

The background of the cover is a photograph of a lush green agricultural field. In the foreground, there are rows of large, light-colored rocks. In the middle ground, a long, straight irrigation canal runs across the field. In the background, there are green trees and a blue sky with some clouds. A large green graphic of a plant with many leaves is overlaid in the bottom right corner.

POVERTY ALLEVIATION AND FOOD SECURITY IN ASIA

Role of Livestock

Food and Agriculture Organization of the United Nations
Regional Office for Asia and the Pacific
December 1999

RAP Publication 1999/4

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Preface

Poverty, as both a cause and an effect of food insecurity, continues to be a major challenge in Asia and the Pacific where the bulk of the poor in developing countries - approximately 75 percent are located. In this region, as elsewhere in the developing regions of the world, poverty is mainly a rural phenomenon: nearly three-fourths of the poor live in rural areas, with the large majority of them dependent on agriculture for employment and income. Agricultural growth thus offers a potentially enormous source of poverty reduction, particularly when the growth is broadly based.

The Asian economic crisis has heightened the critical role that the agricultural sector plays in the way to economic recovery. More than ever, the sector has been called upon to absorb unemployed people forced out of the industrial and services sectors (as well as new entrants to the labour force unable to find work in urban areas), produce more export crops for foreign exchange, increase domestic food supply to mitigate upward pressure in wages and prices, and generate domestic sources of investment.

At the same time, the crisis has the potential of obscuring lessons from recent decades of Asian experience vis-à-vis poverty alleviation and economic development. For example, it has become fashionable, at least in popular discussions, to belittle the importance of economic growth – especially one resembling the recent East Asian experience – in poverty alleviation. The crisis has also given an opportune window to supporters of status quo to question or even be more skeptical about the benefits of economic liberalisation and globalisation, i.e., the opening up of goods, labour, capital, and services markets to world trade. Indeed calls for reversal – or slowdown – of liberalisation efforts have intensified in developed and developing countries alike, especially as the same East Asian economies that openly welcomed globalisation were the first to tumble in the wake of the regional crisis. But as Amartya Sen aptly put it, it would be a great mistake to underestimate what East Asia did achieve.

Beyond the Asian crisis, enormous development problems and policy challenges await the developing countries of the region. Rising population, shrinking agricultural land, increasing demands on limited water resources from the expanding urban and industrial sector, widespread land degradation, and inadequacy of governance infrastructure appear to be more pressing now than ever before, especially as they mount efforts to recover lost grounds arising from the crisis and deepen their integration with the world economy. As recent experience suggests, these issues cannot be divorced from policy concerns impinging on poverty and food security.

This report on livestock is part of a series of supporting documents accompanying the main volume, *Poverty Alleviation and Food Security in Asia: Lessons and Challenges* which was published earlier and which assessed

recent experiences, policies, and select issues on poverty alleviation in Asian developing countries.

The present report aims to inform interested readers particularly high-level policy makers that livestock indeed contributes significantly towards alleviating poverty and improving food security. Its contributory roles can be direct as in providing a life-line for a large proportion of the 95 percent of the world's rural population, who live in the developing world and cultivate 64 percent of the world's arable land. People in these areas have access to less than 20 percent of the world's machinery and 40 percent of the world's chemical fertiliser. It is the draught power, and nutrient recycling inputs of the farm animals that compensate for the lack of access to these modern inputs, and help to maintain the viability and environmental sustainability of farms. Furthermore, livestock are intricately interwoven with the social fabric of many societies. In many situations, livestock constitute the main, if not the only, capital reserve of farming households, serving as a strategic reserve that reduces risk to the farmer and adds stability to the overall farming system.

Contributions from the livestock sub-sector to the economy have been largely underestimated in the past although the sub-sector is providing for a wide range of human needs. The challenge now is to increase the productivity of livestock and improve the quality of livestock products and provide access to markets to assist in maintaining food security and relieving poverty while maintaining the physical environment and protecting human health from zoonotic diseases.

PREM NATH

Assistant Director-General and
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Companion volumes of this report have also been produced. The main volume, ***Poverty Alleviation and Food Security in Asia: Lessons and Challenges***, was prepared with the assistance of A. M. Balisacan. In other agriculture sub-sectors, concerned FAO/RAP officers provided respective technical guidance as follows: F.J. Dent, Senior Soil Management and Fertilizer Use Officer, for ***Land Resources*** by M.G. Douglas; M.K. Papademetriou, Senior Plant Production and Protection Officer, for ***Crop Production*** by R.B. Singh and Edward M. Herath; P. C. Choudhury, Senior Aquaculture Officer, for ***Sustainable Contribution of Fisheries*** by M. Hatta, Yong-Ja Cho, Song Zhiwen, R. Gillet and K. Sivasubramaniam; and P. Durst, Senior Forestry Officer, for ***Enhancing Forestry and Agroforestry Contributions*** by Chun K. Lai and Napoleon T. Vergara. Their technical contributions are greatly appreciated.

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1. Livestock production systems: overview

Livestock plays an important role in nutrition - directly through the consumption of animal products by livestock owners and their families; and indirectly through the sale of animals and animal products as a source of income.

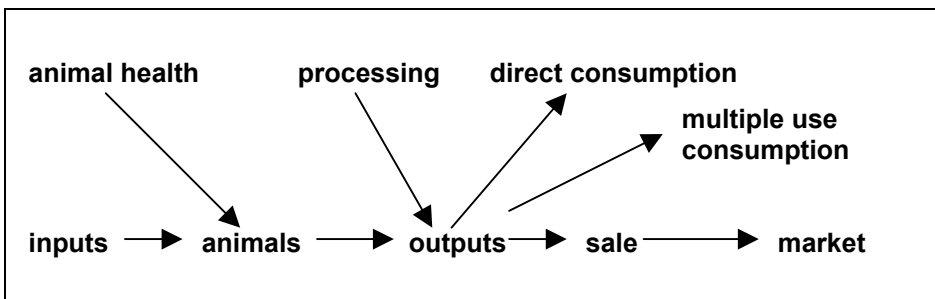
In the past food security studies have concentrated on quantifying the output of cereal crops and the importance of livestock in providing food security has seldom been examined. It has been stated that the role of livestock in food security is usually undervalued. However, it is not simple to quantify the actual role of livestock to include aspects other than direct food production; an effective method to quantifying the importance of livestock has not been developed.

Because of the social and physical diversity of the Asia Pacific region, this report does not provide a detailed analysis for all countries in the region. However, this analyses the role of livestock in providing food security in general for the region, including livestock production and consumption trends. Three countries are examined: namely Bangladesh, Vietnam and the Philippines.

Livestock production systems

Livestock can be considered as a production system as shown in Figure 1, which divides the system into the following: inputs; animal health; animals which are the unit of production; outputs which are the products; and the market which purchases the products and sets the price to the producer. Each of these categories is examined in the following sections.

Figure 1. The livestock production system



Inputs into livestock production

This section outlines inputs into livestock production in general terms. A more detailed examination into inputs for different species in the three countries examined in detail are examined in the sections for the specific countries.

Inputs into livestock production consist of land, housing, water, labour (which is often provided by women), and livestock feed. The most important input into small scale livestock production is livestock feed.

When considering human food security livestock feed can be subdivided into two categories – (i) food that can be used for human consumption, and (ii) food not normally used, or that is unsuitable, for human consumption. In order to examine livestock feed it is therefore useful to consider the following questions:

- What alternative uses does the feed used have? Can it be fed to people? Can it be used as feed for other livestock?
- Is feed grown specifically for animal feed? If so could the land be used to grow other crops for human consumption?

Animal health

This section discusses the general role of animal health inputs and the form of those inputs. Animal health inputs into the livestock production system are examined separately as disease prevention methods are put in place to limit the effects of disease which is a negative input on production. The value of animal health measures is therefore in the form of the preventive measures, specifically to avoid production loss.

The animals

The genetic composition of animals in the production system determines the response of the system to the different inputs. Often, local livestock breeds do not produce at a high level as they have been selected for survival under difficult conditions, including under-nutrition and exposure to various diseases. In contrast, highly productive breeds are more susceptible to disease, thereby increasing the need for animal health measures. These animals often require a high level of nutrition to gain the production benefits.

Outputs from livestock production

Outputs from livestock production vary by species. The outputs are therefore considered in general in this section (specific outputs from each species are discussed in the next section).

- *Direct consumption outputs* are those consumed directly by the farmer's family and can only be consumed once such as milk and eggs.
- *Multiple use consumption outputs* are those that can be used as inputs for the production of additional outputs and are therefore made use of several times. For example, manure can be used to generate biogas, and the residue used as fertilizer which effectively doubles the value of the manure.
- *Sale goods* are those sold by the farmer to produce income. The categories are not mutually exclusive. Wastes are goods that are not used and produce pollution. These are regarded as negative outputs.

Livestock statistics generally quantify the products that are eaten and traded such as meat, milk and eggs and do not consider products such as draught and manure. Meat milk and eggs are therefore discussed in Section 3 which analyses the changes in livestock production. Appendix 6 determines the value of all outputs from cattle production in Bangladesh.

Processing

In some cases suitable processing is essential for an output to be used. An example is the tanning of leather. The processing of outputs results in an increase in their value, for example, the production of cheese from milk. Processing can also increase the shelf life of the product.

