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THE LIVESTOCK AND MEAT SUBSECTOR IN ECUADOR

Review of Production and Marketing Constraints with Suggested Development Strategies

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**The Livestock and Meat Subsector in Ecuador:
Review of Production and Marketing Constraints Issues
with Suggested Development Strategies**

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EXECUTIVE SUMMARY

The livestock and meat subsector is one of the most important components of the agricultural sector in Ecuador. Although the subsector has expanded since the 1950s, several factors have prevented greater growth rates and the subsector's ability to meet higher levels of consumer needs at affordable costs.

This report aims to provide an overview of Ecuador's livestock and meat subsector including the major constraints that affect its performance and its ability to keep pace with the nation's demand. It also suggests broad strategies to lessen and/or alleviate these constraints.

LIVESTOCK PRODUCTION

Livestock production is concentrated in a few provinces in the Highlands and Coastal regions. Compared with the marked growth and improvement in the poultry industry, the change in the dairy and beef industries has been slow and has resulted primarily from expansion in the number of cattle, with no measurable change in either the productivity or in per capita production. The growth rates in the poultry and dairy industries have been slower than their potentials, in part because of distortions created by inappropriate government pricing and/or trade policies. Although the sheep industry is potentially capable of producing sufficient supplies of wool and mutton to satisfy domestic demands at market prices, a sizable portion of the demand for mutton is not being met currently, and wool is imported every year to fill domestic demand.

Two fundamental problems seem to characterize the livestock subsector in Ecuador: high risk and high cost. Major production and technical constraints include:

- **Information Constraints** such as lack of adequate, reliable, and consistent data and information on inventories, production, outlook, cost of production, and other production and management information.
- **Animal Production Constraints** such as: low and/or inappropriate technology; poor or inappropriate farm management and animal husbandry practices; insufficient loanable funds available for livestock production, and herd and pasture improvement purposes.
- **Animal Feed and Nutrition Constraints** such as: relatively poor animal nutrition; shortage and/or high cost of feed grains, soybean meal, and medicines; inefficient feeding systems; poor overall pasture management and insufficient use of improved pasture.
- **Research, Extension, and Education Constraints** such as: inadequate nationwide livestock research and extension programs, and lack of sufficient number of trained personnel.
- **Animal Health Constraints** such as: presence of animal diseases and parasites; inadequate enforcement of animal health laws and regulations; lack of animal disease laboratories for research and development of quality vaccines.

DEVELOPMENT STRATEGY FOR LIVESTOCK PRODUCTION

Livestock production improvement in Ecuador can be accomplished principally through removal of these constraints. A production development strategy should be adopted that includes public and private actions and activities that would lead to self sufficiency in livestock products and to improvement of the population's nutritional status. The strategy should aim at increased production to meet the growing domestic human demand for livestock products at reasonable prices through strengthening the supporting infrastructure and enhancing the capabilities of relevant research and extension institutions. In the long-term, these actions should allow the subsector to generate sufficient surpluses to eliminate the need for imports and to open export opportunities. Moreover, the strategy should encourage the private sector to adopt new and improved technologies that will lead to increased enterprise profitability, higher rural income and sustained employment in the subsector. In order for the production strategy to succeed, a certain amount of government involvement in providing infrastructure and services and policy support is necessary.

The specific actions and activities in the livestock production development strategy include:

Facilitative Programs

Production Information

- Assure the availability of accurate, timely and consistent information on inventories, seasonality, outlook, and other production and management information to producers, researchers, and policy makers.

Research

- Support a national breed improvement program for livestock producers, using locally available and imported stocks and semen. Both the public sector and the private sector should be involved.
- Support an effective national pasture research program focusing on (a) management and optimal utilization of land resources by the various species, (b) improved pasture, and (c) animal nutrition.
- Support the efforts of MAG and the private sector to build capacity to conduct basic and applied research to resolve animal health problems.
- Emphasize in the research and extension programs the disease and parasite control methods that have been shown to be effective technically and economically.
- Encourage the exploitation of the complementarity between livestock and crops. In this respect, it may be advisable to initiate some pilot projects to evaluate the nutritional and economic potentials of alternative animal feeding systems including confinement, forage, crop by-products, and/or grain feeding.

Extension

- Strengthen and expand the existing extension efforts and ensure that they are integrally linked with the research programs. Strong emphasis should be placed on the delivery of improved and appropriate technology and improved practices to producers.

Training/Education

- Enlist support and assistance from national and international universities, and coordinate (e.g., by FUNDAGRO and INIAP) efforts among the various agencies to establish and/or revise curriculum to include programs capable of addressing the country's needs for skilled manpower as related to research and extension in the livestock and livestock products areas.

Pricing and Credit Policies

Animal feed prices

- Remove the animal feed price distortions created by counterproductive government pricing policies and interventions in the producing and marketing of soybean and hard corn.

Credit

- Provide an expanded and simplified pool of credit for investment and operating purposes by livestock producers. Terms of credit and loan procedures should be flexible in order to accommodate the different uses, sizes of loans, and the length of time involved. However, because of the relatively high risk associated with livestock loans, the government may, in the short-term, consider giving incentives to lenders to issue such loans. In addition, producer groups should be encouraged to develop their own credit system by pooling their savings in "credit union" type institutions.

Regulatory Programs

- Standardize and uniformly enforce in all provinces the existing, and possibly new, animal health and sanitary laws and regulations. This will require the full cooperation between MAG, the municipalities, producers, and market intermediaries.

MARKETING OF LIVESTOCK AND LIVESTOCK PRODUCTS

The growth in demand for livestock and livestock products since the 1970s has been driven by growth in population, higher income during the oil boom, and increased urbanization. In response to this rising consumer demand, all segments of the livestock and meat subsector grew, but at varying rates, with the poultry industry registering the most rapid expansion. In the face of the rapid growth in both demand and production, the adequacy and efficiency of the marketing system become of great interest to consumers, producers and the society as a whole.

A development strategy for the livestock and meat marketing system, should recognize marketing as a dynamic system which operates within, and is influenced by, the existing technical, economic, political, legal, and social environments.

Although the existing livestock and meat marketing system in Ecuador has provided the basic services to both producers and consumers, there are significant marketing and performance problems. Improvement and promotion of technical innovations and increasing marketing efficiency are essential for the development of the subsector and would benefit producers and consumers alike.

The following summarizes the major constraints affecting the performance of the marketing system for the livestock and meat marketing industry in Ecuador:

- **Physical Infrastructure Constraints** including:

Livestock Market Facilities with: inadequate quarantine, other holding facilities, and administration/ veterinarian offices; ineffective administration of the laws and regulations; inconsistent enforcement of the collection of fees and maintenance services.

Slaughtering Facilities with: poor sanitary and safety conditions, including water availability problems, and lack of quarantine corrals for diseased animals; absence or inadequate use of chill rooms; absence or inadequate by-products handling facilities; under- or over-utilization of many plants; inappropriate location of many plants in residential areas or in difficult-to-access places.

Transportation and Distribution Facilities with: poor conditions for transporting animals between farms, markets, and slaughter plants; lack of cold storage facilities at meat wholesale and retail markets; inadequate or absence of refrigerated trucks for transporting meat to wholesale and retail outlets.

- **Pricing Policy Constraints** including: government intervention in the product markets by establishing maximum prices that cause distortions in the price determination process, and prevent producers and marketers from receiving correct signals that are essential for making efficient resource allocation decisions; limited use of the more efficient and competitive auction bidding system as a price discovery method.
- **Facilitative and Regulatory Constraints** including: lack of formal grading and standardization systems for live animals, meat, and meat products; insufficient operating and investment credits; insufficient market news and information particularly timely release of market prices, analysis, and outlook information; inadequate or lack of sanitation and inspection services at most livestock markets; absence of sufficient veterinary inspection of live animals and meat at slaughter plants; inadequate control of illegal trade in livestock and products, especially with Colombia and Peru.

MARKETING DEVELOPMENT STRATEGY

A strategy for the development and improvement of the livestock and meat marketing system must recognize the importance of the linkage between production and marketing activities. Public and private actions should aim at improving the integration of the two activities by improving the information, communications and diagnostic processes. The marketing strategy should be directed at:

- Providing clear and stable incentives that will promote private initiatives for improving the operational and pricing efficiencies of the marketing system at all levels by adopting technological innovations and efficient trading methods.
- Providing essential facilitative services that will support the development efforts, and
- Developing an efficient domestic marketing system to achieve self-sufficiency in meat, dairy products, and wool before promoting exports.

In order to achieve the objectives of the marketing strategy certain actions to remove or lessen the deficiencies in the operational and pricing aspects of the domestic marketing system must be taken. The strategy for development and

improvement of Ecuador's livestock and meat marketing system should recognize the important role of price incentives for achieving the desired objectives. Price policies should be determined carefully and must take into consideration the likely impact on resource allocation and ensuring adequate profitability to producers and marketers. The main elements of the marketing strategy include actions and activities in the following three areas: improvement in the marketing infrastructure, introduction of pricing and credit policy reforms, and promotion of private and public services in the areas of grading, market information, credit, training, research, and extension.

