase the flow of information between producers and consumers and at the same time increase the bargaining power of farmers. The promotion of the formation of a private veterinarian professional association might improve the delivery of veterinary services. At the same time, increased access to credit by marketers, processors, and meat distributors might improve the meat distribution system, the quality of animal products, and set the stage to face both the challenges of international trade. These measures should result in lower marketing margins thus expanding production, consumption, and inter-regional trade. As clarified by the overall strategy, the role of the state is not one of doing the activities that would be best left to the private sector. Rather, it is to provide the information, the regulation, and the infrastructure support necessary for improving the marketing and the distribution system. Over

time, this role will become less important, as the private sector will mature and grow in sophistication.

The third priority consists in setting up the regulatory framework and the institutional bases for health, sanitary, and veterinary services effectiveness. That will include an increase in resources devoted to capacity building of the veterinary practitioners, improved facilities for diagnostics and epidemiology, and a privatization of the veterinarian profession. Several inspection systems related to health and environmental control will have to be set up or strengthened to protect animal health and the health of the population. Unless the productivity and marketing improvements are in place, the push for improving animal health and veterinary services will be weak. This is not to deny that animal health and veterinary services are key to the development of the sector. However, it is rather a matter of phasing over time, so that as the system develops, the animal health system and veterinary services will be able to provide the necessary support.

Over time, these priorities might change as the result of a more intensified production system, a higher consumption of meat and animal products in fresh, chilled, and processed form, and higher income of the population. It is expected that the regulatory aspects as well as the health and environmental issues of the livestock sector will become the first priority. In the short terms (the next five years), however, there are still large improvements to be made in the intensification of the production system before other constraints become more binding (see figure 13.1).

ANNEX TO CHAPTER 13

THE MODEL USED FOR POLICY OPTIONS SIMULATIONS

The model used for policy options simulations is called VILASEM (Viet Nam Livestock Agricultural Sector Model). It is a spatial equilibrium model with 13 commodities, among which 6 are feedcrops, 2 are livestock species, and 4 are processed high quality feed. There are 8 regions and the country is trading with the rest of the world. In the case of rice, Viet Nam is a large exporter which can affect world prices.

The model consists of several equations in the supply and demand side; a world rice market equation, income equations, inflow and outflow balancing equations, and price parity equations both for domestic and international trade. The method of solution is by Mixed Complementarity Methods using GAMS programming language.

Indices

i = livestock species (pig, poultry)

r = regions (NE, NW, RRD, NCC, SCC, CH, NES, MRD)

k = animal feed (rice, maize, sweet potatoes, cassava, groundnuts, soybean, fishmeal)

fc=crops (rice, maize, sweet potatoes, cassava, groundnuts, soybean, fishmeal)

f = high quality feed (pigfcm, pigfcc,pltryfcm, pltryfcc)

fci = food (rice, maize, sweet potatoes, cassava, groundnuts, soybean, pig,poultry)

Prices

Buying prices for crops (faced by consumers): $PB_{fc,r}$

Buying prices for crops: (faced by general quality feed industry): $PB_{fc,r}$

Buying prices for crops: (faced by high quality feed industry)$PB_{fc,r}$

Buying prices for feed: (faced by farmers) $PB_{k,r}$

Buying prices for high quality feed: $PB_{f,r}$

Buying prices for liveweight (faced by consumers): $PB_{i,r}$

Selling prices for crops: (faced by farmers): $PS_{fc,r}$

Selling prices for feed: (faced by general quality feed industry): $PS_{k,r}$

Selling prices for meat (faced by livestock producers): $PS_{i,r}$

Selling prices for high quality feed: $PS_{f,r}$

Complementary variables

For crop inflows: $PB_{fc,r}$

For feed inflows: $PB_{fc,r}$

For crop outflows: $PS_{fc,r}$

For feed outflows: $PS_{k,r}$

For liveweight inflows: $PB_{i,r}$

For liveweight outflows: $PS_{i,r}$

For high quality feed inflows: $PB_{f,r}$

For high quality feed outflows: $PS_{f,r}$

For domestic trade crops: TQ^{crops}

For domestic trade feed: TQ^{feed}

For domestic trade meat: TQ^{meat}

For domestic trade feed: TQ^{hqfeed}

For import parity crops: M^{crops}

For import parity feed: M^{feed}

For import parity meat: M^{meat}

For import parity hfeed: M^{hqfeed}

For export parity crops: X^{crops}

For export parity feed: X^{feed}

For export parity meat: X^{meat}

For export parity hfeed: X^{hqfeed}

Supply Equations

Crop Supply

Crop supply is a function of the selling price of the crop fc, and all other crops fc'

$$S_{fc,r}^{crop} = \alpha_{fc,r}^{crop} + S_{fc,r}^{0} * \sum_{fc'=1}^{7} \left(SPE_{fc,fc',r}^{crops} * \ln\left(PS_{fc',r} \right) \right)$$

