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THE FEASIBILITY OF TRANSFERRING AN ANIMAL HEALTH MONITORING SYSTEM FROM THE UNITED STATES TO HONDURAS

By

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ABSTRACT

THE FEASIBILITY OF TRANSFERRING AN ANIMAL HEALTH MONITORING SYSTEM FROM THE UNITED STATES TO HONDURAS

By

Margaret Irene Brown

This research attempts to determine if a low-income country such as Honduras, would benefit from an improved animal health monitoring system, and identify critical factors for successful implementation of such a system. Michigan's National Animal Health Monitoring System (NAHMS) offers a possible information model to provide epidemiological and economic information for Honduran decision makers.

NAHMS' performance was evaluated to assess how well it gathers required information in Michigan. Primary weaknesses identified were lack of data on feed costs and weight gains and insufficient laboratory diagnosis.

Honduran institutions and information needs were assessed to determine if NAHMS' epidemiological and economic concepts would be applicable to Honduras. Honduran officials and donor agencies favor improved information. Government agencies have sufficiently qualified staff but would require strengthened coordination and analytical skills to fully benefit from new information systems. Political considerations and funding availability will ultimately determine if all or part of NAHMS is transferred to Honduras.

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ABBREVIATIONS

APHIS/VS -	Animal and Plant Health Inspection Service/Veterinary Services
BANADESA -	Banco Nacional de Desarrollo Agrícola (National Bank for Agricultural Development)
BCH -	Banco Central de Honduras (Central Bank of Honduras)
CBH -	Central Bank of Honduras
CNG -	Centro Nacional de Ganadería (National Center for Livestock)
CONAL -	Comisión Nacional de Leche (National Commission for Milk)
CURLA -	Centro Universitario de la Región Litoral Atlántico (University Center for the Atlantic Coastal Region)
DGG -	Directorat General de Ganadería (Directorate General for Livestock)
EAP -	Escuela Agrícola Panamericana (Panamerican School for Agriculture)
ENA -	Escuela Nacional de Agricultura (National School for Agriculture)
FAHRMX -	Food Animal Health Resource Management System
FAS -	Foreign Agriculture Service (of the USDA)
FENAGH -	Federación Nacional de Agricultores y Ganaderos de Honduras (National Federation of Crop and Livestock Farmers of Honduras)
Fondo Ganadero -	Livestock Fund; private joint venture business
GOH -	Government of Honduras
IDB -	Inter-American Development Bank

IICA -	Instituto Interamericano de Cooperación Para La Agricultura (Inter-American Institute for Cooperation in Agriculture)
IMF -	International Monetary Fund
LEYDE -	Leche y Derividos (Milk and Milk Products; a milk processing plant in Honduras)
LIC -	Low-Income Country
MNR -	Ministry of Natural Resources (of Honduras)
NAHMS -	National Animal Health Monitoring System
NCBA -	National Cooperative Business Association
OIRSA -	Organismo Internacional Regional de Salud Agropecuaria (International Regional Organization for Animal and Plant Health)
PC -	Parasite Control
PROFOGASA -	Programa Fomento de la Producción Bovina y Salud Animal (Cattle Production and Health Development Program)
SISVESA -	Sistema de Información y Sistema de Vigiléncia Epidemiológico y Salud Animal (Information and Epidemiological Surveillance Systems for Animal Health)
USAID -	US Agency for International Development
USDA -	US Department of Agriculture
WOPC -	Without Parasite Control

Chapter 1: INTRODUCTION

A. Statement of the Problem and Objectives of the Thesis

Addressing animal health problems in developing countries has traditionally been the role of animal health specialists, implementing government-sponsored programs for prevention and treatment. Yet in times of increasing budget crises, many countries have found it necessary to make difficult choices to achieve best use of scarce resources. Determination of research and program designs has often been based on erratic information and on priorities of foreign funding agencies, with limited information on the relative economic importance of specific disease problems.

The question raised by this research is whether a statistically based system that gathers information on prevalence and incidence rates and the relative economic costs of specified animal health problems should be transferred from a developed country for use by policy makers in developing countries to better determine priorities for allocation of human and financial resources. If the system should be transferred, the next question is how can it be transferred to another situation.

This research hypothesizes that current animal health information systems in the case-study country of Honduras do not provide decision makers with information on the relative economic importance or incidence rates of animal diseases. It is assumed that information provided by such an system will improve the quality of decisions made in allocating human and financial resources for program design, research, education and extension activities important to the Honduran livestock industry. The National Animal Health Monitoring System (NAHMS) offers a possible model for an animal health information system that could address information needs in Honduras, but it is speculated that, even if such information needs exist, institutional and technical changes will be required prior to transferring NAHMS to another country.

Five major objectives were identified for the research effort: 1) Ascertain the adequacy of NAHMS to provide information on costs of animal health problems through a partial budgeting exercise on internal parasite control, using NAHMS data on Michigan dairy herds; 2) Analyze animal health information systems currently used in Honduras in terms of their ability to provide disease frequency and economic information on animal health problems to decision makers; 3) Determine if there is a need for improving the existing animal health information system(s) being used in Honduras; 4) Evaluate the appropriateness of using NAHMS as a basis for modifying existing animal health information systems in Honduras; and 5) Suggest institutional and technical modifications necessary to make NAHMS a feasible alternative information system in Honduras.

B. Role of Animal Health Information Systems in Decision Making

1. Components of an Information System

The objective of information systems is to assist with decision making by providing required information to the right person at the necessary time. It is helpful to use a model presented by Park (1987) for assessing animal health information systems. He looks at the decision model, the information model, the data model and the hardware and software model. Park uses the term model to describe each critical component of information systems. For the purposes here, we will use only the decision, information and data models (components) to help assess Honduran information systems and needs; the hardware and software model is not appropriate given the objective of this research.

In Park's model, the decision component examines the decisions which are dependent on the information system, determines if the decision process operates in a centralized or distributive fashion, and assesses how timely decisions must be. The information component is used to determine what kind of information is required to make decisions, how accurate it must be and how timely information must be. Park contends that one should separate decisions from

information since many decision makers do not use information to form their responses but rather make choices intuitively. Thus, in designing information systems, one must keep the distinction in mind. The data component assesses the need for processing and analyzing data collected by the information system.

2. Epidemiology and Economics

Addressing animal health problems has traditionally been the role of animal health specialists. Frequently the focus of their efforts has been directed to those diseases which are clinically detectable, threaten human health or are perceived to be economically important. Over the past 30 years, the emphasis in the animal health field has been on preventative medicine, and many approaches have been developed to control animal diseases. Different information gathering systems have been developed, such as brucellosis detection and slaughterhouse disease detection, each with its strengths and weaknesses (Kaneene and Hurd, 1990). The epidemiological approach collects data on animal health to determine behavior of, and relationships between diseases. The ultimate goal is to predict disease occurrence and thus better manage it, but a strong information base is required to achieve this goal (Bigras-Poulin and Harvey, 1986). Epidemiologists have played an important role in designing surveillance systems to detect and track diseases, and determine incidence rates and distribution of diseases.

Economists have also been involved in animal health programs, but primarily at the farm-management level. Cost analysis of various farm management factors, including animal health problems, is used to identify areas for improving financial efficiency. These farm-level information systems frequently gather data useful for monitoring several diseases, production levels, management practices and costs, but the results often cannot be extrapolated to the general population due to lack of statistical sample selection (Kaneene and Hurd, 1990).

There are advantages to combining these two general approaches, yet until recently, there have been few efforts to do so. An information system that gathers data on a statistically representative sample of the population, and includes data on costs associated with animal health is useful at many levels of decision making. Policy makers at national and state levels as well as farmers can use this kind of information (perhaps in different forms) to determine priorities for animal health problems which are not only the most frequent but also the most economically important.

C. Animal Health Information Systems

Traditionally, animal health information systems have been developed to address national or regional concerns about zoonotic diseases or those which represent actual or potential serious economic losses. Two examples are brucellosis and tuberculosis information systems developed by various states in the US to track and treat these zoonoses; these systems are now being incorporated into a national level system under the US Department of Agriculture's Animal and Plant Inspection Service/Veterinary Service (USDA's APHIS/VS). The information systems are surveillance programs designed to detect single diseases, track and test farmers' herds and to assist in declaring qualifying herds and regions as free of the disease in question. Another example is the US supported program in Central America to monitor potential entry of foot and mouth disease into the region. However, these kinds of information systems do not provide national level information on the economic losses caused by the diseases.

Slaughterhouse surveillance information systems collect frequency data on multiple diseases. This information is obtained by checking slaughtered animals, thus not covering animals such as dairy cows currently in production, young stock or replacement stock. Standards for slaughterhouse inspection may not be uniform across locations making it difficult to pool this source of information (Dohoo and Stahlbaum, 1986).

An information system developed in Minnesota is designed to collect disease incidence data on a statistically-based sample of the total population, but does not collect data on management, production or costs (Diesch, 1982). With personal computers becoming widely available in the 1980s, the animal health field is reviewing information systems with increasing interest. Information systems and accompanying computer software have been developed to provide information considered essential for improved herd health management. The emphasis is shifting from curative treatment of individual animals to preventative health measures for the herd as a whole, and the concept of disease has been broadened to include clinical, subclinical and management-related health conditions (Bohlender, 1986; Radostits, 1987). Thus it becomes important to track herd performance indicators to detect subclinical disease or inefficiencies in production, and to identify appropriate actions.

The Farm Animal Health Resource Management System (FAHRMX) was designed to assist Michigan dairy farmers and their veterinarians comprehensively address animal health problems from a herd health management perspective. Data from FAHRMX have been a useful management tool for individual farmers and veterinarians, and have also provided useful information to university researchers. However, FAHRMX and other systems like it, do not provide information that can be extrapolated to the larger Michigan dairy farming population since participants are not randomly selected (Kaneene, 1986).

1. National Animal Health Monitoring System (NAHMS)

To address some of these problems, the USDA has developed the National Animal Health Monitoring System (NAHMS; this had originally been called National Animal Disease Detection System). NAHMS was designed to collect information from a statistically valid sample of the population so that results could be extrapolated to the entire population and could provide estimates of disease incidence and economic costs of animal health measures on a state-wide

or national basis. NAHMS has been used on a trial basis in twelve states including Michigan, which implemented the program for dairy cattle from 1987 to 1989. The Michigan data collection was carried out over two years (1987 to 1989) from 60 herds each year, and included data on herd inventory, animal movement in the herd, all animal health problems and monetary flows such as purchased feed, medications, veterinary fees, milk sales, milk production and losses, and estimated values of culled or replacement animals (Kaneene and Hurd, 1988; Kaneene et al., 1989).

Information resulting from NAHMS was originally intended to assist national and state officials make better decisions regarding animal health programs by providing information on which diseases are most frequent and most costly. It has become apparent that NAHMS information is also valuable to many other users (Kaneene et al., 1988). Farmers could use the information to identify their most costly health problems and determine economically sound management practices. Veterinarians would be better informed on the most frequent disease problems not identified through other information systems. Universities could target research, teaching and extension to animal health areas of most importance in the region. Pharmaceutical and biologic companies could likewise set their research and promotional agendas to be more responsive to regional needs.

2. Animal Health Information Systems in Low-Income Countries

Many low-income countries (LICs) have developed animal health information systems with various objectives. The 1960s saw an increase in activities to appraise needs and improve control of various diseases (Ellis, 1986). The most common information system is that designed to collect data on diseases with human health considerations or others deemed important for livestock trade with other nations. Problems encountered in LIC information systems are basically the same as those in the US, but are exacerbated by limited human, physical and financial resources. Thus,

while the objectives for achieving improved animal health are the same, LICs must overcome these added constraints to attain the goals.

Many donor nations and organizations have funded development efforts in LICs in a wide range of programs, including livestock development. Livestock programs have generally been concerned with animal health in two broad areas: improving human health (through improved nutrition as well as decreased zoonoses) and increasing productivity. For example, the World Health Organization (WHO) has funded monitoring programs in many LICs to track zoonoses in its effort to improve human health conditions.

Often, projects need information to monitor progress towards achieving their goals, and thus participating LICs are required to collect information for the specific project. An example of this is the World Bank funded loans for agriculture and livestock development. The Bank, and its intermediary agencies, monitor progress on their programs, and often require information on animal health and production levels. In other cases, projects may have the specific objective of gathering information on animal diseases considered important to the donor agency. For example, the USDA enters bilateral agreements with many Latin American countries to monitor foot and mouth disease, African swine fever and equine encephalitis, all of which are important to the US livestock industry.

Since the world-wide economic recession in the 1980s, the LICs have become more sensitive to the necessity for making choices among development alternatives. Increasingly, there is emphasis on evaluating the numerous technological innovations on a cost-effectiveness basis. While farmers are generally credited with carrying out their choices on this basis, they often lack complete information to permit the best choice. Such information would also be useful to officials at higher levels of government, although some would contend that even having this information, they would still base their decisions on political grounds. However, information can and is used to influence even these politically oriented decisions by identifying tradeoffs. Thus, Ellis (1986)

describes the need for information detailed enough to be useful at the farm level, yet broad enough to be used for policy decisions at regional and national levels.

Technologies from developed countries are often transferred to LICs in an effort to improve existing conditions. Problems frequently arise due to incompatibility or inappropriateness of technologies when they are transferred directly to LICs without considering differences in conditions, needs and capabilities between the donor and recipient countries. The transfer of information systems can thus be complex and may not necessarily achieve the intended objectives. A major question addressed by this research is whether there is a need for a NAHMS-based information system in LICs, and under what conditions such a transfer would be logical or likely to succeed. Currently, the Inter-American Institute for Cooperation in Agriculture (IICA, Instituto Interamericano de Cooperación Para La Agricultura) is working on animal health information systems in several Latin American countries. IICA stated that few countries in the region have reliable estimates of real losses due to animal health problems lowering livestock production and productivity (IICA, 1989). As a result, there is less effective allocation of resources dedicated to disease control programs. Existing animal health monitoring systems do not provide sufficient epidemiological or economic data that could be used to establish priorities in animal health and disease control. Thus, it may be that an animal health information system such as NAHMS could be useful in the Central American region.

Honduras was selected because like many Central American countries, livestock represents an important sector in the economy. The region has a unique comparative advantage in beef exports since it is one of the few foot and mouth disease free zones in the world, and as such, has easy access to the US market. The Honduran dairy sector is less important as an export industry, but dairy imports represent a significant drain on scarce foreign exchange. One of the major goals held by the Government of Honduras (GOH) for the livestock sector is to increase local milk production sufficiently to reduce imports to negligible levels (Wheeler et al., 1988).

Perhaps the most important reason for selecting Honduras was the interest expressed by the representative of the Organismo Internacional Regional de Salud Agropecuaria (OIRSA, Regional Organization for Animal and Plant Health) in considering NAHMS as a model for Honduras.

D. Methods and Data Sources

While the main research question was to determine the animal health information needs of Honduras, scheduling did not permit an initial assessment of the conditions in Honduras. Instead, the NAHMS system was evaluated using the partial budget technique to determine how well NAHMS provided information on costs and benefits of internal parasite control programs. The sources of data for this exercise included NAHMS data for the two years of data collection in Michigan (1987-1989) (Kaneene et al., 1989), Telfarm farm enterprise budgets for 1989 (Nott et al., 1989) and a literature review relating to the effects of internal parasites on production parameters in US dairy cattle. The major objective of the partial budget exercise was to identify weaknesses in NAHMS' data collection which would adversely affect subsequent economic analysis.

The next phase was to learn what animal health information systems exist in Honduras and assess how well they met expressed needs of actual and potential users. The focus was primarily on decision makers in the government. Published information was scarce, and the major source of information was the Latinoconsult survey conducted on the livestock sector in 1983 (Latinoconsult, 1984). The survey interviewed almost 7,000 producers to obtain qualitative and quantitative information on all facets of livestock production (only cattle in this case). Additional information on marketing activities was obtained from participants in the various segments of the livestock sub-sector, using different questionnaires.

Besides published reports, interviews were conducted over a 3 week period with officials from all levels of the Directorat General de Ganadería (DGG, the Directorate General of Livestock) with

representatives from donors, meat packing plants, milk processing plants, pharmaceutical companies, farmer organizations and development banks. These interviews served to round out and update information from the Latinoconsult survey. Information uses and needs were discussed and assessed during interviews in an attempt to determine what each of the participants used and perceived as important or lacking.

During interviews with DGG officials, questions were directed to determine opinions on alternative information collection systems. NAHMS was described to elicit reactions and discussion on its potential application in Honduras.

Conclusions were drawn which incorporated the findings on NAHMS' strengths and weaknesses and on Honduras' information needs and institutional capabilities. Several alternatives for improving Honduras' animal health information system were developed, accompanied by rough budget estimates for the alternatives.

E. Content of the Chapters

The purpose of Chapter 2 is to describe NAHMS as it was implemented in Michigan. Partial budgeting is used to ascertain whether NAHMS in Michigan collected sufficient and appropriate information to determine the cost of a farm-level internal parasite control program. The objective of this exercise is to discover strengths and weaknesses of NAHMS before considering it for expanded use in LICs such as Honduras. Internal parasites were not considered an important health problem in Michigan, but were selected because of their relative importance in many LICs. The deficiencies found in NAHMS at this point become a reference point for considering design changes if the system were indeed to be transferred.

The following chapter (Chapter 3) moves to Honduras, and describes the cattle industry in Honduras and its importance to the economy. The intention is to familiarize the reader with some basic conditions of the sector in Honduras that are in many ways different from the US dairy

industry. These differences can affect the level and quality of demand for information on the sector and hence the kind of information system needed to meet the demand. The chapter also sets the stage for Chapter 4, which describes the Honduran institutions involved in the cattle sector and information they use to perform their tasks relating to the livestock industry. Some assessment is made of the institutions' capabilities, their use of information and the quality of that information. Typical of LICs, the government plays an important role in supporting and developing the livestock sector, but Chapter 4 also looks at several private sector, educational and international institutions involved in the sector.

The final chapter, Chapter 5, reviews NAHMS in terms of its appropriateness for use in Honduras in light of Honduran information needs and institutional capabilities. It attempts to answer the question of whether NAHMS represents a sound and feasible alternative to the existing information systems in Honduras. The chapter offers some alternatives with its conclusions and recommendations.

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Chapter 2: USING MICHIGAN NAHMS DATA TO DETERMINE COST OF INTERNAL PARASITES TO DAIRY FARMERS

A. Introduction

Various information systems have been developed to provide users with information on animal health. In 1983 the US Department of Agriculture (USDA) developed one such system, the National Animal Health Monitoring System (NAHMS). NAHMS is distinct from other animal health monitoring systems in that its goal is to generate statistically valid estimates on disease incidence and prevalence, and economic costs of these diseases (Kaneene and Hurd, 1990a). NAHMS was initiated in Michigan in 1986/87 as a pilot test on dairy herds, with the goal of collecting statistically valid data on health events in Michigan dairy herds. NAHMS conducted monthly data collection on 60 randomly selected dairy herds for each of two years (1987/88 and 1988/89). Data were collected that would be used for computing state and national level estimates of disease incidence, prevalence and costs.

Preliminary assessments of NAHMS have shown both strengths and weaknesses (Kaneene and Hurd, 1990b; Hurd and Kaneene, 1990; Lafi, 1990). The objective of this chapter is to assess the capability of NAHMS to collect appropriate and sufficient data to carry out economic analysis on one specific health event, internal parasites, in Michigan dairy herds. This particular problem was chosen due to increasing interest in using animal health monitoring systems in developing countries, where internal parasites are a major health concern. Before transferring an information system to another country, it should be assessed to determine how well it functions and achieves its objectives. Thus the question is to determine the degree to which the NAHMS approach, in its present format, provides economic data on animal health events such as internal parasites that can be used to determine the economic impact of the health problem. If weaknesses are found,

they must be recognized and if possible, remedied before applying the system elsewhere in or outside the US.

While the problem of internal parasites is not given high priority in Michigan dairy herds, this problem was chosen because of international interest in applying NAHMS. The Inter-American Institute for Agriculture Cooperation (IICA), based in Costa Rica, surveyed and received responses from 13 of the Latin American countries within its jurisdiction. The survey results indicate that internal parasites was one of the top priorities in animal health (IICA, 1989). Assessing NAHMS' capability for gathering information on internal parasites provides useful insights into: 1) determining how well NAHMS gathers the appropriate kind and form of data and 2) how well NAHMS, if used in developing countries where internal parasites are a serious problem, would provide the specific information required to assess the economic impact of the problem on dairy production.

The specific objectives of this chapter are to: 1) describe the method used to analyze the economic impact of internal parasites on Michigan dairy herds; 2) present and discuss the results of the economic analysis; 3) present recommendations for improving the NAHMS format used in Michigan.

B. Materials and Methods

The partial budget approach was used to determine the economic effect of controlling internal parasite infestations in a dairy herd. Simpson describes partial budgeting as "a systematic listing of the possible changes in costs and returns in a given time period when production practices change" (Simpson, 1988). The technique of partial budgeting is appropriate in this instance where most of the farm enterprise will not change with the presence or absence of parasite control measures in the herd (Harsh et al., 1981; Alderink and Kaneene, 1988). We

are interested in looking only at the dairy production enterprise of the farm to determine the effects of introducing an internal parasite control intervention.

The partial budget in this case was developed to compare changes in costs and benefits between an average Michigan dairy herd without internal parasite control and one which practices control measures. Averages for herd size, age class distribution, milk sold, costs of medications and labor used were determined from the NAHMS data collected in Round 1 (total herds=48) and Round 2 (total herds=50). A complete description of the methodologies and procedures comprising NAHMS can be found in Kaneene and Hurd (1990a).

Information which was required but not available from NAHMS included data on feed consumption, feed costs, weight gains in young stock, milk hauling, marketing and advertising and breeding fees. This information was obtained from average dairy herd enterprise budgets were developed by Telfarm[1] and based on Michigan farmer records (Nott et al., 1989). Costs for non-commercial feed were obtained from Telfarm-based crop enterprise budgets for hay, silage and corn grain which are used in Michigan dairy enterprises.

It was assumed that Michigan herds have ample opportunity to become infected (and reinfected) with internal parasites due to widespread use of seasonal pasture or dry lot rather than total year round confinement. A review of the NAHMS herds revealed that of the 98 herds sampled, only 15 herds controlled for internal parasites. Of the 15 herds, it appeared that 5 herds used parasite control only on a small percentage of their total herd. Although NAHMS did not collect incidence and species identification information, it was assumed that Michigan dairy farmers do not practice parasite control measures and their herds are likely to have internal parasites. It also was concluded that the sub-sample sizes were too small to compare herds controlling parasites with those not controlling parasites to determine significant production

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[1] Telfarm Record Program is a farm records and financial accounting service provided for a fee to Michigan farmers by Michigan State University Cooperative Extension Service.

differences between the two groups. Individual animal comparisons of response to treatment was not possible because NAHMS data were collected on a herd basis rather than on an individual cow basis.

A Without Parasite Control (WOPC) situation was developed using NAHMS data to determine average herd size, production levels and costs that served as the base for WOPC. NAHMS herds were considered to be in the Without Parasite Control situation due to the infrequent use of parasite control measures in the sampled herds.

The With Parasite Control (PC) situation was developed using NAHMS averages for basic herd characteristics (size of herd, age distribution, milk production), and using results from a literature review to predict gains in weight, milk production, feed efficiency, reproductive efficiency and decreases in mortality and culling rates. The PC herd situation was also assumed to have internal parasites, but at a much reduced load compared to herds with no parasite control measures. There is some evidence that infected animals which receive internal parasite treatment may remain infected and their levels of productivity are less than animals which have never been infected and are totally free of parasites (Smith and Gibbs, 1981). Thus most dairy cattle are assumed to have at least sub-clinical parasitism which adversely affects production levels (Gutiernes et al., 1979; Smith and Gibbs, 1981; and Kunkel and Murphy, 1988).

There is substantial literature supporting the hypothesis that parasites adversely affect milk production in dairy cows. Bliss and Todd (1974) found that Wisconsin dairy cows dewormed the day of calving produced 992 lbs. more milk compared to their previous lactation, while untreated cows produced only 569 lbs. compared to their previous lactation. Comparing this lactation with the expected mature equivalent, the treatment group produced 302 lbs. more than their expected lactation, while the untreated cows produced 174 lbs. less than their expected lactation. Block and Gadbois (1986) conducted a paired comparison following the groups for one year of production. They found no differences between the groups' production levels for the lactation

prior to treatment, but the treated group's production increased 323 kgs. more than the non-treated group after receiving parasite control treatment. Block et al. (1987) also found that treating for internal parasites in Holsteins resulted in a projected 339 kgs. more milk for a 305 day lactation compared to their untreated group.

There is also evidence that parasite treatment can have positive effects on weight gains in young stock. Von Adrichem (1970) found that young stock treated for internal parasites had weight gains between 41.2 and 50.8 kgs. more than untreated young stock in the 361 days following treatment. Meyers and Todd (1980) treated young stock for internal parasites which resulted in weight gains of .03 to .09 kgs./day greater than the control group. Subsequently, treated heifers achieved breeding weight 3 to 7 weeks earlier than untreated heifers. They also found that treated young stock consume .5 to .8 kgs. less concentrate per kg. of weight gain compared to the control group.

In another study, Von Adrichem and Shaw (1977) documented weight gains and feed consumption for treated and untreated twin calves. They found untreated calves had depressed appetites, lower feed efficiency and lower weight gains than the treated group. They estimated that treated calves "saved" 40 kgs. of concentrate and gained 49.2 kgs. more than controls over the same time period.

Evidence of the effect of parasite control on mortality and culling rates, calving intervals and days open is less abundant and not as conclusive as the above production characteristics. Bohlender and Lowry (1986) found that parasite control in adult cows resulted in no significant differences in mortality rates compared to untreated groups. They found that the treated group had a calving interval 4 days shorter than the control group, but that treated groups had 10 to 21% cows open compared to the control group with 14% cows open. Calf mortality rates for only one treatment group resulted in significantly lower rates compared to the untreated group.

Therefore, for purposes of this analysis, these production parameters were assumed to remain unchanged with treatment for internal parasites.

1. Elements of the Partial Budget

As previously noted, not all necessary information was available from the NAHMS data, so other sources were used to estimate costs. Data from Telfarm reports were used to supplement data not found in NAHMS. Where NAHMS and Telfarm information overlapped, they appeared to be fairly consistent.

Feed costs, as noted, were not available from the NAHMS data. Telfarm data for heifers yields an annual feed cost of approximately $460/heifer. For cows in herds producing 14,086 lbs./cow/yr. (the NAHMS herd average for 1988 and 1989) feed costs are approximated to be $596/cow/yr. (Nott et al., 1989). These feed costs were used as approximations for NAHMS herds with an average of 85 cows and 88 calves and heifers. Feed costs for the herd were assumed to be a function of number of cows, number of heifers and calves, level of milk production and labor costs for hay, silage and corn grain produced on the farm.

(1) Feed costs (WOPC) = (Avg. number cows in NAHMS herds @ avg. production level) x (Avg. feed costs/cow/yr.) + (Avg. number of heifers) x (Avg. feed costs/heifer)

(2) Feed costs (PC) = (Avg. number cows in NAHMS herds @ incr. production level due to parasite control) x (Avg. feed costs @ higher prod. level/cow/yr.) + (Number heifers in reduced heifer pool) x (Avg. feed costs/heifer)

Average medication costs for WOPC herds were obtained from NAHMS data and consisted of all medications excluding costs for internal parasite control and, for the PC herd, including costs for parasite control medications.