Infrastructure

- Improve the administration and physical structure of the livestock market facilities. In the short-term, priority should be given to the provision of sanitation and inspection services. In the long-term, consideration should be given to improve the physical facilities. Since markets are owned by municipalities, the costs of these changes and improvements may be covered by service fees paid by the users. An alternative is for producer or merchant groups or associations to perform the necessary changes in an arrangement whereby the group leases the market from the municipality, obtains a loan to make the necessary changes, and uses the user fees to retire the loan.
- Give serious consideration to improving the physical and sanitary conditions of the existing slaughter plants.
- Reevaluate the current location, capacity, and utilization of the existing slaughter plants, including the feasibility of establishing regional slaughtering facilities near major producing areas.
- Encourage the use of cold storage facilities and refrigerated transportation by wholesalers and retailers. To this end, it will be necessary for the government to undertake pricing policy reforms and possibly provide some tax breaks or credit guarantees as incentives to wholesalers and retailers.
- Improve the farm to market roads in order to ensure improvement of the marketing system's operational efficiency.
- Give high priority to improving the quality and efficiency of the hides and skins industry. This will be achieved, in part, through improving the technologies for production, insect and parasite control, and slaughtering, and through training and extension programs for the tanning industry. The tanning association should be encouraged to play a significant role in providing extension and training services to its members.

Pricing and Trade Policies

- Introduce pricing policy reforms that would reduce or eliminate government intervention in the product markets' pricing system. The reforms should aim at allowing free market prices to prevail at all levels in the marketing system. Price controls are ineffective policy instruments to achieve income redistribution objectives of the government.
- Encourage the use of more competitive price discovery methods than presently used by encouraging the use of the auction system in livestock marketing. This objective can be accomplished by providing extension and education materials to buyers and sellers on the economic advantages of using auctions.

- Promote legal international trade in livestock and livestock products through financial and exchange rate measures that include devaluation of the country's currency and provision of incentives for increasing local production to levels that would generate exportable surpluses.

Facilitative and Regulatory Services

- Develop and introduce a system of grades and standards for livestock and livestock products. This would allow for appropriate price differentials that would provide additional incentives to producers and marketers to improve quality and increase productive investment. Furthermore, a workable systems of grades and standards is essential for a good and accurate market information system and a more efficient price discovery process.
- Improve and strongly support the existing market information system. Particularly urgent is the initiation and widespread distribution of market analysis and "outlook" type reports.
- Ensure the availability of an extended source of credit for both investment and operating capital purposes, with minimum direct government intervention.
- Develop research, training and extension programs that address the key marketing problems. This should be undertaken jointly between MAG, other ministries, and the private sector.
- Enforce current, and possibly new, laws and regulations concerning the operation of slaughtering facilities. Uniform application and effective enforcement of the laws and regulations throughout the country are essential to ensure nationwide sanitation and safety conditions.

PLANNING AND PROGRAMMING

The public sector is responsible for the formulation of the country's overall agricultural development strategy. Moreover, the sector provides leadership in the planning, design, implementation and evaluation of projects, and in providing public service activities.

Inappropriate public policies and lack of programs that promote productivity and efficiency in the production and marketing systems are major constraints to an efficient and productive livestock sector in Ecuador. Other public sector-related constraints (in addition to the major constraints and distortions induced by pricing, trade, and regulatory policies, and inadequate research and extension programs) are:

- Lack of a cohesive government objectives and development approach concerning livestock and meat.
- Lack of reliable information to guide public livestock development programs and projects. In this respect, the public sector suffers from the problems facing the private sector in making decisions. Of particular importance in the case of Ecuador is the absence of recent census type data on the crop and livestock production, marketing and food consumption.
- Lack of sufficient number of trained Ecuadorians in the areas of livestock economics, research, and extension.

In order to develop strategies to address planning constraints, the individuals and organizations involved in planning, programming, implementation and evaluation of projects and programs have to take into consideration the different nature of the livestock and meat subsector compared to the crop subsector. This fact should be considered not only by the Government of Ecuador but also by the international donors. The elements of the strategy include:

- Identify a cohesive set of government objectives concerning the public interest in the growth and development of the livestock and meat subsector. This should include an outline of development strategy, including realistic targets and approaches.
- Identify internal and external resources and programs, but avoid the assumption of burdensome external loan obligations. Coordination between the MAG and other ministries, government agencies and institutions, as well as donors, is critical.
- Take steps to plan and conduct an agricultural census and a new household consumption and expenditure survey as early as possible.
- Encourage and continue to support the participation of private groups such as cattle and sheep associations (e.g., MEGALIT and ANCO projects) in the design and implementation of projects and programs.
- Develop human capital through training. This is essential for the development process. Training should be viewed in its broadest sense to include enhancement of agricultural education in the schools, short courses and on-the-job training, and longer-term undergraduate, graduate, and technical education.

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INTRODUCTION

The livestock and meat subsector is one of the most important components of the agricultural sector in Ecuador. Almost one-third of the country's agricultural Gross Domestic Product (GDP) comes from livestock and livestock products, and more than one-third of consumer expenditures on food is spent on red meats, poultry, and dairy products. A large number of people depend on the livestock and meat industry for their livelihood, and a substantial amount of land and capital resources are devoted to the production and marketing of livestock and livestock products. This subsector is also important because of its contribution to the country's nutrition by providing energy and animal protein and because of its potential direct impact on sectorial employment and income and indirect impact on other sectors of the economy. In light of its importance to Ecuador's economy and its potential contribution to meeting the objectives of agricultural development, the livestock and meat subsector should be given high priority in formulating medium-term and long-term agricultural development strategies.

Although Ecuador's livestock and meat subsector has expanded since the 1950s, several factors have prevented greater growth rates and the subsector's ability to meet higher levels of consumer needs at affordable costs. While adverse weather conditions and natural disaster occurrences have played an important role in slowing the subsector's growth during recent years, the long-term problems are caused primarily by technical and economic factors, as well as by inappropriate public policies and inadequate marketing services programs.

The objectives of this report are to: (1) provide an overview of Ecuador's livestock and meat subsector including the major constraints that affect its performance and its ability to keep pace with the nation's demand, and (2) suggest broad strategies to lessen and/or alleviate these constraints taking into consideration the relevant activities being carried out by domestic and international organizations. The information and suggestions presented here are based on personal observations and limited data obtained during a two-week field visit to Ecuador in May 1988.

The report has three sections: production, marketing, and planning. It must be remembered, however, that the issues in each section are highly interrelated and often act together in affecting the performance of the livestock and meat industry.

Since more time and detailed data are required to outline a full development strategy, only broad statements of constraints and development strategies are presented.

LIVESTOCK PRODUCTION

Overview

All species of livestock are produced in every province in Ecuador. However, Esmeraldas and Manabi provinces reported no sheep production in recent years. Livestock production is concentrated in a few provinces in the Highlands and Coastal regions. The location and development of various types of livestock operations appear to follow the principle of comparative advantage. That is, production of a particular species and the system used in its production has developed in areas where it has a comparative advantage, or the least comparative disadvantage. Among the most important factors that determine the present location of various livestock operations in Ecuador are availability and cost of feed, other inputs, and transportation, and location of potential demand for the output. Table 1 presents the Ministry of Agriculture and Livestock's (MAG) estimated livestock populations on Ecuador's farms and ranches during 1980 through 1986.

Table 1: Livestock Inventories in Ecuador, 1980 through 1986
(Million: Head)

Year	Cattle		Total	Sheep	Hogs	Poultry
	Beef	Dairy				
1980	2.1	0.8	2.9	1.1	1.2	32.6
1981	2.4	0.8	3.2	1.3	3.3	37.5
1982	2.4	0.8	3.2	1.3	3.5	41.4
1983	2.5	0.8	3.3	1.3	3.7	27.3
1984	2.7	0.9	3.6	1.0	3.9	33.1
1985	2.8	0.9	3.7	1.1	2.5	40.8
1986	2.8	1.0	3.8	1.2	1.6	49.5

Source: Ministry of Agriculture and Livestock (MAG), Ecuador.

According to the MAG information, about 48% of all cattle inventory in 1986 was in the Highlands, 43% in Coastal region, and 9% in the Eastern Lowlands and

Galapagos. Manabi, Pichincha, Guayas, Loja, and Azuay were the major cattle producing provinces, respectively. Of the 3.8 million cattle, almost one million were classified as dairy cattle (of which about two-thirds were located in the Highland region). It should be pointed out, however, that both dairy and meat animals are kept for the dual purpose of providing both milk and beef. Although limited cattle production is also found in the Eastern Lowlands, transportation is a serious constraint to major cattle development in that region.

For hogs, Highland provinces accounted for 60% of the inventory in 1986, while the Coastal region accounted for 35%, and Eastern Lowlands and the Galapagos Islands combined accounted for 5%. The most important hog producing provinces in 1986 were: Manabi Pichincha, Loja, Azuay, and Guayas, respectively. Almost all the sheep (e.g., 99% of 1986 inventory) were located in the Highlands, with Chimborazo being the top sheep producing province, followed by Cotopaxi, Azuay, Pichincha, and Loja, respectively.

Poultry population in 1986 is estimated at 50 million birds, of which 75% were broilers, 13% layers and the remaining 12% were roasters. More than one-third of all poultry production was located in Pichincha province, another 25% in Guayas, while Manabi province accounted for about 18% of all poultry in Ecuador.

This distribution indicates that sheep production is concentrated in the higher altitudes in the Highlands, beef and dairy cattle are found in the relatively lower areas of the Highlands (mostly dairy) and in the coast (mostly beef). Hog and poultry production is found mostly near large population centers.