Where:

$$\alpha_{fc,r}^{crop} = S_{fc,r}^{0} - S_{fc,r}^{0} * \sum_{fc'=1}^{7} \left(SPE_{fc,fc',r}^{crops} * \ln\left(PS_{fc',r}^{0} \right) \right)$$

Feed Supply

Feed supply is a function of the selling price of feed and the buying price of crops

$$S_{k,r}^{feed} = \alpha_{k,r}^{feed} + S_{k,r}^{0} * \sum_{k'=1}^{7} \left(SPE_{kk',r}^{feed} * \ln\left(PS_{k',r} \right) \right) + S_{k,r}^{0} * \sum_{fc'=1}^{7} \left(SPE_{k,fc',r}^{feed} * \ln\left(PB_{fc',r} \right) \right)$$

Where

$$\alpha_{k,r}^{feed} = S_{k,r}^{0} - S_{k,r}^{0} * \sum_{k'=1}^{7} \left(SPE_{kk',r}^{feed} * \ln\left(PS_{k',r}^{0} \right) \right) + S_{k,r}^{0} * \sum_{fc'=1}^{7} \left(SPE_{k,fc',r}^{feed} * \ln\left(PB_{fc',r}^{0} \right) \right)$$

Livestock Supply

Livestock Supply is a function of the selling price of liveweight and the buying price of low quality feed and the buying price of high quality feed

$$S_{i,r}^{lwt} = \alpha_{i,r}^{lwt} + S_{i,r}^{0} * \sum_{i'=1}^{2} \left(SPE_{i,i',r}^{lwt} * \ln\left(PS_{i',r} \right) \right) + S_{i,r}^{0} * \sum_{k'=1}^{7} \left(SPE_{ik',r}^{lwt} * \ln\left(PB_{k',r} \right) \right)$$

$$+ S_{i,r}^{0} * \sum_{f'=1}^{4} \left(SPE_{if',r}^{lwt} * \ln\left(PB_{f',r} \right) \right)$$

Where

$$\alpha_{i,r}^{lwt} = S_{i,r}^{0} - S_{i,r}^{0} * \sum_{i'=1}^{2} \left(SPE_{ii',r}^{lwt} * \ln\left(PS_{i',r}^{0} \right) \right) + S_{i,r}^{0} * \sum_{k'=1}^{7} \left(SPE_{ik',r}^{lwt} * \ln\left(PB_{k',r}^{0} \right) \right)$$

$$+ S_{i,r}^{0} * \sum_{f'=1}^{4} \left(SPE_{if',r}^{lwt} * \ln\left(PB_{f',r}^{0} \right) \right)$$

High Quality Feed Supply

High quality feed supply is a function of the selling price of high quality feed and the buying price of crops

$$S_{f,r}^{hqfeed} = \alpha_{f,r}^{hqfeed} + S_{f,r}^{0} * \sum_{f'=1}^{4} \left(SPE_{ff',r}^{hqfeed} * \ln\left(PS_{f',r} \right) \right) + S_{f,r}^{0} * \sum_{fc'=1}^{7} \left(SPE_{f,fc',r}^{hqfeed} * \ln\left(PB_{fc',r} \right) \right)$$

Where

$$\alpha_{f,r}^{hqfeed} = S_{f,r}^{0} - S_{f,r}^{0} * \sum_{f'=1}^{4} \left(SPE_{ff',r}^{hqfeed} * \ln\left(PS_{f',r}^{0} \right) \right) + S_{f,r}^{0} * \sum_{fc'=1}^{7} \left(SPE_{f,fc',r}^{hqfeed} * \ln\left(PB_{fc',r}^{0} \right) \right)$$

Demand Equations

Consumer Demand for Food

Consumer demand for food is a function of the buying price of food and income levels

$$D_{fci,r}^{food} = a_{fci,r} + \sum_{fci'=1}^{9}\left(b_{fci,fci',r} * \ln\left(PB_{fci',r}\right)\right) + \left(d_{fci,r} * Y_r\right)$$