(3) Avg. Med. Costs (WOPC) = (Avg. costs excluding parasite control/head, as reported by NAHMS) x (Avg. NAHMS herd size)

(4) Avg. Med. Costs (PC) = Avg. costs including parasite control/head, as reported by NAHMS) x (Herd size with reduced heifer pool)

Herds controlling for parasites have increased labor costs compared to those without parasite control. NAHMS data indicate that all parasite control was performed by farmer, family or hired labor, with no veterinarian labor charged for this work. NAHMS collected information on increased hours of labor required for all herd health events and has valued family and farmer labor at $5.50/hr. This valuation is consistent with Telfarm procedures (1988 = $5.00/hr., 1989 = $6.00).

(5) Labor costs (WOPC) = (Avg. hrs. for all herd health events excluding parasite control/herd/yr.) x $5.50/hr.

(6) Labor costs (PC) = (Avg hrs. for all health events including parasite control/herd/yr.) x $5.50/hr.

Milk selling costs, which include transportation, marketing fees and advertising charged to the farmer, were approximated based on Telfarm data, with costs calculated on the basis of quantity of milk sold per herd per year.

(7) Milk selling costs = (avg. lbs. milk sold/herd/yr.) x ({hauling + advert. + marketing fees}/lbs. milk sold/herd/yr.)

Milk revenue for the WOPC situation was determined from NAHMS data on pounds of milk sold per herd per year and the milk price received, average price received/lbs. milk and the average number of adult cows in NAHMS herds.

(8) Milk Rev. (WOPC) = (Avg. lbs. milk sold/cow/yr.) x (Avg. number cows/NAHMS herd) x (avg. milk price rec'd by NAHMS herds)

(9) Milk Rev. (PC) = {(Avg. lbs. milk sold/cow/yr) x (1 + % increase in milk production due to parasite control)} x (Avg. milk price rec'd by NAHMS herds)

2. Description of Analysis

Parasite control appears to have significant impact on weight gains, particularly in young stock. NAHMS did not collect information on weight gains, or on values of different classes (weight groups) of dairy animals. Thus it is difficult to value the impact of parasite control with respect to weight gains, on a dairy herd. While dairy heifers are sold in Michigan markets there are no published records available on heifer prices by weight. Most Michigan farmers prefer to raise their own replacement stock rather than buying them (personal communication with Nott and the Michigan Livestock Exchange, 1990). Thus market prices were not used to value the

difference in heifer weights resulting from parasite control measures. Instead, the improved rates of gain were assumed to allow heifers to achieve breeding weight more rapidly, and come into production at an earlier age. In comparing the WOPC with PC herds, the rate of heifer entry into the milking herd would be the same, (because calving interval remains the same) but heifers in the PC situation remain in the heifer pool for a shorter period of time since their rate of gain is greater than heifers in the WOPC situation.

This analysis evaluates herds which are in stable equilibrium rather than in transition. If a herd were to change from a WOPC to PC situation, one would see a decrease in heifer inventory during the transition period due to heifers leaving the heifer pool faster. This would increase the milking herd size, but if we assume that farmers would maintain constant herd size, there would be an increase in culled cows, another change in inventory. These inventory changes, however, occur only during the period of transition from WOPC to PC, after which the rate of heifer entry remains "normal", but the resulting heifer pool is smaller since they remain there for a shorter period of time. Thus the benefits of parasite control that result in higher rates of gains in heifers are realized by decreased costs, such as feed, associated with maintaining this smaller heifer pool for a shorter time.

The literature provides ranges of weight gains from .03 to .69 lbs./day of treated stock over untreated groups. The range reflects the variable conditions of breeds, ages, medication used, frequency and timing of treatment. For this study, an average of these figures was taken as an estimate for average weight gains one could expect to result from using parasite control.

The format of the partial budget is shown in Figure 2.1. Ideally, a third category, Herd Without Control, Without Parasites, is desireable to give the full magnitude of losses due to parasite infestations. There are few studies on production performance of totally parasite-free herds which could be used to compare with treated herds. One would expect some difference as it is assumed that treatments only eliminate certain species of parasites and re-infestation

	HERD WITHOUT PARASITE CONTROL	HERD WITH PARASITE CONTROL (Assuming 3.8% prod.)
COSTS		
Feed	{data from Telfarm}	{data from Telfarm}
Medication	. .	{data from Telfarm + NAHMS}
Labor		
farmer (@ $5.50/hr.)		
vet	. .	. .
Milk hauling	. .	{data from Telfarm x lit. rev.}
Milk marketing/advertising	. .	. .
SUBTOTAL COSTS		
BENEFITS		
Milk revenues (lbs. milk prod. x $/lb.)	{data from Telfarm}	{rate from lit. rev. x NAHMS milk price}
SUB-TOTAL BENEFITS		
NET GAINS/LOSSES		
NET CHANGE BENEFITS (W/PARASITE CONTROL - W/O PARASITE CONTROL)		

FIGURE 2.1 PARTIAL BUDGET FORMAT

occurs naturally in most herds. It is unlikely that one would ever achieve a totally parasite-free herd even with parasite control, and thus one expects less than ideal production performance levels.

Costs which were hypothesized to change in response to different levels of parasite control included feed, labor, medications, milk transportation, marketing and advertising. Other costs, such as building and equipment costs were not included because data and other studies indicated little change could be expected due to the presence or absence of parasite control measures. Benefits of parasite control included milk revenues and changes in weight gains in young stock. Increased weight gains in heifers led to a smaller heifer pool and thus lower maintenance costs for non-productive animals. Mortality and culling, which might have decreased with parasite control, were not considered benefits due to lack of evidence in the literature for any positive effects of increased parasite control on these factors.

C. Results and Discussion

Implementing a parasite control program in a "typical" Michigan dairy herd results in a positive revenue change within the given assumptions. Thus, based on the literature which estimates a 3.8% increase in milk production in response to parasite control, a dairy farmer in Michigan could expect to gain $2,616 per herd, (or $15.48/head, based on 1988/89 costs) than a farmer who did not control for parasites for his/her herd of 169 cows and replacement heifers. Assuming that all animals are infected with parasites and that all respond positively to preventative measures, carrying out internal parasite prevention programs in Michigan's 6,012 dairy herds would represent a savings of $15.7 million (at 1989 values) for Michigan's dairy industry. The critical nature of these assumptions will be addressed in the following sensitivity analysis.

1. Sensitivity Analysis

To evaluate the above research further, sensitivity analysis was conducted on selected assumptions and variables. Sensitivity analysis tested the magnitude of assumed benefits resulting from parasite control measures. For example, the literature suggests that milk production increases 3.8%, but using a sensitivity analysis shows how a less optimistic increase in milk production affects the overall outcome.

First, the assumed level of increased benefits in the PC herd (3.8% increased milk production and 5% higher weight gains in heifers) were decreased to less optimistic levels. Milk production in the PC situation was allowed to increase to only 2% and heifers gained weight at only 2% higher than the WOPC situation. This resulted in the PC herd gaining a benefit of only $1,157 per herd above the WOPC herd.

If milk price were to drop 10% from the average paid to NAHMS herds in 1988 and 1989, the difference in net benefits between PC and WOPC would decrease and PC farmers would still receive a higher net benefit than WOPC farmers, even though the increased milk production is worth less. The results of the partial budget are found in Table 2.1 and a summary of the sensitivity analyses can be found in Table 2.2.

To evaluate which of the variables were more sensitive, the relative change in each variable was compared to the relative change in net benefit differences between the WOPC and PC situations. Table 2.2 shows that the analysis is most sensitive to changes in the milk price received by farmers, with a 10% decrease in price causing a 23% decrease in the net benefits received by farmers. Herd size is also a critical factor in the analysis, with a 10% increase in size causing a 15% increase in the net benefit differences between the two situations. The sensitivity measure is similar to an elasticity and is calculated by dividing the percent change in the dependent variable (the differences in net benefits between WOPC and PC herds) by the percentage change in the independent variable (parameters that are changed such as herd size,

TABLE 2.1 PARTIAL BUDGET RESULTS COMPARING WOPC AND PC HERDS UNDER BASE ASSUMPTIONS

	HERD WITHOUT PARASITE CONTROL	HERD WITH PARASITE CONTROL (Assuming 3.8% prod.)
COSTS		
Feed	$73,392	$75,411
Breeding fees	$2,211	$2,355
Medication	$5,236	$5,746
Labor farmer (@ $5.50/hr.) hired/other	$26,742	$26,598
Milk hauling	$7,783	$8,078
Milk marketing/advertising	$3,053	$3,169
SUBTOTAL COSTS	$118,416	$121,357
BENEFITS		
Milk revenues (lbs. milk prod. x $/lb.)	$146,311	$151,868
SUB-TOTAL BENEFITS	$146,311	$151,868
NET GAINS/LOSSES	$27,895	$30,511
NET CHANGE BENEFITS (W/PARASITE CONTROL - W/O PARASITE CONTROL)		$2,616

Herd w/out control, w/parasites: Data from Telfarm data, 1989, for dairy and replacement enterprise

Herd w/control, w/out parasites: Data on production levels, herd composition, medication, labor costs from NAHMS Rounds 1 & 2. Other data on expected changes in production levels from literature review.

Figures do not include depreciation, insurance, rent, taxes or interest.

milk price). Thus, for the milk price change, the sensitivity measure is equal to .23/.099, or 2.1. The analysis is also sensitive to milk production and heifer weight gain levels, with a 53% change in production and weight gain levels yielding a 56% change in the net benefit differences between WOPC and PC base values; the sensitivity measure is 1.1 (.56/.53). Increasing feed costs and increasing per cow production had moderate effects on net benefit differences between the two situations (Table 2.1).

TABLE 2.2 RESULTS OF SENSITIVITY ANALYSIS ON SEVERAL VARIABLES

Michigan, 1990

Changes in Assumptions	Difference Net Benefit Change PC - WOPC ($/herd)	% Change in Depend. Var. / % Change in Indep. Var
Base Assumption: 3.8% incr. PC milk prod. & 5% incr. growth rate in heifers	**2,616**	**0.0**
2% incr. milk prod & 2% incr. growth rate in heifers	1,157	-1.1
10% decr. milk price	2,061	-2.1
5% incr. feed costs, both herds	2,515	-0.8
100% incr. in worm med. cost	2,251	-0.1
10X incr. labor time for worming	2,198	-0.02
10% incr. labor wage	2,461	-0.6
10% incr. herd size (both herds)	3,013	+1.5
10% incr. in per cow prod. (both herds)	2,471	-0.6

Conclusions drawn from these results must be taken with some caution, and the assumptions must be kept in mind. The analysis was done with the assumption that all animals were infected with internal parasites and that they responded positively to treatment. This implies that the parasitism was definitively diagnosed and an effective anthelmintic was used, a situation which may not always occur.

2. Evaluation of NAHMS as a Model

The analysis presents some of the weaknesses of the NAHMS system in gathering sufficient and critical information necessary to carry out detailed economic analysis of the impact of internal parasite infestations on dairy enterprises. If the goal of NAHMS is to provide sufficient information to conduct such analyses, it is obvious that data on feed consumption, feed prices, prices of livestock by weight category, parasite incidence rates and species identification, treatment schedules and more laboratory based diagnosis would be required. Data in the literature indicate high variability in cattle responses to parasite treatments due to differences in parasite species response, timing and frequency of treatments, and age of infected animals. It is therefore important to determine these variables for the specific area being considered in order to project costs and benefits of an internal parasite control program that are accurate for that area. Thus, to determine the economics of a parasite control program more accurately for the state of Michigan, additional information would be required on parasite species identification, incidence rates among herds and the most effective treatment schedule given the parasite species and farm management conditions in Michigan. What NAHMS provides is a statistically valid sample of the Michigan herds that can be used to extrapolate costs and benefits of a parasite control program, given that the necessary information on parasites is incorporated into the NAHMS data collection system.

a. A Critique of NAHMS in Michigan

i. Sampling Methodology

The Michigan NAHMS used random sampling methodology to obtain a survey population that was representative of the population of Michigan dairy farmers. It is one of the few information systems which uses a statistically valid sample and is thus able to extrapolate survey findings to the general population. Without random sampling, an information system produces results which

are not necessarily indicative of the degree and nature of animal health problems for the whole population. For example, researchers in El Salvador collected information on brucellosis prevalence from non-random samples of cattle herds and found individual prevalence rates of 3.7% and herd rates of 47%. One year later, when a stratified random sample was used to collect the same information, individual prevalence rates were found to be .98% and herd rates were 1.46% (Reyes Knoke et al., 1984). Thus NAHMS can provide more reliable information for designing programs for research, education, extension and government programs as well as interested private sector firms, that are more responsive to the needs of the Michigan dairy industry. Applied elsewhere, the random sampling used by NAHMS has the potential to improve the quality of information used for decision making.

ii. Cost Analysis

NAHMS has some difficulty in gathering adequate cost data necessary to conduct thorough financial and economic analyses of the animal health problems encountered on sample farms. There was little emphasis in the Michigan NAHMS on diagnosing dairy animals for internal parasites because it was assumed that this was not a significant health problem. Much of this analysis used research results from a limited number of parasite species. Conditions of the various research situations were not directly comparable because of methods of infesting cattle with parasites, varying treatment schedules, different medications used for treatment, different livestock age groups and different management systems.

If internal parasites are considered to be an important health problem, as they are in many LICs, NAHMS would need to detect these in sampled herds. Laboratory support will be essential to identify parasite load and species identification. This will necessarily increase the cost of implementing NAHMS, and require adequately staffed and supplied laboratories.

Aside from the lack of parasite cases in the Michigan NAHMS, it is obvious data were lacking on many important costs. Generally, cost information was adequate for purchased inputs such as medications, veterinary services, commercial feeds and supplements. There were some problems dividing costs for bulk purchases over estimated time of use and numbers of animals. This was resolved by standardizing procedures under reasonable assumptions. Attempts to collect other cost data, such as labor, were inadequate due to farmers being unaccustomed to tracking time spent on specific tasks. The wage rate for non-wage labor (family labor) was also somewhat arbitrarily determined to be $5.50 per hour, but this is not a serious problem since this was consistently maintained.

A more serious problem is NAHMS' lack of data collection on a substantial number of cost-determining factors. Feed consumption and costs are one of the most critical variable costs in US dairy farming, and slight changes in these can have a significant effect on the financial standing of the operation. Yet NAHMS questionnaires were not designed to collect information on feeds unless they were commercially obtained. Thus, NAHMS did not assign feed costs to farmers who grew their own grains and forages.

NAHMS did not collect information on feed consumption or milk production on individual animals or on the herd as a whole. Neither did it collect data on weight gains or losses of any age group of stock. These are important factors in determining cost of animal health problems since many sub-clinical health conditions, such as parasitism, inflict economic losses through decreased efficiency of feed conversion and weight gains. Another cost factor for which there is no information is the price of livestock at the time of data collection. As a result, other sources of information on costs must be used to carry out the economic analysis for which NAHMS was to provide all the necessary data.

iii. Individual Animal Basis of Data Collection

Another difficulty with the NAHMS data is its inability to address adequately animal health problems requiring individual animal records. Examples of such problems would be reproductive disorders and nutritional problems. Sub-sampling of the survey population has been done in these two specific areas but this increases costs and the already heavy requirement for time-consuming data collection.

iv. Multiple Cause Health Conditions

NAHMS has difficulty with health conditions having multiple causal agents (e.g., several species of internal parasites), where there is little basis for determining how costs should be divided among all present agents. This complicates assigning priorities to complex animal health problems, one of NAHMS' major objectives. It is unfair to place the blame on NAHMS, when in fact the problem is a reflection of our lack of understanding of detailed epidemiology of some animal health conditions. Additional research will enlighten some of the complex relationships.

v. Disease Detection Capability

There is a potential problem with designing NAHMS to detect existing health problems adequately. During the two years of monthly data collection, only two cases of internal parasites were specifically identified.[2] It is possible that cases recorded as diarrhea by the farmer and/or veterinarian may have been internal parasites, but these were not more specifically diagnosed. Yet the literature suggests that internal parasitism is more prevalent than NAHMS results suggest (Gutiernes et al., 1979; Meyers and Todd, 1980; Bliss and Todd, 1974). This raises the question

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[2] While very few cases of parasitism were reported in the Michigan NAHMS, the total number of animals reported as receiving preventative treatment for internal parasites was much higher (477).

of NAHMS' ability to objectively detect animal health problems that are not considered important by the survey designers. This is particularly important for health conditions that are difficult to detect and/or require laboratory confirmation.

vi. Interpretation of NAHMS Information

Caution should be exercised when using NAHMS to determine the costs of animal health problems. Wrong conclusions can be drawn, not so much due to NAHMS itself, but from inaccurate interpretations of analyses. It must be emphasized that NAHMS provides cost estimates for various health problems, but that most health problems will never be totally eliminated (Fetrow, et al., 1986), and thus NAHMS figures do not represent realistic savings to the livestock industry. It is perhaps more realistic to set goals for incidence rates to some lower level than at present, and then determine cost savings due to lower disease rates rather than using the unrealistic rate of zero.

b. Summary of Michigan NAHMS

NAHMS was able to collect high quality data for many but not all information categories necessary to determine the economic impact of animal health problems. Data were collected primarily on past and present farm situations, and although they could be used to set goals for the future, this has not yet been done. Important weaknesses have been identified, and most of these can be overcome through improved design. However, some changes will result in substantially higher implementation costs that will have to be weighed against expected increased benefits of improved information. As Hugh-Jones (1986) points out, "one must always ask how much do we have to know in order to make a sensible decision?"

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Chapter 3: THE HONDURAN CATTLE INDUSTRY

A. Importance of Agriculture and Livestock Contributions to Honduran Gross Domestic Product (GDP)

Agriculture historically has been the largest single contributor to the Honduran GDP, but in the past decade its contribution has decreased from 31% in 1979-81 to 28.4% in 1988. Overall, the GDP has been increasing at a decreasing rate in real terms for much of the 1980s, illustrated by GDP growth rates for 1986, 1987 and 1988 of 4.3%, 4.2% and 4.0% respectively. Agriculture grew at 6.6% in 1987, 2.5% in 1988 and 1.4% in 1989 (CBH, 1988 for 1986-1988; Latinoconsult, 1984, for all other years).

Livestock makes up approximately 20% of the agricultural GDP and has realized only moderate growth over the past few years. Development of the poultry sector has been responsible for much of the livestock sector growth; the non-poultry livestock sector's contribution to the total agriculture sector decreased from 17% in 1980 to 15% in 1982 (Latinoconsult, 1984).

General characteristics of the cattle industry described here are important in determining the supply, demand and marketing of livestock products. Cattle operations are dispersed throughout Honduras, with no real concentrated centers of production, yet demand is highly concentrated in the few large cities (Tegucigalpa, San Pedro Sula). The majority of farms are small and unspecialized, with low total annual sales and low quality products. The Latinoconsult survey estimated that in 1982, fewer than 50% of Honduran cattle producers realized any sales; of those who sold cattle, an average of 11 head of cattle were sold (Latinoconsult, 1984). There is limited access to reliable transport and all-weather roads, which further impedes marketing opportunities. The role of cattle assemblers, slaughterhouses and wholesalers is very important due to the small volume of sales and large distances to markets faced by the majority of farmers.

According to a report from the Inter-American Development Bank (IDB), 54.1% of the economically active population in Honduras was involved in the agriculture or livestock sector.[3] Family labor is the most common source of labor, with 78% of all cattle farms using this as a sole source of labor, while 13% of farms use only temporary labor and 6% use permanently hired labor (Latinoconsult survey, 1984).[4] The latter are generally large farms. The majority of farmers (78%) operate their farms themselves, with larger farms tending to have less owner operated situations.

B. Cattle Production Conditions in Honduras

1. Cattle Population and Distribution

The last livestock and agriculture census was undertaken in 1974, and is now considered out of date due to the changing nature of the livestock industry in the intervening years. Most persons working in the livestock sector use projections based on the 1984 Latinoconsult livestock survey, but even this is now becoming less reliable after more than 6 years. According to the Latinoconsult survey, there were 2,695,000 head of cattle in Honduras in 1983. The Ministry of Natural Resources'(MNR) Directorat General de Ganadería (DGG, Directorate General of Livestock) estimates the current cattle population to be 3,215,281 head for 1989, but this appears somewhat high considering that MNR/DGG numbers reflect excessively high annual growth rates (between 4.5% and 6.1% for each of the past 5 years). Latinoconsult estimated the growth rate to be 4.2% annually over the period of 1974 to 1983, but experts in the livestock sector consider even this figure to be too high, and use 2.5% to 3.5% as more realistic estimates of the annual rate of growth. The USDA's Foreign Agriculture Service (FAS) in Honduras states that cattle population is actually falling due to illegal exports to neighboring countries, and puts the figure

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[3] Economically active population is defined to include adults as well as children who contribute to household income.

[4] Remaining 3% of farmers use combinations of family, temporary or permanent labor.

at 2.4 million head for 1989 (USDA/FAS, 1989). There are approximately 90,250 cattle farms, occupying some 3.16 million ha., figures used consistently by livestock experts. Average farm size is 35 ha./farm, with an average of 30 head of cattle/farm (Latinoconsult, 1984).

Approximately 75% of the cattle are considered dual purpose, with the same herd producing both milk and meat. Of the remainder, 14.4% specialize in raising young stock, 5.2% are specialized dairy farms, and 1% are specialized beef producers. Predominant breeds are Criollo (native, unimproved breed, 50%), Brahman crossed with Criollo (20%), Brown Swiss crossed with Brahman (9%) and Holstein (Latinoconsult, 1984).

The majority of cattle are found on small and medium sized farms, as shown in Table 3.1 below.

TABLE 3.1 DISTRIBUTION OF FARMS BY SIZE, HEAD OF CATTLE

Honduras, 1983

Stratum (Ha.) per farm	% Farm	% Area	% Cattle	Avg. # Head
< 5	23.1	1.9	4.9	6
5 - 9	18.1	3.8	5.9	10
10 - 19	21.8	8.9	11.6	16
20 - 49	21.2	19.3	20.3	29
50 - 99	8.8	17.3	17.5	59
100 - 199	4.4	17.0	15.6	105
200 - 399	1.7	12.8	12.2	214
400 - 599	.5	6.5	5.2	319
600 - 999	.2	4.2	3.0	474
1000 or more	.2	8.3	3.7	588

Source: Latinoconsult, 1984

The majority of producers (63%) have individual holdings of fewer than 20 ha., have 15% of the total land in livestock operations and 22% of the cattle population, while 36% of producers own 20 to 400 ha. of land, 66% of the land and 66% of the cattle. Some 44% of the herds are 10 head of cattle or fewer, with 90% of these on 20 ha. or fewer, yet these account for only 7% of the total population. Most milk production (72%) is from farms of 20 ha. or fewer, with 26% coming from farms of 20-200 ha. These figures are evidence of the subsistence nature of Honduras' cattle sector. Much of the production is for home consumption, and products frequently enter the commercial sector only during times of excess production. Small farms are very isolated from transportation and refrigerated storage facilities and therefore cannot easily or regularly participate in commercial markets with a perishable product such as fluid milk. This has implications for the ability of "normal" packages of assistance, credit and extension to improve the productivity of farms at this level of production.

2. Level of Production, Geographic and Seasonal Differences and the Effect of Agrarian Reform

a. Production Levels

The Latinoconsult survey estimated that 80% of cattle farms have 3% or less profit margin;[5] causes of this low margin are numerous and inter-related. Some of the contributing factors include low productivity, lack of specialization (dual purpose operations predominate), inadequate credit, weak extension programs, and lack of economic incentives. In general, farmers have a low technology and low input approach to their farm enterprises, usually resulting in low yields. Previous efforts to improve productivity have not always addressed the most serious production problems or were given insufficient supervision and logistical support.

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[5] Latinoconsult survey calculated profit margins by dividing net revenues by total capital but did not include returns to farmer's labor. This definition of profit margin will be used throughout this document. Profitability varied according to geographic zone and farm size.

Measures of productivity at the farm level are difficult to obtain due to the lack of records. Calving rates[6] are thought to be between 50% and 55%; calf mortality is approximately 10-12%, while adult mortality is 2-4%. Milk production averages 2.5 liters/cow/day. The calving interval averages between 18 to 20 months, and age at first calving is 42 months (IICA, 1985). The IDB (1985) estimated that beef production (number of cattle sold for slaughter) averaged about 350 million head of cattle annually, which would supply both domestic and export markets. Production levels peaked (to approximately 395 mil. head/yr.) in 1978-82 due to higher world beef prices and to increased cattle population originating from illegal imports from Nicaragua. Production levels have now declined due to increases in illegal export of live cattle to higher priced markets in Guatemala and El Salvador. Carcass yields vary substantially due to the highly variable slaughter weights of cattle. Cattle average 680 lbs. liveweight and have yields varying between 49% and 70%. Generally, boxed beef for export (consisting of prime cuts) yields 34% of liveweight (Latinoconsult, 1984).

b. Geographic Differences

There are distinct regions in Honduras which, due to climatic conditions and rainfall, have varying levels of production and management techniques in livestock operations. In general, the country is divided into three broad regions: the humid north coast, the drier south coast and the central highlands (see Figure 3.1). Distribution of rainfall over the year is found below in Table 3.2.

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[6] Reproduction rates, in this document, are calculated to be: $\frac{\text{Total calves born per year}}{\text{Total adult female cattle}}$

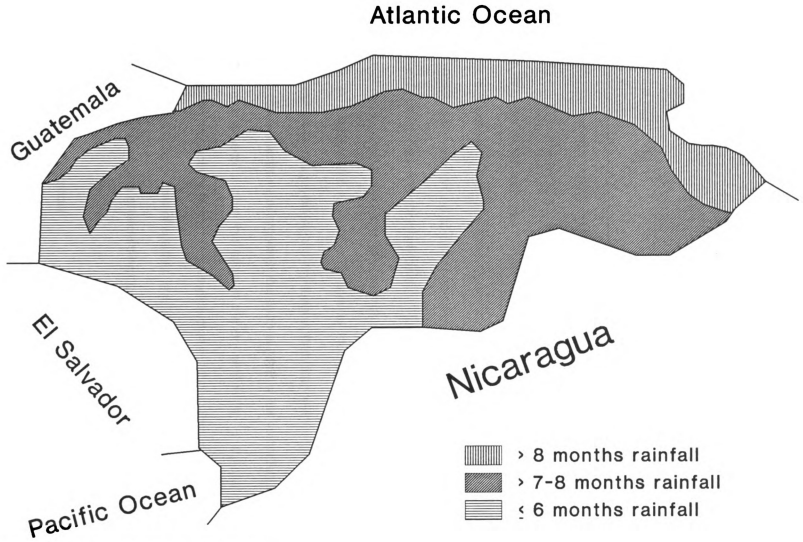

FIGURE 3.1 RAINFALL PATTERNS IN HONDURAS

TABLE 3.2 ANNUAL RAINFALL PATTERNS BY REGION

Honduras, 1983

Region	Length of Rainy Season (mos.)	% Precipitation between May - Oct (mos.)	Length of Deficit Season
North Coast	>8	<50%	0
Central highlands	7-8	60-80	2-7
South Coast	6	>80	2-5

Source: Latinoconsult, 1984.

The South Coast region thus has a limited rainy season during which it receives the major portion of its total annual rainfall. The North Coast not only has a longer rainy season, but it also receives a significant amount in the so-called dry season; unlike the southern part of Honduras, it does not experience near-drought conditions.