The size and rate of growth in livestock inventories and in productivity have varied among the various species. For example, compared with the marked growth and improvement in the poultry industry, the change in the dairy and beef industries has been slow and has resulted primarily from expansion in the number of cattle, with no measurable change in either the productivity or in per capita production. This was in spite of several attempts by the government, private groups and international organizations to improve the breeding stocks. These programs faced serious funding and credit problems that prevented them from achieving their stated goals. The expansion in the beef and dairy cattle inventories has been largely achieved by the significant shifts of crop land (e.g., banana and wheat) to pasture

during the past two decades, and to the expansion in the areas available for grazing in the Coastal region since the 1960s.

The growth rates in the poultry and dairy industries have been slower than their potentials. This was due, in part, to the distortions created by inappropriate government pricing and/or trade policies for feed (e.g., soybean and hard corn) and the products themselves (e.g., milk and meat). For example, the negative impact of these distortions on the dairy industry may be seen in the fact that although Ecuador has the resources to become self-sufficient in dairy products, the Central Bank reports indicate that more than 4,000 metric tons of dry whole milk (DWM) are imported annually to meet domestic demand. It is generally believed that the elimination of price subsidies on imported milk and a modest improvement in productivity could lead to dairy self-sufficiency. These would not only enhance production, employment and rural income, but would also contribute to improving the quality of the diet of low income consumers. The recent actions taken by the government to attempt to correct the dairy products price distortions and to stimulate the development of the dairy industry are steps in the right direction. However, significant improvements of the dairy industry would be enhanced by pricing reforms and improvements in the soybean and hard corn producing and marketing subsectors.

Although there have been some efforts by both the public and private sectors to repopulate the sheep industry, all indications suggest that the sheep industry actually has been contracting during the past two decades. A sizable portion of the demand for mutton currently is not being met due to restrictions on meat imports, while wool is imported every year to fill domestic demand. It should be pointed out that the Ecuadorian sheep industry is potentially capable of producing sufficient supplies of both wool and mutton to more than satisfy all domestic demands at market prices.

Production and Technical Aspects and Constraints

Two fundamental problems seem to characterize the livestock subsector in Ecuador. The first problem is the high risk associated with production, and the second is that livestock production is a high cost activity. The high risk involved in livestock production is due to many factors including:

- natural disasters
- animal disease
- long dry periods in the coastal provinces causing insufficient pasture for year-round operation
- insufficient information on current, as well as expected production and market information (i.e., outlook-type information)
- lack of cold storage (especially for poultry meat)
- government intervention as manifested in fixing retail prices of meat and other products at low levels.

High risk results in lower productivity, wide fluctuation in market supplies and prices, decreased ability to meet commitments on future deliveries, and a reluctance of producers and market intermediaries to invest in improved technologies.

The basic reasons for the high per unit cost of production are:

- low productivity, exacerbated by losses from diseases and parasites, by poor farm management, and by limited animal genetic potentials
- low investment in improved technology because of insufficient knowledge, incentives, and loanable funds
- relatively high cost of inputs, particularly feed, used in livestock production.

These problems, in part, have resulted from inadequate or ineffective public and private investment in new and improved technologies.

This section presents the primary production and technical constraints affecting the development and growth of the livestock and meat subsector in Ecuador. The constraints are discussed under the following headings: production information and statistics, livestock production systems, pasture resources, research and extension, and animal health.

Production Information and Statistics

A complete and effective agricultural information system requires efficient and adequate systems for collection and dissemination of data and information. Without adequate and consistent statistics, it is difficult, if not impossible, to plan projects and programs; or to evaluate the efficiency, problems, and potentials of the agricultural sector.

Until the mid 1980s, the collection and dissemination of agricultural data in Ecuador has been incomplete, fragmented, and generally inefficient. The two primary agencies responsible for agricultural data collection are: (1) the Ministry of Agriculture and Livestock (MAG), and (2) the Institute of Statistics and Census (INEC). In addition to these two agencies, dissemination of data is carried out by the Central Bank, the National Development Bank, and by the Ministry of Finance. Examination of the available information suggests that more emphasis is placed on crops than on livestock, particularly in the analysis and release of outlook type information.

Furthermore, there is discrepancies between MAG's and INEC's livestock data. This is due primarily to the difficulties in obtaining basic livestock data (compared to crops), coupled with insufficient coordination, and using different sources and sampling methodologies by the two agencies. Finding several livestock population estimates with substantial difference in their total and in composition is not unusual. For the user of such statistics, the problem is further exacerbated by lack of criteria to determine which estimate is the most reliable. Thus, planning and policy formulation within the livestock subsector becomes difficult, if not impossible.

Since the mid 1980s, substantial improvement in the collection and dissemination of agricultural statistics has been achieved with the funding and technical support from the government (through MAG and INEC), and USAID/Ecuador. For example, the National Agricultural Statistical System (SEAN), and the technical support provided by the staff of Sigma One Corporation serving on the Agricultural Sector Reorientation Project (ASRP), have been successful in improving the quality of collection and dissemination of data.

However, a higher level of coordination between MAG and INEC in the planning and implementation of field collection and data analysis is necessary for further improvement. Although more emphasis continued to be put on crops, the ASRP staff is currently designing specific surveys concerning livestock production and marketing parameters.

To further improve the country's agricultural information system, a special commission for agricultural statistics was formed; with two subcommissions one each for livestock and crops. The activities of the subcommissions include identification of

means to improve the country's information system and coordination among MAG, INEC, the Central Bank, and the National Planning Council (CONADE).

Livestock Production Systems

Beef, dairy, and sheep production are carried out almost entirely under extensive operations where cattle breeding herds and sheep flocks are kept on large pastures. In contrast, hogs are produced on small farms and by many households. Commercial poultry production is heavily concentrated in the hands of a few large operations that generally include several mechanized units with heavy dependence on soybean meal and feed grains. Except for these large scale poultry operations, livestock production in Ecuador is generally of low-productivity and with relatively low levels of technology.

An important characteristic of livestock production in Ecuador is the lack of effective coordination with and exploitation of the crop subsector. Crops and livestock can complement rather than compete with each other. However, currently, except on some small farms, there is very limited use of crop residues and other agricultural by-products to supplement livestock feeding during dry periods when pasture resources are unavailable or not sufficient for herd maintenance purpose. This is true in the country in general, but in the Coastal region in particular.

Furthermore, Ecuador has no large commercial cattle confinement feeding operations under which animals are placed in feedlots and fed on mixed roughage and concentrate rations. The feedlot system has been used in many countries to fatten high quality animals for the meat market. Feedlot rations could be based on hay, chopped grass, crop by-products, maize, rice bran, molasses, cottonseed or soybean meal, and other domestically available materials.

The high cost of feed grains and other concentrates, and lack of grading and pricing systems that reward producers for high-quality animals (see marketing section of this report), have played a significant role in impeding the development of confinement cattle feeding programs. Other factors have also contributed to this situation, such as lack of research and extension programs on the possible economic advantages of confinement and other feeding programs. To this end, it would be desirable for MAG, in cooperation with producers associations, to conduct pilot

feeding trials, with focus on alternative rations, animal response, grading, and economics of the systems. Producers' willingness to adopt feedlot systems, however, will depend on demonstrated profitability of such systems. This, in turn, depends on making certain changes in the government's pricing and trade policies (for both the products and inputs) and on introducing quality incentives through grading systems for livestock and livestock products.

The shortage and relatively high price of feed grains and soybean meal are examples where factors outside the livestock subsector play a significant role in determining its operations and performance. Specifically, the high cost of animal feeds and the feed supply shortages are caused, to a large extent, by price distortions in the production and marketing of feed commodities. These distortions are a result of inappropriate direct and indirect government interventions in the production, trade, and pricing of commodities such as soybean and hard corn. As indicated earlier, the negative impact of high feed prices is particularly felt in the poultry, dairy, and hog feeding industries, which are heavy users of feed grains and soybean meal for feeding compared to the beef and sheep industries.

Pasture Resources

Pastures are the most important livestock feed resources in Ecuador. A substantial amount of the agricultural land area is suitable for grazing, with more than four million hectares classified as pasture land. As indicated earlier, substantial amount of crop land, particularly in the Highlands, has been transferred to pastures in the last two decades, thus, supporting the expansions in the dairy and beef industries.

Natural, or native, pasture comprises most of the pastures, but approximately 43% of the total area in the country is improved pastures. In the Highlands, more than 70% of the agricultural land is in pasture. In contrast with the year-round availability of pasture grazing in the Highland region, the long dry periods in the Coastal region makes year-round grazing difficult if not impossible.

The potential for increasing pasture productivity through introducing new varieties and improved management of both natural and cultivated pastures, appears to be high. The livestock industry could benefit from pasture improvement programs

that include adaptive research and demonstration. These programs, however, take a considerable amount of time and effort. The success of such a program will depend on the ability to demonstrate to producers not only its technical advantages, but its economic advantages as well.

Finally, the vast pasture resources in the Eastern Lowlands provide opportunity for utilization for livestock production. However, the limiting factors (i.e., transportation and processing facilities) must be addressed before introducing major programs in this part of the country.

Research and Extension

A preliminary assessment of Ecuador's research and extension activities in livestock indicates that there is a need for substantial efforts and improvement in the areas of animal production, animal health, feed and nutrition, and management.

Current livestock-related research programs carried out by the MAG's National Institute for Agricultural Research (INIAP) and by some universities are described by many as being limited in scope and provide little support for the development of the livestock industry. In general, there has been insufficient domestic research to develop livestock production technologies appropriate for conditions in Ecuador. However, the creation in 1986 of the Ecuadorian Foundation for Agricultural Research (Fundacion para El Desarrollo Agropecuario, FUNDAGRO), and the government's decision to allocate a portion of the funds from a \$46 million loan (PROTECA) by the Interamerican Development Bank (Banco Interamericano Desarrollo, BID) to INIAP, will provide operational and research funds to improve agricultural research in Ecuador. Any research programs by INIAP, FUNDAGRO, or other private or public agency concerning livestock production, feed and nutrition, and animal health will have significant impact on the development and growth of livestock and meat subsector.