Producer Demand for Feed

Producer demand for feed is a function of the buying price of feed, the buying price of high quality feed and the selling price of livestock

$$D_{k,r}^{feed} = f_{k,r}^{feed} + D_{k,r}^{0} * \sum_{i'=1}^{2}\left(DPE_{k,i',r}^{feed} * \ln\left(PS_{i',r}\right)\right) + D_{k,r}^{0} * \sum_{k'=1}^{7}\left(DPE_{k,k',r}^{feed} * \ln\left(PB_{k',r}\right)\right)$$

$$+ D_{k,r}^{0} * \sum_{f'=1}^{4}\left(DPE_{k,f',r}^{feed} * \ln\left(PB_{f',r}\right)\right)$$

Where

$$f_{k,r}^{feed} = D_{k,r}^{0} - D_{k,r}^{0} * \sum_{i'=1}^{2}\left(DPE_{k,i',r}^{feed} * \ln\left(PS_{i',r}^{0}\right)\right) + D_{k,r}^{0} * \sum_{k'=1}^{7}\left(DPE_{kk',r}^{feed} * \ln\left(PB_{k',r}^{0}\right)\right)$$

$$+ D_{k,r}^{0} * \sum_{f'=1}^{4}\left(DPE_{k,f',r}^{feed} * \ln\left(PB_{f',r}^{0}\right)\right)$$

General Quality Feed Industry Demand for Crops

Feed industry demand for crops is a function of the selling price of feed and the buying price of crops

$$D_{fc,r}^{ficrop} = f_{fc,r}^{ficrop} + D_{fc,r}^{0} * \sum_{k'=1}^{7}\left(DPE_{fc,k',r}^{ficrop} * \ln\left(PS_{k',r}\right)\right) + D_{fc,r}^{0} * \sum_{fc'=1}^{7}\left(DPE_{fc,fc',r}^{ficrop} * \ln\left(PB_{fc',r}\right)\right)$$

Where

$$f_{fc,r}^{ficrop} = D_{fc,r}^{0} - D_{fc,r}^{0} * \sum_{k'=1}^{7} \left(DPE_{fc,k',r}^{ficrop} * \ln\left(PS_{k',r}^{0} \right) \right) + D_{fc,r}^{0} * \sum_{fc'=1}^{7} \left(DPE_{fc,fc',r}^{ficrop} * \ln\left(PB_{fc',r}^{0} \right) \right)$$

High Quality Feed Industry Demand for Crops

High quality feed industry demand for crops is a function of the selling price of high quality feed and the buying price of crops

$$D_{fc,r}^{hqcrop} = f_{fc,r}^{hqcrop} + D_{fc,r}^{0} * \sum_{k'=1}^{7} \left(DPE_{fc,f',r}^{hqcrop} * \ln\left(PS_{f',r} \right) \right) + D_{fc,r}^{0} * \sum_{fc'=1}^{7} \left(DPE_{fc,fc',r}^{hqcrop} * \ln\left(PB_{fc',r} \right) \right)$$

Where

$$f_{fc,r}^{hqcrop} = D_{fc,r}^{0} - D_{fc,r}^{0} * \sum_{k'=1}^{7} \left(DPE_{fc,f',r}^{hqcrop} * \ln\left(PS_{f',r}^{0} \right) \right) + D_{fc,r}^{0} * \sum_{fc'=1}^{7} \left(DPE_{fc,fc',r}^{hqcrop} * \ln\left(PB_{fc',r}^{0} \right) \right)$$

Producer Demand for High Quality Feed

High quality feed demand by producers is a function of the selling price of liveweight, the buying price of high quality feed and the buying price of general quality feed

$$D_{f,r}^{hqfeed} = f_{f,r}^{hqfeed} + D_{f,r}^{0} * \sum_{i'=1}^{2} \left(DPE_{f,i',r}^{hqfeed} * \ln\left(PS_{i',r} \right) \right) + D_{f,r}^{0} * \sum_{k'=1}^{7} \left(DPE_{f,k',r}^{hqfeed} * \ln\left(PB_{k',r} \right) \right)$$

$$+ D_{f,r}^{0} * \sum_{f'=1}^{4} \left(DPE_{f,f',r}^{hqfeed} * \ln\left(PB_{f',r} \right) \right)$$