This variability in climatic conditions affects farmers' ability to raise livestock and influences their choices of management systems. Farmers in the North Coast area do not generally experience shortages of forages during the dry season, thus their levels of production (meat and milk) are not as variable as their colleagues in the south or parts of the central highlands. Weight gained in the rainy season is often lost again in the dry season in the harsher regions, thus decreasing general productivity levels. To overcome these climatic difficulties, farmers must use supplemental feeding during times of scarcity, but, as will be discussed later, the quality of such forages and a farmer's ability to provide them are often limited.

c. Seasonal Production Differences

Levels of milk production vary seasonally, with production peaking in July during the rainy season (see Figure 3.2). This variable production affects prices in the informal market, depressing

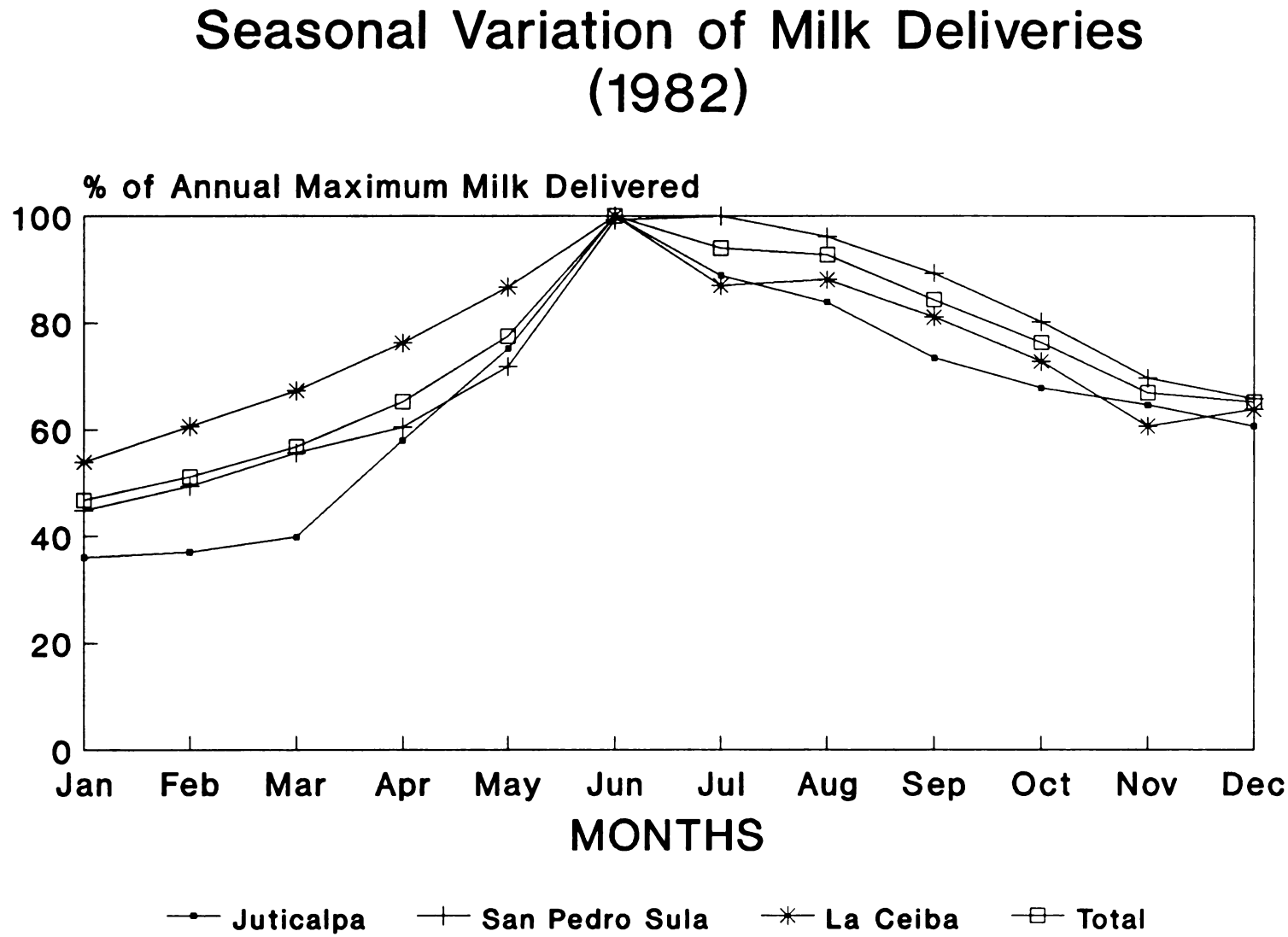

FIGURE 3.2 SEASONAL VARIATION OF MILK DELIVERIES TO MILK PROCESSING PLANTS

prices for milk and cheese during peak production. Production drops dramatically during the dry season, particularly in the southern region of the Pacific. Seasonal weight changes in beef operations are difficult to quantify but farmers recognize this as a serious problem. Some of the seasonality of production could be smoothed by controlled breeding practices and improved methods and quality of conserved fodder for dry season feeding. These same pasture variations cause seasonal fluctuations in beef availability as well.

d. Agrarian Reform

Major land reform legislation was passed in 1972, although there were efforts to implement agrarian reform before this time. In 1972, 70,000 ha. were redistributed, and in 1975, further legislation was passed to eliminate the latifundo (large land holdings) and minifundo (very small land holdings). Limits were placed on the total area a landowner could hold, and varied according to enterprise implemented on the land and the quality of the land involved. For example, land limitations were waived in cases where the enterprise was one of the national priorities. Land for redistribution was taken from state-owned lands as well as privately held lands, and was given to cooperatives and business associations. As of 1983, over 245,000 ha. had been redistributed to 1,658 small farmer groups with over 40,000 members. Problems have resulted from the fact that the GOH has not been financially able to reimburse many private owners for land confiscated for land reform.

3. Level of Technology

In general, the majority of farms use very low levels of technology, and are considered to be extensive production systems. Most farmers do not have capital-intensive operations and do not consider heavy investments in cattle operations to be worthwhile. Few farms use mechanization in any phase of cattle production. Milking, feeding, cleaning and other tasks are done manually.

Owners prefer to have low cost, low investment and low level of management on their farms, often because their cattle operation is not the only economic activity in which they are involved, and because they have few price incentives for increasing production. The problem was succinctly described by one member of the Farmer's Association in Olancho who said that most farmers do not know the difference between investment and expenditure when making financial decisions for farm operations. The following sub-sections describe various farm management activities and are indicative of the level of technology used by cattle farmers in Honduras.

a. Pasture Management

The cattle industry in Honduras is almost totally dependent on a pasture-based system of production. The Latinoconsult survey found that most farmers (85%) had pastures with low nutritive value; at one month of age or older, they do not provide sufficient levels of energy or protein to meet nutritional requirements for growth or production. Only 7% of farms had improved (better nutritive quality) Estrella grass pastures. Over 90% of farmers had more than one paddock for rotational grazing, but 55% of farms did not have the minimum of 3 paddocks needed to implement effective rotation by age and sex of livestock. Three-quarters of the farmers did not cut their pastures to promote improved growth and quality of pasture (Latinoconsult, 1984).

b. Livestock Feeds and Supplements

Only 28% of farmers use commercial concentrate for their cattle (Latinoconsult, 1984). There are only two concentrate producers in Honduras, and generally concentrate is manufactured for the poultry industry. The content is highly variable, since the bulk of ingredients must be imported. This has become increasingly the case as Honduran domestic production of even corn has fallen. Since the devaluation of the domestic currency, prices of concentrate have risen dramatically, and supply is unreliable. Farmers complain that quality is also highly variable, with

noticeable effects on milk production. Besides commercial concentrate, farmers also use molasses (49%), sometimes mixed with urea, and rice bran (39%). Few cooperatives or farmer associations provide services to supply or produce concentrate for their members.

Most farmers (67%) provide supplemental forage in times of scarce pastures, but the quality and quantity of such supplementation is poor. Fewer than one quarter of farmers actually preserve forage (hay or silage) for dry season scarcity. Other nutritional supplements are used in varying degrees. Only 7% of farmers regularly use mineralized salt, although 90% provide their stock un-mineralized salt. The majority of those who use mineralized salt were large farmers. Of the farmers who use mineralized salt, only a small percentage (8.5%) use it at the recommended *ad libitum* rate.

c. Animal Health

The most common diseases, based on field observation by MNR and private vets, are anthrax, black leg and shipping fever. However, there are no data on the incidence rates of many of these diseases. There are more complete, although perhaps not entirely reliable, figures on diseases considered important to Honduras. Generally these are diseases which have an impact on beef exports (e.g., foot and mouth) but may not be the most prevalent diseases in the cattle industry. There is also concern for zoonotic diseases, and thus an emphasis on brucellosis and tuberculosis, although these diseases do not have a high incidence rate in most parts of Honduras. Many dairy farmers report that mastitis, reproductive problems, toxicities, pneumonia and diarrhea in calves are serious problems. The two largest pharmaceutical companies operating in Honduras report that their largest sales in the cattle sector are anthelmintics, vaccines for black leg, malignant edema and shipping fever, vitamins, and products for ectoparasite control (Cordoña, 1990; Quiñones, 1990).

Health practices are not routinely carried out. Only 9% of farmers use animal health services provided by veterinarians, but farmers receive these services from extension agents even less frequently. Vaccination against prevalent diseases is practiced by approximately 50% of farmers, while even fewer (21%) deworm their cattle. Prevalence of health care practices on farms changes according to the size of farm. For example, 70% of farmers with fewer than 10 head do not deworm their stock, while 90% with "large" herds do deworm. Even among those farmers who carry out health practices on their herds, the quality (frequency, correct dosing, care of vaccine) is often poor (Latinoconsult, 1984).

d. Breeding Practices

Artificial insemination (AI) is used on only 0.8% of farms, and even on larger farms (more than 500 head), only 15-18% use AI. Much of this is due to the difficulty of obtaining semen; there are few private distributors and the government AI program has a reputation of running out of semen from top bulls (Latinoconsult, 1984). Farmers frequently do not separate their cattle by sex or age group, and with little castration practiced, uncontrolled breeding often occurs. This can result in premature breeding of heifers, or more commonly, calves with unknown parentage if there are several bulls in the herd, and uncertain calving dates since breeding occurs without farmer's knowledge. Some 18% of farmers admitted that they do not control breeding, while 66% said they attempt to regulate breeding heifers to occur at 2 to 3 years of age. Only 4% of farms use palpation to detect pregnancy, and much of this is done by the farmer himself. In a special study on pregnancy rates, Latinoconsult found low reproductive rates which it concluded were primarily due to poor management and poor levels of nutrition.

e. Record Keeping

Record keeping is minimal at the farm level, with only 18% of farmers keeping any kind of herd records at all. Frequently these records are merely a listing of total head of cattle owned. Almost 90% of small farmers (fewer than 10 head) keep no herd records, while 89% of large farmers (over 1000 head) keep records. The most frequent records kept are on costs of operation, births, cattle sales, milk sales and deaths. However there appears to be little use of information from records to identify problems or to improve productivity (Latinoconsult, 1984). Only some productivity measures are recognized as important (milk production, weaning and slaughter weights, calving interval), while others are poorly understood or not seen as important.

Farmers are obligated to keep track of income for tax purposes. Therefore, most have some sort of account of quantity of milk sold (not necessarily the same as milk produced), and number of cattle sold. Beyond this basic information, there is no consistency. Because small farmers may only sell 30 to 40% of their total production, their sales records will not reflect true production levels.

Information on items such as milk production and weight gains, is often obtained using non-standardized measurements or eyeball estimations. Animal scales are rare in slaughterhouses, not to mention farms. Information on herd health, individual production and reproduction records, and cash inflows and outflows is not usually kept nor available at the farm level. The exceptions are those cases where farmers are participants in special programs, such as Programa Fomento de la Producción Bovina y Salud Animal (PROFOGASA, Cattle Production and Health Development Program) or Fondo Ganadero (addressed in Chapter 4), and are required to keep records in accordance with the needs of the program.

4. Information

Flow of information to farmers is limited. Farmers who participate in livestock development programs receive information on improved farming methods from government technicians, and on animal health topics, from livestock supplies retailers. Some pharmaceutical companies have field staff who provide product information. Milk processing plants also give production level information to their farmer clients and some plants provide technical assistance on improved farming methods to these farmers. Farmers who sell cattle for export through meat packing plants receive information on carcass yields of their cattle. Generally, few farmers receive consistent, regular and useable information on improving production or productivity from any source. This is confirmed by the Latinoconsult survey, which found that less than 18% of interviewed farmers received technical assistance from any source, public or private.

Flow of information from farmers to government or private sector agencies is also limited, yet farmers represent one of the most important sources of information on the livestock sector. All too often, this critical link in the information chain is assumed to be willing to cooperate or even ignored, with little regard to how farmers perceive outside requests to collect such personal information. Even once cooperation is obtained, it is often difficult to convince farmers of the usefulness of keeping records without a concentrated effort on the part of the DGG and its field workers. Part of the problem is lack of positive incentives; farmers have not seen that record keeping leads to financial benefits. Because of the sensitive relation of the information to taxes, keeping accurate records on herd size, production levels and income is actually a disincentive to farmers.

C. Description of Beef and Dairy Sectors

1. Beef Sector

Honduras, similar to Mexico, the Caribbean nations and the other Central American nations, is free of foot and mouth disease and therefore has a ready market in the US for its beef exports. Beef exports represent an important source of foreign exchange earnings for Honduras, although at 2.7% of the total value of exports, beef is considerably less important than bananas (40.8%) and coffee (21.3%) (CBH, 1988). The amount of beef exported from Honduras to the US varies from year to year depending on beef market conditions in the US (Wheeler et al., 1988). (See Table 3.3).

TABLE 3.3 BEEF PRODUCTION, EXPORT AND DOMESTIC CONSUMPTION

Honduras, 1971-1981

Year	Total Slaughter (000 Tons)	Export (000 T)	Export %	Consumption (000 T)	Consumption (Kg/person)
1971	38	22	58	16	5.9
1972	39	26	67	13	4.6
1973	42	28	67	14	4.8
1974	35	20	57	16	5.4
1975	40	25	63	14	4.5
1976	42	30	71	12	3.8
1977	42	26	62	15	4.5
1978	54	33	61	21	6.1
1979	59	38	64	21	5.9
1980	63	37	59	27	7.3
1981	60	34	57	26	6.8

Source: Latinoconsult, 1984.

In the period from 1970 to 1982, beef exports grew at an annual rate of 3.8%. However this figure does not indicate the variability of the market. For example, there was a significant increase in exports in 1975-77, at the expense of the domestic market, which received only 30 to 43% of

total Honduran beef supply. According to a 1985 IDB report, the value of beef exports has decreased from $61.2 mil. in 1979 to $34.3 mil. in 1982 (IDB, 1985).[7] The IDB's conclusion is that beef exports experienced a serious decrease, but part of this decline is due to the normal fluctuation of the international beef market.

Since 1988, US beef prices for Honduran beef have been less than prices in El Salvador and Guatemala. Thus, the higher prices of the neighboring countries has led to increased beef production (at the apparent cost to the dairy industry) and increased legal and illegal exports to these countries.

The USDA/FAS estimates that 100,000 to 125,000 head of cattle are exported annually as contraband to El Salvador and Guatemala (USDA/FAS, 1989). These exports are considered illegal since they do not go through official export channels or inspection procedures. Such illegal border crossing is relatively easy according to some officials, and high beef prices, combined with the low probability of facing stiff penalties, provide incentives to producers.

Meat exports to the US fell 11% in 1987 and another 2.1% in 1988 (CBH, 1988). While there are no data on the precise amounts of beef production or domestic consumption (IDB's 1985 report estimated annual domestic consumption to be 5-7 kg/year), the consensus among producers and government officials is that domestic supply for beef has decreased and domestic demand has also fallen.

Domestic supply has decreased due to higher prices offered in neighboring countries and the US, making exports more attractive to producers. Domestic prices have risen due to decreased domestic supply and this in turn has depressed domestic demand for beef. Domestic demand has also decreased presumably because inflation and increasing unemployment have decreased disposable household income. Official figures put inflation for 1988 at 4% and for 1989 at 9.8%

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[7] There is no indication in this report if prices quoted are in real or nominal terms.

(USDA, 1989). Unofficial estimates for 1989 claim that 20 to 25% is more realistic. Unemployment is officially quoted at 15%, but unofficially it is estimated to be closer to 35-40% (USDA, 1989). In response, consumers are decreasing their consumption of beef and shifting to less expensive poultry as a substitute (USDA/FAS, 1989).

The Latinoconsult report estimates demand and supply for beef for the year 2000. The report's projections were based on a 3% annual growth rate of the cattle population, although this was less than the annual growth rate for the period of 1970 to 1980. They assumed that demand would not increase greatly from their findings of 5-7 kgs./person/yr., and used two levels of per capita consumption, 6 and 8 kgs., for their projections. They further assumed that domestic demand would be met first, and production beyond that would be exported to the US and other Central American countries. Under these assumptions, they projected adequate beef production for domestic demand, with a total of 100 million tons of beef produced per year (Latinoconsult, 1984).

2. Dairy Sector

GOH officials estimate that total milk consumption to be increasing based on levels of milk production and milk imports reported by domestic milk processing plants. However, it is estimated that per capita milk consumption has in fact decreased from 83 liters in 1973 to 73 liters in 1988 (USDA/FAS, 1989). (See Table 3.4).

For the past decade the government of Honduras has supported a policy to increase domestic dairy production and to reduce commercial imports of dry milk; there is some evidence of a slow transition from dual purpose to dairy production. In 1984, milk imports represented 85% of all livestock imports and have increased over time. In 1977, milk imports were valued at $7.2 million and by 1981, they had increased to $16 million (IDB, 1985). Wheeler et al. (1988) claim that $15 million was spent annually on milk imports in the mid-1980s. This represents a significant

foreign exchange expenditure in the agriculture sector. Until recently the government was hesitant to enforce reduced imports or increase fluid milk prices (as an incentive to local producers) due to the sensitive political nature of possibly depriving the population of sufficient milk. The government is now enforcing a policy requiring all businesses that use milk as a primary ingredient, such as milk processing plants, to use at least 50% local fluid milk. This has increased the milk processing plants' costs of production in the past two years. Decreasing supplies of milk on the world market and devaluation of the lempira in early 1990 have increased prices Honduras must pay per unit of imported milk. As a result, the volume of milk imports decreased by 6.5% in 1988, and by 35% in 1989 (MNR, 1990). It remains to be seen whether the domestic dairy sector will respond to this decrease in milk imports by increasing production to levels sufficient to supply domestic demand.

TABLE 3.4 MILK PRODUCTION, IMPORTS AND PER CAPITA CONSUMPTION

Honduras, 1978-1988

Year	Formal Mkt.	Informal Mkt.[a]	Total[a]	Imports	Per Capita (liters)
	(000,000 liters)				
1978	27.8	201.2	229.0	52.8	83
1979	27.1	209.8	236.9	64.1	84
1980	25.8	210.0	235.8	78.4	85
1981	23.9	217.3	241.2	73.4	83
1982	30.7	214.9	245.6	58.8	76
1983	36.6	207.9	244.5	72.4	78
1984	43.4	206.9	250.3	67.9	76
1985	47.0	209.3	256.3	67.7	75
1986	52.3	210.2	262.5	85.9	79
1987	54.4	214.4	268.8	70.0	75
1988	62.1	213.2	275.3	60.0	73

[a] There are no figures for Informal Market production. The GOH estimates production levels based on trends in the Formal Market.

Source: Wheeler et. al., 1988.

Demand for milk is growing primarily due to increasing population, estimated to be growing at 2.8% to 3% per year (USDA/FAS, 1989). Increasing income is another source of increasing demand, but due to inflation and low to zero growth of GDP in the past few years, it is unlikely that per capita income has contributed significantly to increased demand. The Latinoconsult survey showed annual growth of demand to be quite low (1.3%), while supply grew at an average of 4.3% from 1970 to 1982. The survey also projected supply and demand for milk in Honduras by the year 2000. Using an annual population growth rate of 3.3%, and high and low per capita consumption levels, and supply growing at a more conservative rate than found in the survey, they found that domestic supply would not be able to keep pace with demand (at current prices) except at the lower consumption level and higher production level.

3. Marketing and Pricing

a. Beef Sector

Prices for exported beef are heavily influenced by beef prices in the US, Honduras' major beef export market. Meat packing plants in Honduras use the Yellow Sheet to determine prices they will receive for beef cattle. However, prices paid by the plants to producers are not clearly established although there is some relation between US price changes and prices offered by packing plants to producers. Generally, producers receive prices based on liveweight, age and sex, with some premiums paid for heavier weights. Other standards of quality which could serve as a pricing base do not exist.

The Central Bank of Honduras (CBH) is the only source of time-series information on beef prices at the producer level. The prices show cyclical variation except during the period of the government controlled price ceiling on beef prices from 1974 to 1981. Price controls had a negative effect on beef industry development, and were eliminated in 1981.

The majority of cattle are raised on small farms, and according to Latinoconsult's survey, only 49% of farms sold cattle in 1982. Both small and large farms sell a relatively small percentage of their total animals (see Table 3.5).

TABLE 3.5 DISTRIBUTION OF CATTLE SALES BY HERD SIZE

Honduras, 1982

Herd Size (in # head)	% Farms Selling Cattle	% Total Cattle Sold	# Head Sold
< 10	30.7	5.4	2.2
10-29	54.1	13.1	4.1
30-49	67.9	9.0	7.9
50-99	76.2	29.8	24.0
100-199	85.5	10.8	21.9
200-299	93.4	9.6	51.2
300-499	87.1	11.1	98.9
500-999	90.5	4.7	121.4
> 1000	94.3	6.5	652.1

Source: Latinoconsult, 1984.

Of the total sales of cattle by producers, 66% go for slaughter, 21% for fattening and 13% are young stock sold to others to raise. Of the cattle that are slaughtered, 44% are sold to packing plants, 13% to the municipal slaughter facility, called the Metropolitan Meat Processor (PROMDECA), and 43% are sold to local (usually rural) slaughterhouses (Latinoconsult, 1984). Many cattle are sold for fattening because of their poor condition at the time of sale, and must be kept for several months prior to slaughter.

Small farms generally raise young stock and frequently have dairy operations. Thus, sales of cattle for slaughter are relatively unimportant on these farms compared to sales of young stock

or culled dairy cows. Because of the small volume and their geographic dispersion, as well as lack of local markets, the majority of small producers do not sell their animals directly to slaughterhouses or wholesalers (see Figure 3.3). Instead, there are regional cattle assemblers who collect small lots of animals and in turn sell these to meat packing plants or slaughterhouses. They may also hold cattle for several months to fatten them until they are more marketable. These assemblers offer producers a per-head price irrespective of individual animal weights or condition, and thus take on the risk of less marketable animals.

Approximately 25% of all beef cattle are slaughtered in either San Pedro Sula or Tegucigalpa, and are brought there by the rural assemblers. In Tegucigalpa, PROMDECA provides producers and/or assemblers slaughter and processing facilities and veterinarian inspections for their cattle. It also has facilities to make blood meal and bone meal. Use is open to the public, and fees are charged to users on a per-head-of-cattle basis.

After slaughter, wholesalers receive the meat which is either delivered by PROMDECA or picked up directly by the wholesaler. It is then delivered to retailers. In both Tegucigalpa and San Pedro Sula, a few wholesalers control the major portion (over 65%) of the meat distribution operation. Outside of these two major urban areas, rural slaughter facilities, estimated to number 280, are much more rudimentary, often without equipment or even running water, and volumes of meat processed are smaller (Latinoconsult, 1984). Cattle owners or assemblers may use the facilities for a fee, but there are no marketing services offered. Assemblers or owners themselves are responsible for selling the beef in the local market or to retailers in the village.

Beef destined for export must be processed through meat packing plants. By law, 10% of the meat processed in these plants must be sold on the domestic market. In 1983, there were 7 packing plants in Honduras, but by 1990, there were only 4 still in operation. The plant closings are attributed to the increase in illegal export of live cattle to neighboring countries in the past few

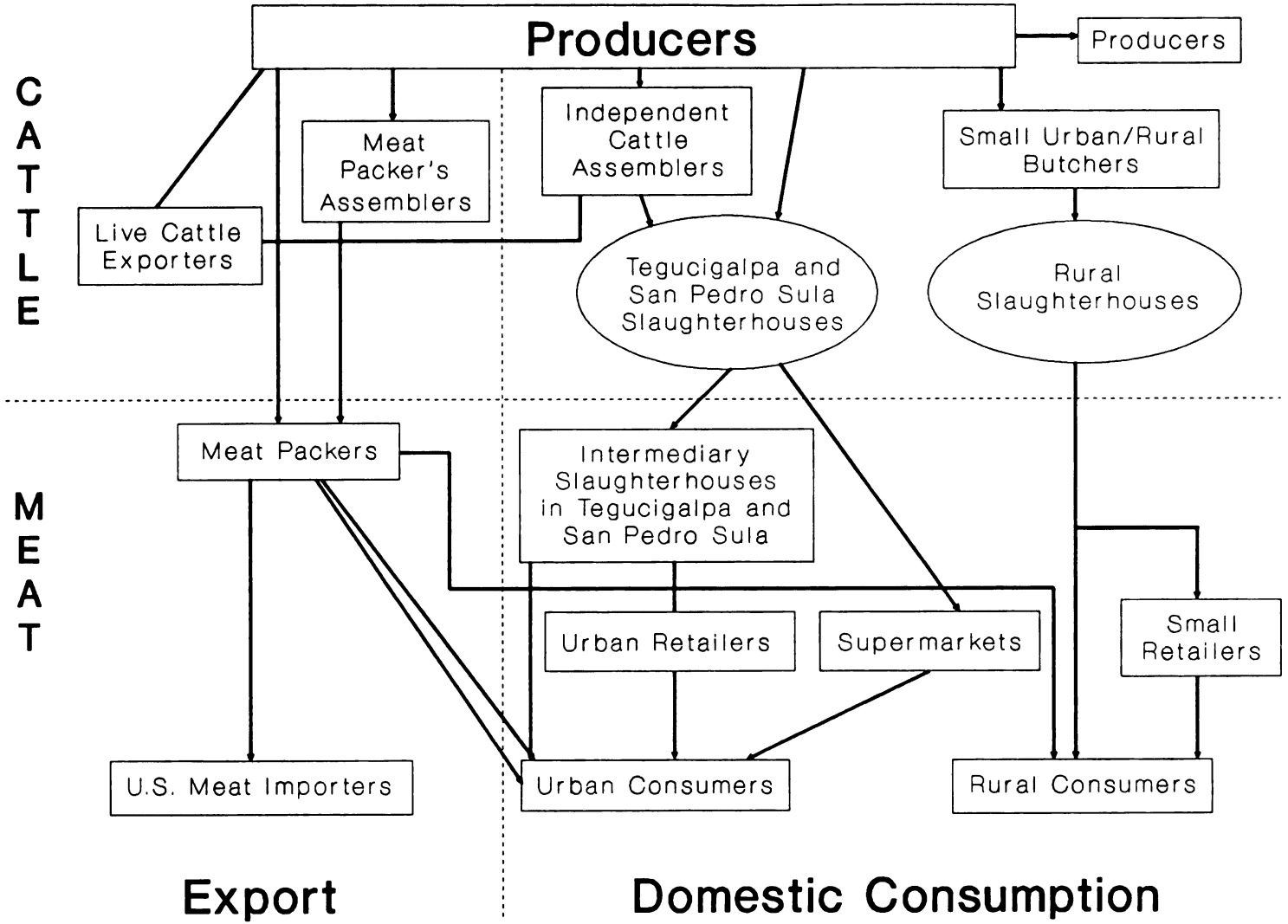

FIGURE 3.3 BEEF MARKETING CHANNELS IN HONDURAS

years. Due to this reduced number of cattle for slaughter, plants do not have sufficient supply to operate on a year-round basis, and it is estimated that they operate at about 50% of capacity (Latinoconsult, 1984). Usually, these plants have some degree of vertical integration, fattening cattle on their own farms, but they also purchase directly from independent farmers (on a contract basis), from farmers through the plant's own purchase agent or from independent cattle assemblers.