In spite of a variety of government and private extension service type programs, there is no effective national extension network in Ecuador. This has impeded widespread adoption of known appropriate technologies. However, funding provided through the MAG extension program (PROTECA) will strengthen and expand the public extension activities, through provision of materials, vehicles, construction

of facilities, and training. The efforts by private sector groups can and should play a significant role in providing extension and training services to producers.

In addition, several projects funded by the international community and carried out jointly by the government and private livestock organizations are involved in activities to strengthen the country's agricultural research and extension capabilities. For example, the USAID-funded Rural Technology Transfer System project (RTTS), which was initiated in 1981 and scheduled to end in 1990, has been designed to further the socioeconomic development in Ecuador by transferring appropriate technologies and providing extension support to agricultural producers. Specifically, the project's foreign exchange and local currency funds are being used to support activities in the following areas: (1) transfer of technology, (2) institutional building, and (3) planning. This is accomplished through providing to the private sector technical assistance, MAG counterparts, training, and funding of field work.

Regarding livestock, the RTTS project has initiated several subprojects in the areas of dairy (Dairy Production Improvement Project, DPIP), sheep (Sheep Production Improvement, SIP, carried out in association with the National Association of Sheep Growers [ANCO]), and beef cattle (Improvement of Livestock Production and Marketing in the Coastal Area, known as MEGALIT). The focus of the activities carried out under these subprojects is on conducting production economics and marketing studies, market information, transfer of technology, extension and training. All the activities are carried out jointly between private livestock associations and the government of Ecuador.

Another important project with somewhat similar objectives as RTTS is the Livestock Development Program (PROFOGAN) which is funded by West Germany. The project has four components: production, marketing, planning, and transfer of technology and institutional building. These activities are carried out in six production zones, and are supported by technical advisors, MAG counterparts, and funding.

Taking into consideration the manpower, financial, and time constraints under which these projects have been operating, their achievements are significant. However, based on many discussions and personal observations, it appears that certain problems have impeded more significant achievements. For example, it appears

that in designing these projects, there was a lack of full appreciation of the extent of time required for livestock projects to achieve their goals. As a result, some activities and some technical assistance (e.g., advisors) are being terminated or reduced before the goals of the project are reached. In addition, it appears that the government's support of field activities (primarily by providing counterpart extension personnel and vehicles) is insufficient. For example, relatively few individuals with minimal transportation and other facilities have been assigned to MEGALIT and ANCO projects.

It is important for both the government of Ecuador and the donors to recognize that in light of the biological nature of livestock improvement programs, long-term financial and technical assistance commitments are essential in order to achieve the objectives of such programs.

Animal Health

The current animal health programs have not been very successful in preventing major outbreaks of diseases. The cattle industry still suffers from several diseases. For example, hoof and mouth disease appears to remain a major problem; other animal diseases include brucellosis, leptospirosis, rabies, external parasites (mostly in the coastal region) and internal parasites (mostly in the Highland region), among others. The health problem is more profound with hogs, (e.g., hog cholera) due largely to the difficulties in implementing effective disease control measures on the widely scattered small farm and household units.

The problems are further exacerbated by the inadequate enforcement of the existing laws and regulations concerning intra- and inter-provincial movement of diseased livestock. The existing disease and parasite problems continue to pose a threat to animal productivity and human health and nutrition.

Concluding Remarks

Although the various production and technical constraints have had a negative impact on the productivity and output of the livestock sector as a whole, their impact on small farmers has been particularly severe. This is because small farmers

as a group tend to have less production skills and less information on, or access to, appropriate technologies than do large farmers.

In spite of the many problems which have faced the livestock and meat subsector, production of most commodities has been maintained at relatively adequate levels that has kept the flow of products to consumers. However, the favorable natural conditions coupled with the potential utilization of known technology, suggest that Ecuador has a comparative advantage and great potential to expand feed supplies, to increase livestock productivity, and for a greatly expanded livestock and meat subsector. The potentially large output would be sufficient to meet the country's growing needs, and in the long-term may generate surpluses to support export.

Summary of Production and Technical Constraints

Identification of the constraints impeding the growth and development of Ecuador's livestock and meat subsector is the first step in exploring means and strategies to address them. The discussion presented in this section indicates that the most important production and technical constraints are:

Information Constraints

- Lack of adequate, reliable, and consistent data and information on inventories, production, outlook, cost of production, and other production and management information, which causes added risk and difficulties in planning by both the private and public sectors.

Animal Production Constraints

- Low and/or inappropriate technology, causing high per unit cost of production, and low productivity.
- Poor or inappropriate farm management and animal husbandry practices.
- Insufficient loanable funds available for livestock production, and herd and pasture improvement purposes, or difficulty in obtaining loans even if funds are available. This problem exists in part because lenders' perception that livestock loans have relatively higher risk than other types of investment.

Animal Feed and Nutrition Constraints

- Relatively poor animal nutrition, including mineral deficiency, in most areas.

- Shortage and/or high cost of feed grains, soybean meal, and medicines.
- Inefficient feeding systems, including absence of or insufficient use of supplemental and/or intensive feeding programs, crop residues, and agricultural by-products.
- Poor overall pasture management and insufficient use of improved pasture. Although this problem is more severe in the beef cattle (i.e., coastal) areas, a significant opportunity for improvement also exists in the dairy areas (i.e., in the Highlands) and possibly for beef production in the Eastern Lowlands.

Research, Extension, and Education Constraints

- Inadequate nationwide livestock research and extension programs which are exacerbated by a lack of sufficient number of trained personnel and has led to:
 - Inappropriate herd management practices.
 - Lack or insufficient use of improved bloodlines.
 - Low overall technology and productivity.

Animal Health Constraints

- Presence of animal diseases (some endemic) and parasites in all provinces which limit the interregional trade.
- Inadequate enforcement of animal health laws and regulations that are uniform nationwide.
- Lack of animal disease laboratories for research and development of quality vaccines.

DEVELOPMENT STRATEGY FOR LIVESTOCK PRODUCTION

Livestock production improvement in Ecuador can be accomplished principally by removing the primary constraints discussed above by adopting a production development strategy that includes public and private actions and activities that would lead to self sufficiency in livestock products and to improvement of the population's nutritional status. The strategy should aim at increased production to meet the growing domestic human demand for livestock products at reasonable prices through strengthening the supporting infrastructure and enhancing the capabilities of relevant research and extension institutions. In the long-term, these actions should allow the subsector to generate sufficient surpluses to eliminate the need for imports and to open export opportunities. Moreover, the strategy should encourage the private sector to adopt new and improved technologies that will lead to increased enterprise profitability, higher rural income and sustained employment in the

subsector. In order for the production strategy to succeed, a certain amount of government involvement in providing infrastructure and services and policy support is necessary.

The specific actions and activities in the livestock production development strategy fall in one of the following three areas:

- Facilitative programs
 - information
 - research
 - extension
 - training
- Pricing and credit policies
- Regulatory programs

Facilitative Programs

An important objective of the production development strategy is to increase the level of technology and productivity at the micro level by providing appropriate livestock and feed technologies and management packages to livestock producers. The following summarizes the recommended facilitative programs and actions within the production development strategy.

Production Information

- Assure the availability of accurate, timely and consistent information on inventories, seasonality, outlook, and other production and management information to producers, researchers, and policy makers. This can be achieved by continuing the support of MAG's and INEC's efforts to improve the country's agricultural information system. To this end, the government should take steps to maximize the level of coordination between the two agencies, including all of SEAN activities, and ensure the availability of funds and personnel to effectively implement the field, computing, and dissemination activities. The recent formation of a subcommission on livestock statistics and ASRP staff involvement in coordination, design and analysis of data are important steps in addressing the production information constraints.

Research

- Support a national breed improvement program for livestock producers, using locally available and imported stocks and semen. It is recommended that domestic stocks should be utilized to the maximum practical extent, as these animals are suited to local conditions. The potential of expanded use of artificial insemination (currently being

used primarily by dairy operations) should be examined. Although INIAP may take the leadership in conducting research in these areas, it is essential that livestock producer cooperatives and associations (e.g., MEGALIT and ANCO), and private foundations (e.g., FUNDAGRO) be encouraged to participate in the development and execution of the breed improvement program.

- Support an effective national pasture research program focusing on (a) management and optimal utilization of land resources by the various species, (b) improved pasture, and (c) animal nutrition. It should be pointed out that improvement of pasture management should take into consideration not only optimal animal performance and pasture productivity, but must also be consistent with land conservation practices. This mostly long-term program can be included in the INIAP research activities, but external contributions through USAID (e.g., RTTS), other donors and international centers (e.g., the International Center for Tropical Agriculture, CIAT) is possible.
- Support MAG's efforts to build its capacity to conduct basic and applied research to resolve existing potential Ecuador - specific animal health problems. This goal can be achieved by strengthening INIAP and by encouraging the cooperation with universities and research institutions. Most of the needed funds could be made available through FUNDAGRO and PROTECA, but other sources (e.g., producers groups and international lending and donor organizations) should be explored.
- Emphasize in the research and extension programs the disease and parasite control methods that have been shown to be effective technically and economically.
- Encourage the exploitation of the complementarity between livestock and crops. In this respect, it may be advisable to initiate some pilot projects to evaluate the nutritional and economic potentials of alternative animal feeding systems including confinement, forage, crop by-products, and/or grain feeding. This goal could be achieved by utilizing the results of the research on animal feeding in cooperation between MAG, INIAP, and cattle producers through some of the existing private and mixed cattle improvement programs (e.g., MEGALIT).