The market

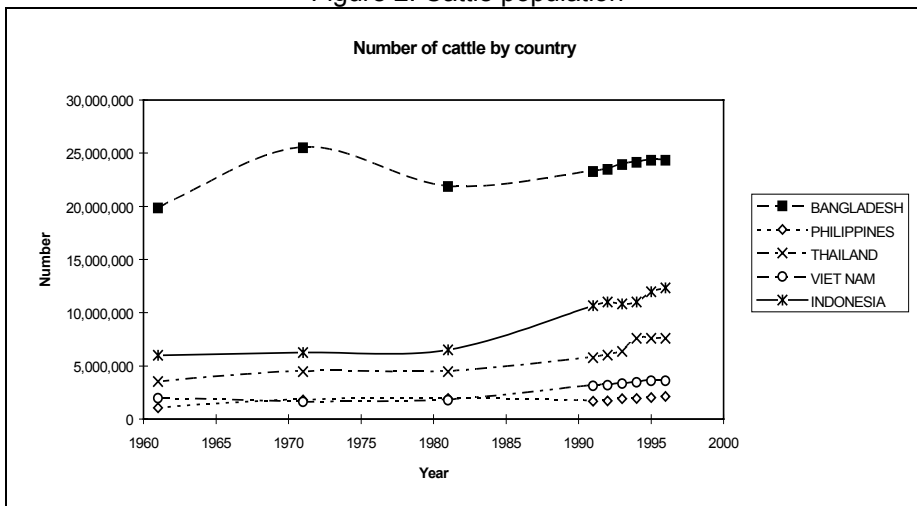
The market is included as part of the livestock production system. Without an available market paying a fair price it is not feasible to consider the expansion of production by increasing inputs in the other parts of the system.

2. Livestock population, production and trends

This section examines the distribution and productivity of several species of livestock in the region. Production per head was calculated as the total production divided by the livestock population in the country. It is used as an indicator of productivity. This number was used to indicate whether changes in total production were due to an increase in livestock population or the productivity of animals in the country.¹ In most countries examined there was an increase in cattle population.

Most countries examined showed an increase in cattle population, except in Bangladesh where the number of cattle tended to fluctuate over time without a consistent trend. In Bangladesh the number of cattle per person in rural areas has been decreasing over time. In the other countries studied, the number of cattle per person was stable or increasing slowly.

Figure 2. Cattle population



Production of meat and milk per animal varies considerably between countries. The rapid increase in milk production per head of cattle in Indonesia and Thailand (Figure 3) illustrates the potential to increase production in the region especially where production per head is at low levels.

Meat production per head of cattle, except in the Philippines where it is increasing rapidly, does not show any sustained trends (Figure 4). Meat production per head of cattle is much lower in Bangladesh than in other countries.

Figure 5 shows that the number of goats is increasing rapidly in Bangladesh. Its growth is slower in other countries. In contrast, Figure 6

¹ The data in the above sections were obtained from WAICENT via the World Wide Web.

demonstrates that production per goat is increasing in the Philippines and not in the other countries.

Figure 3. Milk production

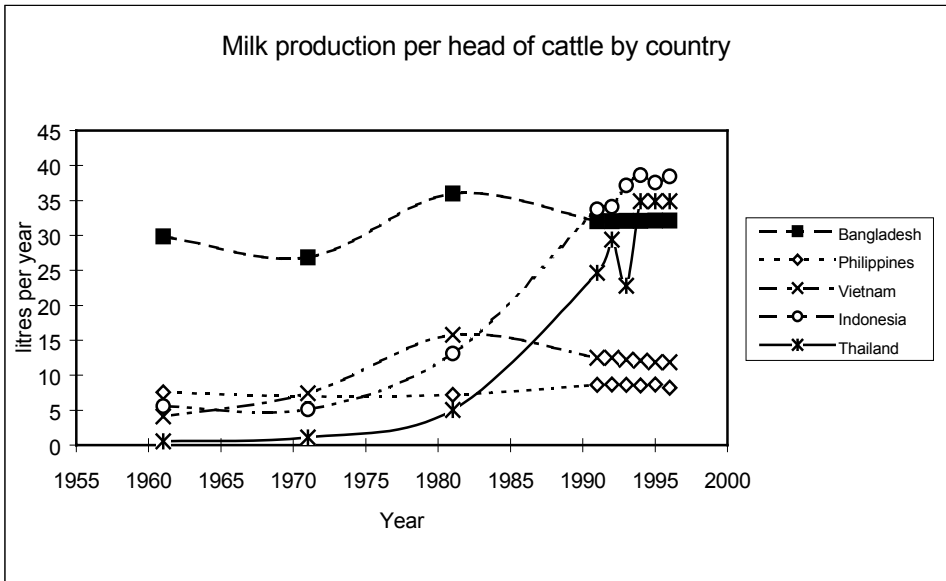
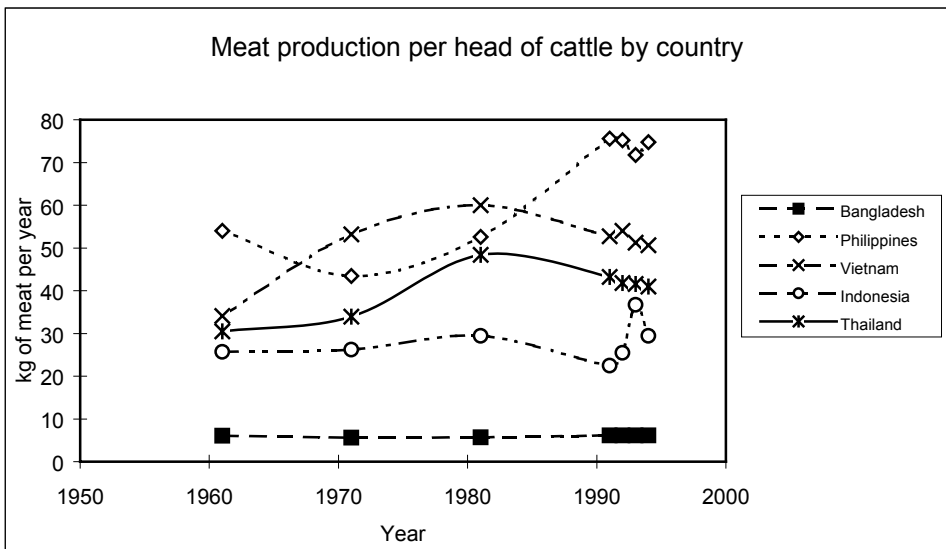


Figure 4. Cattle meat production



Pig numbers are increasing in the region, in particular in Vietnam and Indonesia (Figure 7). Production per head is also increasing, most rapidly in the Philippines.

The chicken population has increased, with the largest increase noted in Indonesia (Figure 9). Sharp increases in meat production per chicken (Figure 10) were observed in the Philippines and Thailand, with a similar situation applying to egg production (Figure 11).