Because of the limited number of packing plants, independent farmers feel they have little control over prices offered by the plants, yet they have few alternatives. Selling for the domestic market usually involves paying cattle assemblers, or the farmer pays for his own transportation and time costs, with little chance of receiving a price significantly different from that offered by the packing plant price. As mentioned previously, many plants have varying degrees of vertical integration, and some are also considered conglomerates, and are subsidiaries of multinationals such as United Beef and Packed Provisions. Two plants in the same region purchase their cattle from the same large cattle assembler, essentially eliminating price competition, and farmers are forced to accept the price offered or they must go to other regions in hopes of finding better prices.

b. Milk Sector

Fluid milk price ranges are fixed by the government in an effort to ensure access to milk by all income groups. However, there are two commercial channels for milk in Honduras (see Figure 3.4). The formal or controlled sector consists of fluid milk processed through the milk plants, and handles only 25 to 30% of total milk produced (Caballero, 1990). Cheese and other milk products processed through the plants are not subject to price controls. The remainder of milk moves through the informal or uncontrolled sector. Of this, 75% remains fluid milk, part goes for home consumption (54%) and part is sold either by the producer himself or through milk purchasing

Milk Marketing Channels

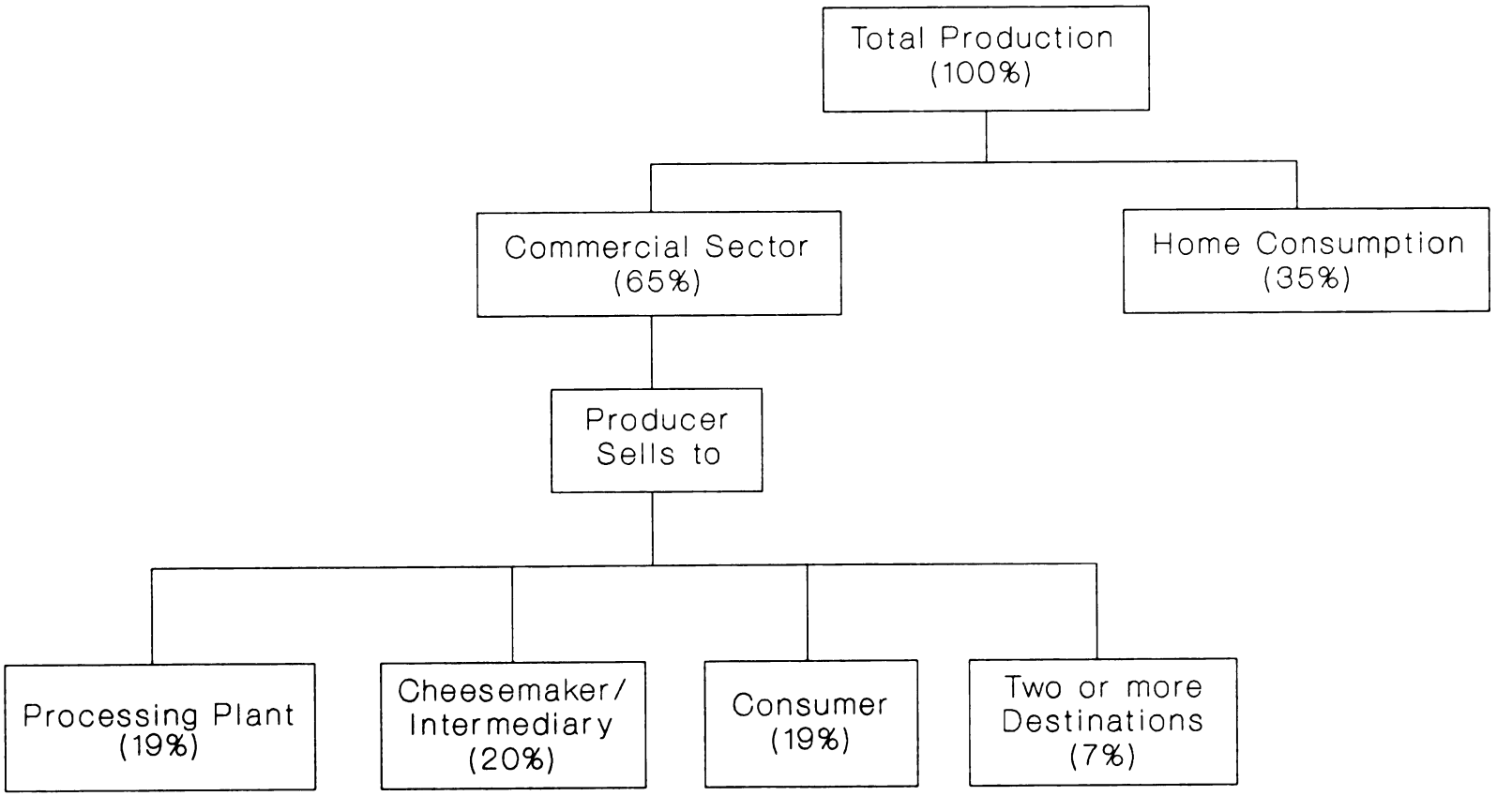

FIGURE 3.4 MILK MARKETING CHANNELS IN HONDURAS

agents or cheesemakers, to consumers. The remaining 25% of the production flowing through the informal sector is made into cheese, by either the producer or by cheesemakers and sold to consumers (Latinoconsult, 1984). Prices are not controlled for any milk or milk products in the informal sector.

Milk processing plants are unable to adjust to increases in costs of production through increasing milk prices due to government regulation of price. Until approximately 1987, the plants could reduce their production costs by importing and reconstituting cheaper dry milk which was then mixed with some proportion of local milk. One plant, Delta, produced fluid milk derived 100% from such milk imports. In 1987, in an effort to increase domestic production, the Comisión Nacional de Leche (CONAL, the National Commission for Milk) was able to obtain passage of legislation requiring all businesses, such as milk processing plants, that use milk as a primary raw ingredient to use at least 50% local fluid milk in their production. Thus the new law forced Delta to change its processing to include local fluid milk where it had been previously using only imported milk.

Milk production experiences large seasonal fluctuations, yet milk prices in the controlled sector remain constant year round (see previous Figure 3.2). In the informal sector where price is not controlled, the seasonal production changes result in price fluctuations of 20 to 40%. Prices offered in the informal market are lower than the formal market during the rainy season of high production, and higher than the formal sector during the low production period of the dry season.

Farmers have experienced a decline in real prices received for milk in the formal market. From the period 1975 to 1988, farmers experienced a decrease in milk prices in real terms of almost 33% (see Table 3.6).

TABLE 3.6 PRICES RECEIVED BY PRODUCERS PER LITER FLUID MILK

Honduras, 1975-1986

YEAR	NOMINAL PRICE[a]	REAL PRICE[b]
1975	.31	.40
1976	.32	.37
1977	.31	.33
1978	.36	.36
1979	.39	.35
1980	.45	.34
1981	.46	.32
1982	.49	.31
1983	.48	.28
1984	.49	.27
1985	.51	.28
1986	.52	.27

[a] in Lempira (1 Lp. = $US .50)
[b] Real prices are 1978 based.

Source: Wheeler et al., 1988.

Producers have some knowledge of milk prices because of government-controlled pricing on the formal market which influences milk processing plant purchase prices. Nonetheless producers who sell to the informal sector, particularly to cheesemaking industries, have much less price information available. While there are some quality control and pricing standards in the formal sector, the informal sector has no set quality or pricing standards. These standards are not always well enforced, and the levels of acceptance, compared to US standards, are much lower. Milk is tested for bacteria count and milk fat, and price incentives are also given to farmers who sell their milk already cooled. The milk processing plants all use similar standards for classifying milk they accept from producers, and use price differences to encourage producers to deliver higher quality milk.

D. Summary and Conclusions

The last livestock census was taken in 1974, with an interim survey conducted in 1984, thus estimates of the current population are not consistent. The USDA/FAS puts the figure at approximately 2.6 million head of cattle on some 90,250 farms. Some officials feel the population is declining primarily due to illegal export of live animals to neighboring countries. The vast majority of cattle farming is non-specialized, with over 75% of the farms producing dual products of meat and milk. Most farms are small (30 ha.) and have an average of 35 head of cattle, but the distribution of farms according to size and number of cattle shows the wide spectrum in the Honduran cattle industry. Differences in management capabilities, productivity and level of technology used are often correlated with the size of farm. Many small farms produce at the subsistence level and yet these farms are typical of the majority of Honduran livestock operations.

Climate and rainfall patterns influence choices available to farmers and determines their management systems. Production levels are highly variable over the year according to how these factors affect the availability of fodder. The nutritional base for most cattle operations is pastures and most pastures are native species with low nutritive values.

Supplemental feeds are used to carry cattle through the dry season, but these are poor quality and often available in insufficient quantities. Health care includes only the basics, with few farmers routinely practicing preventive measures.

The cattle industry is an important contributor to the Honduran economy, but in recent years, it has grown at a decreasing rate. This is due partially to the overvalued domestic currency (devalued in early 1990) as well as low levels of productivity in the sector. Beef exports fluctuate according to US beef market, although in recent years, higher prices in neighboring Central American countries have resulted in an important though illegal outlet for live cattle. Domestic beef supply has decreased and prices have increased resulting in consumers substituting to less

expensive poultry. Future beef export levels are more difficult to predict since these are more dependent on US beef prices, US demand and prices in neighboring countries.

Domestic dairy production has apparently grown despite decreasing real prices at the farm level, but per capita consumption has decreased significantly in the last 10 years. Because domestic milk production is insufficient to meet demand, Honduras traditionally imports dry milk on a commercial basis and receives some donations. Commercial imports represent a significant expenditure of foreign exchange which is in increasingly short supply.

There are two basic marketing channels for milk in Honduras, the formal sector involving milk processing plants, and the informal sector involving either home processing or selling fluid milk to cheesemakers. Fluid milk prices in the formal sector are controlled by the government to ensure that all income classes have access to milk, but this has become a deterrent to increasing production. Inexpensive milk imports are additional disincentives to local producers, but in 1987, the government enacted legislation requiring businesses to use increased amounts of domestically produced milk. Decreased world supplies of milk have increased prices of imported milk, further assisting Honduran dairy farmers by discouraging milk processing plants' widespread use of cheap imports.

Prices in the informal sector are not controlled by the government, but are much more variable due to seasonal milk production fluctuations. Thus farmers using the informal sector are forced to accept lower prices during times of high production. Quality standards are used only in the formal sector by processing plants, and are still somewhat undeveloped and not always regularly enforced.

Marketing channels for beef are numerous due to the dispersed nature of the producers compared to the highly concentrated centers of consumption in urban areas. The channels usually involve cattle assemblers, fatteners, slaughterhouses, wholesalers and retailers. Marketing for milk is less complex but in some ways more difficult due to the lack of infrastructure and

refrigeration, which forces many small farmers to market their milk through informal channels, often at unfavorable prices.

In general, the Honduran cattle industry can be described as very stratified, with highly variable levels of productivity. The industry is not specialized due to the uncertainty of market conditions, prices and supply of inputs and services. Producers are highly dispersed, thus the role of marketing intermediaries (e.g., cattle assemblers, wholesalers, slaughterhouses, milk purchasing agents) is important. Producers have little power to negotiate prices, because there are few measurable standards and/or prices are set by the government. Even with the current willingness of the government to consider raising milk prices, producers will still face other critical bottlenecks inhibiting increased production.

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Chapter 4: IDENTIFICATION AND ASSESSMENT OF INSTITUTIONS IN THE HONDURAN LIVESTOCK SECTOR

A. Introduction

The purpose of this chapter is to identify and describe the actors in the Honduran livestock industry in terms of their roles in the sector's development, their capabilities and the quality and use of information available to them. A wide variety of agencies participate in the sector, including the government, the private sector, universities and international organizations. Each has distinct roles and contributions, and each has varying capabilities for carrying out its mandate. Often there are overlapping responsibilities, which should be recognized in order to avoid unnecessary duplication of work. It is critical to understand each institution's strengths and weaknesses in order to assess their ability to adopt changes intended to improve their performance. Prior to improving existing systems or adopting new systems, the institution's responsibilities and its ability to carry them out will determine the likelihood of success or failure of the new ventures. One must assess capabilities, desires and perceived needs not only of institutions directly involved in the proposed changes, but others that may be affected directly or indirectly.

B. Decision Making Processes and Information Use in Honduras

Government planning is a centralized process in Honduras, with little delegation of authority given to lower levels of government to make substantive decisions. Thus, for planning purposes, information is most often needed at the central level. Many decisions are made on the basis of political influence, with minimal use of technical information to aid in decision making. Timing of decisions is highly variable, with some decisions having to be made immediately due to their emergency nature. These are less susceptible to political whims and usually deal with outbreaks

of exotic or economically important diseases. Information needs and expected actions in response to receiving the information are well defined, and have fewer political implications.

1. General Information

a. Agriculture Census

Census data are used to obtain high-quality information on the entire population, most frequently on numbers (head of each species of livestock), distribution (by income group, land ownership, etc.) and characteristics (breed, age, value). Such information is often a valuable indicator of problems or important changes in various characteristics of the agricultural sector, and helps planners allocate resources to address needs.

The last agricultural census in Honduras was conducted in 1974, and officials agree that the information contained in the census is no longer valid. The census counted the entire population to determine crop extensions and livestock populations. Collection of such quantities of data are time consuming and thus censuses are generally conducted only once every ten years. Analysis of census data requires significant amounts of time, adding to the lag time between data collection and use of information and affecting how useful the results are to decision makers. The data and resulting analysis are generally centralized and most often used for national statistics.

Since the information from the 1974 agricultural census is no longer an accurate accounting of the sector, it is logical to ask if the GOH will undertake another census. It appears highly unlikely that this will happen, despite constant complaints from decision makers on the lack of up-to-date information. Conducting a census is not only time consuming but costly. In these years of limited budgets, a census is viewed by most as an unaffordable luxury. Another reason an agricultural census will not be undertaken, according to the Sub-Director of the DGG, is that the Census Bureau is undergoing numerous personnel and organizational changes after the 1990 election, and is not capable of mounting such a large effort in the near future (Espinoza, 1990).

b. Livestock Surveys

Surveys offer the advantage over censuses of being faster to implement and analyze, and therefore less costly. Quality of the information collected is highly dependent on the validity of the sampling methods used to select the sample and on the quality of enumerators gathering the data.

In 1983, a private agricultural consulting firm, Latinoconsult S.A., was contracted by MNR to carry out an extensive survey of the Honduran livestock sector. Part of the impetus to conduct an extensive survey was to up-date information on the sector since the implementation of agrarian reform efforts beginning in 1972.

The results of the Latinoconsult survey have been used by MNR staff and donor agencies to formulate policies and design programs. Some private sector firms, including pharmaceutical companies, use the survey results to make projections of cattle population in order to estimate future demand for their services. The widespread use of this survey attests to its high quality and to the demand for and use of quality information. It is equally important to note that individual farmers have little use for the survey results, although they have benefited indirectly as recipients of programs using survey information in their design.

2. GOH Use of Information

Information required by the GOH and donor projects comes from numerous reporting systems. Despite the abundance of data generated by these reporting systems, it is difficult to obtain information important for longer term actions on even basic questions (livestock population for example). Abundant information may be collected to fulfill some project requirement, but is not always used. Typical of many LIC situations, field technicians in the DGG gather required data haphazardly and send it up the system where it rests without analysis or further use. Using

Park's (1987) decision and information models (as described in Chapter 1), we can see definite gaps in the system as it presently functions. Those who generate data have little use for it; those who should have a use for the information may receive it late or not at all. Finally, even when information may be available on time, politics often take precedence over information-based decisions.

C. Government Institutions: Structure, Information Use and Capability

1. Ministry of Natural Resources

The GOH has organized its efforts to address the agricultural[8] and livestock sectors through the MNR. In addition to these two sectors, the MNR is also responsible for the mining and natural resources/environmental sectors. In 1983, the MNR was restructured to include the livestock and agriculture sectors under one directorate general; below the directorate general level, each sector is separated into a directorate (see Figure 4.1).

The Directorate General for Livestock (DGG) is responsible for stimulating the development of livestock production through provision of services in research, animal health, training, extension, marketing assistance and implementation of relevant regulations. The DGG is also responsible for contributing to the National Livestock Development Plan. Below the DGG are the National Livestock Center (CNG) and seven departments: Research, Cattle Development, Animal Health, Planning, Laboratory Services, Livestock Standards and Control, and Administration. (See Figure 4.2). The director of the DGG has a Technical Committee and an Advisory Committee, the former to assist in technical decisions, and the latter to advise on livestock policies. The Advisory Committee is composed of members of other organizations such as BANADESA, the CBH, the Ministry of the Economy, and FENAGH.

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[8] Throughout the text, the term agriculture is understood to include all non-livestock agricultural activities. In Honduras, this would primarily consist of subsistence and cash crops.

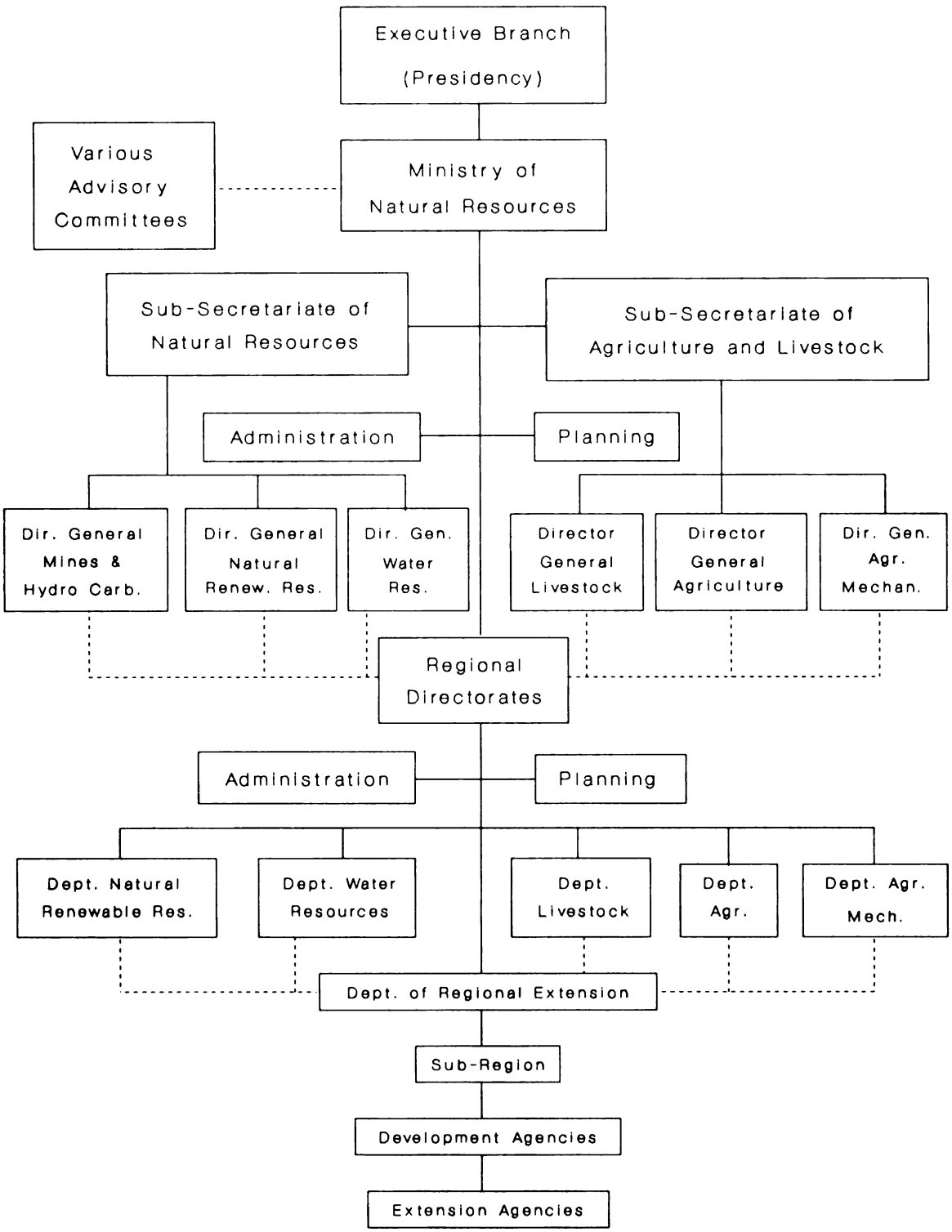

FIGURE 4.1 ORGANIZATIONAL CHART OF THE MINISTRY OF NATURAL RESOURCES

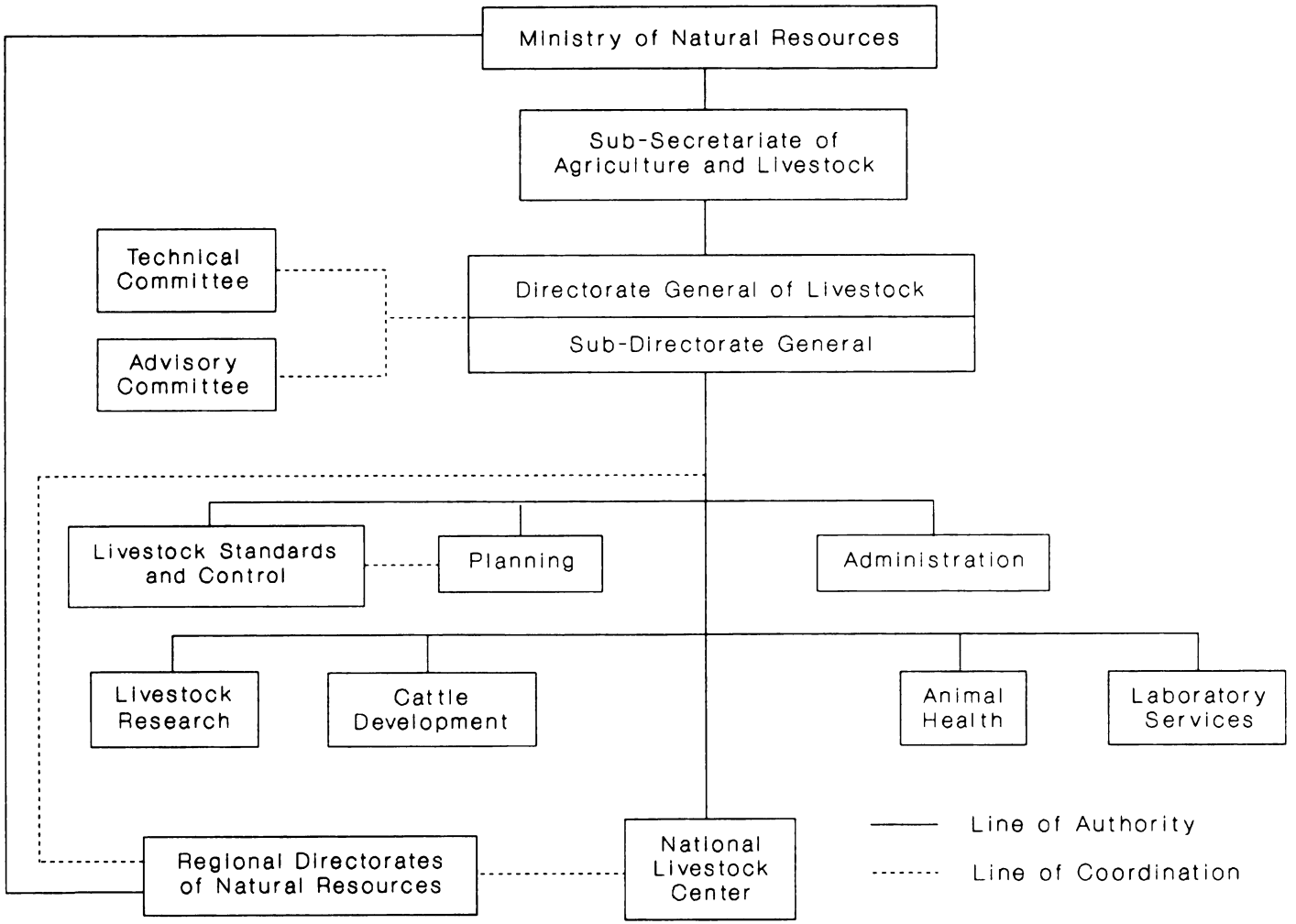

FIGURE 4.2 ORGANIZATIONAL CHART OF THE DIRECTORATE GENERAL OF LIVESTOCK

The DGG has regional offices in 10 of the 18 departments (provinces) in Honduras, and each is headed by a Regional Director. Under the Regional Director is the Regional Department of Livestock, which is responsible for coordinating all activities of the DGG at the regional level. There is little decentralization of decision making processes, project identification or budget allocations. The regional offices are primarily occupied with implementing programs and other activities planned and budgeted from the MNR's central offices.

The budget process, in theory, starts with regions identifying needs based on previous research and experience with on-going programs. Ideas are presented to the national Planning department, which submits its budget proposal to the Ministry of the Economy for final approval and funding. In reality, ideas from the regional offices are accepted only if they fit within existing programs and funding, and final decisions are made without active participation of regional representatives. A significant portion of the annual budget (70% of the 1982 budget) is used for personnel salaries, with the remainder used for per diems, gasoline, purchase of materials and equipment. Some portion of the DGG's total expenditures (19% of the 1983 budget) originates from foreign donor-funded projects (Latinoconsult, 1984).

In 1983, the DGG had a total of 230 professionals and technicians working as staff. Of these, 75 had university degrees (agronomists, animal scientists or veterinarians), with the remainder being technicians (with advanced training in fields such as artificial insemination and agronomy). By 1988, the DGG had increased their staff, and at least 134 had university degrees. The departments of Animal Health, Laboratory Services and Livestock Standards and Control have the largest number of DGG staff, accounting for 70% of its personnel (See Table 4.1).

The relatively large number of veterinarians, and specialists in microbiology, pharmacology and laboratory technicians indicates the DGG's priorities are geared to animal health rather than animal production or genetic improvement. This is of course somewhat related to the external sources of funding it receives (i.e., the loan from the IDB). The table also shows that the GOH

has a significant number of well qualified technical personnel in the field. Level of education does not appear to be the most important limiting factor in the DGG's implementation of livestock programs. An indication of the DGG's effort to work at the field level is evident in that the majority of its staff is located in the field rather than in the central offices of the ministry. In reality however, field staff often get little further than their offices since vehicle and gasoline availability are limited. New regulations aimed at decreasing the unofficial use of official vehicles and diminishing gasoline expenditures further limit field staff mobility.