Extension

- Strengthen and expand the existing extension efforts and ensure that they are integrally linked with the research programs. Strong emphasis should be placed on the delivery of improved and appropriate technology and improved practices to producers. In this respect, additional training of personnel in the public and private sectors may be necessary and should be given high priority. The financial support given to MAG through PROTECA, as well as the livestock-related activities carried out under projects such as the USAID-funded RTTS and the West Germany-funded PROFOGAN (which are carried out in cooperation with and in support of the private sector) will provide most of the support needed. Additional internal

(both private and public) and external resources should be identified for further improvement in the extension service.

Training/Education

- Enlist support and assistance from national and international universities, and coordinate (e.g., by FUNDAGRO and INIAP) efforts among the various agencies to establish and/or revise curriculum to include programs capable of addressing the country's needs for skilled manpower as related to research and extension in the livestock and livestock products areas.

Pricing and Credit Policies

The strategy for livestock subsector development should be based on the recognition of the important role of factor and products prices and credit in providing incentives to producers for increased productivity and production. Input prices can be influenced by direct or indirect government intervention. The impact of distortions due to interventions in the product markets is discussed in the marketing section of this report. Regarding inputs, the price support programs and policies that lead to prices above the free-market-determined levels are examples of government intervention in the producing and marketing systems of inputs (e.g., hard corn and soybean in Ecuador). In both cases there is a direct impact on the cost of livestock production. The aim of public pricing policies should be to maintain input prices at levels that ensure enterprise profitability. Likewise, credit policies should facilitate the availability of credit for operational and investment purposes with minimum or no government intervention.

Animal feed prices

- Remove the animal feed price distortions created by counterproductive government pricing policies and interventions in the producing and marketing of soybean and hard corn. The distortions can be removed or reduced through policy reforms that allow market forces to operate freely, and resource allocation decisions to be made in an environment that promotes technological changes and cost reductions, given the country's comparative advantage (or disadvantage) in production and trade.

Credit

- Provide an expanded and simplified pool of credit for investment and operating purposes by livestock producers. Terms of credit and loan procedures should be flexible in order to accommodate the different uses, sizes of loans, and the length of time involved. Private

commercial banks and financial institutions, as well as National Development Bank (BNF) should be able to provide the necessary funds.

However, because of the relatively high risk associated with livestock loans, the government may, in the short-term, consider giving incentives to lenders to issue such loans. This can be achieved through loan repayment guarantees and/or tax advantages. In the long-term, lenders' followup on loans coupled with effective extension service would reduce the risk element in livestock loans, hence, increase the availability of credit with minimum or no government intervention.

In addition, producer groups should be encouraged to develop their own credit system by pooling their savings in "credit union" type institutions. It may be desirable to explore the possibilities of providing seed money for such financial entities from public or external sources. For example, USAID has provided seed money for rural credit systems through funds generated from the monetization of PL 480 commodity assistance programs in several countries. To be effective and sustainable, such programs should be part of overall rural development efforts including extension service and education.

Regulatory Programs

- Standardize and uniformly enforce in all provinces the existing, and possibly new, animal health and sanitary laws and regulations. This will require the full cooperation between MAG, the municipalities, producers, and market intermediaries.

MARKETING OF LIVESTOCK AND LIVESTOCK PRODUCTS

The growth in demand for livestock and livestock products since the 1970s has been driven by growth in population, higher income during the oil boom, and increased urbanization. In response to this rising consumer demand, all segments of the livestock and meat subsector grew, but at varying rates, with the poultry industry registering the most rapid expansion. Table 2 presents the aggregate and per capita production (apparent consumption) of red meat, poultry meat, eggs, and milk in Ecuador from 1980 to 1986. As the data do not reflect large "unofficial" slaughter of animals, total production and apparent per capita consumption of meat are higher than shown.

Table 2: Aggregate and Per Capita Production of Livestock Products in Ecuador, 1980 through 1986

	1980	1981	1982	1983	1984	1985	1986
<u>Aggregate Production (Thousand Metric Tons)</u>							
Beef	92.4	95.1	99.3	92.7	84.6	91.4	110.9
Pork	22.9	27.7	31.4	29.0	22.7	19.4	22.5
Mutton	4.2	4.4	4.4	4.7	4.4	2.4	1.9
Chicken	36.5	41.5	45.8	30.5	36.6	43.9	54.5
Eggs	44.8	45.2	49.4	36.7	39.6	43.1	51.6
<u>Per Capita Production (Apparent Consumption) (Kg/person)</u>							
Beef	11.4	11.4	11.5	10.4	9.3	9.7	11.5
Pork	2.8	3.3	3.7	3.3	2.5	2.1	2.3
Mutton	0.5	0.5	0.5	0.5	0.5	0.3	0.2
Chicken	4.5	5.0	5.3	3.4	4.0	4.7	5.6
Eggs	5.5	5.4	5.7	4.1	4.3	4.6	5.3
Milk (liters)	80.1	79.8	81.4	80.7	82.5	84.2	86.2
<u>Estimates of Human Population (thousands)</u>							
	8,123	8,361	8,606	8,857	9,115	9,378	9,647

Source: Calculated by Sigma One from data provided by the Ministry of Agriculture and Livestock (MAG). All numbers are rounded.

Notes: To the extent that Ecuador had no imports and exports of these commodities (except for some milk imports), and because the other modifying factors (e.g., cold storage and other inventories) were either nil or limited, total consumption is assumed to be equal to domestic production and equal to availability. Inclusion of imported milk adds 5 to 7% to the per capita milk consumption figures. Illegal exports would reduce domestic availability of the commodities.

In the face of the rapid growth in both demand and production, the adequacy and efficiency of the marketing system become of great interest to consumers, producers and the society as a whole.

The final objectives of marketing activities is to satisfy consumer demand by performing various marketing activities or functions such as transportation, processing, storage and distribution. Marketing has been defined in many ways, but most definitions focus on the activities performed after the products leave the original production location. Under this definition, marketing begins when commodities and products move from the farm and ends when they reach the

consumer. It includes activities such as: handling, transportation, processing, and distribution.

In order to formulate a development strategy for the livestock and meat marketing system, a broader and less restrictive definition should be used that includes the following issues:

- Physical infrastructure - including market facilities, transportation, storage, processing, and distribution.
- Pricing and pricing policies - including price formation, price discovery, the subsequent transmission to producers and consumers of signals needed to balance supply and demand, and government policies and programs that influence prices.
- Facilitative and regulatory functions - those concerned with research and extension, grading and standardization, credit, market information, and laws and regulations.

Inclusion of the above issues when developing a marketing strategy recognizes marketing as a dynamic system which operates within, and is influenced by, the existing technical, economic, political, legal, and social environments.

Overview of the Marketing Infrastructure and Constraints

Livestock Markets

The livestock marketing system in Ecuador is largely operated by the private sector. However, most market facilities are owned by municipalities. According to the Ministry of Agriculture and Livestock (MAG), there were 81 livestock markets operating throughout Ecuador during 1986. Although a few markets have modern facilities (e.g., loading chutes, holding pens, and platform scales), most include only a vacant space in villages or outside large cities. The different species are separated and sold in different parts of the marketplace. However, some mixing and mingling takes place, especially in the smaller more remote markets, where the risk of spreading animal diseases becomes a problem.

Of the 81 livestock markets operating in 1986, 64 were located in the Highlands, 12 in the Coastal region, five in the Eastern Lowlands, and none in the Galapagos Islands. This location pattern is a direct reflection of the different methods used by producers in marketing their livestock. In general, producers in the Highlands sell their animals in markets located near their farms, where animals are either trekked or brought in by a truck. In comparison, available information

suggest that most of livestock in the Coastal region are sold at the farm directly to middlemen.

Buyers at the livestock markets may be other producers or middlemen known as introductores, who, in turn, may resell the animals at the same market or, as often the case, take them to a slaughter plant. The meat and by-products usually are sold to wholesalers but may be sold directly to butcher shops.

Livestock Slaughter Plants

Livestock slaughtering and meat processing are important links in the production-marketing system. Slaughtering in Ecuador occurs at either municipal or private slaughter plants (official slaughter), or on the farm or at some other private or public place (unofficial slaughter). Official slaughter in 1986 was estimated as follows: 610,236 cattle, 448,703 hogs, and 151,041 sheep. Guayas, Pichincha, Tungurahua, and Manabi were the leading provinces in terms of number of animals slaughtered.

One of the most striking aspects of livestock slaughter in Ecuador is that an extremely high proportion of the slaughter is conducted outside the official channels (i.e., not in municipal or private plants). MAG estimates that a number of animals equal to 45% of the hogs and sheep slaughtered in abattoirs is slaughtered either on the farm or in open public places (some are not far from a slaughter plant). The estimate for cattle is about 20% of the number slaughtered officially. Although the practice of on-the-farm slaughter is known in developed countries, meat produced by such methods is generally used for home consumption and seldom enters commercial channels. In Ecuador, however, most of the "unofficial" meat is sold to the public.