Where

$$f_{f,r}^{hqfeed} = D_{f,r}^{0} - D_{f,r}^{0} * \sum_{i'=1}^{2} \left(DPE_{f,i',r}^{hqfeed} * \ln\left(PS_{i',r}^{0} \right) \right) + D_{f,r}^{0} * \sum_{k'=1}^{7} \left(DPE_{f,k',r}^{hqfeed} * \ln\left(PB_{k',r}^{0} \right) \right)$$

$$+ D^{0}_{f,r} * \sum_{f'=1}^{4} \left(DPE^{hqfeed}_{f,f',r} * \ln\left(PB^{0}_{f',r} \right) \right)$$

World Rice Market

$$\sum_{r=1}^{7} X^{rice}_{r} = a^{rice}_{w} + b^{rice}_{w} * PX_{rice}$$

Where:

$$b_{w} = \frac{DPE^{rice}_{w} * X^{0}_{rice}}{PX^{0}_{rice}}$$

$$a_{w} = X^{0}_{rice} - b_{w} * PX^{0}_{rice}$$

Income:

$$I_{r} = I^{nf}_{r} + I^{crops}_{r} + I^{lwt}_{r} + I^{feed}_{r} + I^{hqfeed}_{r} + I^{other}_{r}$$

Income from sales of crops:

$$I^{crop}_{r} = \sum_{fc} \left(PS_{fc,r} * S^{crop}_{fc,r} \right) * \gamma_{fc,r}$$

where $\gamma_{fc,r}$ is proportion of production value above production costs

Income from livestock production

$$I_r^{lwt} = \sum_i (PS_{i,r} * S_{i,r}^{lwt}) - \sum_k (PB_{k,r} * D_{k,r}^{feed}) - \sum_f \left(PB_{f,r} * D_{f,r}^{hqfeed}\right)$$

Income of feed industry

$$I_r^{feed} = \sum_k \left(PS_{k,r} * S_{k,r}^{feed}\right) - \sum_{fc} \left(PB_{fc,r} + D_{fc,r}^{ficrop}\right)$$

Income of high quality feed industry

$$I_r^{hqfeed} = \sum_f \left(PS_{f,r} * S_{f,r}^{hqfeed}\right) - \sum_{fc} \left(PB_{fc,r} + D_{fc,r}^{hqcrop}\right)$$

Shipments into Region (Inflow):

crops:

$$\sum_{r'} TQ^{crops}{}_{fc,r'r} + M^{crops}{}_{fc,r} \geq D_{fc,r}^{food} + D_{fc,r}^{ficrop} + D_{fc,r}^{hqcrop}$$

feed:

$$\sum_{r'} TQ^{feed}{}_{kr'r} + M^{feed}{}_{kr} \geq D_{k,r}^{feed}$$

meat:

$$\sum_{r'} TQ^{meat}{}_{ir'r} + M^{meat}{}_{ir} \geq D^{food}_{i,r}$$

high quality feed:

$$\sum_{r'} TQ^{hfeed}{}_{fr'r} + M^{hfeed}{}_{fr} \geq D^{hqfeed}_{f,r}$$

Shipments out of Region (Outflow):

crops:

$$S^{crops}_{fc,r} \geq \sum_{r'} TQ^{crops}{}_{fc,rr'} + X^{crops}{}_{fc,r}$$

feed:

$$S^{feed}_{k,r} \geq \sum_{r'} TQ^{feed}{}_{k,rr'} + X^{feed}{}_{k,r}$$

meat:

$$S^{lwt}_{i,r} \geq \sum_{r'} TQ^{meat}{}_{i,rr'} + X^{meat}{}_{i,r}$$

high quality feed:

$$S^{hqfeed}_{f,r} \geq \sum_{r'} TQ^{hqfeed}{}_{f,rr'} + X^{hqfeed}{}_{f,r}$$

Prices:

Domestic Trade:

crops:

$$PS_{fc,r} + TP^{crops}_{fc,rr'} + MKT^{crops}_{fc,r} + ITT^{crops}_{fc,rr'} \geq PB_{fc,r'}$$

feed:

$$PS_{k,r} + TP^{feed}_{k,rr'} + MKT^{feed}_{k,r} + ITT^{feed}_{k,rr'} \geq PB_{k,r'}$$

liveweight:

$$PS_{i,r} + TP^{lwt}_{i,rr'} + MKT^{lwt}_{i,r} + ITT^{lwt}_{i,rr'} + WAST_{i,rr'} \geq PB_{i,r'}$$

high quality feed:

$$PS_{f,r} + TP^{hqfeed}_{f,rr'} + MKT^{hqfeed}_{f,r} + ITT^{hqfeed}_{f,rr'} \geq PB_{f,r'}$$