TABLE 4.1 DISTRIBUTION OF TECHNICAL PERSONNEL IN DGG[a] BY TRAINING AND REGION[b]

Honduras, 1988

Ed. Level of Technical Personnel	Number of DGG Employees		
	National Level	Regional Offices	Total
M.S.	5	4	9
B.S./Agriculture	12	53	65
DVM	16	44	60
Technical degrees			
Agriculture	11	93	104
Microbiology	9	8	17
Chemistry	1	0	1
Pharmacology	6	2	8
Economics	1	2	3
Bus. Admin.	4	0	4
Lab. Tech.	4	7	11
Public Admin.	0	1	1
Education	1	0	1
TOTAL	70 (25%)	214 (75%)	284

[a] Directorat General de Ganadería, (Directorate General of Livestock), of the Ministry of Natural Resources.

[b] The DGG has divided Honduras' 18 departments (provinces) into 10 administrative regions; the data here includes an 11th region, which is the National Livestock Center.

Source: Wheeler et al., 1988.

a. Department of Animal Health/DGG

i. Structure. The Animal Health department is responsible for reviewing and revising laws, regulations, policies and manuals pertaining to prevention, control and/or eradication of infectious diseases; follow-up on prevention, control and/or eradication activities for infectious and parasitic diseases; maintaining structural organization capable of responding to emergency epidemics of endemic or exotic diseases; and establishing relations with a network of organizations, domestic and international, that have common interests in animal health issues (MNR, 1984).

The Animal Health department is comprised of 5 divisions: Epidemiology, Reproduction, Enzootic Diseases, Exotic Diseases and Quarantine, and Special Projects. Epidemiology is responsible for bio-statistics and for an information system called SISVESA (Sistema de Información y Sistema de Vigiléncia Epidemiológico y Salud Animal); Reproduction provides artificial insemination services and has reproduction management responsibilities; Enzootic Diseases conducts vaccination campaigns, mastitis control programs and vampire bat control programs; Exotic Diseases and Quarantine is the liaison point for Bilateral Agreements dealing with diseases (e.g., foot and mouth) and supervises quarantine; Special Projects currently involves the IDB-funded projects for brucellosis and TB control and for tick and warble fly control.

Each of the 10 administrative regions in Honduras has at least one DGG veterinarian, as well as administrative and field personnel. DGG veterinarians at the regional level are responsible for implementing and supervising the agency's animal health programs. The DGG sees its role as a facilitator and regulator, but major responsibility for implementation is left to the producers and the private sector. The DGG, with its limited human and fiscal resources, can only provide guidance and minimal services to farmers. Thus farmers are responsible for seeking out and paying for most services they may require.

ii. Activities. The Animal Health department is responsible for collecting and reporting information on the official reportable diseases[9] through its information system. This system is undergoing changes but at present consists of weekly reports from DGG regional veterinarians who track reportable diseases. Veterinarians also track non-reportable diseases, but priorities and agency response are not always clearly defined in these cases.

Beginning in the late 1970's, the IDB provided loan funds for animal health programs including the present PROFOGASA. This program supports brucellosis and TB control and has funded major increases in DGG's Animal Health staffing levels. These actions have strengthened the DGG's infrastructural and human resource base. The question now is what will happen to the DGG in 1991 with the termination of the current IDB-funded PROFOGASA program. Besides PROFOGASA, the Animal Health department has other activities in epidemiological surveillance of exotic diseases (foot and mouth, African swine fever), vaccination campaigns (rabies, equine encephalitis, hog cholera), and animal health education. However, these activities are much smaller than the PROFOGASA project, and according to one IDB official, his agency, through PROFOGASA, supports 90% of the DGG's activities (Martinez, 1990).

b. Department of Laboratory Services/DGG

i. Structure. The Laboratory Services, part of the Animal Health department until 1983 when it became a separate department, is responsible for activities in microbiology, pathology, parasitology, virology, hematology, urinalysis and production of vaccines. Under the

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[9] Reportable diseases are those which by law must be reported to the government. In Honduras there are 16 such diseases covering all important species of livestock. Actions which must be taken when a reportable disease is identified on a farm vary with the disease in question. In the case of brucellosis for example, the positive testing animal is supposed to be destroyed. Several cases described the difficulty of implementing this regulation.

PROFOGASA program, a regional system of laboratories was built and staffed. There is presently a laboratory in each of 7 regions and a central referral laboratory.

ii. Activities. The central laboratory, in addition to disease diagnosis, conducts research on diseases, and, on a limited basis, it produces vaccines. Current research, funded by PROFOGASA, is investigating life cycles and product efficacy for control of tick and warble flies. Vaccine production is in reality minimal due to lack of materials and equipment.

DGG staff, private veterinarians and farmers bring samples to the nearest laboratory for testing, with the most common requests being for disease and parasite identification, and toxicity diagnosis. However, requests for even these services are few, with perhaps 50 to 100 samples/day delivered to a laboratory by an average of 2 to 3 clients per day. PROFOGASA generates the most work for the laboratories, so it is questionable what their status will be when the program terminates in 1991.

The system of laboratories does not function well due to bureaucratic inefficiency, inappropriately targeted funding and lack of incentives for staff to provide high quality, prompt services to clients. Visits to three of the regional laboratories and the central laboratory revealed well-staffed facilities (some contend over-staffed), but a serious lack of support. Staff in all four laboratories complained of lack of reagents, malfunctioning equipment and lack of up-to-date information which affected the quality of laboratory analysis performed. Clients (including privately practicing veterinarians) complained of rude treatment, slow turn-around time for results and unreliable results.

iii. Information Sources in Laboratory Services. The GOH has an information system for 16 reportable diseases that are contagious and are considered real or potential threats to Honduran economy. The information system functions on a weekly basis, with DGG regional veterinarians responsible for visiting two to three farms per day to detect any animal health problems. There are no specific criteria for selecting farms to be visited, and often veterinarians will visit those

farmers who actively seek their assistance, or those within short distances. Every week, each veterinarian submits results of his/her farm visits and any other supplemental information on these diseases, to the regional laboratory's bio-statistician, who in turn submits it to the central laboratory. The reports are issued punctually and are distributed quickly to a wide range of officials within the GOH as well as to international agencies including the USDA, IICA and OIRSA. These agencies review the report for status of diseases important to their organization's region.

A review of these reports shows that while they may be punctual, they do not reveal much more than the number of cases of a disease, and its location. Most diseases reported by veterinarians are not confirmed by laboratory diagnosis. Officials in the DGG admit that their regional veterinarians do not have time or transportation support to be in the field to monitor animal health adequately. Frequently, farmers are the ones who come to the regional DGG office to report the case and symptoms to the veterinarian. Thus information in these reports comes from a very limited number of non-random farm visits and diagnosis may be done by neither a veterinarian nor a laboratory.

In addition to the reportable diseases information system, the Laboratory Services also provides information to clients (farmers, DGG and private veterinarians) on samples brought into the laboratories for examination. In the case where the DGG regional veterinarian has submitted a sample on behalf of a farmer, he can then prescribe treatment for the farmer's problem. Information on laboratory test results is not necessarily transmitted to the DGG veterinarian from samples brought in by farmers directly rather than through the DGG veterinarian. Thus, the DGG veterinarian may not be aware of the animal health status in his region.

Communicating regional health problems (which may or may not be confirmed by laboratory tests) frequently takes place via telephone or radio. Not all diagnoses are confirmed by laboratory tests, and some regional laboratories are not capable of performing some tests due to lack of trained specialists, equipment or supplies. In some cases, samples that cannot be tested in the

regional laboratory are forwarded to the central referral laboratory or to another regional laboratory having the necessary capability. Samples are transported by DGG veterinarians if they have access to transportation and adequate gasoline; by private farmers if they have transport available; or by commercial bus routes. Laboratory staff indicate that samples sometimes come poorly packaged or handled, preventing laboratory analysis.

The Laboratory Services office is supposed to issue an annual report which compiles results of the Animal Health field technicians (MNR, 1985). This report apparently has been issued only twice, the last one being in April 1985, which reported on 1984 activities. The information was gathered from a statistically biased sample (479 farms participating in the DGG Animal Health program), and most participants were not in isolated areas (90% could be reached by car), but it does give some idea of number of cases of diseases. Since it is an annual report, with a lag time of only 4 months, it could be useful input for budget and planning processes for the DGG. This is not necessarily the case, since there are no GOH programs to control internal parasites despite the finding in the report that internal parasites was the most frequently reported disease.

c. Department of Cattle Development/DGG

i. Structure. The Cattle Development department is responsible for coordinating and complementing research, planning and technology transfer efforts in the implementation of the DGG's cattle projects. It assists in strengthening the industrialization and commercialization of the cattle industry and its products and encourages the formation and functioning of cattle farmers' groups (MNR, 1984).

ii. Activities. The Cattle Development's principal activity at the farm level is the Technology Transfer (TT) program, funded by IDB's PROFOGASA. The TT program, started in 1983, is the DGG's major extension effort. Prior to 1983, the Agriculture and Livestock directorates both used Agriculture's extension system but now each has its own separate service.

iii. Extension. Extension is one of the Cattle Development's major activities and is intended to increase livestock production in Honduras. The Latinoconsult survey found that 96% of the farmers interviewed claimed they received no regular extension from MNR or any other source. Those who do receive regular technical assistance are likely to be those farmers with more than 1000 head of cattle (51% in this stratum receive services). Table 4.2 shows the percentage of all technical assistance provided by numerous institutions to Honduran livestock owners. It is not clear if these services are exclusively for cattle or include other livestock and/or crops.

TABLE 4.2 SOURCE OF TECHNICAL ASSISTANCE FOR CATTLE FARMERS

Honduras, 1983

Source of Technical Assistance	% Farmers Receiving[a]
MNR	57
Ag. Dev. Bank (BANADESA)	16
Ag.input distributors/manuf.	10
Central Bank Honduras	6
Private technicians	6
Private banks	5
Agrarian Reform Inst.	2
Others	7

[a] Percentages exceed 100 due to farmers using more than one source of technical assistance.

Source: Latinoconsult, 1984.

To its credit, MNR represents backgrounds in agronomy, livestock or zoology. Technicians make initial visits to farmers in a specified area to determine if they qualify to participate in the program, and to classify their level of technology use. Farmers are selected based on subjective standards such as willingness to participate and keep records, receptivity to new ideas and leadership potential.

There are 22 routes in the TT program and each route is served by one technician and covers 60 to 80 producers. Detailed information on herd health, production and management is kept on a monthly basis by the farmer and collected later by the technician. In theory, farmers participate in the TT program for only two years, after which they are expected to have adopted the new technologies. The Cattle Development department's goal is to expand the number of routes to 52, thereby covering 4,100 producers.

The program has not been formally evaluated to date, but many officials and private sector experts feel the program has not been successful. Farmer selection standards make it difficult to direct assistance to those most in need. The difficulty of transportation discourages technicians from selecting farmers who are in more isolated areas. Even if these difficulties were overcome, the two-year limit for receiving assistance appears unrealistic, with little time for farmers to understand and accept new technologies. Technicians are generally well qualified in technical areas of cattle health and management, but lack training in extension techniques and in adult and informal education. To date there has been little evaluation to determine the economic costs and benefits to farmers of many of the selected technologies being promoted by the DGG. With only weak coordination between planning, research and the TT program the DGG is unable to adapt the program to specific regional and farmer needs.

iv. Information Sources for Cattle Development. Reports from the TT technicians are made on a monthly basis, while the researcher's reports are submitted on a weekly basis. The research reports cover the same topics of cattle production and costs, but also include any results of pasture trials. These reports appear to have a wide distribution, being sent from the regional DGG offices to various offices in the DGG as well as the IDB. However, most officials concede that quality of the information is generally poor, inconsistent and unreliable. Poor and infrequent supervision, low motivation and lack of transport contribute to the poor quality of the reports. In addition, lack of record keeping on the farm increases the chances that farmers' recall of events

over the past month will be faulty and/or inconsistent. Disease diagnosis is done by the farmer for the most part, and even if a veterinarian is called for a problem, the resulting diagnosis is not necessarily confirmed by laboratory tests.

The PROFOGASA information system for the TT program has been active for almost two years, yet very little use has been made of it. It is compiled by the DGG's Cattle Development office in Tegucigalpa and summaries are sent back to the regional DGG offices. The reports have adequate distribution, and most offices in the DGG, IDB and CBH are aware of their existence. Nonetheless, little use has been made of the information to influence planning at the regional level since most of these decisions are made at the central level. Analysis of data collected has been minimal and capabilities appear weak at both the regional and central DGG levels.

d. Department of Livestock Research/ DGG

i. Structure. The Livestock Research department, created in 1984, is responsible for identifying and conducting research projects; identifying needs in the livestock sector, and, through research, finding solutions and alternatives; generating and testing new technologies for subsequent transfer to cattle farmers; diffusing research results to enable wider distribution of technologies; and coordinating livestock research at the national level (MNR, 1984).

ii. Activities. At the national level, there are two major components in the department's research agenda: holistic (farming) systems research, which is concerned with the farm as the production unit; and pasture research. The department's pasture research program addresses pasture species identification and management. Much of the research uses on-farm trials to test adaptability of different species with higher nutritive value, pasture rotation intervals and effects of separating herds by age and sex during grazing.

The DGG research efforts have not been active long enough to provide useful results at the farm level. Like the Cattle Development department however, analysis capabilities are deficient, and it is unclear why there has been little done with the data collected to date.

The research agenda is often formulated by external funding agencies interpreting the livestock sector needs, or by DGG perceptions of needs, with little input from research findings or extension activities. There are few incentives to researchers in public sector institutions (DGG and universities interested in livestock research) to conduct research, since this does not appear to be a high priority area for the DGG. Another potential force to drive research agendas would be farmers. However, they have not organized themselves to become an effective lobby for specific research that responds to their needs.

While the DGG has numerous written agreements to collaborate with institutions of higher education, practically speaking, there have been few active collaborative efforts. Such collaboration would be beneficial to both institutions, but has been given little priority and no funding.

iii. Information Sources in Livestock Research. The Livestock Research department under the PROFOGASA program, collects detailed information on farm activities on a weekly basis to determine inputs, outputs, production level, reproduction rates, feeding practices, other management practices in animal health, costs and farm income. The department has its own technicians who conduct the weekly surveys for systems research under the direction of DGG regional directors. Frequently, these technicians use the same farms and the same data collection forms for their surveys as the TT technicians use for their program. Each research technician is responsible for visiting and collecting information from 5 farmers rather than 15 as the TT technicians. Farmer selection criteria for both the TT and research programs are very similar (farmer interest in participating, willingness to keep records). The Livestock Research data are generally considered more reliable because data are collected on a more frequent basis,

thereby negating the need to rely on farmer records (usually minimal) or farmer recall for details of the preceding month's activities.

e. Department of Planning/DGG

The Planning department represents the DGG in the latter's relations relevant to planning activities in the rest of MNR. It proposes general policies, objectives and goals for the DGG within the National Development Plan for the livestock sector, and formulates proposals for presentation to external funding sources. The department participates in identification, formulation, monitoring and evaluation of Operative Plans, programs and budgets in the DGG, and disperses necessary information for the MNR's overall use in monitoring and supervision of its programs. It is the Planning department which is responsible for coordinating the various departments within DGG as well as other sectoral planning divisions within the MNR. The department is also responsible for organizational and/or structural changes within the DGG, in conjunction with the Sectoral Planning division of the MNR. The MNR has reorganized several times within the past decade, and the Ministry, including the DGG is currently (1990) undergoing yet another reorganization.

In reality, the Planning department is not always able to carry out all its duties. For example, in recent meetings to discuss new technical directions for the DGG, representatives from Planning were present. Officials from DGG technical departments commented that this was not always the case, but they also criticized Planning's participation because their perceived lack of technical knowledge precluded them from understanding the real problems in the field. Despite the fact that Planning receives reports on project implementation, there appears to be little use of this information to direct the planning process or establish priorities. Not surprisingly, the planning process is highly political and technical aspects are not always given the importance they merit. Evaluations are, on paper, incorporated into the planning process, yet to date there have been few, if any, formal evaluations of the on-going projects in the DGG.

Project identification is also a politically oriented process, often with the added complication of external donor agencies wielding considerable power over the outcome. For example, the 1985 IDB project identification document cited research results indicating that of all animal health problems studied, internal parasites were the most common problem in cattle (28% frequency rate; IDB, 1985) but the PROFOGASA program designed by the IDB has no internal parasite component. Instead, brucellosis and TB, with frequency rates of 5% for the former and .4% for the latter (Latinoconsult, 1984) were identified as critical diseases to be targeted in control programs[10], without further analysis on the relative costs of each health problem. The control programs also demonstrate the lack of decentralized planning. In some parts of Honduras (San Pedro Sula), the prevalence rate of brucellosis was and is much higher than in others, yet the control program was designed to have national coverage rather than targeting the most needy regions for special emphasis.

f. Department of Livestock Standards and Control/DGG

The department of Livestock Standards and Control is responsible for inspection of export-destined beef as well as beef for domestic consumption; inspection of live animals being imported or exported; and control of biological products (vaccines). The department enforces regulations which require an official declaration of a disease's presence prior to importing vaccines for the disease.

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[10] These diseases were given priority due to their human health implications, but no cost analysis was done to determine which health problems caused larger economic losses or to compare implementation costs of alternative control programs.

g. Department of Administration/DGG

The Administration department is responsible for ensuring the efficient use of resources in the DGG, and that they are used in accordance with laws and regulations set up by the Budget, Audit and Treasury offices. On paper, the department has the power of audit and financial control, but in reality, the department has only minimal budget allocations and is constrained in carrying out its assigned duties.

h. National Center for Livestock/DGG

The National Center for Livestock (Centro Nacional de Ganadería, CNG) has a mandate to promote the genetic improvement of small farmer cattle herds through the importation of genetically superior animals. It was to develop a genetically superior breeding herd, from which it could sell offspring to small farmers. It is also meant to serve as the DGG's permanent center for applied research and permanent demonstration farm for Honduran cattle producers.

Currently the CNG has activities in training, animal health, nutrition and feeds and research for both dairy and beef cattle, and it has begun some activities with swine. It is located on 1,100 ha. and in 1983 had 1400 head of cattle, 38% of which were dairy (Brown Swiss and Holstein) and 62% beef (comprised of 56% Brahman, the remainder being Charolais and Santa Gertrudis; Latinoconsult, 1984).

The Center's predominant emphasis has been on raising and selling genetically improved stock to cattle farmers, but it has rarely been able to meet the demand. Sales are limited to 2 animals per producer, and, according to the manager, sales in the past few years averaged 70 head/year for dairy as well as for beef cattle. This is a significant decrease from the 140 to 266 head/year in sales in 1980-82 as cited by the Latinoconsult survey. The sales decline could be due to the aging of the herd and the management's attempt to build up herd replacements from the young stock that would otherwise be sold to farmers. Almost two-thirds of sales have been

beef animals. Sale prices for stock are fixed by the government and depend on the age and sex of the animal sold. Prices are considered to be significantly lower than market prices, resulting in high demand.

Targeting small farmers appears to have been difficult. The CNG manager related that most farmers who come to the Center to purchase stock receive financing from banks participating in development projects. However, data show that very few (4%) small farmers have ever applied for loans to finance any part of their livestock operation. These farmers generally do not have sufficient funds to purchase cattle without external financing. Thus it seems that the clientele of the CNG program is medium and larger farmers.

Training for farmers and DGG technicians is the second major activity at CNG. CNG staff give regular cheesemaking courses to farmers as well as to DGG field workers (generally the TT technicians). The Center makes enough cheese to sell, but all revenues (from both cattle and cheese sales) are returned to the national treasury.

Other extension and training activities include the publishing of bulletins on topics related to livestock and hosting field days at CNG for farmer groups and DGG technicians. The Center has no active extension service nor does it work closely with the DGG's field technicians. This has resulted in CNG cattle being distributed with little or no technical assistance or follow-up provided to client farmers. Thus, even with the introduction of improved breeds, production levels have not always increased because farmers have not adopted better management technologies to realize fully the genetic potential of their cattle.

The Center's research activities emphasize pastures: fertilizer applications, rotation of pastures, resistance to dry season, and cattle weight gains on different pasture species. So far, there have been few studies on use of concentrate or cost analysis of meat or milk production. The research area is yet another example of the lack of functional coordination between different parts of the DGG despite their similar goals.

The CNG has a professional staff of 10, including a resident veterinarian, and approximately 50 other employees. A foreign advisor noted, however, that the productivity levels of CNG's cattle operation are similar to those of the average Honduran cattle farmer. Problems with reproduction, nutrition and animal health are not due to lack of technical capability but rather to poor management and lack of authority for the manager to act on problems as they arise. There is little flexibility in managing the Center's budget to accommodate emergencies (equipment failure, outbreak of disease), and resolving problems through bureaucratic channels is frequently time-consuming and ineffective. It has been suggested that a petty cash system be set up to alleviate some of the financial bottlenecks which adversely affect the management of the Center. Incentives to improve CNG's performance are very few, and in this respect, it is no different from the rest of the government personnel system. Performance-based promotions or recognition are the exception rather than the rule, and promotions themselves, in times of budget crisis, are rare. Supervision of personnel is infrequent and ineffective, since many appointments are motivated by political factors.

2. Public Sector Banks

a. Farmer Credit Services

The GOH, like many LICs, has developed a policy of cooperation and integration of agricultural development projects implemented or supported by public agencies. Thus, development banks are not only sources of credit targeted to the desired agricultural group, but are expected either to provide or to cooperate with agencies that provide technical assistance/extension services as part of their loan supervision duties. The policy's intention is not only to develop the agriculture sector but also to achieve higher rates of loan recovery. In Honduras, there are three development banks, of which BANADESA is responsible for agricultural

development, CONADI, for industrial development and the Autonomous Municipal Bank, for municipal development.

Formal-sector credit, like technical assistance, is not commonly used by Honduran cattle farmers. The Latinoconsult survey found that only 4.5% of surveyed farmers had asked for and received credit in 1981/82. Some 91.5% of the interviewed farmers had not requested loans, while 3.6% had their loan requests turned down. Larger farmers tend to request and receive loans more frequently than small farmers as shown in Table 4.3 below.

TABLE 4.3 LOAN REQUESTS AND APPROVALS, BY FARM SIZE

Honduras, 1983

Farm Size # Head Cattle	No Credit Requested (%)	Credit Requested & Obtained (%)	Credit Requested & Not Obtained (%)
< 10	97	2	1
10-29	92	3	5
30-49	85	6	8 [a]
50-99	82	11	5
100-199	71	16	11
200-299	70	21	7
300-499	69	23	5
500-999	53	41	3
> 1000	54	42	4

[a] Rows may not sum to 100% because of some farmers having loan requests in process at time of survey.

Source: Latinoconsult, 1984.

It is evident that only farmers with 500 or more head of cattle use loans to a significant degree. Small farmers usually do not have sufficient collateral to obtain loans, and many medium sized farmers expressed unwillingness to risk going into debt for their cattle operation. They also felt that the interest rates were too high (13 to 15% were the rates usually quoted during

interviews) to warrant obtaining a loan for an operation which may not earn more than a 3% profit margin. Farmers whose credit requests were rejected cited lack of bank funds, lack of sufficient collateral and being too isolated as reasons of rejection. There are also problems associated with clear land titles which often interferes with obtaining loans.

Policies on collateral vary according to individual banks. Most commercial banks require 60% of the value of titled land and constructions as collateral. BANADESA is the only bank which allows the value of the livestock purchased with a loan to be used as part of the collateral.

It is unclear how much demand exists for livestock loans. Most farmers express reservations about taking out loans, but part of their reluctance is due to the nature of collateral requirements and high interest rates. Most loans have interest rates between 12 and 14%, and Wheeler et al. (1988) state that given the low profit margin of typical dairy operations, farmers would be very sensitive to changes in interest rates.

The problem of credit, however, goes beyond the "technical" issues discussed above. Low applicant levels at the small farmer stratum may be due to these farmers' belief that they do not fulfill the requirements. Many small farmers may not request loans because they fear debt. Most had clear ideas of how they would hypothetically use loans, saying they would buy cows and heifers, improve breeding stock and improve pastures and fences, but not invest in mechanization or artificial insemination.

b. Central Bank of Honduras (CBH)

The CBH participates directly and indirectly in lending to the agricultural sector. It provides funding advances and rediscounts funding to banks that in turn finance farmers. Through this mechanism, the CBH provides funding to banks that may have limited financial resources, which inhibit the amounts and numbers of loans disbursed.

The CBH is directly involved in lending to the livestock sector through its participation in World Bank funded agriculture and livestock development projects. The GOH receives the loan funds from the World Bank and in turn lends these funds to the CBH which lends to other government and private banks. These banks lend to producers or organized groups throughout Honduras for the purposes outlined by the World Bank.

Most of the loans directed to the livestock sector have gone to dairy operations, and within that category, most funds have been used for the purchase of bulls and for improving pastures (Latinoconsult, 1984). According to figures from 1983, loans were directed to small farmers, with 44% of total number of loans, and 34% of total value of loans going to farmers with less than 100 ha. As of early 1983, arrears were high, at 25% on capital and 14% on interest payments. Originally, the CBH program gave credit and technical assistance to farmer recipients. The CBH provided supervision, funding for per diem and transportation for DGG staff to give technical assistance to loan recipients. Thus, the CBH is conforming to the GOH's policy of providing a complete package of financing and extension to loan recipients.

With the recent change in government and budget tightening, the CBH is experiencing difficulty in providing financial support for technical assistance complementary to its livestock sector loans. It proposes terminating the technical assistance currently provided free of charge to its loan recipients. Instead, it is proposing that, in the future, services (provided 1 DGG veterinarian and up to 2 DGG technicians) would be privatized and made available to requesting farmer associations for an established fee. If the proposal is approved, farmers will have to pay for DGG's services they consider worthwhile.

c. BANADESA

BANADESA plays a major role in development of the agricultural and livestock sectors in Honduras. It uses its own funds (44%) and receives funding from the Central Bank of Honduras

(26%). The remainder of funding comes from international organizations, particularly the World Bank, IDB and the US Agency for International Development (USAID), which channel agriculture sector development funds through BANADESA. BANADESA contributes an estimated one-third of the Honduran banking system's funds for these sectors' development (Wheeler et al., 1988). Approximately 60% of IDB-funded loans go to livestock operations and 90% of these are for dairy operations. The average loan size of L6,250 indicates that loans are likely going to small farmers.

BANADESA's level of funding available for loan disbursements has decreased over time, partly due to tightening financial conditions and high levels of arrears. The bank's relative shares of financing between agriculture and livestock sectors has been variable. Wheeler et al. (1988) report that from 1983 to 1987, the livestock sector had received increasing portions of allocated funds compared to the crop sector.

d. General Banking Sector Information on Livestock

The CBH and the Ministry of the Economy receive and distribute information relevant to the livestock sector, but this information is generally highly aggregated, grouping livestock with agriculture. The CBH receives part of its information on the livestock sector from DGG livestock field technicians but this is not always reliable. These DGG reports are then aggregated and used to provide general information on the livestock sector's performance.

The Ministry of Economy receives aggregated reports on livestock and all other agricultural sectors from the MNR, and combining all these reports, develops its information on the whole agriculture sector. Thus, the general nature of both the CBH's and the Ministry of Economy's information makes it unlikely that this would be useful to the DGG in identifying priority areas in the livestock sector.

D. Private Sector Institutions, Structure and Capability

There is increased interest on the part of the new government in Honduras in privatization efforts. Thus the private sector could become more active in agricultural development activities in the future. An example of this movement was briefly noted above regarding the possible privatization of technical assistance services to farmers. Private sector firms which have interests in the livestock sector include the commercial banks, the Fondo Ganadero, pharmaceutical companies, farmer associations, meat packing plants and milk processing plants.