Figure 5. Goat population

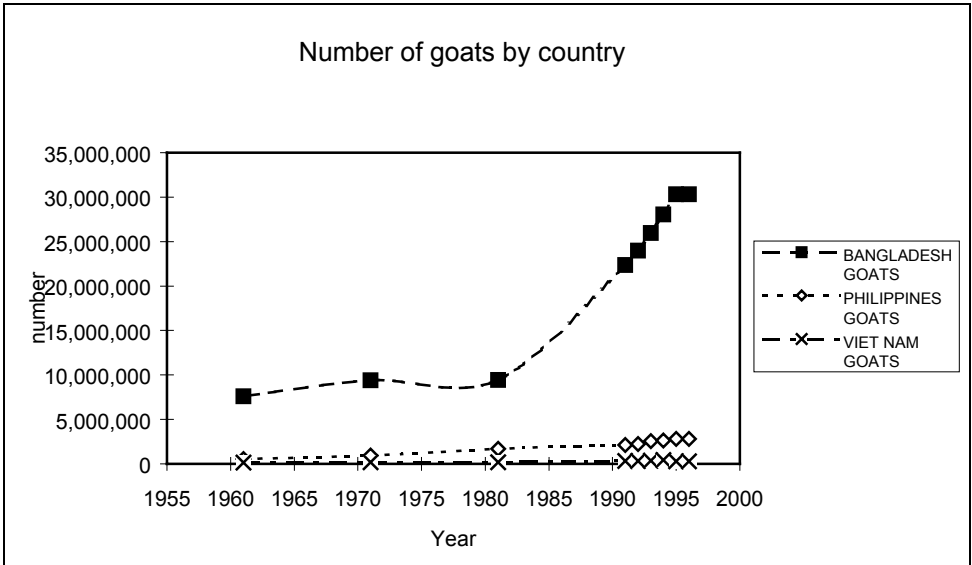


Figure 6. Goat meat production

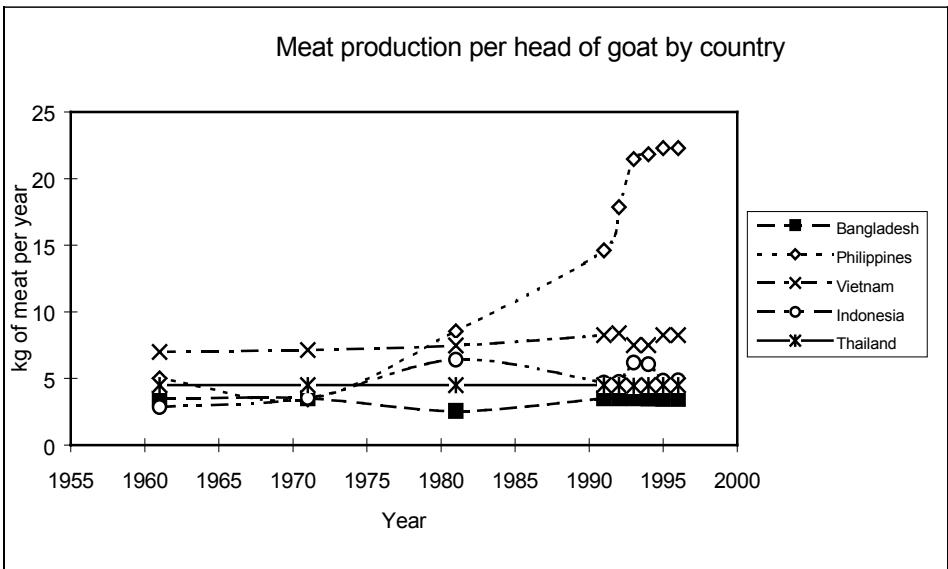


Figure 7. Pig population

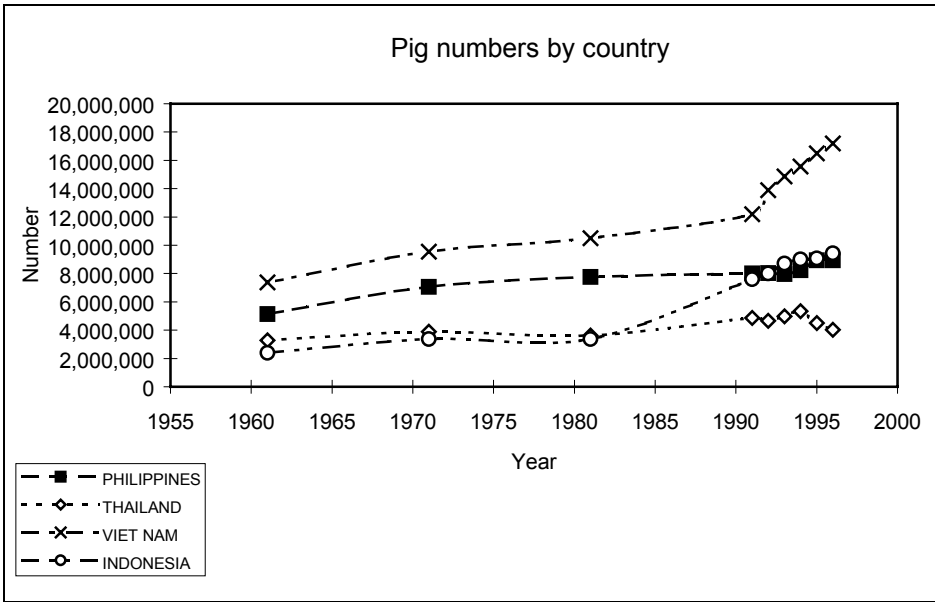


Figure 8. Pig meat production

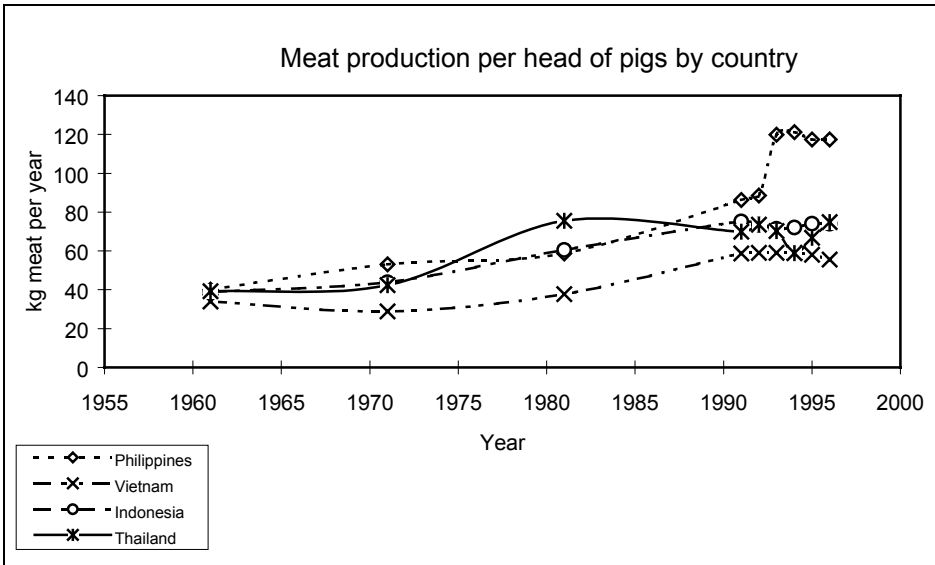


Figure 9. Chicken population

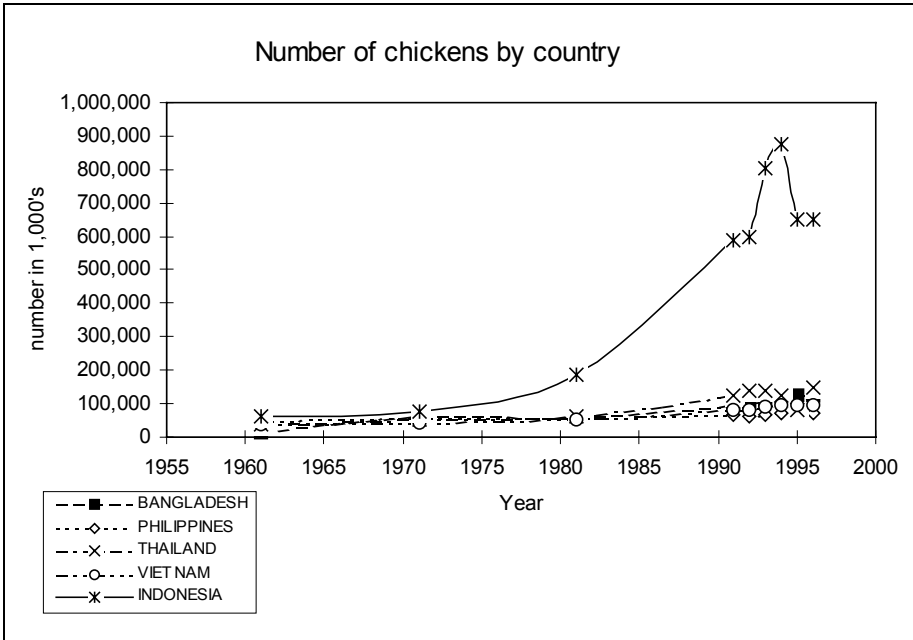


Figure 10. Chicken meat production

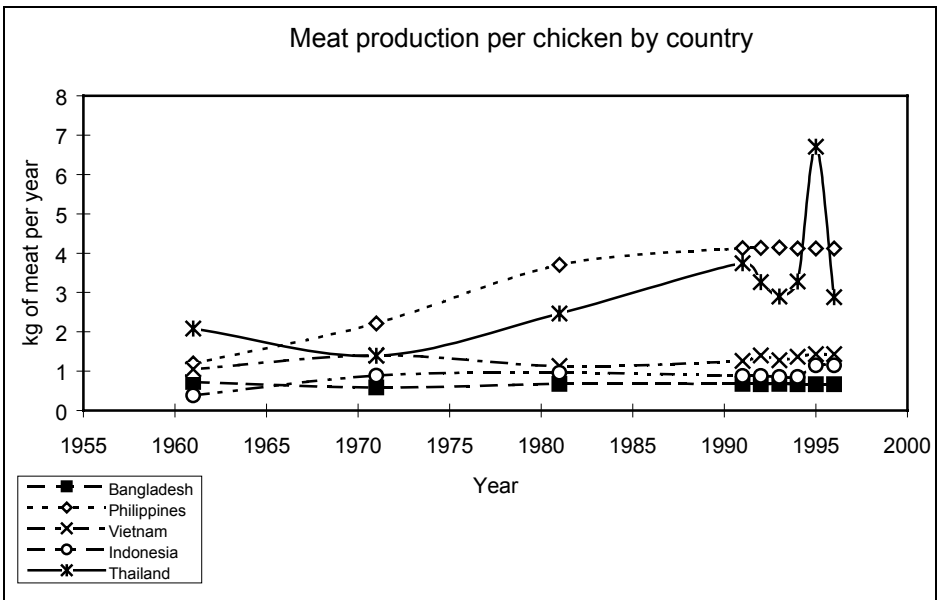


Figure 11. Chicken egg production

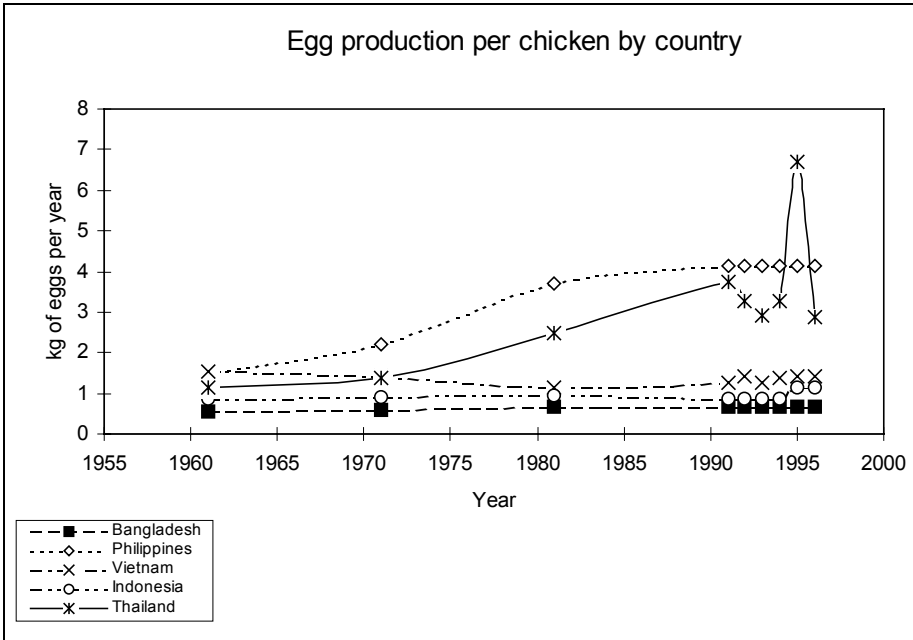
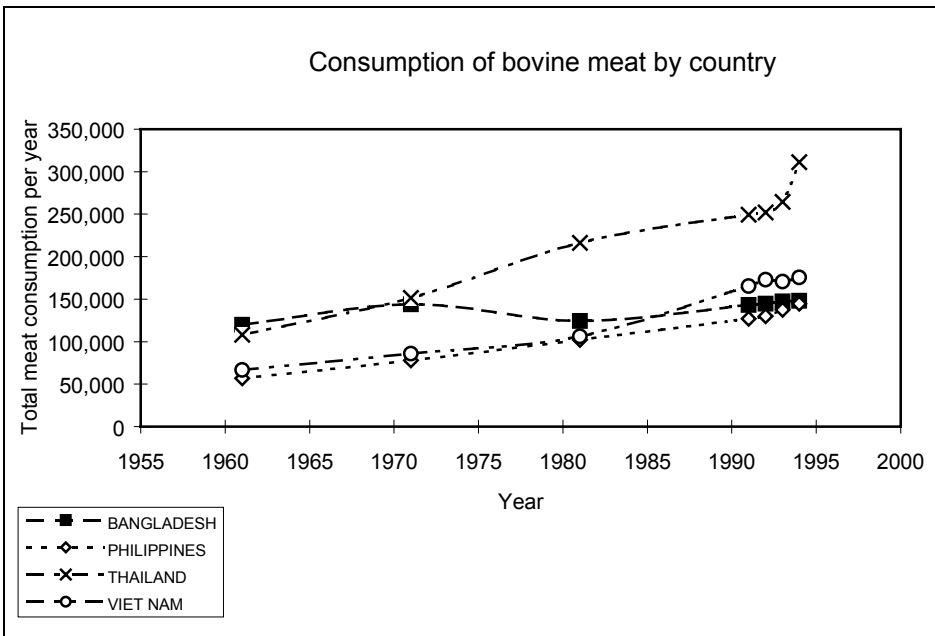


Figure 12. Bovine meat consumption, selected countries



Summary of trends in livestock production and consumption

Production of livestock products is increasing throughout the region. In almost all cases this is due to an increase in the productivity of animals as well as an increase in animal numbers.