MAG reported 113 slaughter plants in Ecuador in 1986. Except for four private plants and one jointly owned, all plants were owned and operated by municipalities. Of the 113 plants, 53 were located in the Highlands, 43 in the Coastal region, 15 in the Eastern Lowlands, and two in the Galapagos. According to MAG, only nine plants were considered "good" or class A, while eight plants were classified as B "fair", and the remaining 96 were considered class C "poor" plants.

Except for the class A and B plants, most of the other plants are simple facilities which may or may not have hoists, holding spaces, or water supply. Many plants are poorly located in cities and heavily populated areas. A large number appear to be underutilized. Most lack safety and sanitary features; most do not have a quarantine facility for diseased animals, sufficient water supply, chilling facilities, or systems for proper handling of by-products. A common observation about slaughter plants is the absence or inadequate level of veterinary inspection. Although there are laws and regulations to govern the operation of slaughter plants, these are either insufficient or not adequately and uniformly enforced.

Slaughter plants operate every weekday and sometimes on Saturdays. Most plants slaughter animals early in the day, but some operate late at night. Animals are slaughtered, dressed, and quartered for a fee, according to the schedule of their arrival at the plant. In general, animals are slaughtered on the same day, but may be held over night if delivered late in the day. The underutilization of many plants, coupled with the generally small fees paid for services, results in the inability of most municipalities to collect sufficient funds to supplement their relatively small official budgets and to cover the required costs at desirable operating levels. In many plants, hides and skins are used as partial payment for use of the facilities; the resale value of these helps to offset plant operating costs.

Transportation and Distribution Systems

Although the country has a relatively efficient and extensive road system, farm to market roads are generally poor and the methods by which animals and products are transported appears to have severe problems. Animals are transported in overcrowded trucks (sheep are often stacked in the truck) with minimal or no rest, water, or feed during long journeys. They arrive at the market (or slaughter plant) in less than optimal condition. During the journey, they are subjected to injuries, bruising, weight loss, crippling, and sometimes death. These conditions affect not only the quality of carcasses, but also reduce the quality of hides and skins, hence, poor transportation represent a significant economic cost.

Intra-city transportation of meat carcasses and by-products often involves piling the products into private vehicles. Some municipal slaughter plants own and operate delivery vehicles to transport carcasses to locations within the city where the plant

is located, while some meat wholesalers operate large trucks between slaughter plants in surplus areas and large cities. Only a few meat trucks (primarily those owned by large private operations) are refrigerated.

Wholesale and retail meat distribution in Ecuador is simple, except for a few large commercialized distribution operations. Although there are some discussions about the possibility of introducing boxed meat into the distribution system, meat is currently transported from slaughter plants to local shops and public markets in carcass form for further breaking of the carcasses and distribution. The majority of retail outlets are small shops located in central markets or in semi-permanent structures along the roads. Most of the wholesale and retail facilities lack adequate sanitary conditions and only a few have chilling equipment.

Under the hot meat system (the dominant method used in all regions of Ecuador), meat is sold to consumers the same day of slaughter and is generally consumed that day, with no refrigeration used at the slaughter plant, during transportation or at wholesale and retail distribution. On the other hand, carcasses and all forms of processed meats handled by the large and vertically integrated operations (e.g., Supermaxi) are marketed under the chilled meat system where refrigeration at both the plant and at the retail outlets is used. The extent of the chilled meat system is rather minor in relation to the total meat produced in Ecuador.

The Tanning Industry

Hides and skins are important by-products of the slaughtering industry. The hides and skins industry in Ecuador is large, and according to MAG included 44 private commercial tanneries in 1987. The industry is served by a new but relatively active association, Asociacion Nacional De Curtidores Del Ecuador, located in Ambato in the province of Tungurahua, where almost 50% of the country's hides are processed.

According to industry sources, 27 of the 44 commercial tanneries are large and mostly specialized. For example, 25 of the 27 large tanneries specialize in processing cattle hides and the remaining two handle both cattle hides and sheep skins. The industry is concentrated in the Highlands with 22 of the commercial tanneries located

in the Tungurahua province. In addition to the large commercial tanneries, industry sources estimate that there are about 300 smaller rural tanning operations (handling mainly sheep skins). The industry produces finished products that are used locally for shoes and other leather products. A simple grading system exists for both raw hides and skins and for the finished products. Most hides and skins are of low quality and would require substantial improvement to compete in the international market.

The aggregate design capacity of all commercial tanneries is estimated at 1.3 million hides and skins annually, but MAG and industry sources indicate that the industry is currently operating at a little over 70% of capacity. About 720,000 hides and 200,000 skins are processed in Ecuador annually. Low quality raw materials and an inadequately trained labor force have been the two major problems for this industry, according to the tanning Association. The tanning industry has the potential to grow with domestic demand. Although no international trade in hides, skins, or unfinished products is permitted, it appears that a sizable trade probably could develop in response to an expanding livestock numbers. Appropriate incentives and making certain changes in the quality of the raw and finished products (including introducing measures of control of insects or parasites that damage animal hides and reduce quality) will be necessary to penetrate the international market.

Pricing Policies and Constraints

In an open voluntary exchange (i.e., open market) setting, prices play an important role as conveyors of information. The information conveyed by relative prices not only determines what goods will be made available and what amounts, it also determines the particular mix of resources that will be used to produce the various goods.

If prices are not permitted to change when supply and demand conditions change (e.g., by government-imposed price controls), the market will not be able to make the requisite adjustments because relative prices will not convey accurate information. Before discussing pricing policies in Ecuador as related to the livestock subsector, two terms are identified and distinguished. These are: price determination and price discovery

Price determination in an open economy involves the interaction of supply and demand forces which are, in turn, determined by supply and demand shifters. The most important demand shifters are changes in real income, in tastes and preferences and in the relative prices of related goods and services. Supply shifters include changes in technology and in the cost of important inputs. The price that evolves from a free interaction of the supply and demand forces serves an important role as a rationing tool of both production and consumption of commodities and products.

Price discovery on the other hand refers to the interaction of buyers and sellers in the market place and price negotiation. Their interaction is based on expectation of supply and demand levels, and prices are "discovered" through bidding or by direct negotiation. Prices may also be discovered using formula pricing, committee pricing, or administered pricing methods. In Ecuador, the private treaty (i.e., negotiation between an individual buyer and an individual seller) is the only system used at all livestock and meat markets. No trades are conducted using the open bidding (i.e., auction) system. Although the private treaty method allows for some degree of competition, as sellers are able to negotiate with several buyers before making their decision, it is not as competitive as the auction system.

Direct and indirect government intervention in the pricing process in the product markets can influence the price levels and often leads to distortions in the production and marketing systems. Intervention may take several forms, including:

- minimum prices to producers,
- maximum prices to consumers,
- direct importation by the government of commodities, and
- marketing by government of consumer products at subsidized prices.

The government of Ecuador has a long history of intervention in the pricing process of agricultural commodities, including livestock and livestock products. For political reasons, the government has established maximum consumer prices for red meat, milk, poultry, and eggs. Such a policy is intended to keep the prices paid by urban consumers for these products at levels lower than those likely to evolve from the interaction of supply and demand forces. These distorted prices are generally low and have limited the producers' incentive for increased production (i.e., supply), and

have also limited marketers' incentives for investment in improved and modern marketing facilities.

For example, the government of Ecuador's intervention in the product markets through the importation of dry whole milk (DWM) and the subsequent involvement of the National Agency for Retail Food Sales (ENPROVIT) in the actual selling of the reconstituted or dry milk at low price, coupled with price control for fresh milk have been major disincentives to pasteurizing plants and overall growth of the dairy industry. Furthermore, the partial dependence of ENPROVIT on revenue generated from the dry milk business for operating capital, has created disincentives for policy reforms that would promote increased production and improve the population nutrition and producers income.

Preliminary assessment of the effectiveness of administering and actually enforcing the "official" or fixed prices indicates that they are largely ignored or, at best, not uniformly enforced. This is evidenced in the fact that market prices of meat, milk and eggs have been rising since the 1970 and in most cases remained higher than the official prices, except for lower quality products sold in some rural areas and to poor urban consumers. Nevertheless, as long as the "official" prices are perceived by producers and marketers as price ceilings that can be potentially enforced, they will create uncertainty among producers and marketers, hence, limit both production and investment incentives.

Facilitative and Regulatory Functions

Grading and Standardization

Grading refers to the separation of items of a commodity into distinct groupings that are highly uniform in certain attributes concerning market valuation and preference. Developing a comprehensive grading system is complex because of the difficulties in establishing evaluation criteria for the attributes involved. However, a simple grading system may be initially adopted as a first step in developing a more comprehensive and effective one.

Grades and standards are important because they provide a meaningful way by which price differentials can be associated with desired (or undesired) quality characteristics. Economists have long recognized that uniform application of grades

and standards can enhance both the pricing and operational efficiency of the marketing system, an important aspect of public policy. Grades are also important for an effective market news system.

The livestock and meat subsector in Ecuador is characterized by the absence of a formal grading and standardization system. Live animals are sold on the hoof on per head basis without formal consideration of breed, weight, age, or quality. There are some indications, however, that some large beef cattle producers sell animals directly to slaughter plants on a live or carcass quality basis. The quality in such cases is determined by standards established by the buyer.

Despite the fact that both meat sellers and the consumers recognize different qualities of meat, there is no formal grading system for meat at the wholesale or retail levels. As with livestock, lack of such a system does not allow the price differentials associated with different qualities to be reflected back to participants in the production and marketing systems, thereby, leading to misallocation of resources. A well-designed grading system can improve overall marketing efficiency and can pass valuable information back to producers and marketers.