1. Commercial Banks

a. Role

There are 14 commercial banks in Honduras involved in the agriculture sector. The GOH has encouraged their participation in the agriculture sector through providing, via CBH, special lines of discounted credit. In the mid-1980s, with the relative decline of BANADESA's role, these banks became more important in providing credit for livestock activities.

Reasons for BANADESA's decline are not clear, but financial difficulties coupled with decreased demand for purchase of improved livestock are likely reasons. Farmers might have been requesting loans for activities not covered by BANADESA's programs or terms (using BANADESA loans to purchase cattle for fattening is not permitted), whereas commercial banks may have more flexible lending objectives.

Even with higher interest rates, loans offered by commercial banks are frequently more attractive to farmers because of lower transactions costs (less waiting time, fewer forms) compared to government development banks. Approximately 20% of the commercial sector's loans are for livestock operations (Latinoconsult, 1984). Agriculture and livestock operations combined received 26% of total funds channeled through commercial banks, and private banks have consistently had 20% of their loan portfolio in livestock operations. There were no data

available to determine what portion of these loans were part of the World Bank livestock credit program compared to pure commercial loans.

Generally, commercial banks do not provide technical assistance except where financing is originally from donors or the CBH in conjunction with a development project.

b. Information Quality and Use

Generally, commercial banks collect information only on status of outstanding loans and other financial information relating to the health of their own institution. Prior to approving a loan for farmers, the bank carries out a financial assessment to determine the viability of the farming operation, but generally these assessments do not include information on animal health. Rather they deal with the purely financial profitability and factors that directly impinge on this.

However, if the banks are involved in channeling development funds, they are often required to conduct more follow-up after the loan has been dispersed. If the banks are associated with the CBH program, they may also have access to information from bank technicians, the DGG reporting system or other technical assistance information systems.

2. Fondo Ganadero

a. Role

The Fondo Ganadero was created in 1984 as a private enterprise funded from private and public sources, and controlled by private sector producers. The Fondo is designed to be an income-generating and self-sustaining joint venture between the Fondo and individual cattle owners. The objective is to provide improved cattle to small and medium farmers, and to do so in such a way as to be profitable for the Fondo. Funds are used to form production companies, and the Fondo provides cattle, technical assistance, supervision and if necessary, cash loans to the participant production company. The participant, also called the depositor, supplies land and

labor and manages the farm operation. Profits and risks are shared between the depositor (55%) and the Fondo (45%).

The Fondo also operates two farms under its own management, as well as a mineralized salt production operation and a veterinary supplies operation. These activities support the cattle lending operation through providing breeding cattle and some production inputs.

Currently there are 134 depositors in the Fondo's program, and an estimated 20,000 head of cattle have been distributed by the Fondo. Most cattle are distributed to depositors as breeding stock or to be raised for beef and the majority of recipients are medium sized farmers, with an average herd size of 75 breeding cows (total herd size approximately 200 head). The director estimates that the Fondo is operating at a 10% to 15% profit margin. This is significant improvement over the Fondo's situation in its earlier years, when it operated at a loss.

The Fondo provides technical assistance and production inputs to its depositors; in fact, participants in the Fondo's programs are required to use some inputs such as mineralized salt, vaccines and anthelmintics. Input costs are charged to the farmer's Fondo account and are divided between the Fondo and the farmer (at the same 55%-45% rates as the shared profits) when the account is liquidated. Farmers are also required to make a herd health plan and keep herd records with assistance from the Fondo's technicians.

Eight technicians are employed by the Fondo which provides them with vehicles and per diem for visiting client farmers. The technicians receive periodic training to improve their technical knowledge and are supervised regularly by other Fondo staff. Supervisory staff consist of a veterinarian, a coordinator and a farm manager. Before the Fondo approves a prospective client for a loan, it conducts an initial inspection during which the farmer's situation is analyzed and submitted to a committee for approval. If approved, the farmer receives cattle and regular follow-up visits by a technician and Fondo supervisors.

Most officials praise the Fondo Ganadero for its success both as a private sector firm as well as a livestock development agency. Their staff is well-trained and is highly motivated to perform well in the field. One of the Fondo's innovative incentives for their technicians is the provision of a vehicle for field work. Technicians are given the vehicle with the option to buy it after 4 years of official use. Thus, the employees are given incentive to stay with the Fondo for at least 4 years, and at the same time, they do not abuse their work vehicle, which can eventually be their own. The Fondo's system of regular contact with farmers and follow-up supervision is noteworthy, since this quality of extension is lacking in most GOH technical assistance programs.

b. Information Quality and Use

Farmers participating in the Fondo's program are required to keep certain records on births, deaths and weights and must develop a herd health plan (calendar of vaccinations, deworming, etc.). Thus, these farmers do have useful records on individual animals in their herd. The Fondo does not use the information itself, but through its extension agents, tries to show farmers how to use herd information to achieve higher production. The information could be useful to the DGG, providing evidence of various improved technologies' effects on production levels. However, information from Fondo participants is not necessarily representative of "typical" Honduran cattle farmers since they passed the Fondo's prerequisites of herd size and willingness to participate in the program.

3. National Commission for Milk (Comisión Nacional de la Leche, CONAL)

a. Role

CONAL was founded in 1985 as a mixed government and private sector agency to support the GOH in strengthening the dairy cattle sector. Among other tasks, CONAL assists in formulating national policies to increase domestic milk supply and it was also involved in

developing the National Plan for Cattle Development. Among its goals for the dairy sector are to increase local production; shift milk marketing from the informal to the formal market; raise per capita consumption of milk from the current 73 liters/day to 90 liters/day; and develop guidance for policies relating to pricing, processing and credit. CONAL would like to increase Honduran production of powdered milk and to decrease reliance on and foreign exchange expenditures for imported milk.

CONAL is presided over by the MNR, and its secretary sits in the DGG offices in Tegucigalpa. Meetings are held once monthly. CONAL's achievements to date have included passage of legislation to increase use of local milk by milk processing plants, and obtaining authority to determine how much milk will be imported for Honduran consumption. It is presently cooperating with FENAGH and IICA on a study of milk production costs, the results of which will be used to support a request to the GOH to increase the price for milk on the formal market. The secretary of CONAL sees price as one of the most important incentives for farmers to increase their milk production.

b. Information Quality and Use

Because of its mixed government and private sector nature, CONAL ideally should have easy access to many sources of information relating to the Honduran dairy sector. Yet in a 1987 report, CONAL could find data on milk imports over five years only after going to several different sources; no single source had data for all five years (CONAL, 1987). This gives an indication of the information coordination and distribution problem in Honduras.

CONAL, per se, does not have an information system but receives information on milk processing plant production and milk import requests from milk processing plants. To project what quantities of milk should be imported, CONAL must project future production and future consumption. It appears to use data from the Latinoconsult survey as a base for these

projections, adjusting the survey results for the time difference. The quality of data used for projections is therefore not extremely reliable given the changes the livestock sector has undergone since the 1983 survey data collection. A review of a CONAL report on the milk production situation shows many unexplainable inconsistencies which in part are due to lack of reliable information.

Pricing policy recommendations require CONAL to obtain data first hand since reliable, up-to-date information is not available. Thus, it is not surprising that they have collaborated with IICA and FENAGH on a study to determine the cost of milk production. In principle, the information from the PROFOGASA program should become a source of such information since DGG technicians are collecting data from farmers on their costs of production.

4. Farmer Organizations

a. Role

There are two major kinds of producer organizations in Honduras: farmer associations (Asociaciones de Ganaderos y Agricultores), and farmer cooperatives. The associations originated with the agrarian reform movement in an attempt to protect the associates from confiscation of their land. They tend to be made up of medium to larger sized crop and livestock farmers, and until recently, have generally not been active in providing specific services to their associates. It is estimated that only about 10% of all farmers are members of Associations (Gallardo, 1990).

Farmer associations exist in all 18 departments of Honduras, and are federated at the national level through FENAGH. These associations have an estimated membership of around 700

farmers (Latinoconsult, 1984).[11] The majority of associations are still active in monitoring the implementation of agrarian reform laws, pricing policies and on a more social level, annual cattle exhibitions.

Small farmers do have other organizational options. Farmers who received land during the agrarian reform movement formed cooperatives, and in general, these are more likely to have cropping rather than livestock operations. However, there are some livestock cooperatives which are well known for their aggressive marketing efforts. Cooperatives offer great potential for large and especially small farmers to reap financial benefits which otherwise may elude them. Given the bottlenecks present in the beef and milk markets, producers need to organize to decrease the uncertainties in availability and prices of agricultural inputs (concentrates and animal health supplies), and of their products. Cooperative organization also offers small farmers a chance to strengthen their political voice, to express concerns presently not voiced or done so by a minority of larger farmers. There are indications that some farmers, realizing that the current economic difficulties will not be resolved quickly, are becoming more interested in benefits of cooperation. Concern over milk marketing problems in the mid-1980s led to the formation of 6 cooperatives that provide their members with milk cooling and collection centers.

Associates pay regular fees for which they receive various services depending on each individual association. For example, some keep a registration of the farmer's herd and allow the associate to participate in departmental cattle exhibitions. Some associations have begun to provide more production oriented services, such as Olancho's milk cooling and collection center and La Ceiba's proposed agriculture inputs store and herd record keeping effort.

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[11] Other sources quote membership numbers as high as 4,000. This seems highly unlikely, although some associations do have 300-400 listed members. Of these, perhaps only 15% to 20% are active.

FENAGH's sees a need to diversify its role and is trying to address production needs of its member farmers. In June 1990, FENAGH assisted CONAL and IICA with the cost of milk production study whose results will be used to determine if an increase in the government-controlled price of milk on the formal market is justified. FENAGH continues its review of legislation and it provides input into the political process regarding actions which may affect agriculturalists. One such effort is an attempt to establish standards for fat content of milk as a basis for differential pricing. Most recently, FENAGH has initiated a monthly bulletin for its member Associations which contains input prices and other economic information, advice on technical problems, and social events, in an attempt to improve communication among the federation members.

The associations have become a focal point for the GOH's privatization efforts. As described in Section 4.C.2.b, there is a proposal for associations to pick up costs of technical assistance provided by the DGG to farmers. A major problem with technical assistance being privatized and provided through the associations is the limited access small farmers will have to such services. It is estimated that only 10% of cattle farmers are represented through the associations, and most of these are medium to large farmers. Small farmers typically do not join the associations for lack of common interests (particularly with respect to land reform issues) and inability to pay membership fees. If technical assistance is to be channeled through the associations, provisions must be made for small farmers to receive assistance at an affordable cost.

An alternative to joining an association is for farmers to form cooperatives. Agricultural cooperatives are generally the result of the agrarian reform movement, and tend to be more specialized in their membership and services compared to the associations. It is estimated that half (590) of the total number of cooperatives in Honduras are agricultural, with membership of 30,000. However, counting only truly functional cooperatives, the total would be less. There are very few cattle farmer cooperatives, since most of the cooperatives resulting from agrarian reform

undertook cropping rather than livestock activities. Cooperatives that do exist in the cattle sector are typically dairy-oriented and were formed to overcome milk marketing problems. Some facilitate the members' milk sales to processing plants, while others have purchased milk cooling equipment to set up milk collection and short-term storage in membership areas. Generally these cooperatives are locally based and operated, but one exception, called COHPAAL, has regional and national coverage goals. In addition to better milk prices, cooperatives have been given an added incentive to form: they are exempt from income and sales taxes, import and export duties and other taxes on inheritances and donations.

Cooperatives, including the few livestock cooperatives, have had problems due to small memberships, leaving the cooperative with a weak base upon which to build any viable financial activities. Typically not all the members actively participate, further eroding the cooperative's strength. Management and administrative capability is often deficient, and few opportunities exist for cooperatives to obtain training in these areas. There are large numbers of cooperatives that are officially listed but are not functioning. Thus cooperatives are not in a sufficiently strong position yet to take on very complex activities. For this reason, the NCBA recommended against livestock cooperatives attempting to integrate vertically by controlling the milk processing phase of the market (Wheeler et al., 1988). The NCBA report points out that cooperatives as yet do not have the volume of business to enable them to vertically integrate to provide inputs, milk marketing, processing and selling products for its members. Management and administrative capabilities are often deficient in the cooperative movement, and few opportunities exist to obtain training to overcome these weaknesses (Wheeler et al., 1988).

b. Information Quality and Use

The information which is available and used varies according to the objectives of each farmer association. Most associations have membership lists and very basic information on farm size and number of animals owned, but little more. Cooperatives have similarly varied agendas according to the objectives of their members. Neither type of farmer organization at this time has perceived the need to keep production levels and costs or animal health records for their members nor have they assisted members in understanding the utility of keeping such records individually.

With increasing input prices, scarce foreign exchange and real declines in farm product prices, FENAGH has broadened its view of how it should serve its member associations. One of its new initiatives is the publication of a monthly bulletin containing information on input prices and availability, recommended technical and management practices, and social events of interest to cattle farmers. As a member of many governmental committees and agencies, FENAGH has access to much information and has the potential to influence decisions. It holds a key position to use its influence as a political lobby for (larger) farmers, provided it can obtain the information to undertake sound analysis and propose policy changes critical to its lobbying role.

FENAGH and farmer associations provide little information and from only a limited number of Honduran farmers. It is estimated that only 10% of farmers are members of associations. Member farmers are generally those with medium to large cattle operations, and are not representative of the majority of farmers. Information from livestock cooperatives, while coming from perhaps a more representative sample of Honduran farmers, is still very limited due to paucity of such cooperatives.

5. Slaughterhouses and Meat Packing Plants

a. Role

In the case of Honduras, meat packing plants slaughter cattle intended for export, and since most exported meat is destined for the US, it is subject to much stricter inspection than domestically consumed beef. The USDA periodically inspects the meat to ensure that US quality standards are maintained.

There are four meat packing plants in operation in Honduras. Plants have the technical capability to advise farmers on many management topics since they usually have a veterinarian and their own meat inspectors on staff. They also record cattle weights and can provide this to producers as part of an effort to increase productivity. This would also benefit the plants in the long run since heavier animals have higher carcass yields. However, incentives for these changes are currently not strong enough to induce the changes. Farmers face limited alternatives to the processing plants to market their cattle, and they lack organized power to demand better services from the plants. The plants have little incentive to offer services to attract more producers since most of their supply is contracted or assured from their own farms. However, some plants provide producers with loans to purchase cattle for fattening or for some farm improvements, but this is apparently not an institutionalized service.

b. Information Quality and Use

Meat packing plants (for export) must comply with inspection regulations established and monitored by the USDA, thus they do have some records on the Honduran beef industry. Farmers receive only information regarding carcass weight and price, but plant inspection should provide information on animal health and would again give some indication of common diseases and health problems (e.g., internal parasites). In the Carnilandia plant, such information is neither used by the plant nor passed on to cattle owners. Getting the information to farmers may be

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more difficult due to the prominent role cattle assemblers play in buying small lots of cattle, consolidating and then selling these to the packing plants. Thus slaughter information would not be easily dispersed to farmers supplying the plant.

Municipal slaughter facilities do not carry out inspections, and in smaller towns and villages, slaughter is frequently done by the cattle owner. Thus, disease or health problems may go undetected or incorrectly diagnosed. Large urban areas have slaughterhouses that are run by agents specializing in slaughter who may be capable of recognizing health problems. In neither situation are records kept on such information, and a farmer may have little idea of his herd's health problems even if something is detected at slaughter.

Slaughterhouses can provide good supplementary diagnoses, but only on certain health conditions (those with visible lesions, for example). There are other disadvantages as well. Inspection results are biased since only beef cattle and aged or sickly animals are routinely brought for slaughter (Lloyd, 1989). Outwardly healthy stock, young stock and dairy stock would less frequently be present. There may be inconsistent inspection systems (if they exist), between slaughterhouses and slaughter personnel may have little training in disease identification and inspection. Health conditions may have gross signs that should be confirmed by microscopic inspection, and these would be difficult to carry out in most Honduran slaughterhouses.

6. Milk Processing Plants

a. Role

Milk processing plants handle only a small percentage (an estimated 25%) of total milk produced in Honduras, and thus have the potential to increase their participation in the milk market[12]. Presently there are three major milk processing plants in Honduras: Sula, a

[12] The milk market, in this context, is intended to include milk and milk products such as cheese.

government-owned plant which started operation in 1951, and Leyde (Leche y Derividos, started in 1973) and Delta which are private businesses.

Over the past several years, Leyde has increased its market area through an aggressive campaign to obtain more clients. (See Table 4.4)[13]

TABLE 4.4 RAW MILK PURCHASES OF SULA AND LEYDE MILK PLANTS

Honduras 1977-1988

Year	Sula (000s liters)	Leyde (000s liters)
1977	20,944	7,061
1978	20,212	7,630
1979	19,249	7,878
1980	17,053	8,727
1981	14,687	9,200
1982	20,141	10,500
1983	23,410	13,200
1984	25,204	18,200
1985	27,375	20,010
1986	28,996	23,317
1987	27,969	26,400
1988[a]	32,805	34,000

[a] Projected figures

Source: Wheeler et al., 1988.

The Sula milk plant has a processing facility in both Tegucigalpa and San Pedro Sula. Until recently, Sula was the largest milk plant in Honduras, but Leyde's volume now equals Sula's. There has been much criticism of Sula for its lack of efficient management and questionable quality control in production. Sula now faces serious competition from private sector plants such

[13] Figures for Delta are not relevant until 1988 when this plant began receiving fluid milk from producers. Prior to this its business was limited to reconstituting imported dehydrated milk.

as Leyde and Delta. Because of its public agency nature, Sula has found decision making tedious and difficult on issues such as competition with private plants. Sula buys milk from any farmers who wish to sell, at any time of year, provided their milk meets quality standards. Prices for milk are constant throughout the year, but vary according to quality, whether milk is picked up by Sula or delivered and whether milk is chilled prior to Sula's receipt of it. Milk collection stations are independent of Sula, operated by private enterprises or farmer groups. The plant does not operate on a contract basis with producers. The incentives for farmers to sell to Sula are that they are not obligated to sell milk to the plant when informal market prices for milk are higher than government prices, and they do not have to wait two weeks for payment from Sula, as they do when selling to Leyde.

Sula processes milk and manufactures several milk products which it markets primarily in San Pedro Sula and Tegucigalpa. It also has equipment for making dehydrated milk, but management contends that it is still not profitable at current prices and volume. The Sula plants are prime targets for the new government effort to privatize government owned industries. To date, there have been no concrete offers to buy the Sula plant.

Leyde now serves approximately 1200 producers, mostly in the north coast area. In contrast to Sula, it offers a variety of services to its producers including technical assistance in animal health, reproduction and nutrition, veterinary supplies at discounted prices, feed supplements (molasses, mineralized salt), artificial insemination service and a reliable milk collection system. Leyde has built or purchased milk collection and cooling stations throughout its market area, which enable farmers to deliver their milk to a center closer to their farm, and help decrease milk spoilage due to lack of farmer-owned cooling facilities. In the future, Leyde will add two field inspectors to its staff who will have responsibility to inspect farms and provide assistance to Leyde farmer clients to increase quality and quantity of milk.

Leyde staff are well trained (many have US university degrees) and the company has maintained a reputation for high quality products and professional business conduct. As a private enterprise with limited ability to use price as an incentive to attract producers, Leyde has proven to be innovative and quick to identify other means to expand its market area. While Sula has also made efforts to expand its area, it has been less effective. For example, technical assistance is provided to farmers selling to Sula, but since Sula does not have contract agreements with its producer clients, there is less continuity in its client population compared to Leyde's.

Delta has only recently begun participating in the domestic fluid milk market because of the new law requiring a minimum of 50% of all milk processed must originate from domestic fluid milk. Prior to this, Delta operated as a milk reconstitution plant using imported dry milk and milk products as its ingredients. It is smaller than either Sula or Leyde, but in the past year, it too has campaigned aggressively to increase its client area. However, according to the NCBA report, farmers dislike Delta because of its previous practice of selling imported rehydrated milk at prices below farmer's milk. Some officials think Delta will therefore have a difficult time gaining farmer's trust necessary to gain future clients (Wheeler et al., 1988).

b. Information Quality and Use

Milk processing plants maintain records on overall levels of milk received, both fluid milk from local producers and imported dehydrated milk. By law, they are supposed to perform numerous tests on all fluid milk they purchase, and thus have information on quality of milk they receive. Leyde also has a record of input costs for producers who use Leyde's veterinary supply store and molasses feed supplement. Some of this information would be a useful indicator of a farmer's herd health status and if compiled, could give DGG officials some idea of the degree of problems such as mastitis and sanitary conditions on farms. However, the information would be coming from a biased population, e.g.,those farmers able and willing to sell their milk to processing plants.

Observed health problems would also be biased to those detectable in milk, and from only those animals in production. It may also not be in the plants' interest to accurately report animal health problems.

Another weakness of this information source is that only an estimated 25% of total milk in Honduras flows through the formal market of the plants. Thus, problems identified through plant records would not necessarily reflect those in the majority of herds in the country. Milk production information from farmers may not be complete or on a year-round basis since not all plants have consistent clientele throughout the year. A final shortcoming is that much of the information is considered sensitive. Farmers are wary of allowing the government access to information on their production levels. Milk plants are also reluctant to disclose information on quantities of imported milk (because of its role in lowering plant operating costs) and quality test results.

7. Pharmaceutical Companies

a. Role

The two major pharmaceutical companies which provide livestock health products are Ceiba-Geigy and Bayer, although there are numerous smaller ones. Both firms receive their manufactured products from parent companies for sale in Honduras and are extremely active in promoting their products at the retail and farmer level. To carry out such promotions, both Ceiba-Geigy and Bayer have veterinarians on their full-time staff, and in Ceiba-Geigy's case, they supplement their field staff with veterinarians for short-term contracts.

To determine what future demand will be, the firms use MNR figures for livestock population and disease frequency rates, but due to the poor quality of this information, they supplement it with their own data on product sales at their retail outlets (Cordoña, 1990; Quiñones, 1990). The latter information gives them estimates for what products are being used, but does not really provide reliable information on actual animal health problems. Accurate disease identification and

frequency rates would be of obvious use to these companies, but they do not perceive their role to be data collectors for such public-good information.

Product promotions are considered very important activities for increasing local demand. Both companies feel that small farmers in isolated areas are the most likely to adopt new practices and target such farmers during their promotions. These are most likely farmers who receive little technical assistance from other sources; thus the pharmaceutical companies perform a necessary service to the livestock sector. The companies also give training to retailers carrying their products since many farmers who do not use government veterinarian services rely on retailers to provide them with diagnosis and treatment information. Bayer is also cooperating with FENAGH, IICA and others in their study on milk production costs, and is assisting some of the farmer associations to increase their use of improved technologies.

b. Information Quality and Use

Bayer and Ceiba-Geigy, and presumably many of the smaller pharmaceutical companies as well, track their product sales through regular reports from retailers carrying their products. These records are fairly reliable although perhaps not easily accessible to the public due to the competitive nature of the market.

Information on product sales gives some idea of what farmers and veterinarians perceive as major health problems. However, the information is biased given that small farmers may buy products less frequently, certain pharmaceutical companies specialize in certain products, marketing practices may influence sales and the sale of a product may not reflect a correct diagnosis. In one case, a farmer was sold an anthelmintic for an animal that a DGG veterinarian later diagnosed as having pneumonia.

8. Private Veterinary Services

There is no veterinary college in Honduras, thus all students wishing to study veterinary medicine must be able to pay typically higher costs to attend college in another country. Veterinarians are well respected, and are employed in various positions. Very few have private practices. Small farmers use veterinarians only in emergency cases, and frequently cannot afford even at-cost fees charged by private practice veterinarians. Thus, earnings from large animal private practices are not attractive. Some veterinarians are employed as full-time staff by the very large farmers who can fully use and afford the luxury of a private veterinarian. Many veterinarians work for the MNR, development banks or other government agencies. Salaries are low, but job security is very attractive. The business sector also employs many veterinarians in the agro-products industries such as livestock feed and pharmaceutical companies. In general, Honduras cattle owners cannot support an active private veterinary practice. Instead, farmers rely on DGG veterinarians for field visits and on veterinarians who have retail veterinary supply stores for advice and medications.

E. Universities and Educational Institutions

The three Honduran institutions described below graduate between 50 to 150 students with agricultural training per year. As previously mentioned, students wishing to become veterinarians must study outside Honduras since the country does not have a Faculty of Veterinary Medicine. Countries in the region with such faculties include Mexico, Costa Rica and Guatemala.

The DGG has agreements with several universities and institutions to cooperate on research and other mutually beneficial activities related to the livestock sector. These agreements came about under the IDB loan programs, beginning several years ago.

In general, there are only weak relations and coordination between the DGG and education and research institutions, and there appears to be little political will to strengthen such links.

Institutions with credible reputations such as Escuela Agrícola Panamericana (EAP, Panamerican School for Agriculture) may be reluctant to become involved with government institutions and their projects which are known to have serious weaknesses. Lack of communication between institutions has led to duplication of research and training efforts and poor distribution of results of such efforts. Building relations would require clear guidelines, responsibilities and statement of objectives, as well as consistent supervision from all parties involved. Given the institutional capabilities of both the DGG and the universities, implementation of the cooperative agreements in the near future seems unlikely.

1. Centro Universitario Regional Litoral Atlántico (CURLA)

The Centro Universitario Regional Litoral Atlántico (CURLA, University Center for the Atlantic Coastal Region) is located in La Ceiba, on the north coast, an area known for its livestock production. The university is actually the Faculty of Agronomy of the National Autonomous University of Honduras. It has some extension and research activities, but generally has limited facilities. There is a working dairy and a cheesemaking facility for training purposes but it has no dormitory facilities to accommodate long-term training for persons other than its own students. It has little budget support for travel off the university campus, thus students have difficulty obtaining farm-level experience or conducting farm level research. While CURLA has 7 veterinarians on the staff, their duties are generally limited to teaching. Professors are expected to conduct research in addition to their teaching duties, but most research is conducted on the university premises due to limited budget. Distribution of research results to outside institutions is minimal.

2. Escuela Agrícola Panamericana (EAP)

The Escuela Agrícola Panamericana at Zamorano (EAP, Panamerican School of Agriculture) is a post-high school technical school open to all Latin Americans, which offers a practice-oriented training in agronomy and animal husbandry. It is internationally known for its high quality education, and its graduates are in high demand. It has its own dairy, processes milk and makes cheese from its own production as well as from milk received from area farmers. The school has facilities for training and conducts short courses in various fields related to agriculture and livestock.

Like CURLA, EAP has a cooperative agreement with the DGG to conduct research on pasture improvement and yields, on improved cattle breeding and increasing milk production. However, research efforts have been few and the results have had only limited distribution outside the school. Under the IDB loans, funding was to be available for research and training, but there has been little coordination between the DGG and EAP to undertake these activities.

3. Escuela Nacional de Agricultura (ENA)

The Escuela Nacional de Agricultura (ENA, National School of Agriculture), like EAP, is a technical school offering training in agriculture. It is actually under the MNR, and is located at the same site as an MNR agriculture experimental station. Thus, ENA students are exposed to regional agricultural problems and the research being conducted to find alternatives.

F. International Organizations

International organizations have supported the development of the Honduran livestock sector for many years. Prominent organizations include the IDB, the World Bank, OIRSA, IICA and USAID. Typically these organizations provide loans (or occasionally grants) to the GOH to

support programs aimed at increasing the productivity of the sector and strengthening the GOH institutions responsible for providing services to the sector.