International Trade:

Import parity:

crops:

$$PI_{fc} + TPW_{fc,r}^{crops} + ITM_{fc,r}^{crops} \geq PB_{fc,r}$$

feeds:

$$PI_{k} + TPW_{k,r}^{feed} + ITM_{k,r}^{feed} \geq PB_{k,r}$$

liveweight:

$$PI_{i} + TPW_{i,r}^{lwt} + ITM_{i,r}^{lwt} \geq PB_{i,r}$$

high quality feed:

$$PI_{f} + TPW_{f,r}^{hqfeed} + ITM_{f,r}^{hqfeed} \geq PB_{f,r}$$

Export Parity:

crops:

$$PS_{fc,r} + TPW^{crops}_{fc,r} + ITX^{crops}_{fc,r} \geq PX^{crops}_{fc}$$

feeds:

$$PS_{k,r} + TPW^{feed}_{k,r} + ITX^{feed}_{k,r} \geq PX^{crops}_{k}$$

liveweight:

$$PS_{i,r} + TPW^{lwt}_{i,r} + ITX^{lwt}_{i,r} \geq PX^{lwt}_{i}$$

high quality feed:

$$PS_{f,r} + TPW^{hqfeed}_{f,r} + ITX^{hqfeed}_{f,r} \geq PX^{hqfeed}_{f}$$

Variables

Sets

i = livestock species (pig, poultry)

r = regions (NE, NW, RRD, NCC, SCC, CH, NES, MRD)

k = animal feed (rice, maize, sweet potatoes, cassava, groundnuts, soybean, fishmeal)

fc=crops (rice, maize, sweet potatoes, cassava, groundnuts, soybean, fishmeal)

f = high quality feed (pigfcm, pigfcc,pltryfcm, pltryfcc)

fci = food (rice, maize, sweet potatoes, cassava, groundnuts, soybean, pig,poultry)

Prices

Buying prices for crops (faced by consumers): $PB_{fc,r}$

Buying prices for crops: (faced by general quality feed industry): $PB_{fc,r}$

Buying prices for crops: (faced by high quality feed industry)$PB_{fc,r}$

Buying prices for feed: (faced by farmers) $PB_{k,r}$

Buying prices for high quality feed: $PB_{f,r}$

Buying prices for liveweight (faced by consumers): $PB_{i,r}$

Selling prices for crops: (faced by farmers): $PS_{fc,r}$

Selling prices for feed: (faced by general quality feed industry): $PS_{k,r}$

Selling prices for meat (faced by livestock producers): $PS_{i,r}$

Selling prices for high quality feed: $PS_{f,r}$

Crop export price: PM_{fc}

Feed export price: PM_{k}

Liveweight export price: PM_i

High quality feed export price: PM_f

Crop import price: PM_{fc}

Feed import price: PM_k

Liveweight import price: PM_i

High quality feed import price: PM_f

Imports

$M_{fc,r}$	Imports of crop fc into region r
$M_{k,r}$	Imports of feed k into region r
$M_{i,r}$	Imports of meat I into region r
$M_{f,r}$	Imports of high quality feed into region r

Exports

$X_{fc,r}$	Exports of crop fc from region r
$X_{k,r}$	Exports of feed k from region r
$X_{i,r}$	Exports of meat I from region r
$X_{f,r}$	Exports of high quality feed from region r

Commodity flows

$TQ_{fc,rr'}$	Flow of crop fc from region r' to region r

$TQ_{k,rr'}$ Flow of feed k from region r' to region r

$TQ_{i,rr'}$ Flow of meat I from region r' to region r

$TQ_{f,rr'}$ Flow of high quality feed for meat i from region r' to region r

Transportation Costs

$TP_{fc,rr'}$ Transportation Cost of crop fc from region r' to region r

$TP_{k,rr'}$ Transportation Cost of feed k from region r' to region r

$TP_{i,rr'}$ Transportation Cost of meat I from region r' to region r

$TP_{f,rr'}$ Transportation Cost of high quality feed for meat i from region r' to region r

$TPW_{fc,r}$ Transportation cost of crop fc from world to region r (or from region r to world)