In countries where income is increasing, the quantity of animal products consumed also increases (Figure 12 shows the consumption of beef over time). In the case of the Philippines and Vietnam, beef consumption is gradually increasing; in Thailand the increase has been more rapid in recent years. Similar trends for other livestock products may be noted, with expanding markets throughout the region.

2. Role of livestock in food security

Livestock provides not only food for the producers, but also a range of other products which could be sold or consumed by the livestock owner to provide nutrition, income, traction and fuel. The major products of livestock include draught power, meat, milk, eggs, manure which is used as fertilizer or fuel, feathers, fibre, hides, and horns. In addition to these products livestock serve as an asset and may provide a reserve that can be converted to cash in times of need.

Livestock production and its role in food security

Growing and selling livestock enables the poor rural families (in particular women) to enter the cash economy. In this way, livestock production provides increased stability in income for the family without disrupting other food producing activities.

The majority of livestock in the countries studied are kept by smallholders, with each producer owning a small number of animals. Specific areas are not set aside for grazing or fodder production but livestock are fed on crop residues. They are “opportunistic feeders.” In most cases, feeding his livestock does not cost the farmer anything. Their diet is mostly made up of residues from the farmer’s own crops, and the livestock graze and scavenge on common or waste land. Small scale producers do not feed their livestock with food that is otherwise used for human consumption.

In contrast to the small scale producer, commercial production is generally intensive and based on imported livestock feeds. This situation differs from the mountainous areas in Vietnam where land could be set aside for grazing.

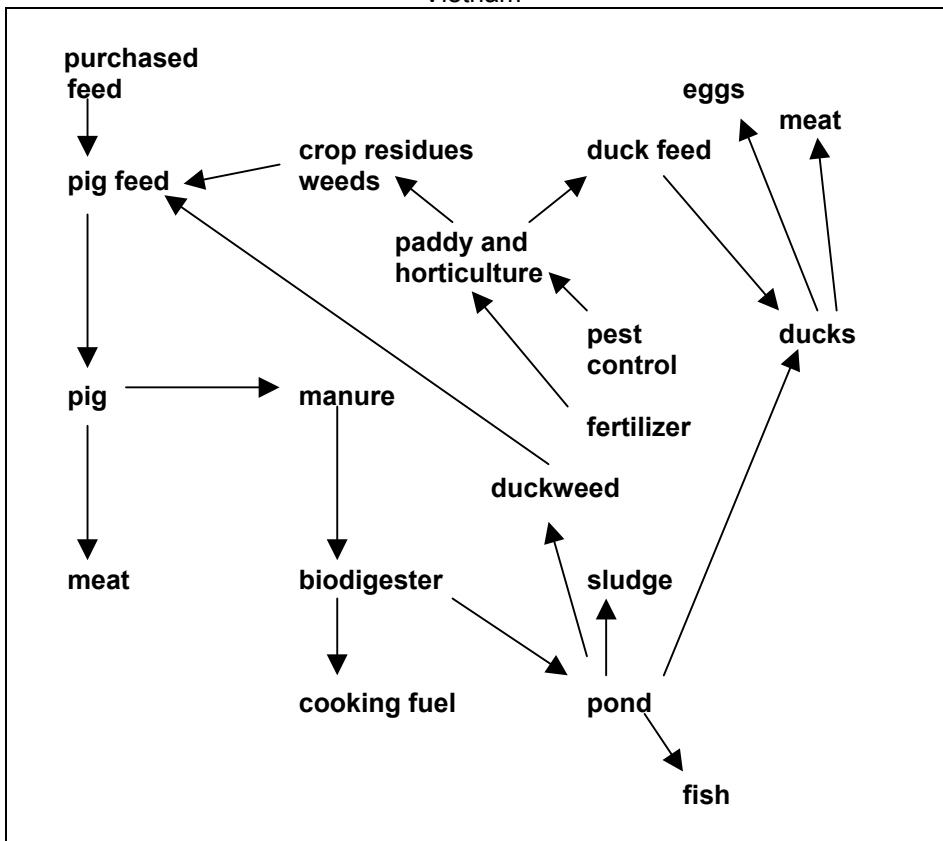
Table 1. Value of large ruminant production in Bangladesh

Outputs	Valuation method	Quantity produced	Value per unit (taka)	Total value of prod'n (taka)	Proportion of total prod'n
Power	hire/day	96,027,120	160	15,364,339,200	0.22
Milk	price/litre	806,000,000	19	15,314,000,000	0.22
Meat	price/kg	151,500,000	70	10,605,000,000	0.15
Hides	price/hide	757,500	500	378,750,000	0.01
Manure	price/kg	7,825,125,500	3.75	29,344,220,625	0.41
Total (taka)				71,006,309,825	

Livestock produced under the prevailing small scale conditions in the region have a low level of productivity. This is partly because the diet is generally at or below maintenance levels, and all of the food is used for maintenance rather than production of livestock products. This is demonstrated in the case of large ruminants in Bangladesh where dung is the most valuable output from these animals (Table 1).

In most cases livestock are an integral part of the system of sustainable mixed farming. This is true in Vietnam with the VAC system (Figure 12). This system enables farmers to make maximum use of outputs such as crop residues and animal manure which are often considered of low value.

Figure 13. Livestock in sustainable farming, example of VAC system in Vietnam



In Bangladesh the system of production is less integrated. The maximum value is not necessarily gained from all outputs of cattle production (Figure 14).

Constraints to small-scale livestock production in Asia

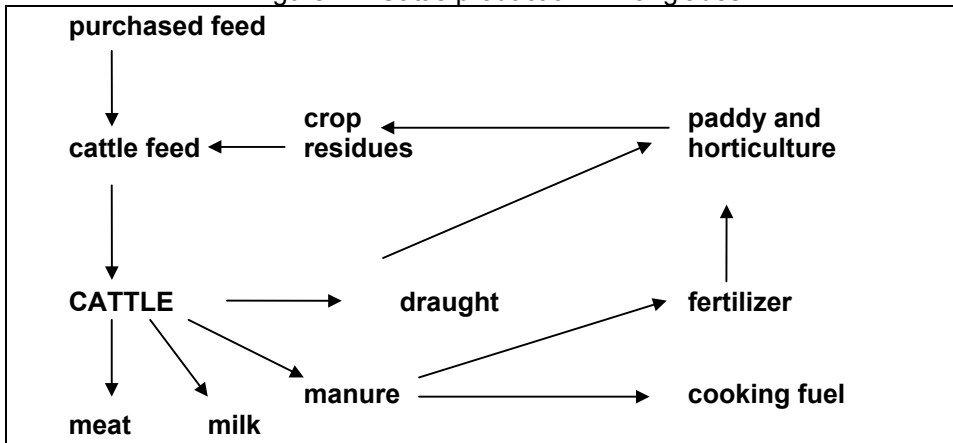
Problems in increasing livestock production were almost similar for the countries under study. The most significant constraints are nutrition, animal health, animal productivity/genetic make-up of the animals, extension of information provision of finance to small scale producers, and marketing

Nutrition

The provision of adequate nutrition to livestock is a major problem in the region. However, considerable information on alternative feed resources is

available and there is a need to extend this information to livestock owners. Any information should include production benefits derived from alternative feeds and appropriate feeding regimes.

Figure 14. Cattle production in Bangladesh



A slight increase in feed intake through the provision of supplementation has been noted to lead to large increases in production. For example, supplementary feeding of indigenous cattle by smallholders in Bangladesh increased milk yield from 1 litre per day to 5 litres per day. It is important to note that this change took place without any change in the genetic make up of the animals.

Livestock health

Livestock health is a limiting factor to production. While the specific disease cited varied between countries, it was noted that a major problem was the low level of knowledge and understanding of livestock producers of the benefits of disease control. However, even those aware of the benefits had limited access to appropriate vaccines and therapeutic drugs.

In some situations cooperatives and non government organizations (NGO's) have provided limited training and assisted in organizing vaccination of stock. Milkvita in Bangladesh conducts a vaccination programme for dairy cattle against foot and mouth disease. No doubt its aim is to protect its milk supply, but its assistance is invaluable in the livestock industry in the country. In another example, the Bangladesh Rural Advancement Committee (BRAC) has trained people who serve as vaccinators to livestock owners in their area. These vaccinators keep the appropriate vaccines and charge for their services.

As livestock owners become commercially based, they will become more aware of the benefits of disease control but will not be aware of the most appropriate methods for disease control. Government veterinary services are not tailored to meet these aims and there is a need for them to reassess their role in livestock health.

Animal productivity/genetic make-up of the animals

When animals are fed a low quality rations and are not protected from disease, genetic traits for survival are more important than those for production. With an increase in nutrition and health, large gains are made in productivity. Improvements in production traits only become important once certain conditions in health and nutrition are met and production levels reached. These conditions vary between species.

Extension of information

The collection, organization and distribution of information is important in successful livestock development. Most farmers in the region are smallholders. As each country has a large number of farmers, it would not be possible for agencies to have regular contact with each farmer. In this situation, it would not be cost effective to provide smallholder farmers with extension service. Instead it would be more appropriate to base the service at the community level.