1. Inter-American Development Bank (IDB)

The IDB has supported agriculture and livestock development programs in Honduras because of the importance of these sectors to the national economy and the large portion of the population supported by these sectors. The bank's overall development priorities in Honduras are preserving natural resources, especially forest areas, and improving the rural standard of living through provision of better government services. It looks to the GOH for guidance in identifying programs to address priority areas for development (Martinez, 1990).

The IDB has been very active in the Honduran livestock sector. As of 1985, the bank had provided 59 loans to the GOH, totalling over $7 billion, of which $1 billion were for the agriculture and livestock sectors (IDB, 1985). One of the earliest loans for the livestock sector was authorized in 1974, and funded an animal health program designed to build up an infrastructural base for disease control and specifically funded campaigns against bovine brucellosis and TB. There were subsequent loans, which in 1987 resulted in the current multi-component PROFOGASA program. This has built on the previous programs but in addition to animal health, includes programs in extension and training for professionals, administrators and farmers. The animal health and some of the training activities have been implemented but as yet, the communication and extension training activities have not started.

The IDB presently receives most of its information on the livestock sector's performance in the context of the PROFOGASA project through reports submitted by the TT and livestock research field technicians. To date, analysis has been scant, and this appears to be the weakest link in GOH information systems. The most useful analysis of the livestock sector has been done by

outside consultants working on donor-funded projects or from private companies such as Latinoconsult and CONPPA.

The PROFOGASA program is scheduled to end in May 1991, but both GOH and IDB officials presently believe that additional time will be approved in order to implement the communication and extension training components. IDB has not evaluated the program, but will be reviewing it in the near future. Officials feel that the program has not achieved its goal of strengthening the GOH planning process nor its information system but will probably continue supporting the GOH in its livestock programs. The bank feels that the problem with the DGG is not the lack of technical capability but rather inability to articulate consistent policies to direct the sector and to carry out programs which support the policies. There are many inconsistencies in the planning and implementation process, due to conflicting demands by many actors (including donors), and to lack of coordination among and supervision of field operations.

The IDB recognizes the weaknesses of its GOH counterparts, but its PROFOGASA program does not appear to address these once the program is over. PROFOGASA funds most of the salaries, logistic support and materials to operate the animal health programs. Once the IDB funds have been used, there is no assurance that the GOH will be able and willing to support these programs at the current levels. With the current financial crisis and International Monetary Fund's (IMF) economic restructuring program[14], the GOH may not be able to support the same levels of staff, particularly if there are no significant economic benefits resulting from the IDB program.

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[14] The IMF and the GOH have just recently agreed to a Structural Adjustment program requiring difficult financial actions to improve the economic health of Honduras.

2. World Bank

In general, the World Bank is not directly involved in implementation of its livestock projects in Honduras. Funds are usually channeled through the CBH, which in turn lends them to commercial banks. The World Bank has provided numerous loans to the agricultural and livestock sectors, beginning in 1970 with a loan for long-term investments in the cattle sector. Subsequently there have been 4 other major loans providing funding for three agriculture and livestock development projects. Funding for these projects has increased over time in both nominal and real terms, and with the decrease in overall financing available to the livestock sector, the World Bank's proportion of total sectoral financing has increased from 1.8% in 1973 to 7.2% in 1982 (Latinoconsult, 1984).

The thrust of most agriculture and livestock projects has been to increase production and exports of products, and in later projects, mechanization and agro-industrialization. Some loans have been structured to assist small farmers, particularly those projects designed after the agrarian reform. They also provide technical assistance, usually provided through the DGG, as described in Section 4.C.2.b. Currently, livestock development is not a high priority sector for the World Bank and support for the sector will likely remain minimal in the future.

3. Organismo Internacional Regional de Sanidad Agropecuaria (OIRSA)

The International Regional Organization for Animal and Plant Health (OIRSA) was created in 1955 in response to the region's concern about control of animal and plant diseases.[15] Its creation was approved by all member countries' national congresses, and is perhaps the only international organization working in the region to have such approval. It also receives financial support from each of the member countries' congresses. The organization has evolved to provide

[15] OIRSA's region covers Panama, Central America and Mexico.

more than just emergency level support at times of crisis, and is now active in providing technical assistance and training to host countries. It has a representative and several technical staff in each member country, and thus has an effective network of qualified staff to track and report animal and plant disease conditions in the entire region (Umaña, 1990).

OIRSA plays a small but important role in the Honduran livestock sector. It is responsible for tracking and reporting diseases considered important to the Panama, Mexico and the Central American region, and thus works closely with DGG offices and personnel throughout Honduras. OIRSA staff supplement DGG personnel, provide training to the GOH to strengthen its quarantine services and provide some extension services when required.[16] The organization has obtained agreement from the GOH which will authorize DGG funding for an additional position (veterinarian) to carry out OIRSA's field activities. Under an AID grant to University of Wisconsin, OIRSA is also involved in research on bluetongue disease to determine its frequency in OIRSA's member countries. OIRSA plans to increase its small applied research activities in Honduras to obtain better information on diseases and animal health problems which adversely affect the livestock industry.

OIRSA has competent field and administrative staff, with adequate logistical support (transportation and per diem) to enable them to carry out their field activities. They have expanded their area of interest beyond the original objectives to include topics of a broader nature.

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[16] For example, OIRSA provided written pamphlets and training to farmers and extension staff to prepare them for the African honeybee threat.

4. Instituto Interamericana de Cooperación Para La Agricultura (IICA)

The Inter-American Institute for Cooperation in Agriculture (IICA) like OIRSA, is a Latin American regional organization, with headquarters in Costa Rica.[17] Its area of responsibility is larger than that of OIRSA, covering all of Latin America and the Caribbean, but its objectives of control of animal and plant diseases important to the region, are similar to OIRSA's (IICA, 1986). In this capacity, it is responsible for weekly reporting of all swine diseases, especially African Swine Fever cases, to the swine disease center in Brazil.

IICA's activities include provision of training and technical assistance to the GOH, and it is an active member of several projects funded by IDB such as PROFOGASA (IICA, 1985). IICA also cooperates with many of agencies involved in Honduras' livestock sector, such as the DGG for pasture research and disease reporting systems, OIRSA for disease reporting and information, Centro de Agricultura, Technologia, Investigación y Enseñanza (CATIE) with training, and FENAGH, on their cost of milk production study.

Although there is overlap between IICA and OIRSA geographically and in responsibilities, there does not appear to be duplication of efforts in Honduras. IICA does not have as many field activities or staff as OIRSA, is not involved in quarantine activities, and focusses on different aspects of animal health problems.

5. US Agency for International Development (USAID)

For the most part, USAID has not been directly involved in efforts to develop the Honduran livestock sector. Its most recent project in this area is the Small Farmer Livestock Improvement Project, which assists the Fondo Ganadero to increase the availability of genetically improved stock to small and medium farmers. While this project does support the livestock sector, another

[17] IICA's region of responsibility covers all of Latin America and the Caribbean nations. Thus its region overlaps with OIRSA's in several countries.

important aspect of the project, for USAID's purposes, is that it also is a private sector initiative. Section 4.D.2 (Fondo Ganadero) describes the program in more detail. USAID support for the Fondo is expected to terminate in 1990, and when asked about follow-up projects, the USAID project officer was doubtful of USAID's further direct involvement in the Honduran livestock sector. There is a remote chance that this sector would be indirectly supported through USAID's planned agriculture policy project, but this is still in initial discussions.

6. US Department of Agriculture (USDA)

The USDA is involved in some international programs that have relevance to the US agriculture sector. Thus, the USDA has a Foreign Agriculture Service (FAS) that monitors agricultural production of other countries in order to estimate yields and world market conditions. It is also involved in commercial and bilateral agricultural commodity sales and donations. Generally there is at least one USDA/FAS representative in each country with US diplomatic relations.

The Animal and Plant Health Inspection Service (APHIS) is another branch of the USDA, and is responsible for monitoring diseases or health problems that can affect the US agriculture and livestock industry. APHIS has bilateral agreements with many countries to assist in disease control and surveillance operations for diseases deemed potential or actual problems for the US. In Honduras, such a bilateral agreement exists and involves assistance from APHIS to monitor foot and mouth disease, equine encephalitis and swine fever as well as plant health problems. In Costa Rica, APHIS has assigned a full-time USDA veterinarian to work on a pilot effort to implement an animal health monitoring system modeled on NAHMS in Costa Rica and, in the future, in other Latin American countries.

G. Summary and Conclusions

The agriculture and livestock sectors make significant contributions to the Honduran economy, but receive a smaller portion of the GOH budget for their development than they contribute to the GDP. The MNR budget has decreased 50% in real terms in the period from 1980 to 1988 (CONPPA, 1990).

Significant numbers of small farmers depend on livestock as a primary source of income yet recent problems of inflation and devaluation of domestic currency have augmented their costs of production. It is important that the industry become more efficient and increase levels of production and productivity if it is to continue to be an important contributor to the economy.

In general, the MNR suffers from a lack of politically strong leadership to articulate and implement long-term strategic policies in the livestock sector. There is much duplication of efforts among the various actors in the sector, yet it is unclear to what degree projects have achieved their stated goals. Coordination among sectoral actors and between the critical phases of planning, implementation, evaluation, extension and research are weak to non-existent. Identification of sectoral needs is often in response to crises and/or to donor's perception of sectoral priorities, rather than based on more solid research and evaluation of previous programs. According to one report, the various sectors under the MNR rarely have "systematically aligned (their programs) with the needs of the different National Development Plans, nor with the needs or realities of national agricultural development" (CONPPA, 1990).

In part, the problems are a result of lack of decentralization and delegation of authority to those who are in better positions to plan and implement programs addressing local needs. The numerous reorganizations of the MNR and the DGG within it have only added to normal bureaucratic structural and legal complexities inherent in any organization.

The weak institutional capability of the MNR has affected the ability of other organizations to function effectively in the livestock sector. Development banks must work with the DGG to provide

technical assistance to their loan recipients. To decrease the risk of lending to the agricultural sector, private banks channel discounted funds from the development banks, and thus also work to some degree with the government. International organizations channel their agricultural development funding through the MNR, which is responsible for implementing such programs. Lastly, the private sector cannot provide many services due to their public-goods nature. Thus the government cannot be excluded from the development process in Honduras. In light of this, some international donor agencies have attempted to strengthen the MNR through training and assistance in planning and implementation of appropriate programs. Often these attempts are not long-lasting due to the political nature of the GOH's personnel system, and the lack of the system's logistical support or incentives rewarding good performance.

At the producer level, there are few farmer organizational structures that effectively act to resolve problems of production. Farmer associations are class-exclusive, while the cooperative movement, particularly at the small farmer level, is still frequently a government-imposed structure. The associations have the potential to become powerful lobbyists for their members, but they do not represent the great majority of Honduran farmers.

International organizations have assisted the livestock sector primarily by providing funds for financing livestock operations and for improving animal health services. However, efforts have been lacking in improving the coordination of planning, implementation, research, extension and evaluation activities to result in coherent development of the livestock sector. Donor programs tend to address the symptoms of institutional weaknesses with few efforts to correct their source.

Information regarding animal health in Honduras is not readily available, and is frequently not in a useable form for decision makers who wish to identify priority areas in livestock development. Existing systems provide information which is often incomplete, irregular, unreliable and/or biased toward certain producer groups. Disease identification is not regularly confirmed by laboratory tests, despite major investments the GOH has made in establishing a regional animal health

laboratory network. Problems stem from many sources including lack of sufficient supervision of field staff gathering data, poor logistical support for field and laboratory staff, lack of incentives for farmers to keep herd records and a centralized planning and budget system which gives little incentive to regional DGGs to use information on local conditions to plan programs suitable to their regions.

Distribution of existing information does not appear to be a problem for public sector agencies, but some information from the private sector is sensitive and not easily available. The latter is characteristic of many farmers particularly regarding their levels of production and herd size, since this information has implications for taxes and agrarian reform regulations. Milk processing plants and pharmaceutical companies are also sensitive to release of their information due to the competitive nature of their markets.

At the higher levels of the MNR and the DGG, there is not only recognition of the information problem but also a more global view of what information is needed. At present, an effort is underway, with IICA's assistance, to develop an improved information system and to better coordinate collection and use of information. A review of the proposed information system reveals yet another narrow system which will only generate more (and hopefully better quality) information on PROFOGASA's four priority areas of brucellosis, TB, ticks and warble fly. Data analysis is the weakest part of the information system in the GOH. This could be overcome by using private sector agencies with such skills, and, in the long run, by training GOH staff in these skill areas.

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Chapter 5: POLICY IMPLICATIONS FOR USE OF NAHMS IN LIC INFORMATION SYSTEMS: HONDURAS

A. Introduction

It is frequently the case that technologies[18] successfully used in developed countries are transferred for use in LICs (Evenson, 1984; Staatz and Eicher, 1984). The international development field is filled with such attempts, many of which have ended in failure. Any proposal to try yet another transfer is rightfully subjected to great skepticism and criticism. Experience should have taught us that, despite close resemblances between two situations, not all technologies can be taken from their original setting and directly applied to a new situation. Even within the same country, some technologies are such that regional differences can preclude their transferability.

All this is not to say that transferring technology is inappropriate in all cases. Instead, each case must be evaluated on its own merit, taking into account differences between donor and recipient areas in their political, economic, cultural and social circumstances and in their desire to acquire new technology. The following assessment deals with the specific case of transferring a US developed animal health information system (NAHMS) to Honduras, in an effort to improve information for decision makers in Honduras. It is hoped that quality of decision making at the national level will be improved by either adopting a NAHMS-like system, or more realistically, by incorporating some of the concepts of NAHMS into existing systems. Better decisions will in turn result in improved resource allocation and improved production.

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[18] In this document, technology refers to the use of any biological, chemical, mechanical, methodological, or institutional innovations or the use of any body of knowledge, that increases effective resource utilization.

B. DGG's Information Needs

Before designing a new or improved information system for the DGG, the agency's information requirements should be considered. Information needs are often difficult to articulate and even when they are clearly identified, the results are frequently conflicting due to different users' needs. For the purposes of this research, consideration is given only to the information needs that decision makers in the DGG have identified as important to their planning tasks. This is the most appropriate group because of their relatively more important role in Honduras' highly centralized planning system compared to other potential users, and also due to the nature of information generated by NAHMS.

1. Honduran Needs

National level decision makers in Honduras require information on animal health problems to ensure that the livestock sector continues to contribute to the national economy. In order to identify problems and establish a basis of priority, information is needed on frequency of animal health problems, and the costs of those problems to the country. With this in hand, national level planners can better determine priority areas in the livestock sector and direct resources more effectively. Research, education and extension programs can be directed towards priorities thus identified, and DGG technical assistance programs can be designed to address these needs. Using this information, the GOH can develop more cohesive National Development Plans for the livestock sector. In addition, the GOH would be in a stronger position to negotiate with donor agencies' biased interests in determining content of future programs.

The Vice-Minister for Agriculture and Livestock and the Sub-Director for the DGG have the clearest sense of overall agency needs and see the importance of having regular sources of information on the status of the livestock sector beyond what the current systems and sources provide. They both expressed an urgent need to identify the most critical health problems in

livestock production. They agreed that one way to rank the "most critical" problems would be to determine the costs of the problems. Without this kind of information, the Vice-Minister feels strongly that the DGG cannot design programs to address problems most effectively, putting the agency in a weak negotiating position vis-a-vis external funding agencies. The Vice-Minister stated that the development of a system that could provide policy and decision makers with such information is his highest priority (Matamoros, 1990; Espinoza, 1990).

Information needs at other levels were only superficially examined since the primary users of an information system were initially identified to be decision makers in the central government and donor agencies. Few agencies active in the livestock sector are actively seeking to improve existing information. Farmers, for the most part, do not see the usefulness of the national system since they perceive the benefits of the system to be long-term and indirect. Other private sector agencies express varying degrees of enthusiasm for better information but most feel that it is the government's responsibility to collect such information. One pharmaceutical company is willing to assist information collection efforts in minor ways, but the second company does not see the necessity of participating at all.

2. Adequacy of Honduran Information Systems in Addressing Needs

Decision makers in the DGG are interested in collecting information on diseases and other animal health problems which may be decreasing production and productivity. At this time, regular reporting is carried out for only some diseases and these are not necessarily the most common ones. The PROFOGASA project collects information on brucellosis, TB, ticks and warble fly, while the Laboratory Services department in the DGG regularly collects data on numbers of cases for the 16 reportable diseases. However, there is no mechanism that guarantees similar regular reporting of animal health problems not included in the list of 16 diseases. Livestock censuses and surveys are too ad hoc for the purposes of decision makers who require

information on a consistent basis. The other sources of information have disadvantages and deficiencies discussed in Chapter 4. Even the DGG's proposed information system, SISVESA, will not provide the desired kind of information. Thus, high level officials in the DGG do not have up-to-date information to identify livestock health problems of most importance in terms of frequency or economic losses. Analysis of current data is either non-existent or very weak throughout much of the DGG.

C. Transferring an Animal Health Information System from the US to LICs: Policy Implications in the Case of Honduras

Certain characteristics of NAHMS deserve consideration when designing information systems for national level use in the US or in other countries. Over the past 20 years, the traditional clinical veterinary medicine that focused on individual animal health problems has given way to the newer direction of herd health management (Bigras-Poulin and Harvey, 1986; Morris, 1986). NAHMS addresses herd health management by combining epidemiology with economics to derive an information base that can be used to support decisions on animal health.

An interesting application of NAHMS is presently underway in Costa Rica with IICA's and USDA/APHIS' assistance. IICA is modifying NAHMS to develop a compatible animal health information system for the entire Latin American region. The Costa Rican effort is still very much in a pilot stage, covering only a small area of the country. NAHMS has not been modified to any extent and therefore results from data collection in Costa Rica will have the same weaknesses previously identified in NAHMS. To date, there have been some implementation difficulties with timeliness of operations and farmer motivation, but relatively little problem with identifying and training enumerators (Moulthrop, 1989a; 1989b; 1990).

OIRSA has expressed interest in the possibility of NAHMS being adapted for use in Honduras. Information resulting from a system similar to NAHMS could assist LICs such as Honduras identify

the most common diseases and provide relative cost information. This information can influence GOH and donor funding decisions in areas of research, extension and education programs in the livestock sector. The following is a discussion of other strengths and weaknesses that may be relevant in considering the transfer of NAHMS to Honduras.

The GOH has been interested in animal health monitoring and information systems for many years and has even had several donor-funded projects to develop such systems (Umaña, 1990). Currently, the DGG, with assistance from IICA, is designing a new information system, SISVESA, which is intended to unify the various information systems used by the DGG. Because of DGG's involvement with PROFOGASA, it is not surprising that SISVESA's orientation is toward farm level detection and control of brucellosis, tuberculosis, ticks and warble fly. Beyond this, the only information collected is basic figures on herd size and composition, and farm location. Thus, despite its voluminous nature, SISVESA is limited in the information it collects.

1. Ability of NAHMS to Meet Honduran Information Needs

Transferring a technology such as an information system is complex and time-consuming even under the best circumstances. The question is whether NAHMS, with its strengths and weaknesses for use in the US, should be considered a worthy candidate for transfer to another country. Early evaluations of NAHMS have revealed some of its weaknesses. For example, Kaneene and Hurd (1990) found that cost estimates needed by NAHMS are not always available and can be difficult to estimate. Multiple health events in one animal complicate the allocation of costs attributed to each health problem. They also found that NAHMS' estimates of costs could be considered only short-term gross costs because of the nature of the cost data collected. Chapter 2 dealt with NAHMS' ability to estimate disease frequency and costs for internal parasites in Michigan, and identified what changes would be required to incorporate the necessary information. With these weaknesses now identified, judgments must be made whether the

deficiencies can be corrected. If not rectifiable, the question is then whether the problems will adversely affect the system's achievement of its objectives in the new situation. What follows is an examination of NAHMS' ability to serve Honduras' information needs.

a. Sampling Methodology

NAHMS would strengthen existing systems in Honduras in several important ways. Current systems provide information from non-random samples of farmers. Such farmers are usually more willing to participate in government or other programs and often are within easy reach of many services; thus, they do not necessarily represent the majority of Honduran farmers or their problems and needs. Given the goals of increasing domestic milk and meat production, the GOH, through the DGG, will have to reach more farmers than it does currently. Yet the DGG's contact with very small and very large farmers is minimal, and thus it has little first-hand knowledge of what problems these groups experience. Data that are currently gathered on a non-random basis could be collected on a random sampling basis to provide clearer information on cattle health problems of the various strata of Honduran farmers. Random sampling could also provide more accurate information on disease frequencies than is now obtained in the reportable disease system.

b. Cost Analysis

A second advantage offered by NAHMS is its collection of farm-level cost data on animal health problems. The DGG can use animal health cost analysis to assign priority to the most economically important problems. Combined with the incidence rates for animal health problems, the cost analysis can be an effective tool for setting national priorities for the DGG and other GOH and donor agencies.

Given the conditions in Honduras, problems of collecting information on feed and labor will be at least as difficult as in the US. Cattle feeding systems are based on native pasture, with some farmers supplementing this with agricultural by-products. There is rarely any monetary cost associated with pastures since they are not usually reseeded, fertilized, or cut. There are possible opportunity costs of using pasture for livestock since there are other potentially more lucrative crops that could be raised instead, but this is a difficult concept to impart and implement in the US or elsewhere. Labor used on most farms is family labor, and again is rarely given monetary value. NAHMS would only be able to estimate values for such items and enumerators would need to be trained, supervised and perhaps given "refresher courses" to ensure consistent data gathering techniques in this area.

The lack of information on feeds in Honduras will be less serious compared to the US, since most Honduran farmers purchase concentrates rather than grow grain crops for their livestock operation. Some farmers do make and use hay or silage, and costs for these would need to be calculated. Costs for forages would probably have to be estimated based on opportunity costs since there is no market for these kinds of feeds.

NAHMS does not collect adequate information on feed consumption, milk production or weight gains in young stock, making it difficult to calculate economic impact of health problems affecting these factors. Similar problems would exist in implementing NAHMS in Honduras, and resolving them could be more complicated. Few farmers keep herd records or see value in them. There may be some problem with illiteracy among farmers in the more isolated areas of Honduras, but most have children or other relatives who are literate. There is a need for a long-term extension effort to educate farmers on the importance and use of records for their economic benefit. Most farmers are motivated to change only if they see monetary benefits in the near future, but Honduran farmers may not necessarily realize this through increased milk production

due to marketing problems and fixed prices on the formal market. At this point, few farmers feel incentives to change their management and/or increase their production.

Provided that they can be convinced of the need to keep records, one of the first activities for most farmers will be to use individual animal identification (branding, ear tags). Milk production can be recorded by providing farmers with incremental, color-coded calibrated buckets. Weight changes can be estimated using heart girth measuring tapes to provide some estimates of weight changes.[19] Again, the consistency and reliability of data will depend greatly on the willingness of farmers to participate and on the enumerator's interest in following up on data collected by farmers during his/her scheduled visits.

c. Individual Animal Basis of Data Collection

NAHMS experiences difficulty in collecting data on animal health problems such as reproductive disorders and nutritional problems, on an individual basis. Collecting information on reproductive and nutrition problems will require significantly more staff time and financial resources. Laboratory support is essential and laboratories must have guaranteed supplies, functional equipment and trained, motivated staff. The Honduran system of laboratories has the potential to carry out such analyses, but lacks supervision and budgetary flexibility to address short-fall of supplies.

A more serious problem will be obtaining sufficient funding to carry out such laboratory work. The GOH may need to limit such laboratory-dependent activities to geographic areas or diseases that are considered the most critical. Unfortunately, this defeats the objective of NAHMS to

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[19]Although these tapes may not be accurate for the diverse cattle population of Honduras, they would provide information on relative weight changes. This information, while not perfect, would give at least rough estimates.

identify just what those areas and health problems are before resources are expended on them. However, this may be a necessary compromise.

d. Multiple Cause Health Conditions

In the context of LICs, this problem is less likely to be resolved, given most countries' limited financial resources for such research. In Honduras, some improvement may result in increasing the laboratory-confirmed diagnoses to better identify causal agents. This may be particularly beneficial with internal parasites so that the most effective anthelmintics can be used against the identified parasites.

e. Disease Detection Capability

NAHMS offers a system that would routinely collect data on animal health problems encountered on the farm. The system would include data on economically important problems such as long calving intervals, delayed heifer breeding, anestrous, retained placenta, metritis, mastitis and calfhood pneumonia and diarrhea. In contrast to existing information, NAHMS would provide incidence rates for these problems as well as the reportable diseases relevant to the Honduran cattle sector. Knowing the various incidence rates, the DGG could then direct its programs for research, extension and education to address the most frequent diseases.

While NAHMS is intended to collect information on whatever animal health events occur on a sample farm, it is apparent from the Michigan data that the system can be biased in the problems it detects. Despite this weakness, NAHMS would represent an improvement over existing systems in Honduras which focus on a limited number of animal health problems. It has the potential to strengthen Honduran planning processes, particularly at regional levels.

There are some anticipated drawbacks to using NAHMS as a basis for improving Honduran information systems. Officials in Honduras have expressed interest in several areas of livestock

health which are not frequently reported such as reproductive problems, nutritional deficiencies and internal parasites. The Michigan NAHMS has collected data on some reproductive disorders, but has done much less with nutrient deficiencies or internal parasites.

f. Centralized Information

NAHMS is designed for centralized data entry, compilation and analysis, which suits the Honduran situation well in several respects. The level of competency in analysis is generally higher in the capital compared to regional offices. There is more likelihood of computer availability and support services in the capital city. The information that would be generated by NAHMS would be used primarily by decision makers in the central government since this is where planning and budget authorities lie. Not coincidentally, this is also where the greatest interest lies.

2. Should NAHMS be used in Honduras? Benefits and Beneficiaries

The decision to use NAHMS, or even some of the concepts used in NAHMS is a subjective one, and the strengths and weaknesses in NAHMS must be weighed against the needs, political will and capabilities of the relevant GOH officials. Although some of the necessary pre-conditions may exist, DGG officials may decide that the benefits of a more sophisticated system such as NAHMS do not outweigh the costs (monetary as well as opportunity). This is a valid consideration since the resources required to undertake and implement NAHMS will be substantial.

One of the most obvious beneficiaries of better animal health information, after the DGG, would be the donor community involved in the Honduran livestock sector. The IDB in particular would greatly benefit from knowing how effective its livestock programs are by measuring changes in disease frequencies. Organizations like IICA and OIRSA would also be able to use this information to determine what diseases are most frequent and most costly to better direct their control and education programs in Honduras.

Most of the private sector actors expressed concern over the lack of high quality information on the Honduran livestock sector. However, very few expressed willingness to pay for improved information. For example, pharmaceutical companies clearly have much to gain from information on disease prevalence and distribution, but of the two prominent commercial houses in Honduras, only one offered to cooperate in setting up an information system. The other representative believed that a national system was too large and broad to serve his company's needs. FENAGH has shown a growing appreciation for information dispersement. Having access to animal health information would allow it to become a more effective lobbying power on behalf of its farmer constituents.