The country, however, is not without experience with a grading system. For example, a large vertically integrated operation (Supermaxi) is currently procuring livestock and selling meat according to a company-established quality grading system. Premiums are paid for higher quality livestock based on three different quality carcass grades and meat is sold on a price scale that recognizes the different retail cuts and their quality. The additional transaction costs, time involved, and the scarcity of the skills necessary to effectively adopt a grading system have prevented widespread application of grading in procurement and marketing of livestock and meat.

Market Information

Accurate and timely market information is important for sound production and marketing decisions in the private sector and for policy formulation and program development by the public sector. A distinction should be made between data and information. Data are products of sampling or enumerating a certain population and require further transformation before they are ultimately used. Private and public

decision makers don't generally use data directly but only after some analysis or interpretation is performed by an information system. That is, an information system is a process by which data are given meaning and are presented in a form usable directly by decision makers. The distinction between data and information has significant implication on income distribution. The disparity in analytical capabilities among data users indicate that an equal distribution of data in society would have a very different impact on income than an equal distribution of information. Because large firms are able to use public and private data to produce their own information on prices and market conditions, lack of or inadequate public information system could increase income inequality and place small buyers and sellers at disadvantage in the marketplace.

The needs for information by the various groups vary according to time (i.e., long-term and short-term) and nature (e.g., basic information, market analysis), and may also vary by purpose and user (e.g., private and public). Long-term information includes commodity forecasts that can be used by producers and marketing firms to make decisions on a wide range issues such as production, storage, selling and slaughter. It also includes information on price movements and market structure, conduct and performance, and other important issues for the purpose of planning and legislation. On the other hand, short-term information is basically market news and outlook reports on current and expected market conditions in several markets. Market news are used by producers, marketing firms and consumers in making short-term decisions concerned with the questions of when, where, and what commodities and products to buy and sell. To be effective, market news activities must be timely and accurate and should utilize grades and other commonly known descriptive terminology in reporting the trends and conditions in the market. In addition to public market news service, private groups in many countries, including Ecuador, have developed and used their own short-term information systems.

A good information and communications system is essential for promoting marketing efficiency and for promoting equitable income distribution. In Ecuador, it appears that the current information system in its infancy stage provides insufficient long- and short-term information and market analysis, particularly for livestock and livestock products. As indicated earlier, small farm producers suffer more from this problem, as they are more dispersed and have less access to information and possess a lower level of analytical capabilities than large producers or intermediaries.

The market news system was initially established with support from the Food and Agriculture Organization of the United Nations (FAO) in the Ministry of Social Welfare. It subsequently was moved to MAG with USAID support in 1987, and has made considerable progress in reporting market prices and market conditions for a wide range of commodities. The system utilizes a network of microcomputers linked by telex lines. With funding and technical support by the staff of the USAID financed Agricultural Sector Reorientation Project (ASRP), the market news system continues to improve in terms of collection and dissemination of market information through the mass media and weekly bulletins. However, emphasis continues to be placed more on crops than on livestock. On the other hand, the German government is supporting a major effort to generate market information for livestock through its Proyecto de Fomento Ganadero (PROFOGAN).

The recent formation of a special subcommission on livestock statistics will certainly have a positive impact on the market news service and its ability to provide more timely release of livestock information to market participants. However, improvement in the effectiveness of the information system could be greatly enhanced by providing more analysis of the data, e.g., issuing outlook reports, and by enlisting assistance and contribution from the users of the information in identifying and evaluating the weakness, problems and methods to improve the system.

In regard to the long-term type information, significant work is urgently needed on a wide range of market research issues including: market structure, conduct, performance, efficiency, impact of government pricing; facilitative, and regulatory policies, marketing costs and margins, storage, grading, transportation, consumer demand, and price analysis.

Credit

Credit is needed to finance short-term, intermediate, and long-term activities. Short-term loans are generally used for operating purposes while most of the intermediate and all long-term loans are used primarily for investment in production facilities, marketing infrastructure, and improved technologies. Although Ecuador has a relatively well developed credit infrastructure, the system is oriented towards serving cash and export crops with an apparent bias against financing livestock and livestock-related activities. The National Development Bank (Banco Nacional de

Fomento, BNF), FODERUMA, and the private commercial banks in Ecuador have been involved in issuing agricultural credit to individuals and organized groups, but because of the large administrative costs for small loans, they have preferred lending money to large operations. In addition, merchants, dealers, and farmers associations make marketing loans.

Preliminary assessment of the credit situation as related to livestock marketing and products distribution indicates a general inadequacy of loanable funds for business operation and for investment in infrastructure including storage, processing, transportation, and distribution facilities. From the demand side, inadequate investment in marketing facilities and improved technologies was due to a large extent to the counterproductive government pricing policies discussed earlier. On the other hand, insufficient supply of loanable funds for livestock and meat marketing is related to lenders' reluctance to make loans that are risky and more difficult to administer than other types of loans. It appears that the collateral requirement and the long delays involved in processing loan applications, especially small ones, have added unnecessarily to the social cost of credit.

Improving the overall credit situation will require some long-term economy-wide changes designed to promote conditions that encourage the flow of capital to the livestock and meat subsector. There also are ways to make improvements in the short-term. For example, some revision of the roles and operations of the public and private lending institutions to include more supervised management and more careful preparation of plans by borrowers. Moreover, charging realistic and economically rational interest rates coupled with government guarantees would reduce lending risks and increase the pool of loanable funds to the subsector. Finally, establishment of merchants' credit unions may be an attractive alternative to solving the marketing credit problem by providing operating and investment capital to members. As discussed in the production section of this report, public and/or external support to provide seed money to such private credit institutions should be explored.

Public Laws and Regulations

Government laws and regulations are the parts of public policy that are related to regulatory and restraining policies. To this effect, the livestock and meat subsector in Ecuador operates, as do other sectors of the economy, within the

bounds and guidelines of a wide array of governmental regulations designed to promote and enhance public welfare, including health, economic well-being, social conditions, humane and other aspects of welfare.

In Ecuador, enforcement of laws and regulations concerning animal health at livestock markets and movement of animals between markets is either minimal or totally lacking. Likewise, the laws and regulations governing sanitary conditions and meat inspection at slaughter plants and meat distribution facilities are not adequately or uniformly enforced. Preliminary assessment of the effectiveness and implementation of the regulatory policy strongly indicates a need for improvement.

Summary of Marketing Constraints

Although the existing livestock and meat marketing system in Ecuador has provided the basic services to both producers and consumers, the above discussion indicates that there are significant marketing and performance problems. Improvement and promotion of technical innovations and increasing marketing efficiency are essential for the development of the subsector and would benefit producers and consumers alike. Identification of the major constraints affecting the performance of the marketing system is important in formulating a comprehensive development strategy. The following list presents a summary of the most important constraints facing the livestock and meat marketing industry in Ecuador:

Physical Infrastructure Constraints

Livestock Market Facilities

- Inadequate quarantine, other holding facilities, and administration/veterinarian offices at most markets.
- Ineffective administration of the laws and regulations. Collection of fees and maintenance services are not enforced consistently.

Slaughtering Facilities

- Poor sanitary and safety conditions, including water availability problems, and lack of quarantine corrals for diseased animals.
- Absence or inadequate use of chill rooms.
- Absence or inadequate by-products handling facilities.
- Under- or over-utilization of many slaughter plants.

- Inappropriate location. Many plants are located in residential areas or in difficult-to-access places.

Transportation and Distribution Facilities

- Poor conditions for transporting animals between farms, markets, and slaughter plants
- Lack of cold storage facilities at meat wholesale and retail markets.
- Inadequate or absence of refrigerated trucks for transporting meat from slaughter plants to wholesale and retail outlets.

Pricing Policy Constraints

- Government intervention in the product markets by establishing maximum prices that cause distortions in the price determination process, and prevent producers and marketers from receiving correct signals that are essential for making efficient resource allocation decisions.
- Limited use of the more efficient and competitive auction bidding system as a price discovery method.

Facilitative and Regulatory Constraints

- Lack of formal grading and standardization systems for live animals, meat, and meat products.
- Insufficient operating and investment credits.
- Insufficient market news and information particularly timely release of market prices, analysis, and outlook information.
- Inadequate or lack of sanitation and inspection services at most livestock markets.
- Absence of sufficient veterinary inspection of live animals and meat at slaughter plants.
- Inadequate control of illegal trade in livestock and products, especially with Colombia and Peru.

MARKETING DEVELOPMENT STRATEGY

A strategy for the development and improvement of the livestock and meat marketing system must recognize the importance of the linkage between production and marketing activities. Public and private actions should aim at improving the integration of the two activities by improving the information, communications and diagnostic processes.

The marketing strategy should be directed at:

- Providing clear and stable incentives that will promote private initiatives for improving the operational and pricing efficiencies of the marketing system at all levels by adopting technological innovations and efficient trading methods.
- Providing essential facilitative services that will support the development efforts, and
- Developing an efficient domestic marketing system to achieve self-sufficiency in meat, dairy products, and wool before promoting exports.

In order to achieve the objectives of the marketing strategy certain actions to remove or lessen the deficiencies in the operational and pricing aspects of the domestic marketing system must be taken. The strategy for development and improvement of Ecuador's livestock and meat marketing system should recognize the important role of price incentives for achieving the desired objectives. Price policies should be determined carefully and must take into consideration the likely impact on resource allocation and ensuring adequate profitability to producers and marketers.

The main elements of the marketing strategy include actions and activities in the following three areas:

- Improvement in the marketing infrastructure,
- Introduction of pricing and credit policy reforms, and
- Promotion of private and public services in the areas of grading, market information, credit, training, research, and extension.