Many agencies have contact with farmers, in particular NGOs which are involved in rural development. The provision of extension material and technical support to these agencies would provide a more effective method of extension.

Livestock in sustainable agricultural production

The role of livestock in the VAC system in Vietnam is shown in Figure 13. In this situation, livestock produce outputs which are used or sold by the farmer utilising inputs produced on the farm.

Livestock can have a variety of effects on the environment. The significance of these effects depends on the use of livestock by man rather than in any specific action of livestock.

Where land has become severely degraded, livestock can play a role in the rehabilitation of that land. As degraded land is being rehabilitated, it can be grazed at low intensity for weed control, thereby serving three purposes: (1) it provides food for the livestock; (2) their cropping of weeds preserves soil moisture; and (3) livestock dung contributes to soil fertility during the rehabilitation.

Effects of intensive livestock production systems on the environment

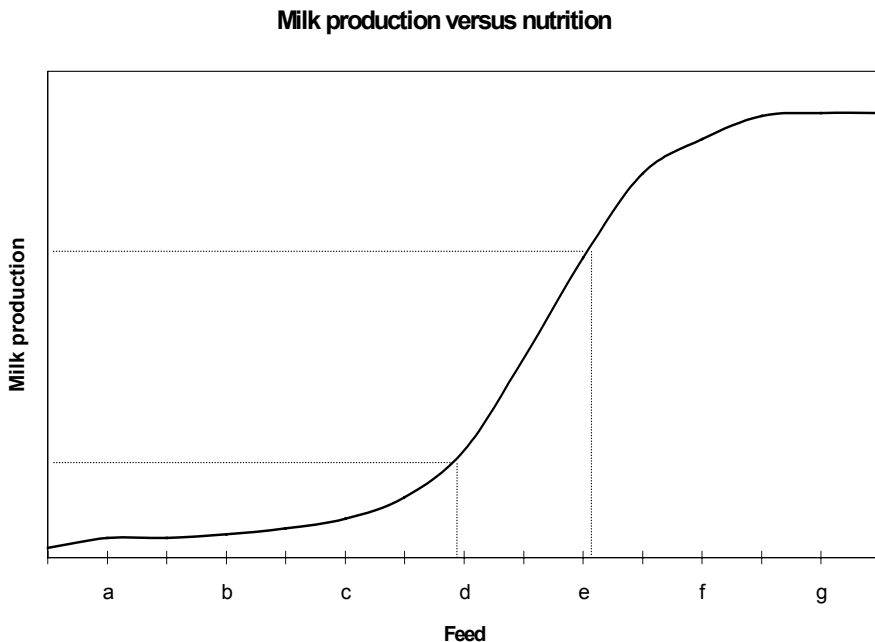
Intensive systems require large amounts of water and produce considerable quantities of manure in a small area of land. The effect of this waste on the environment can be negative or positive, depending on the use to which it is put. In areas with high human population, the animal waste adds to the large amount of human waste if not used. Because the aim of intensive industries is usually to improve profit margins, environmentally friendly and sustainable practices may not be in the immediate interests of intensive enterprises.

Mechanisation which is encouraged in intensive enterprises reduces employment available to the community.

Increasing livestock production

Livestock owned by small scale producers in the region are producing at low levels. This is due to a combination of factors. The main factors are limited feed resources with animals fed a submaintenance to maintenance diet. Figure 15 describes a relationship between milk production and nutrition. In the situation, the small scale producer inputs are likely to be at point **d** and result in low production as most of the feed intake is used to maintain the animal. A relatively small increase in feed inputs would result in a large increase in production - for example an increase in feed inputs to point **e** would result in a large increase in milk production.

Figure 15. Milk production vs. nutrition



Increasing livestock production requires that all parts of the livestock production system be examined to determine the areas which would give the greatest benefit. An example of rapidly increasing the value of a livestock product is the use of a biodigester for the production of methane for household cooking and the production of fertilizer. This process effectively doubles the value of livestock manure to the family.

An individual family, community or corporation must have the following to be able to buy and raise livestock: (1) money to purchase parent stock; (2) land in which to keep them; (3) food to feed them with; (4) a market for their

products; (5) a way to remove and/or recycle their waste; and (6) adequate hygiene and disease control (which is especially important in intensive production) and which could be on a property and regional basis

The form of development (intensive to extensive) and selection of stock type will depend on many factors: (1) need for a rapid return on the initial investment; (2) need for a constant cash flow; (3) availability of land; and (4) location of market and infrastructure (such as transport to market).

The animal revolution

The presence of a large number of relatively unproductive animals can lead to the conclusion that livestock are a drain on the resources of a poor country. However, an alternative approach can be taken in which the productivity of these livestock can be rapidly increased with a small increase in inputs. In addition, more effective use of the outputs from livestock production through processing and marketing can lead to considerable increases in the effects of livestock production on the lifestyle of livestock producers.

In Bangladesh six-fold increases in milk production from indigenous cows have been achieved with small increases in inputs. This demonstrates the potential to dramatically increase production from livestock in the region.

Increasing livestock production and productivity

Small scale producers

Several common factors were cited as limiting livestock production in all three countries studied, namely: (1) nutrition; (2) animal health; (3) animal productivity (genetic makeup); and (4) extension of information to producers.

Most smallholders keep livestock with a low level of productivity. This can be greatly increased by improving the nutrition and health of these animals. Once the farmer purchases livestock for the purpose of increased production, he should consider their genetic make-up and modify production characteristics to take advantage of improved nutrition and health. However, unless genetic make up restricts production, there are advantages in using indigenous animals which have better disease resistance and ability to survive periods of poor nutrition.

This study did not delve into which species of animals should be targeted to increase productivity. Poultry involves the smallest investment for commercial production and therefore reduces the risk or effect of failure due, for example to disease outbreak. When production is low, gains could be large by increasing the level of nutrition of lactating cows irrespective of their genetic make-up. In this situation the need to increase production traits only becomes relevant once production reaches a relatively high level.

Intensive livestock industries

In Asia and the Pacific, intensive livestock industries rely on imported genetics, technology and feed. The margins gained by these producers are often small and require a high level of management skills and technical

expertise to survive. In addition, intensive livestock industries often compete with people for food. This is because the use of by-products and waste products does not allow the rapid growth that is associated with these industries.

Increasing the value of livestock production

The value of livestock production to small scale producers can be increased by: (1) providing markets and market access; (2) effective processing of product, and (3) increasing the quality of the product.

Animal welfare and food security

Improving the nutrition and health of livestock in rural areas would provide many positive benefits for animal welfare. Many animals are now kept under poor conditions and are often underfed and poorly cared for. Once the animals become productive, they become of greater value to the owner and provide an income that can be increased by better feeding and health care.

4. Conclusions and recommendations

Some countries in the Asia Pacific Region have demonstrated that a rapid increase in livestock productivity is possible. A number of livestock in the region have low levels of production as a result of low levels of nutrition and health. A relatively small input into fodder production and health, comprising a small increase in inputs, would result in a large increase in production. This is because much of the inputs would be used for production rather than for maintenance of the animal. This is a similar situation to the Green Revolution, during which for relatively few changes in inputs the outputs of crop production were greatly increased.

Many animals receive maintenance or below maintenance levels of nutrition resulting in low levels of production. Increasing the quantity of feed by reducing the number of animals does not provide a solution as the nutritional value of the available feed is low. The addition of a small amount of higher quality feed can have a large effect on production in this situation. In the case of milk production, the use of cattle with a small body size would result in reduced maintenance requirements of the animal, thus enabling more efficient use of available feed for milk production.

The effectiveness of many livestock projects in Bangladesh shows that production could be increased rapidly. A major step in this process would be the education of livestock owners to view their livestock as income earning.

This report does not attempt to quantify the role of livestock in terms of nutritional intake. This is because many of the outputs are not directly nutritional but play a role in the integrated farming approach that is used by most farmers in the region.

Generally, the role of livestock had centered on the outputs that can be consumed and are usually quantified by standard government-collected statistics. However, this study demonstrates that such a method of estimation is flawed, greatly underestimating the importance of livestock. For example, such statistics underestimates the value of large ruminant production in Bangladesh by at least 50%.

The large rural population, small farm size and intensive land use in the region do not allow the setting aside of areas specifically for livestock grazing or fodder production. As a result the provision of adequate nutrition for livestock production is a major constraint.

Summary of findings

1. *The role of livestock in food security is undervalued.* Livestock provides nutrition, power and income for small scale producers thereby increasing food security and contributing to rural development. The costs of inputs into this system are low. For example, feed for ruminants consists mainly of rice straw and grazing from waste, fallow and common land.

2. *Livestock productivity is low.* This can be increased in several areas, in particular: (1) inputs (especially livestock nutrition); (2) animal health; (3) genetics (which requires a balancing of survival and production characteristics); and (4) the use of outputs (such as dung which can greatly increase the value of the outputs). In each of these areas there are limitations to increasing production.
3. *The region has a large number of animals with a low level of productivity.* These animals are being fed to about maintenance level. With an increase in the level of feeding much of the additional nutrition would be partitioned to production. This has been demonstrated in Bangladesh where the provision of a small amount of supplement has led to increased milk production, from 1 to 6 litres per day in indigenous cows. Therefore, by concentrating on improving the efficiency of production of the animals owned by smallholders, large gains in total production can be made rapidly.
4. *Considerable work is being carried out in the region to determine the availability and effect of a range of alternative livestock feed production methods that do not impinge on human food production.*
5. *Research on disease diagnosis and vaccine production is being carried out in the region.* However, suitable village level disease control programmes have not been devised. The development of such programmes requires a modification of standard government methods which often involves the use of large scale disease control programmes rather than the use of strategic vaccination by individual producers.
6. *Cross breeding programmes to increase the productivity of livestock are being carried out in all countries studied.*
7. *Integrated sustainable farming systems have been developed in Vietnam and allow farmers to gain the maximum benefit from limited resources.* In addition, it provides the farmer with a sense of purpose and improves the local environment. In these systems the use of bio-digesters to produce biogas and fertilizer increases the value of animal manure and is being studied at the University for Tropical Agriculture and Bangladesh Livestock Research Institute and applied extensively in the field in Vietnam. Manure is also used directly in fishponds to increase fish production and to assist in the growth of duckweed for livestock feeding.
8. *Marketing systems to ensure fair prices for livestock producers have been put in place by organizations such as Bangladesh Rural Advancement Committee in developing poultry projects and Milkvita a dairy cooperative in Bangladesh.* However, small scale livestock farmers often receive low prices for their products.
9. *Increasing livestock production by poor farmers would provide a useful short to medium term benefit, especially where farm labour is underutilised.* Livestock enables the farmer to enter the cash economy. If the production levels of animals already owned by the farmer are increased, the benefit is received for little cost. The long term effects as

the economy expands and infrastructure improves are more difficult to predict.