$TPW_{k,r}$ Transportation cost of feed k from world to region r (or from region r to world)

$TPW_{i,r}$ Transportation cost of meat i from world to region r (or from region r to world)

$TPW_{f,r}$ Transportation cost of high quality feed f from world to region r (or from region r to world)

Marketing Costs

$MKT_{fc,r}$ Marketing cost of crop fc in region r

$MKT_{k,r}$ Marketing cost of crop k in region r

$MKT_{i,r}$ Marketing cost of meat i in region r

$MKT_{f,r}$ Marketing cost of high quality feed f in region r

Implicit tax of importing and exporting commodities

$ITM_{fc,r}$	Implicit tax of importing crop fc in region r
$ITM_{k,r}$	Implicit tax of importing feed k in region r
$ITM_{i,r}$	Implicit tax of importing meat i in region r
$ITM_{f,r}$	Implicit tax of importing high quality feed f in region r
$ITX_{fc,r}$	Implicit tax of exporting crop fc from region r to world
$ITX_{k,r}$	Implicit tax of exporting feed k from region r to world
$ITX_{i,r}$	Implicit tax of exporting meat from region r to world
$ITX_{f,r}$	Implicit tax of exporting high quality feed f from region r to world

Other parameters

$ITT_{kif,rr'}$	Implicit tax of transferring commodity kif between region r and region r’
$ALPHA_{fc,r}$	Percent of cost of production in total production of crop fc in region r
$WAST_{i,r}$	Wastage during transportation of liveweight of species i from region r' to region r

Income

I_r	Income in region r
$I^{nf}_{,r}$	Non-farm income in region r
$I^{crop}_{,r}$	Feed industry income in region r
$I^{hqfeed}_{,r}$	High quality feed industry income in region r
$I^{lwt}_{,r}$	Income from livestock I production in region r
$I^{crop}_{,,r}$	Income from crops in region r
$I^{ot}_{,r}$	Income from other agricultural activities

Elasticities

SPE^{crop} Crop Supply Elasticity

SPE^{feed} Feed Supply Elasticity

SPE^{hqfeed} High Quality Feed Supply Elasticity

SPE^{lwt} Liveweight Supply Elasticity

DPE^{food} Food Demand Elasticity (consumers)

DPE^{feed} Feed Demand Elasticity (livestock producers)

DPE^{ficrop} Crop Demand Elasticity (General Quality Feed Industry)

DPE^{hqcrop} Crop Demand Elasticity (High Quality Feed Industry)

DPE^{hqfeed} High Quality Feed Demand Elasticity (Livestock Producers)

The previous chapters have presented an overview of **CHAPTER 14**

CONCLUSIONS

The livestock sector contributes about 13 percent to agricultural GDP; employs a large part of the rural population, and has an active presence in all the regions of Viet Nam. Within agriculture, the livestock sector has an important role to play partly because of its interaction with crop production via feed, fertilization and animal traction and partly because livestock production is closely linked with agroindustry via slaughtering and processing industry of animal products. Animal products consumption is growing rapidly, stimulated by rapid income growth, changing pattern of food demand, and the requirements of a more protein-rich diet. Given that animal products have usually a higher value added than crops and require less agricultural land, the development of livestock sector is seen as an important element of a strategy for income diversification.

The livestock sector in Viet Nam, based on a rich database of both field level data collected during the implementation of the project and secondary data available from various government organizations. The analysis of the data allowed to identify the main constraints to the development of the sector and to propose a strategy and a set of policy options to overcome those constraints. In this concluding chapter we reiterate our arguments for the state to have a more active role in the sector than it has been in the past.

Contrary to the crop sector, in the past the livestock sector has developed largely without a strong support by the government. That is reflected in a rather small state budget investment and also in a relatively small commitment in terms of supporting services such as research, extension, animal health, and inspection systems necessary to enforce the existing regulations.

Why did the livestock sector receive less support by the state during the past decade than the crop sector? Food security in Viet Nam was perceived until recently in terms of having enough rice. In a society that experienced widespread hunger as recently as 1988 and where still some people among the poor are classified as hungry, food security was identified with having enough rice to eat. Other foods, particularly high value foods such as meat were considered as luxury. After all, even today, one kg of lean pork meat is equivalent to 8 kg of rice. Given this background, the focus on rice and crop agriculture in agricultural policy was understandable.