The following is a brief discussion of some recommended actions under each of the above three areas.

Infrastructure

- Improve the administration and physical structure of the livestock market facilities. In the short-term, priority should be given to the provision of sanitation and inspection services. Except for the urgent need for quarantine corrals, the majority of the existing market facilities appear to be sufficient in the short-term. In the long-term, consideration should be given to improve the physical facilities. Improvement should be introduced gradually, depending on available funds. Included should be construction of offices, fences, and holding corrals, and the installation of weight scales.

Since markets are owned by municipalities, the costs of these changes and improvements may be covered by service fees paid by the users. An alternative is for producer or merchant groups or associations to perform the necessary changes in an arrangement whereby the group leases the market from the municipality, obtains a loan to make the necessary changes, and uses the user fees to retire the loan. In any case, higher user fees may be necessary, but improved services would reduce users' resistance to the increased charges.

- Give serious consideration to improving the physical and sanitary conditions of the existing slaughter plants. This should include provision of effective inspection service, and major renovation of the physical facilities. Since all of the slaughter plants in need of improvement are owned and operated by municipalities, the additional costs should be covered by imposing realistic and economically rational user fees.
- Reevaluate the current location, capacity, and utilization of the existing slaughter plants. The results of such an evaluation could suggest methods of combining, expanding or closing of certain plants. The feasibility of establishing regional slaughtering facilities near major producing areas should be explored. While the existing system of operating slaughter plants by municipalities appears to provide important services, there are some indications that the same could be provided by more efficient and strategically located regional facilities. The results of the feasibility study should provide a guideline for further actions.
- Encourage the use of cold storage facilities and refrigerated transportation by wholesalers and retailers. Major renovations of facilities and upgrading the transportation system would require additional capital. To this end, it will be necessary for the government to undertake pricing policy reforms and possibly provide some tax breaks or credit guarantees as incentives to wholesalers and retailers, individually or as a group (e.g., trade associations), to invest in improved facilities and to encourage them to adopt innovative meat handling and distribution technologies.
- Improve the farm to market roads in order to ensure improvement of the marketing system's operational efficiency.
- Give high priority to improving the quality and efficiency of the hides and skins industry. This will be achieved, in part, through improving the technologies for production, insect and parasite control, and slaughtering, and through training and extension programs for the tanning industry. The government should encourage the tanning association to play a significant role in providing extension and training services to its members. However, any public programs, including potential donors activities concerning the tanning industry, should be directed toward both the commercial as well as rural tanneries.

Pricing and Trade Policies

- Introduce pricing policy reforms that would reduce or eliminate government intervention in the product markets' pricing system. The reforms should aim at allowing free market prices to prevail at all levels in the marketing system. While price controls are intended to assist low income consumers groups, especially those in urban areas, they have been rarely enforced. The presence of official fixed low prices, however, has limited the incentives to producers to increase production or to produce high quality products, which resulted in shortages and increasing actual market prices. Price controls are ineffective policy instruments to achieve income redistribution objectives of the government. For example, the intervention in pricing tends to discriminate against the same lower income families which the policy is intended to help, since they often pay relatively high prices for the low quality products made available by merchants at the low fixed levels.
- Encourage the use of more competitive price discovery methods than presently used by encouraging the use of the auction system in livestock marketing. This objective can be accomplished by providing extension and education materials to buyers and sellers on the economic advantages of using auctions. The information should be based on economic analyses and may include joint pilot projects between MAG and the various livestock production and marketing groups.
- Promote legal international trade in livestock and livestock products through financial and exchange rate measures that include devaluation of the country's currency and provision of incentives for increasing local production to levels that would generate exportable surpluses.

Facilitative and Regulatory Services

- Develop and introduce a system of grades and standards for livestock and livestock products. Lack of a formal grading and standardization has contributed to the present inefficiency of the marketing system. The introduction of a workable grading system would allow for appropriate price differentials that would provide additional incentives to producers and marketers to improve quality and increase productive investment. Furthermore, a workable systems of grades and standards is essential for a good and accurate market information system and a more efficient price discovery process. The suggested system should be simple and must reflect common and meaningful attributes of the products, but the development of even a simple grading system is a difficult and time-consuming. In Ecuador, the Instituto Ecuatoriano de Normalizacion could presumably take the leadership in developing the system. However, cooperation with MAG's Marketing sub-Secretariat and input from producers, consumer and marketing groups, and research organizations, will be required.
- Improve and strongly support the existing market information system. Particularly urgent is the initiation and widespread distribution of market analysis and "outlook" type reports. Improvement of the

market news system will be enhanced by obtaining feedback from system users, especially producers on small and medium-sized farms. This could be achieved by forming a users group which will participate in the process of addition, revision and expansion of the existing system.

- Ensure the availability of an extended source of credit for both investment and operating capital purposes. This element of the marketing strategy should be achieved by a minimum direct government intervention. However, public support in the form of loan guarantees to private banks and other financial institutions may be necessary.
- Develop research, training and extension programs that address the key marketing problems. This should be undertaken jointly between MAG, other ministries, and the private sector (e.g., FUNDAGRO and key producers and marketing associations such as MEGALIT and ANCO). MAG should increase its capability in the area of market analysis of issues that include policy analysis, marketing costs and margins, market structure, conduct and performance, the economics of grades and standards, transportation, etc.
- Enforce current, and possibly new, laws and regulations concerning the operation of slaughtering facilities. Uniform application and effective enforcement of the laws and regulations throughout the country are essential to ensure nationwide sanitation and safety conditions.

PLANNING AND PROGRAMMING

The public sector is responsible for the formulation of the country's overall agricultural development strategy. Moreover, the sector provides leadership in the planning, design, implementation and evaluation of projects, and in providing public service activities. However, inappropriate public policies and lack of programs that promote productivity and efficiency in the production and marketing systems are major constraints to an efficient and productive livestock sector in Ecuador. In addition to the major constraints and distortions induced by: (1) pricing, trade, and regulatory policies, and (2) inadequate research and extension programs, the following are other public sector-related constraints:

- Lack of a cohesive government objectives and development approach concerning livestock and meat. The problem is clearly seen in the lack of organized approach to problem identification, data collection and analysis, policy and strategy formation, establishment of priorities, project implementation and evaluation. A well coordinated and effective system approach is essential for the efficient use of the

country's scarce resources, manpower planning and organization, and for budget allocation purposes.

- Lack of reliable information to guide public livestock development programs and projects. In this respect, the public sector suffers from the problems facing the private sector in making decisions. This problem has resulted primarily from inadequate and sometimes uncoordinated, systems for data collection, analysis, and dissemination. In absence of organized and up-to-date production and marketing data bases and information, the formulation of effective policies, plans, and programs is very difficult.

Of particular importance in the case of Ecuador is the absence of recent census type data on the crop and livestock production, marketing and food consumption. The last agricultural census was conducted in 1976 and currently provides little information on the current structure and characteristics of the sector. Furthermore, more than 10 years have passed since the last household consumption and expenditure survey was conducted. The inadequacy of recent data limits the ability to plan production, marketing and service programs in the private and public sectors. The ad hoc collection of data and special studies are useful, but they are not sufficient for effective planning, programming and evaluation.

- Lack of sufficient number of trained Ecuadorians in the areas of livestock economics, research, and extension. Preliminary information indicates that many of the relatively small number of qualified individuals are over extended and/or misplaced. Experience in agricultural economics, planning, policy formulation and analysis, project preparation and implementation, and management, is particularly weak, but is essential in organizing and implementing a livestock development strategy in Ecuador. Achieving the objectives of the strategy would require additional, or reassignment of personnel in the animal and feed research and extension areas.

Suggested Strategies to Address Planning Constraints

The individuals and organizations involved in planning, programming, implementation and evaluation of projects and programs have to take into consideration the different nature of the livestock and meat subsector compared to the crop subsector. Specifically, in formulating livestock projects and programs, it is essential to consider the biological nature of animals. Although some improvement in productivity and production can be achieved in the short-term (e.g., by adopting improved technology and practices), major breed improvement, development and growth can be achieved only in the long-term. This fact should be considered not only by the Government of Ecuador but also by the international donors. Long-term manpower and financial commitment is essential in achieving the subsector's

developmental objectives. Furthermore, livestock and meat subsector does not operate in isolation from the rest of the economy and the full benefits from projects, programs and services could not be achieved without sound government pricing and trade policies.

Specific Planning Strategies

- Identify a cohesive set of government objectives concerning the public interest in the growth and development of the livestock and meat subsector. This should include an outline of development strategy, including realistic targets and approaches. The Policy Analysis Unit at the MAG should be actively involved in this process, along with other public and private organizations including the Institute for Agricultural Development Strategies (IDEA).
- Identify internal and external resources and programs, but avoid the assumption of burdensome external loan obligations. Coordination between the MAG and other ministries, government agencies and institutions, as well as donors, is critical.
- Take steps to plan and conduct an agricultural census and a new household consumption and expenditure survey as early as possible. The MAG should play a significant role in the planning and implementation of the census. External Support could be provided under the ASRP.
- Encourage and continue to support the participation of private groups such cattle and sheep associations (e.g., MEGALIT and ANCO projects) in the design and implementation of projects and programs. This is an effective method of technology transfer and manpower training.
- Develop the human capital through training. This is essential for the development process. Training should be viewed in its broadest sense to include enhancement of agricultural education in the schools, short courses and on-the-job training, and longer-term undergraduate, graduate, and technical education.