10. *Governments, for example Vietnam, are provided with conflicting advice on the development of the agricultural sector.* The advice at times seems to concentrate on the interests of the advisor rather than the local community.
11. Due to a lack of livestock feed resources and the shortage of land for livestock feed production, ***most countries in the region are not in a position to develop large scale intensive livestock industries without the importation of feedstuff.*** The major comparative advantage these countries offer is relatively cheap labour and government concessions.
12. *Government extension services have generally failed to provide information to individual farmers,* mainly because the task is too large. The role of government agencies needs to be re-evaluated.
13. *The integration of governments, research agencies (including government, universities and non-government), NGOs, cooperatives (and other farmer groups) and international organizations must be carried out.* Any such development should involve links between organizations in different countries in the region.
14. *An advantage NGOs provide is the examination of the community as a whole and the integration of livestock development into community development.* However, these organizations often lack technical expertise in livestock production. The provision of technical information to livestock producers through NGOs and farmers' cooperatives by government extension services provides an avenue to more effective livestock development.
15. *Any livestock strategy developed must be in keeping with the resources that are available within the production system and that the products meet market requirements.*

Recommendations

1. *Livestock should be considered as part of any future food security activities* because of their important role in food security and rural development.
2. *Livestock development projects should focus on improving the productivity of animals presently in the region and small scale farmers should given priority.* This would enable effective use of a relatively unproductive resource with a small increase in inputs. Productivity improvement should be integrated with programmes to ensure the more effective use of livestock outputs, such as the use of biodigesters that would increase the value of animal manure, and effective marketing systems that ensure access to markets and that fair prices are paid for animal products.

3. *Support should be given to improve communication between organizations in the region involved in livestock development, in particular where one country or organization has specific expertise and experience in an area of livestock development.* For example, in Vietnam there is considerable expertise in the development of integrated sustainable farming systems while in Bangladesh NGOs have considerable experience in assisting communities set up commercially viable livestock programs.
4. *Work should be undertaken to assist organizations involved in livestock development to determine which combinations of species and breeds of livestock provide the greatest benefit to farmers under different circumstances and conditions* (including access to markets for outputs and availability of inputs). Such an examination should include detailed examination of successful projects that have been carried out and involve investigation of the infrastructure needed for successful implementation.
5. *Further work should be carried out on the development and dissemination of information on alternative production of livestock feeds* as this is a major limiting factor in livestock development.
6. *Animal health constraints to livestock production should be investigated and appropriate and economically viable control programmes be developed for small scale farmers.* This would involve the need for an innovative approach to be taken to the collection of animal health information and the provision of advice on vaccination and drug use (such as anthelmintics) at a local level.
7. *Government livestock services should be assisted to change their focus in the provision of services to livestock producers.* This would involve a shift to the provision of technical advice to livestock project development agencies such as NGOs, and cooperatives rather than directly to farmers and involves a major shift in the philosophy of government livestock services.
8. *The Food and Agriculture Organization (FAO) should reassess the way in which it provides technical support for livestock development.* One alternative is to increase its role as a facilitator assisting other organizations to carry out livestock development.

Valuing the production of large ruminants

The annual value of large ruminant production (*TVL*) can be estimated using the following formula:

$$TVL = PV + MV + OV + DV + CV + HV$$

where

DV is the value of draught power
MV is the value of milk produced
OV is the value of offspring produced
DV is the value of manure, and
MeV is the value of meat produced
HV is the value of hides produced.

$$PV = t \times pP$$

where

t is the time spent performing draught work in days, and
pP is the price of draught work per hour (excluding the cost of labour).

It would be expected that at peak times of use the price of draught power would be greater than at other times. therefore any price must be an estimate of the overall price of draught power throughout the year.

$$MV = qM \times pM$$

where

qM is the quantity of milk produced
pM is the price of milk.

$$DV = n \times qD \times pD$$

where

n is the number of animals
qD is the quantity of manure produced per animal in kilograms, and
pD is the price per kilogram of the manure.

$$MeV = qC \times pC$$

where

qC is the quantity of large ruminant meat produced, and
pC is the price of meat per kilogram.

$$HV = qH \times pH$$

where

qH is the number of hides produced, and
pH is the price per hide.

Costs of keeping large ruminants

The annual cost of keeping large ruminants (CL) can be calculated using the formula:

$$CL = n \times (g + h + t + v)$$

where

- n is the number of animals
- g is the cost of feed per animal
- h is the cost of housing
- t is the cost of tending and in the case of draught animals of training each animal, and
- v is the cost of maintaining a draught animals health.

Prices used in the calculation of the value of livestock production in Bangladesh

Large ruminants

Meat farmgate price: Tk70 per kg

Milk Tk19 per litre

Manure: price was calculated using two methods, namely (1) the firewood equivalent method, and (2) the market price for wet manure sold for use as fertilizer. Both methods provide similar prices for dry manure

For the firewood equivalent method the value of dried dung was assumed to be equivalent to the cost of firewood which was sold in the market. Firewood was sold in the market for Tk300 for 80 kg (Tk3.75 per kg).

In the market, wet manure is sold for Tk150 per pushcart. The contents of the pushcart weigh approximately 80 kg. This method produces a price of Tk1.875 per kg for wet manure. On the assumption of 60% moisture content in the manure, this would be equivalent to Tk4.6875 per kg dry weight. The lower price using the firewood equivalent method was used due to uncertainties over the weight of the pushcart.

Price for draught power

Two indirect methods were considered to estimate the price for draught power hire. These were: (1) the value of milk production forgone due to the use of cows as draught animals, and (2) the rickshaw equivalent method.

Under the first method, it was assumed that a cow used for draught will have a reduced in milk production of 1.5 litres of milk for each day that she is used for draught work. Milk has a market price of Tk19 per day. As two animals are used for each plough, the value of draught power per day (vP) is calculated as:

$$vP = 2 \times mpf \times pM$$

where

mpf is the milk production forgone, and

pM is the price of milk per litre

In this case

$$vP = 2 \times 1.5 \times 19$$

which is T 57 per day per team of draught animals.

Under the rickshaw equivalent method, the calculation is based on the capital cost of a rickshaw in comparison to the cost of a team of draught

animals. Using the rate of hire of a rickshaw, the daily hire of a draught team is estimated using the formula:

$$hP = \frac{cdt}{cr} \times dhr$$

where

hP is the daily hire for a draught team

cdt is the capital cost of a draught team

cr is the capital cost of a rickshaw, and

dhr is the daily hire of a rickshaw (excluding labour).

The following estimates for the costs were obtained:

Cost of rickshaw	Tk5,000
Daily hire of rickshaw (without labour)	Tk20
Capital cost of draught animal	Tk10,000

Using these estimates the value of a days draught power was estimated at Tk160.

Calculating the value of poultry production

The total value of poultry production (TVP) is calculated using the following formula:

$$TVB = EV + MeV + DV + PV$$

Where

EV is the value of egg production
MeV is the value of meat production
DV is the value of manure, and
PV is the value of pest control.

$$EV = qE \times pE$$

where

qE is the number/weight of eggs per year
pE is the farm gate price per egg/per kilogram

$$MeV = qMe \times pMe$$

where

qMe is the quantity of meat produced
pMe is the farm gate price per unit for meat

$$DV = n \times d \times pD$$

where

d is the quantity of manure per bird per year in kg
pMe is the price of manure per kilogram

Cost of poultry production

$$CB = n (g + h + t + v + cd)$$

cd is the cost of disposing of waste.

Valuing the production of pigs

The total annual value of keeping growing pigs (*TVGP*) can be estimated using the following formula:

$$TVGP = (BV + DV) - CGP$$

where

- BV* is the sale value of a pig less the purchase cost
- DV* is the value of manure, and
- CGP* is the cost of keeping a growing pig.

The annual costs of keeping growing pigs (*CGP*) can be calculated using the following formula:

$$CGP = n (g + h + l + v + w)$$

where

- n* is the number of pigs
- g* is the cost of feed
- h* is the cost of housing
- l* is the cost of labour
- v* is the cost of maintaining health, and
- w* is the cost of disposing of waste

Livestock in food security in Bangladesh

In Bangladesh 30% of rural households own no land other than the homestead. The average farm size is 0.72ha and family size is seven. Livestock comprising cattle, buffalo, goats, sheep and poultry (including ducks) are an integral part of the farming system in Bangladesh.

Most of the ruminants are owned by farmers with less than one ha of land. Farmers with 0.6 to 1 ha of land have the greatest variety of livestock types. Most of the livestock are owned by rural households with little or no land. This is particularly the case for small ruminants where 66% of goats are kept by the households with 0 -0.5 ha of land (39% of farmers). This group also keeps 33% of cows and 5.85% of bullocks. Households with more than 2 ha of land account for about 33% of the bullocks.

Number of livestock per rural household (average)

- 2.6 cattle and buffalo
- 1 goat/sheep
- 7.5 chickens

Number of livestock per non municipal households

- 1.5 cattle
- 2.7 goat/sheep
- 5.1 poultry

Data on livestock production are not available on a systematic basis.