This situation, however, is destined to change. This is not only because Viet Nam crop agriculture during the 1990s has achieved enormous success and food surplus has been achieved to the point that a large amount of food is now exported. There are other reasons why the attention to livestock sector will grow. First, increasing domestic demand for animal products has already induced rapid growth of the sector over the past 10 years and more is expected to occur in the future as income continue to grow and urbanization increases the demand for a more diversified diet. Second, livestock development is expected to contribute to more rapid income growth of the agricultural population than was the case for crops. Given land scarcity, intensive livestock production promises to generate more income than intensive crop production. Third, even more than in the case of crops, livestock sector development is linked to the development of other sectors in agriculture (for example feedcrops) and in industry (for example, feed industry, processing industry, animal drug industry). These wider linkages are associated to higher income multiplier effects than crop agriculture.

These reasons may provide the background for more attention to the livestock sector, but they do not necessarily justify a more active role of the state in the sector. After all, the growth of the livestock sector during the 1990s has been in response to strong growth of domestic demand

induced by rapid income growth of the population. Modest increases in productivity have been achieved during this period mainly through the efforts played by the private sector in production and marketing and by the foreign sector in the feed industry. State organizations in breeding, research, extension, animal health and veterinary services have tried to do their best; however, given the general neglect of the livestock sector by the state and with little investment and support to the sector, their role has been necessarily modest.

This study advocates a more active role of the state in the livestock sector. However, this more active role in the future should not be confused with the role that the state played in agriculture in the past, where for example, state organizations and SOE were involved in commercial activities that could be more effectively and efficiently pursued by the private sector. The more active role for the state envisaged here is as a provider of public goods necessary for maintaining, accelerating, and participating the growth of the sector.

The report has argued that in order to maintain the growth of the past decades, a more active role of the state will be needed to establish regulations, enforcement mechanisms, monitoring and reporting systems, and surveillance systems for ensuring animal health, prevention of animal diseases and epidemic outbreaks. This is predicated on the basis of the observation that livestock production is becoming bigger, more intensive, and the distribution of animal products on a much larger scale than at the beginning of the 1990s. If past growth continues, by the year 2010, meat consumption will be four times as much as at the beginning of the 1990s. Even though that promises well in terms of improved nutrition of the population and in terms of added income for livestock producers, the challenges for the animal system and the environment will have to be dealt appropriately in order to avoid serious outbreak of animal diseases, the escalation of food borne diseases, and the contamination of water and soil by wastes and residues associated to slaughtering and meat processing industry.

The second argument for a more active role of the state is related to the need of accelerating growth of the livestock sector. It is argued that in the future agriculture in Viet Nam will be affected negatively by the declining importance of rice to sustain growth. That is because of lower domestic and international demand for rice. Unless other sectors in agriculture can compensate for the lower growth in rice production, the overall growth of agriculture will suffer. That is an outcome that the government of Viet Nam would rather avoid in view of the critical role that agriculture provides as employer for the majority of the population of Viet Nam, a position that will continue to occupy for the next decade. Unless agriculture continues the growth of the past decade, and unless non-agricultural activities grow even more rapidly, rural areas will continue to lag behind urban areas and the prospect of widening gaps will be a reality. The acceleration of growth in livestock sector appears then as a need, not just as a desire.

This need is within the reach of Viet Nam. Given that the growth during the past decade has been sustained at 4.4 percent without a concerted effort to provide adequate technological, marketing, and institutional support, one would expect that with a more active role of the state in providing the set of public goods necessary to increase productivity, better result will occur.

The third argument for a more active role of the state in the livestock sector is related to the creation of institutions to ensure that the greatest number of people, particularly among small-scale producers, shares the benefits of growth. There has been an implicit and sometimes explicit thinking among different state organizations suggesting that the most effective way to promote the livestock sector is to target the most commercialized and largest producers. The study has shown that even small-scale producers are highly commercialized and that specialized small-scale producers can be as efficient as larger ones. Because of the lack of increasing returns to scale in livestock production, the small-scale of production is not necessarily and impediment to

efficiency for the sector, provided that the production is of a specialized and commercialized type and not a subsistence type. In order for small-scale producers to be efficient, however, they need supporting institutions that improve access to technology, credit, and information related to markets, regulations, and contracts. The state has an important role to play in building and supporting these institutions. Their role is critical not only for maintaining and accelerating growth, but even more so for sharing the benefits of growth among the largest number of small-scale producers.