- There was no significant change in the number of cattle and buffaloes but sheep and goat population rose by 50% in 1977 to 62% in 1983/4.
- Poultry population increased by 37% during the same period.
- Goats produce 28% of total milk yield and 70,000 tonnes of meat each year (19% of total meat production). The rural population eat more of goats cattle, because their small body size and smaller value makes it viable to slaughter an animal for food. There seems to be a high level of neonatal mortality in goats. Goats are usually not housed separately but may be housed in the house or with cattle
- Ducks are more commonly found near areas that are flooded seasonally or near ponds.
- Poultry are widely distributed and are mainly scavengers. Small ruminants and poultry are generally raised by women, who also manage the purchase and sale of poultry, eggs and goats.

- Livestock are usually sold in response to the financial needs of the household rather than in response to market prices. The income from livestock sales is used to meet farm and household expenses.

Value of livestock production in Bangladesh

Large ruminants

The value of large ruminant production is shown in Table A1, which demonstrates that manure is the major product from large ruminants providing 41% of the total livestock production. This is in spite of the use of a highly conservative estimate of the volume of manure output to allow for some not being collected and used specifically for fuel and fertilizer.

The value of draught providing 22% of total output must be considered an underestimate of the importance of draught in food security. The loss of draught power at ploughing time would result in large reductions in crop production. Disease and nutrition are limitations to draught power. For example, foot and mouth disease occurs throughout the year but is more common during the rains, the time at which most ploughing is carried out.

Meat production which provides 15% of large ruminant production may be an overestimate of true production as many cattle are imported from India for slaughter. The contribution of imported cattle to meat production in Bangladesh has not been estimated. Milk production provides 22% of total ruminant production and is believed to be of increasing importance.

Constraints to livestock production

Some major factors were cited as being most important in limiting animal production in Bangladesh: (1) nutrition; (2) animal health; (3) poor extension of information to producers; (4) problems associated with land ownership; (5) absence of effective land use planning; and (6) market infrastructure

Nutrition

Most livestock feed is comprised of crop residues (rice straw) supplemented with green fodder and weeds from cultivated fields. The estimated dry matter intake is 2 kg of rice straw and 1 kg of green fodder per day.

- Weeds from cultivated fields (1 tonne DM per acre)
- Grass is rarely cultivated for fodder. In effect Bangladesh does not have any land for the production of feed exclusively for animals.
- The use of trees and shrubs for livestock fodder is traditionally carried out in Bangladesh. Cultivating these trees does not require arable land or large amounts of labour. The use of trees and shrubs is expanding.
- Leaves from various trees such as jackfruits, mander, korie, shewara and bamboo are fed to goats and sheep.

- Water hyacinth is fed to cattle and buffalo in association with rice straw.

Crop residues consist of (1) straw from rice, wheat and other cereal grains; (2) pulses; and (3) bagasse and cane tops. Rice straw accounts for about 38.4% of the dry matter requirement

Table A-1. Value of large ruminant production in Bangladesh

Outputs	Valuation method	Quantity produced	Value per unit (taka)	Total value of prod'n (taka)	Proportion of total prod'n
Power	hire/day	96,027,120	160	15,364,339,200	0.22
Milk	price/litre	806,000,000	19	15,314,000,000	0.22
Meat	price/kg	151,500,000	70	10,605,000,000	0.15
Hides	price/hide	757,500	500	378,750,000	0.01
Manure	price/kg	7,825,125,500	3.75	29,344,220,625	0.41
Total (taka)				71,006,309,825	1.00

Small ruminants

Table A-2. Value of small ruminant production in Bangladesh

Outputs	Valuation method	Quantity produced	Value per unit (taka)	Total value of prod'n (taka)	Proportion of total prod'n
Milk	Price/litre	554,120,000	19	10,528,280,000	0.55
Meat	Price/kg	105,000,000	70	7,350,000,000	0.38
Hides	Price	7,000,000	200	1,400,000,000	0.07
Manure (dry)	Price/kg	9,250,293	3.75	34,688,599	0.00
Total (taka)				19,312,968,599	

Poultry

Table A-3. Value of poultry production in Bangladesh

Outputs	Valuation method	Quantity produced	Value per unit (taka)	Total value of prod'n (taka)	Proportion of total value
Eggs	price/kg	82,000,000	45.45	3,726,900,000	0.37
Meat	price/kg	89,481,000	70	6,263,670,000	0.63
Pest control					
Manure	price/kg	22,386,000	0.83	18,655,000	0.00
Feathers					
Total (taka)				10,009,225,000	

Concentrates consist of rice bran, wheat bran, oil cakes, pulse bran, molasses and fish meal. These contribute only 6.8% of the total dry matter requirement for livestock.

Methods of feeding

- Straw is usually fed chopped and soaked with water with some cut grass.
- Rice gruel mixed with a small amount of oil cake or bran is used in some cases to feed milking cows.

At present 44% of dry matter, 26% of crude protein and 17% of the energy requirements are met from available feed resources. The major feed for livestock is straw, 2kg of straw is available per head per day. Supplementation is limited to about 1 kg of green fodder plus very small quantities of cereal and oilseed by-products

Animal health

- Internal parasites especially when young.
- foot and mouth, black quarter in cattle,
- Newcastle disease, fowl pox, fowl cholera and duck plague in poultry
- Deaths of kids due to infectious diseases and predation are reported to occur.

Current livestock projects and their effect on food security

Agriculture accounts for 63% of household income and livestock development is seen as a major way for the rural poor, in particular those with little or no land, to generate income and make use of underutilised labour.

A number of successful livestock development projects have been implemented mostly through the NGOs, sometimes in association with the Department of Livestock Services. In general the projects concentrate on the development of the poultry sector through the provision of credit for the purchase of stock and stock feed, and the provision of a marketing structure for the products. The small scale poultry farms developed in these projects are mostly housed. Because these projects are small scale and effectively managed, severe disease outbreaks have been avoided. In addition the provision of a large number of small scale producers minimises the risk of a major interruption in the marketing framework.

A problem with the development of a housed poultry system is the need to provide a balanced ration. Because most of the inputs into the feed are imported, the feed provides a weak link in the chain of production, with the transport costs borne by the producer. In some feed suppliers bags of imported ration are available for sale.

Projects to increase milk production and goat production are also undertaken, often with success. Many of these programmes target the improvement in nutrition and health of animals to increase production rather than changing the type of animal. This has been a successful measure because production is low and relatively simple to increase.

Privatisation of veterinary services, in particular the production of vaccines for use in livestock, are part of future projects. The possibility of severe outbreaks of disease following the introduction of a charge for vaccines is a possibility and the provision of an effective training and extension programme on disease control must be implemented as part of any such program.

Livestock in food security in the Philippines

The livestock industry in the Philippines has two distinct sectors. The small-scale semi-subsistence sector and the commercial sector. The commercial sector relies on the importation of feed and generally operates intensive production systems involving poultry, pigs and beef feedlot production. In the beef feedlot industry virtually all the feeder animals are imported. The bulk of the feed used to supply the pig and poultry industries is also imported. Pork is the most popular meat and 60-65% of meat eaten in the Philippines is pork

Large ruminants

The large ruminant industry has three components: (1) buffalo (draught, milk and meat); (2) beef cattle; and (3) dairy cattle. The buffalo or carabao industry is composed of 97% backyard farming and 3% commercial farming. Backyard farmers use buffaloes for draft(95%), milk(5%) and meat. Buffaloes are required to be over 7 years old before slaughter if male and over 11 years if female.

The industry has shown negative growth rates. However, the Bureau of Animal Industry (BAI) says that this was reversed recently, with numbers adjusted up to 2.8 million. The Carabao Center was created in 1982 and until 1993 received support from UNDP. Inadequate breeding stock requires importation to upgrade and increase numbers. However, a need exists to increase support services as reduced numbers and high slaughter rates threaten draught power availability.

About 85% of the cattle in the beef industry are comprised of backyard enterprises. This will require regional restructuring due to spreading urbanisation. Backyard growers rely on farm waste for feed supplies. Feeds used by the commercial beef raisers are based largely on silage (75 day corn chop), sugarcane tops and chopped sugarcane with rice bran and copra meal, tapioca, pineapple pulp, local cotton seed meal, wheat pollard and brewery spent grain. The amounts fed fluctuate with price availability and acceptance by the cattle, the feeds being introduced slowly and continually monitored for performance and rations being modified to ensure at least 1 kg/day growth.

All feedlot cattle are imported and fed over a period from 90 to 120 days. They are sold when they reach 380-400 kgs. Cattle over 450 kg are penalised in the market place as they become difficult to process.

A 1996 study of the Institute of Agribusiness Development and Policy, University of Asia and the Pacific forecasts a continuing 4% increase in demand for beef but growers will have to rely on imports as few local cattle are available. Locally bred cattle appear to be finished for slaughter on the property of origin. The owners make use of feeds, often to supplement sugarcane tops or growing and cutting *Leucena* as a supplement.

With the decline in cattle numbers in Luzon and generally in commercial herds, feedlots rely virtually totally on imports of Australian steers for fattening. Approximately 192,000 heads of cattle were imported in 1995 for feedlot production

Factors that contribute to low cattle numbers are land tenure insecurity, inadequate support systems, marketing and transport infrastructure. Local feed resources are not well exploited although industrial byproducts, sugarcane tops and other crop residues are used widely. There is also inadequate population livestock base for breeding, which leads to the inability of natural increases to keep pace with the high level of marketing. The livestock are of generally poor quality, including the imports

The dairy Industry is 65% smallholder and 35% commercial dairy. Domestic production accounts for is less than 1% of supply. The industry is practically non existent except in the highlands where the local demand is met by some small dairy enterprises.

Markets are poorly developed and there is virtually no marketing as there is a very large import of milk products from Australia and New Zealand. Cooperatives exist and there is substantial unused capacity in the local processing industry.

Swine industry

The swine industry produces 1.2 million tonnes of pork annually. The backyard industry accounts for 83% of the swine population and commercial operators account for 17%. Swine marketing needs to be overhauled as “agents” now move about buying individual animals, often not giving a fair price. If FMD is declared in a region, agents focus on that affected region and substantially devalue prices.

The commercial enterprises are intensive, and have high turnovers with tight profit margins usually integrating feed supply, processing and marketing with production. There is concern about rising costs of feeds, leading to efforts at seeking feed substitutes and liberalisation of imports of livestock feeds. Some operators allegedly escape duties on feeds by using grains imported free of duty for human consumption. They are also seeking exemption from CARP to establish more stable sources of local feed supply.

Poultry industry

The poultry industry is largely composed of small scale producers. It is estimated that 70% of the birds are kept in backyard enterprises and 30% in commercial operations. In general commercial broiler operators are contracted by feedmills to raise the birds.

Native chickens are used by the smallholder farmers and hybrids by commercial intensive farmers who integrate feed supply, processing and marketing with production. Feeds are virtually fully imported, being yellow maize and soybean meal, although copra meal and rice bran is substituted to some extent

Concerns are about rising costs of feeds and competition with imported birds from Thailand; the lack of development of local feed supplies and the consequent efforts at liberalisation of imports of feeds. Poultry disease management is also a concern; village and smallholder chicken farmers suggest the use of V4 Newcastle Disease Vaccine.

Ducks are commonly a part of mixed farming enterprises. They are used to gather grain from rice fields after they are harvested.

Small ruminants

Small ruminants, particularly goats, are either kept by smallholder farmers or more intensively on government farms. The goat population has shown a steady rate of increase (a five-fold increase since 1961), following an increase in market demand for goat meat as well as its milk and fibre. They are used extensively by the backyard enterprises and the rural poor who make use of marginal lands so that health management is often at a low standard. Improved support services with improved quality breeding stock are required. Heifer International and other NGOs have a programme where they provide good quality goats, specifically 6 does and a buck, as a model. Feed and housing have to be available and the repayment consist of two kids per doe. Goats are generally grown on slats or tethered out.

Sheep have a very small population base.

Livestock nutrition

Commercial pig and poultry feeds compete with the human population for cereals. The rations are composed mainly of 50% maize and 25% soybean. Yellow maize (5-8% of which is imported) at a cost of P5-8/kg while the entire soybean supply is imported. Soybean costs P 9-11/kg. Rice bran and pollard make up the rest of the diet with copra meal, fish meal being replacement components for soybean when available.

Fish meal is an offal by-product and is available at a reasonable price, but lacks in quality. Sorghum and canola meal have anti-nutritional factors so are fed in small amounts. Meat and bone meal, rendered poultry products, which include feathers, are used when available but rendering is not universally practiced due to energy requirements and cost.

Other feeds are corn gluten, wheat pollard, brewery grain and yeast. There is an increasing supply of tapioca, sweet potato and molasses as sources of carbohydrate. Banana meal fibre and pineapple pulp, although sufficient in quantity, is more useful to ruminant nutrition. Backyard swine and poultry nutrition relies largely on swill and scavenging although ducks are commonly fed on rice stubble to eat snails and fallen rice heads and the manure is also seen as a benefit.

Swine raisers in different regions have buying advantages when it comes to stock feeds, for example, those in Central Luzon where Region II corners all the feed. Desiccated sweet potato is grown but is exported to Taiwan as it is owned by overseas interests. Substitutes for sweet corn are being sort and the Department of Agriculture has been approached to establish a

laboratory process to test a mixture of sweet potato and copra cake and establish grower cooperatives to supply the product.

The expected yield of sweet potato is 20-40 tonnes/ha using developed varieties. To look at the feasibility and establish the process as a viable commercial enterprise as a corn substitute.

Conversion ratios achieved are 2.8-3.0 for swine and about 2.0 for poultry. Note that when village chickens give a very poor conversion which might mediate against intensifying village poultry without improving breed performance. Swine in prime condition sell for P55-60/kg liveweight while the culls sell for around P45/kg liveweight. About 15% of the swine meat is processed but as this is increasingly imported, this demand is falling off

Threats to the swine and poultry industry arise from uncertain costs of feed. The increase in corn production is 1.2% per year, while that from livestock (swine and poultry), 5-7%. A feedlot cartel is growing silage to reduce its need for corn

Animal health

Disease was not seen as a threat to the survival of either the swine or poultry commercial livestock industries as the level of management was able to combat all of the significant disease problems. The biggest problem identified was reduced profit margins due to increased animal feed costs. Even in the backyard swine enterprises, disease was not seen as a priority as management systems were available to counter these. Diseases listed in order of priority were: (1) swine fever; (2) foot and mouth disease; and (3) pseudo rabies (Aujeszky's disease).

The backyard poultry industry has the following problems in order of priority: (1) avian pests and parasites; (2) Newcastle disease; and (3) fowl cholera.

The backyard cattle industry faces the problems of (1) foot and mouth disease and (2) astereullosis.

Pollution

Waste control is not an issue in the Philippines although two rivers have been declared officially dead. By-product rendering, although producing a valuable product, is not well established and there is a big variation in the quality of the product. An agency should look towards the more efficient utilisation of by-products. Liquid wastes do not receive enzyme treatment to reduce phosphates, and are therefore emerging as a serious problem.

Trade

Trade issues are emerging, with the WTO and GATT pushing for tariff reduction. Poultry from Thailand will be a threat to commercial producers unless the tariffs on feed imports are also reduced. Flour millers are able to import wheat with minimum tariff and this can find its way into substitute corn and soy but is supposed to be for human consumption.

Government policies

Government policies have not been able to assist livestock owners. In June 1988 the Comprehensive Agrarian Reform Programme (CARP) was introduced. Under this programme, landholders with more than 5 ha would have their land subdivided and given to the "landless." Due to lack of skills and resources on the part of the landless people, large tracts of land went out of production. Some of the new landholders speculated on their new land in the hope of quick financial gain. There is now legislation as CARL. Landholders in the more remote areas such as on Mindanao, away from government enforcement, can now protect their land more easily.

All the other ASEAN countries permit animal feed imports with low tariffs. Thus they are able to produce pigs and poultry at lower prices. Corn imported for animal feeds - that is, yellow corn - attracts a tariff of 35% if it falls within minimal access volume (MAV),. Beyond this, the tariff is 100%. The processing of sweet potato holds the greatest promise using 15% soybean meal for protein content. Rice hull chicken litter with 30% copra meal or rice bran has been used to feed cattle. This is fed with mineral premixes and molasses plus grass and rice straw have achieved weight gains of 2kg/day are achieved with a superior quality meat.

Constraints to livestock production in the Philippines

Constraints to improving livestock production are the following: (1) livestock nutrition with MAV applying to feed imports and not significantly more to establish substitute feeds; (2) livestock health and the need to eradicate FMD to permit the free movement of livestock from Luzon; (3) lack of security of land tenure; (4) urbanisation; (5) land use priority for cropping; (6) marketing and poor transport infrastructure; and (7) cattle rustling (theft).

Other concerns were the following: (1) fragility of the upland environments; (2) very poor infra structure support; (3) labour is moving to the cities; and (4) efficiency of national resource management.

Livestock in food security in Viet Nam

The pattern of livestock ownership in Vietnam varies with the agricultural zone. However, in all areas, swine are the most important animals, with most farmers owning some heads of swine. Ducks and chickens are widespread, with ducks present in large numbers in the Mekong River Delta. In the south the role of buffaloes is decreasing as farmers are unable to allocate land to support them.

Livestock especially swine are kept as a form of savings and provide a return in excess of bank interest rates.

Constraints to livestock production in Vietnam

The following are the major constraints to livestock production in Vietnam: (1) nutrition; (2) animal health; (3) animal productivity; and (4) extension of information to producers

Nutrition

Most livestock kept by small scale farmers are fed on crop by-products and are kept in pens near the farmer's house. Virtually no land is set aside for fodder production, nor is grazing land available with the exception of the mountainous areas. The provision of adequate nutrition to livestock is a problem for farmers as the cost of prepared feeds is high in comparison to the farmer's income. Alternative feed production systems are being developed at the University of Tropical Agriculture near Ho Chi Minh City in association with FAO. These include the production of duck weed in ponds, the use of fodder trees and alternative systems for the processing of crop by-products.

Commercial feedmills are being developed by private feedmills using locally available and imported ingredients to produce balanced diets for swine and poultry. An ACIAR project is also examining the constraints to production with respect to nutrition.

Animal health

Disease poses a large problem to successful livestock production. This area is not well developed in Vietnam. With the change from local to exotic breeds, the situation is expected to become more apparent. Duck plague for example may kill up to 95% of ducks in a flock during an outbreak.

Animal productivity

The indigenous pig appears to be relatively disease-resistant and tolerant of poor feeding. However, it was developed for a market where fat was highly prized and are therefore fat. This is an inefficient use of available feed and a number of alternative cross-bred types of swine and systems for their production have been developed. Its aims are to reduce fat to lean ratios, increase fertility and improve feed conversion and growth rates. Production-

and fertility-tested boars are sold farmers from government breeding farms. However, they usually are sold to the larger and more developed farms.

Several problems exist with the use of crossbred swine. These include increased disease susceptibility and a decreased ability to survive in periods of nutritional stress. This means that exotic and crossbred swine require a higher level of care than indigenous swine.

Similar breeding programmes are being carried out for chickens and ducks with the aim of developing stable crossbred animals for distribution to farmers.

This study does not attempt to quantify any of the limitations to production.

Government policy for livestock development

As the income of the population increased, so did the demand for meat and milk. However, this demand is not met from local sources.

The Government aims to increase livestock production from 26% to 30% of total agricultural production. To do this, focus is on two areas: (1) development of the dairy industry through use of the Red Sindhi breed; and (2) development of the pig industry through cross-breeding programmes using exotic breeds.

The policies to achieve these aims are (1) the development of government breeding stations and (2) development of the government extension service

Both areas are being developed using a combination of government and external resources. The extension component is regarded as underfunded to achieve the goals set and acts more to provide a focus for the collection of information.

Programmes for increasing the diversity of the agricultural sector to make use of regional variation in conditions are being developed. In addition the need for market development is recognised. Livestock disease is regarded as a major constraint to livestock production.

Organizational chart for interactions between different organizations for the provision of information