The milk and meat packing plants are also less enthusiastic about their need for animal health information. They may become more concerned if there were increased enforcement of stringent domestic health standards.

a. Implications for Increased Milk Production

Domestic demand for milk will likely increase primarily due to the growing population. Depending on the size of increased demand relative to supply, increased milk production could lead to decreased prices in the informal market. Lower prices would create disincentives to farmers, particularly those farmers lacking access to formal market milk processing plants offering fixed but perhaps higher prices. Thus, farmers must be able to lower their costs of production and perhaps increase their access to the formal market. The latter may require that the GOH offer incentives to milk plants to increase their area coverage. One example would be offering credit to milk plants to build additional collection and cooling centers in the more isolated areas. Alternatively, farmer cooperatives and associations could be offered credit to build these for their memberships. The latter alternative would be less attractive since farmer membership in these organizations tends to be dominated by medium and large farmers.

Farmers are sensitive to price and consistently voice their reluctance to increase milk production unless they receive higher prices. On the demand side of the market, consumers are also sensitive to increases in milk prices[20], and the GOH has maintained price ceilings on the formal milk market with the intention of providing access to milk for all income classes. Hence, it is difficult for the GOH to use price increases as incentives to raise production. Even with an information system that identifies the most important and costly animal health problems, the GOH will have to demonstrate to farmers how to use this information to their financial benefit. Rather than increasing the formal market price, the GOH's objective must be to reduce farmers' costs of production. This will be much more complex since farmers will not see the incentive as quickly or directly as a milk price increase. The GOH may have to compromise by offering some increase in milk prices on the formal market while making the research and extension services more effective in disseminating information to decrease costs of production.

The formal milk market has the capacity to absorb more production since the existing plants run at an average of 50% to 60% capacity. However, the formal market does have problems with the seasonal peaks of production, when both Sula and Leyde run close to full capacity. Increased production may increase employment opportunities at these milk plants, and quality of processed products may be higher than those of the informal sector. It is conjectured that with a sufficient and steady supply of milk, the milk powder plant at Sula would become profitable to run. Overall, it appears that the formal sector would benefit from increased milk production.

The informal sector would most likely respond to increased production with decreased prices to producers. While consumers would gain, producers will benefit only if they can lower their costs of production. Farmers could turn to the formal market provided they had access; those

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[20] According to Experience Inc. report (van de Wetering, 1983), producers are actually less sensitive to changes in milk price than consumers.

most likely to use the formal market would be those near collection stations or having transport facilities, but more isolated farmers would be forced to accept lower informal market prices.

If the formal sector were able to serve all farmers, the production flowing to the informal market could drop to a sufficiently low level to increase milk price in the informal sector and to decrease employment in this sector. This would adversely affect small milk producers in isolated areas, small family-owned cheese "factories" that have little ability to search out new sources of production, and the poorer consumers unable to tolerate even small increases in milk price.

b. Implications for Increased Beef Production

Similar to the demand for milk, the domestic demand for beef in the near future is anticipated to grow due to increases in population rather than in real income. Even so, increased supply of beef may cause prices to decline on the domestic markets although the amount marketed domestically will depend on export demand. The latter is independent of the Honduran beef supply. Increasing domestic price for beef could lead to further declines in demand if consumers continue to shift to less expensive poultry and pork. Thus, similar to the dairy industry, beef producers will have to look for ways to lower production costs rather than rely on price increases as a way to increase profits.

c. Implications for Foreign Exchange Earnings and Savings

Increased production resulting from improved problem identification in the cattle sector would enable the GOH to decrease its foreign exchange expenditures for dry milk imports since it would be producing domestic milk for domestic demand. It is harder to predict the effect on the beef export market since this depends more on demand conditions in the US economy than on Honduran supply. If Honduran supply were to increase, it is not easy to predict how much would result in export earnings for Honduras. Illegal exports and the variability in the US beef market

will affect how much domestic beef is exported. There is a domestic market for beef, but this is less likely to be catered to as long as local prices are less than the legal and illegal export market prices.

d. Implications for Consumers

How would an improved information system affect the consumer in Honduras? Since the formal milk market price is controlled, the effect on the consumer will depend on government policy. As mentioned in earlier chapters, farmer associations are increasing pressure on the GOH to raise the formal milk price to at least maintain current levels of production. The GOH hopes to increase domestic production to keep up with growing demand, but is hesitant to increase consumer prices because milk is viewed as one of the basic food commodities. Thus, the GOH should direct its dairy policies to lower costs of production rather than increasing producer prices as incentives to increase production.

The effect of an information system on beef consumers is less straightforward. Beef consumption has declined due to rises in retail price that resulted from decreased domestic supply. Beef producers decreased their supply to domestic markets in the past few years due to higher prices offered in legal and illegal exports. Raising beef prices to encourage increased beef supply will only further decrease quantity demanded.

The dual purpose nature of most cattle operations in Honduras also affects producers' decisions. If beef prices increase, many dual purpose farmers may shift the emphasis of their operation from dairy to beef. In this case, the proposed information system will not directly benefit the beef consumer. The GOH may prefer to direct its attention to streamlining the marketing channels of the beef sector so that prices are accurately communicated from producers through cattle assemblers, slaughterhouses, wholesalers and retailers to consumers. The beef market appears to be less competitive than the milk market, and the GOH may need to focus on some

of these marketing problems. Increasing competition at the meat packing and wholesale levels would improve some marketing channels. Establishing quality standards that are enforceable and tied to producer prices may also encourage increased beef supply.

e. Summary of Benefits

Based on the qualitative factors discussed here, NAHMS, or some form of NAHMS, would benefit the GOH decision makers as well as the dairy producers and consumers. It will have less of a beneficial impact on the beef industry and it is apparent that not all producers and consumers will benefit equally.

The overall goal of improved information is to increase the livestock sector's production. If an information system is implemented and yields increased production, the GOH must be aware of issues regarding the distribution of benefits. If the GOH intends to increase milk production to keep up with demand, it will have to identify production constraints and educate farmers to alleviate them. Thus it is obvious that extension, credit and other services for farmers, in addition to better information to decision makers, will be necessary to obtain increased production.

3. Institutional Requirements for Transferring NAHMS to Honduras

Despite the advantages offered by NAHMS, adoption of the system by the GOH will not be easy nor be a guaranteed success. Information systems have come and gone in Honduras, and most of them have originated from agencies outside Honduras. NAHMS is just one of many attempts, so there is some skepticism about yet another system. Imposed systems have rarely received the consistent and strong commitment from government officials necessary to maintain momentum because the systems have not addressed needs felt by the GOH. If NAHMS is to succeed where others have failed, a strong "propaganda" component will be necessary to ensure that potential users are able to fully utilize the information generated.

On the more technical side of the transferability question are such things as the GOH's ability to develop sample frames and undertake random sampling techniques; to ensure accurate data collection and reporting; and to make the necessary modifications in NAHMS to collect the desired data. Since agricultural censuses and livestock surveys have previously been conducted, there is some experience in sampling and survey techniques. Quality of the census data may be questionable, but the livestock survey and report conducted by Latinoconsult is high quality. Thus, it would be wise to contract a capable private sector firm to set up sampling and data collection schemes.

The most likely choice for enumerators would be the present DGG field technicians, who are familiar with numerous farmers and farm management systems in their regions. They have adequate educational backgrounds to be trained in basic survey techniques and disease diagnosis. The major concern is for adequate supervision of data collection over the entire collection period, and for sufficient logistical support for enumerators. Incentives for both enumerators and supervisors must ensure consistently high quality data collection. Incentives may include the transfer of government supplied transport (e.g., motorcycles) to the enumerator after a specified amount of time; reliable provision of supplies; regular training and refresher courses; and regular performance evaluations. Supervisors, if they are regional officials, may be motivated to perform well with similar incentives. In the longer term, an important incentive would be the supervisor's use of information generated in the system to develop programs for their region.

Farmer participation is one of the most critical elements in obtaining high quality data. Disincentives must be eliminated and positive incentives must be developed to guarantee their willing cooperation. It may be difficult to convince participants of the confidentiality of collected data, but this may be necessary to assure farmers that the information will not be accessible to officials for tax purposes. Positive incentives could be built in by providing participating farmers

with monthly summary reports on the status of their farm compared to others in their stratum. This could be accompanied with advice on using information to identify cost-effective management changes to improve their production. (This worked well in the Michigan NAHMS.) This will not be easy to achieve due to the lack of routine record-keeping among the majority of farmers and the inexperienced extension service. A disadvantage of this is the potential bias of the information derived from the farmers receiving technical assistance during their participation in this program. However, the GOH may be willing to accept some degree of bias in their information since their priority is two-fold: increasing production at the farm level and increasing the quantity and quality of information from the farm level.

If benefits from NAHMS are to be fully realized, data analysis and distribution of the findings are key. Traditionally, these areas are the most problematic and least considered in designing information systems. The GOH does not perceive this as a problem, but there is little evidence that strong analytic capabilities exist in the DGG. A brief review of selected reports and evaluations showed many discrepancies, unclear presentation of information and conclusions that frequently were not strongly supported by the data. This was not the case for the Latinoconsult survey results nor with other private sector "think tank" consulting agencies. Thus, obtaining short-term assistance from such a firm to outline basic guidelines for data analysis and report writing would be highly recommended. However, the long-term solution is to recruit qualified personnel or provide training for existing personnel to strengthen analytic skills in the agency.

Distribution of information resulting from the NAHMS effort should be clearly outlined in the early stages of developing the system. There is some degree of disorder in the DGG, partly due to recent changes in the government, but also due to the political nature of decision making. This inhibits smooth flow of information that in turn can affect timely and appropriate decisions. Guidelines for reporting responsibilities and deadlines would need to be agreed upon and distributed to all parties involved.

Perhaps the most important factor in determining whether NAHMS will be successfully implemented is the strength and long-term commitment of the DGG to the activity. At this point, upper levels of the DGG and the Vice-Minister for Agriculture and Livestock are very interested in developing an information system along the principles of NAHMS.

To carry out a system such as NAHMS, top leadership as well as lower levels of the DGG must be fully committed. Personnel at lower levels need to be actively involved and a concerted effort is needed to improve supervision of DGG field activities. As mentioned previously, farmer participation will be critical for ensuring quality results, and the DGG, especially field staff, must maintain excellent relations with participating farmers to sustain their interest in the program. Thus, even though the initial results of NAHMS are to be directed to the needs of national decision makers, it is critical that the system be designed to provide farmers with information relevant to their specific farm situation. Farmers' interest in participating can be more easily maintained if they can quickly see how the information they provide the system can benefit them.

D. Next Steps Toward Improving Animal Health Systems in Honduras

The DGG's objectives relative to animal health have to date not been clearly articulated, even in the National Development Plan. Programs to address some of the stated needs have been largely designed and funded by international donor agencies, and thus may be biased to each donor's interpretation of priorities.

Yet, systems do exist and function to a certain degree. When considering whether NAHMS should be used to improve quality and availability of information, it is not necessary to eliminate all existing systems. In many cases, these systems serve certain specific needs. For example, the reportable disease system provides important information in a timely fashion to a multitude of GOH and foreign agencies. This has merit, although the quality of information must be improved.

The DGG could consider at least three alternatives relating to the use of NAHMS. The first would be a more extreme and costly one of adopting NAHMS as a whole and separate information system. Other options to this use certain concepts from NAHMS that, when grafted onto existing systems, will improve what the DGG currently uses. Alternatives 2 and 3, discussed below, incorporate some of these aspects into existing systems without as much disruption and at less cost than transferring the whole NAHMS system.

1. Alternatives

a. Alternative 1: Transferring NAHMS Intact

To accommodate the different situation in Honduras, the NAHMS model would have to be modified to ensure that data are collected on diseases common to Honduras. More information will be required about internal and external parasites, tick-borne diseases, reproductive problems and nutritional deficiencies. This will also require more laboratory-confirmed tests, and thus more coordination between enumerators and regional laboratories, as well as increased financial and logistical support from the DGG for both. An illustrative budget for this alternative is found in Table 5.1.

The first task would be to set up one committee responsible for daily implementation of the system, and a second one for general oversight and broader policy guidance. Technically qualified personnel must be on the implementation committee since they would be responsible for setting up sampling strategies, designing and reviewing questionnaires, and overseeing field staff for data collection, compilation and analysis. Assistance and participation from qualified private sector firms will be important to ensure high quality survey design. The policy committee would ensure that the system is designed and modified to meet needs, that information, once analyzed, is distributed and used as intended.

TABLE 5.1 BUDGET FOR ALTERNATIVE 1 - IMPLEMENTING NAHMS IN HONDURAS

Illustrative Budget Line Items	Lempira[a]
Personnel	
GOH/DGG existing staff, add'l time (5 pers.x L2200/mo.x 12mo.)	132,000
Res. Ass't (private sector; new) (1 pers. x L6000/mo x 12 mo.)	72,000
Computer Programer (1 pers. x L2,000/mo. x 12 mo.)	24,000
Data cleaning/entry/mgt. personnel (1 pers. x L1800/mo. x 12 mo.)	21,600
Enumerators (2pers./region x L1800/mo./pers x 12 mo.)	432,000
Supervisors (1pers./region x L2500/mo./pers. x 12 mo.)	300,000
Sub-total for Personnel	981,600
Sample Frame, Sample Selection	
3 pers. x L4000/mo. x 2 mo.	24,000
Travel to select farmers (per diem + fuel)	1,232
Sub-total for Sampling	25,232
Questionnaire Development	
1 pers. x L4000/mo x 1 mo.	4,000
1 pers. x L6,000 x 2 mo.	12,000
Sub-total for Questionnaire	16,000
Training	
20 Data collectors x L510.75/per/day x 8 days	10,215
Supervisor training (10 pers. x 590.75/pers/day x 8 days)	5,908
2 Follow-up sessions: (30 pers. x 550.75/day x 4 days)	8,523
Training fees for 1 week @ 50,000	100,000
Sub-total for Training	124,645
Data Collection	
20 Enumerators x 4 farms/month x 5L/day per diem x 2X/mo.	9,600
Travel costs @ 5 gal./mo. @ L6.15/gal.	7,380
Forms for data collection	1,000
New motorcycles/vehicles (2/region x L24,000/unit x 10 regions)	480,000
Sub-total for data collection	487,980
Supervision	
10 Supervisors x 2 trips/mo. x L8/trip x 12 mo.(per diem + fuel)	969
Data Management	
Training for data entry/cleaning	1,000

TABLE 5.1 (cont'd.)

Laboratory Support	
Bacterial tests @ 6x/yr. x L180/test x 120 animals	129,600
Viral tests @ 6x/yr. x L125/test @ 120 animals	90,000
Parasite diagnosis @ 2x/yr. x L30/test x 120 animals	7,200
Training for 2 technicians/lab. (2 pers. x L1000/pers/mo.)	16,000
Materials, supplies (L30,000/lab/mo. x 12 mo.)	2,880,000
Sub-total for laboratory support	
Computer Costs	
Computer, monitor, printer	15,000
Software	3,000
Materials, supplies (L600/mo. x 12 mo.)	7,200
Sub-total Computer Costs	25,200
Distribution of Information (L60/copy x 5 copies)	3,000
TOTAL	4,798,426

MNR Budget '90 = 142,214,185 NAHMS as % MNR Budget = 3.4
DGG Budget '90 = 13,853,673 NAHMS as % DGG Budget = 34.6
[a] Approximate exchange rate (as of Sept. 1990) is L6 = $1 US.

It would be prudent to follow Costa Rica's example to start data collection and analysis on a small scale, learning from mistakes and correcting them before starting a national level effort. Starting on a small scale would gradually build up capability of enumerators, farmers and analysts, and would require less initial funding. One option within this alternative would be to concentrate initial survey efforts in regions with high populations of cattle. It might also be useful to focus initially on only a few animal health problems rather than attempt to cover all the desired problem areas. Over time, geographic area and number of health problems included could be expanded.

Survey design, questionnaire development, pre-testing and sampling would be carried out using methodology acceptable for social science surveys. Initial concern will be for the development of the sample frame. It is assumed that the Latinoconsult survey frame, despite its age, could be a used as a basis for developing an updated sample frame for this survey.

Data collection in the Michigan NAHMS was done on a monthly basis but experience in Honduras has shown that monthly visits may not supply sufficiently high quality data and visits may need to be done every two weeks. Monthly visits might be feasible if farmers were given sufficient initial and follow-up training on record keeping.

Another issue to be resolved is the frequency with which a NAHMS-type of survey could and should be conducted in Honduras. The illustrative budget gives an estimated cost for implementing NAHMS for one year. If NAHMS were to be repeated annually, some costs, such as sample frame development would decrease. However, given the scarcity of resources, it appears unlikely that such a survey could be justified on an annual basis. It is important, however, that it be carried out on some regular basis, perhaps every five years, if it is to assist in government planning activities.

A longer term goal would be to delegate more authority to the regions to plan and implement programs sensitive to regional needs. For effective planning, the regions would need information

on local conditions. If a NAHMS-based system were already in place for national level planning purposes, relatively few modifications would be necessary to convert it for use at the regional level.

Costs for implementing NAHMS in Honduras could be as high as L 4.79 mil., equal to 3.4% of the MNR's total budget for 1990 and 35% of the DGG's 1990 budget. Thus, implementing NAHMS as a separate information system would represent a substantial expenditure and may not be appropriate given GOH priorities.

b. Alternative 2: Incorporation of NAHMS Components into PROFOGASA

The second alternative would be to consider expanding disease and cost information presently gathered under the PROFOGASA program in order to strengthen the existing information system. This may be a more practical alternative to the first, given the anticipated budget problems. The PROFOGASA program has provided some training to 32 DGG field technicians, and its information gathering goals are not inconsistent with NAHMS. Increased data on diseases and costs would provide a broader base of information than is currently obtained from PROFOGASA or anticipated from SISVESA.[21]

Cost estimates for this alternative, (L953,889; equivalent to 0.7% of the 1990 MNR's budget and 7% of the DGG's 1990 budget), are more within range for implementation in Honduras (see Table 5.2). This alternative would require training DGG field technicians in improved data collection and informal education techniques. The latter is to make technicians more effective extension agents so that new knowledge gained from the information system can readily benefit participating farmers. Alternative 2 would improve qualitative data on cattle health and

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[21] The possibility of incorporating useful aspects of NAHMS into GOH information systems was discussed with the DGG Sub-Director. Both the random sampling and cost data were viewed as positive additions which NAHMS could provide SISVESA and PROFOGASA.

TABLE 5.2 BUDGET FOR ALTERNATIVE 2 - PROFOGASA WITHOUT RANDOM SAMPLING

Illustrative Budget Line Items			Lempira[a]
Coordination Committees			2,000
1 d/mo. x 10 persons = policy comm.			2,000
2 d/mo. x 5 persons = tech. comm.			
Form Revision			
2 persons x 30 d/person @ L 200/d			12,000
Training			
32 tech. x 1 wk. x training fee/person			50,000
2 follow-up @ 2 days x 32 tech. x training fee			35,000
Per diem for 32 tech. for 17 days			32,640
Travel to training site for 32 tech + 10 supervisors for 3 trips			3,875
Per diem for 10 supervisors for 6 days			4,200
	Sub-total	125,714	
Supervision			
10 supervisors x 2 d/mo. x 12 mo. travel + per diem			3,894
Data Collection			
32 tech. 2X/mo. x 4 farms:			
Per diem for 32 tech x 8 d/mo. x 12 mo. @ 5 L/d			15,360
Travel for 32 tech. 8 trips/mo. x 12 mo. x 5 gal./mo.			11,808
Forms @ 2 sets/mo./farm x 4 farms x 32 tech. x 12 mo.			18,432
Equipment: Buckets, weight tape measures for 4 farms x 32 tech.			7,680
Motorcycles: 2/region			480,000
	Sub-total	533,280	
Laboratory support			
Training for 2 lab. technicians/lab.			16,000
Materials, supplies for 8 labs. @ L600/mo./lab.			115,200
	Sub-total	131,200	
Data Analysis			
Computer, monitor, printer			15,000
Software, supplies			10,200
Data Analyst (private sector)			96,000
Data entry, cleaning, 1 person plus trg.			22,600
TOTAL			953,889

MNR '90 Budget = 142,214,185 NAHMS as % MNR Budget = 0.7
DGG '90 Budget = 13,853,673 NAHMS as % DGG Budget = 6.9
[a] Approximate exchange rate (as of Sept. 1990) is L6 = $1 US.

management problems and their associated costs, but would not collect data to calculate disease incidence rates because its lacks random sampling. If random sampling were desireable, costs for the alternative would increase in order to develop a sample frame.

c. Alternative 3: Strengthening Reportable Disease Information System

This alternative incorporates random sampling and strengthened laboratory services into the reportable disease system. Thus, disease surveillance, conducted by existing DGG veterinarians, would yield more accurate information on disease frequency. The laboratory system would also be enhanced by providing training to technicians and regular supplies of reagents and other materials. This alternative could supplement Alternative 2 but can be implemented independently as well. Ideally both would be incorporated by the DGG.

Costs for this alternative would be higher than Alternative 2, at L3.48 mil., since it would require substantial laboratory support and the development of a sample frame (see Table 5.3). This cost represents 2.4% of the MNR's 1990 budget and 25% of the DGG's 1990 budget. The three alternatives are compared in Table 5.4.

d. Conclusion

Given the three alternatives outlined above, and in light of likely budget tightening measures in the near future, it would seem that Alternative 2 is the most probable candidate for implementation. This alternative would provide improved quality of data over a fairly extensive geographic area since the existing technicians who would be conducting the data collection are in all 10 administrative districts. This alternative would not provide data that can be extrapolated to the total cattle population of Honduras, and thus one could not calculate incidence rates of identified diseases. Nonetheless, the system would present the government with "ballpark" estimates of farm-level costs of animal health problems that are not currently monitored and would

TABLE 5.3 BUDGET FOR ALTERNATIVE 3 - REPORTABLE DISEASES

Illustrative Budget Line Items		Lempira[a]
Develop Sample Frame		
3 persons @ salary x 2 months		24,000
Revise Forms		
1 person x 1 month		6,000
Printing costs		60,000
Sample Selection		
Per diem for 10 vets. x 10 days		1,000
Travel costs		369
Training		
Training fee for 1 wk. for 10 vets		50,000
Travel for 10 vets to training site		308
Per diem during training for vets		5,600
Travel for 2 DGG staff to training site		62
Per diem for 2 DGG staff x 1 wk.		1,600
2 two-day follow-up training sessions for 10 vets, 2 DGG staff, w/ travel & per diem		38,069
Sub-total training	95,638	
Data Collection		
Per diem for 10 vets @ 2 days/wk. for 12 mos.		9,600
Travel for 10 vets @ 5 gal./mo @ L6.15/gal. for 12 mo.		3,690
Sample collection supplies, forms		15,000
Laboratory diagnosis		
Bacterial tests @ 6x/yr. @ L/test @ 10% animals		129,600
Viral tests @ 6x/yr. @ L/test @ 10% animals		90,000
Parasite diagnosis @ 2x/yr. @L/test @ 10% animals		7,200
Training for lab. technicians		16,000
Materials, supplies		2,880,000
Sub-total lab.	3,122,800	
Data Analysis		
Computer, monitor, printer		15,000
Software, supplies		10,200
Data Analyst (private sector)		96,000
Data entry, cleaning, 1 person plus trg.		22,600
Other costs		2,000
TOTAL		3,483,897

MNR '90 Budget = 142,214,185 NAHMS as % MNR Budget = 2.4
DGG '90 Budget = 13,853,673 NAHMS as % DGG Budget = 25.1
[a] Approximate exchange rate (as of Sept. 1990) is L6 = $1 US.

TABLE 5.4 ESTIMATED COSTS OF INFORMATION SYSTEM ALTERNATIVES FOR HONDURAS

Illustrative Budget Line Items	Alt. 1-NAHMS	Alt. 2	Alt. 3
		Lempira	
Salaries	981,600	118,600	118,600
Training	125,645	125,715	95,638
Sample frame development	25,232	0	25,369
Questionnaire development	16,000	12,000	66,000
Data Collection			
Transportation	7,380	14,502	3,690
Per diem	10,569	16,560	9,600
Materials, equip.	481,000	506,112	15,000
Laboratory diagnosis	3,122,800	131,200	3,122,800
Data analysis	25,200	25,200	25,200
Other	3,000	4,000	2,000
TOTAL	4,798,426	953,889	3,481,897

Source: Individual cost estimates from MNR/DGG, 1990.

also provide a framework to which future random sampling could easily be appended. This kind of information is also the most useful to farmers and to extension workers, and could lead to increased support for more monitoring in the future.

Practically speaking, the implementation of Alternative 2 would require support from outside the GOH; the most likely agency would be the IDB, since they presently support PROFOGASA. The PROFOGASA program will be up for renewal shortly and it would be an opportune moment to build information system activities into the extension at that time. High and medium level DGG staff need to be included in determining general objectives of such a system and in working out design and implementation details. Assistance from the private sector would probably be required, at least initially, for data analysis to ensure maximum utilization of the information system. This alternative also funds training for DGG laboratory technicians and for procuring limited supplies for the anticipated increased use of laboratory services by this information system.

The long-term expectation of implementing an improved information system is to increase levels of livestock production in Honduras. If milk production were to increase 1% due to the improved information system, this would represent an increase of L3.16 mil. for the domestic dairy industry.[22] Even if production increased only 0.5%, this would still result in L1.58 mil. generated due to higher production levels. For the beef industry, a 0.5% increase in production would yield L115,000 in increased exports and L2.2 mil. in increased domestic production (at 1989 estimated prices). Thus, it would appear that the GOH could reasonably undertake Alternative 2 even if milk and beef production increase by 0.5% since the returns still exceed the cost of Alternative 2.

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[22] This was calculated at the 1989 GOH price level for fluid milk on the formal market.

2. Roles of International Agencies

The initial support for the idea of developing an animal health information system in Honduras came from OIRSA. After determining needs and abilities for an information system such as NAHMS in Honduras, one must ascertain what OIRSA's role might be. As an international organization, it is interested in the ability of the Central American region to gather and exchange information on animal and plant health problems. Having a NAHMS-like system would provide OIRSA (and IICA, which has objectives similar to OIRSA's) with better quality information. The OIRSA representative to Honduras does not see his agency's function as one of active participation in carrying out NAHMS. OIRSA's role would be more as a coordinator and advisor to the DGG during planning and implementation of a new system.

IICA is already actively involved in setting up NAHMS in Costa Rica but apparently does not have plans to do so in Honduras. It is currently working with the DGG on the PROFOGASA project and on developing SISVESA. It is ironic that the agency is supporting NAHMS in Costa Rica in hopes of developing a region-wide compatible information system, yet the same agency is assisting in developing a very narrowly focused system in Honduras.

The IDB is the most logical agency to assist in the development of an improved information system for Honduras' livestock industry. The agency has long-term programs in the sector and these programs would benefit from improved information. At this point, the IDB is interested in obtaining better information and will be working, through PROFOGASA's next phase, on extension and communication activities in the DGG.

Neither the World Bank nor USAID are likely agencies from which to seek support since livestock, per se, is not a high priority sector in their Latin American missions.

E. General Summary and Conclusions on Transferring Information Systems to LICs

1. Identifying Needs and Existing Systems

Before introducing new or improved information systems, it is necessary to assess the country's information needs and systems which currently are serving those needs. Information needs will vary according to the users, and systems developed to provide the desired information should reflect this. It is important to distinguish these differences and determine information requirements and priorities. In the example of developing an information system for animal health, it would be advisable to identify which species of livestock are economically most important in order to tailor the system to those species. There can be problems in choosing species even on the basis of "economic importance." For whom and at what level is a particular species considered important? In many LICs, poultry is one of the most common livestock found, but most is owned by small or landless farmers, managed at a subsistence level and not considered economically important.

IICA conducted a survey of Latin American countries to determine each country's priorities regarding the species and diseases considered most important. Honduras responded that dairy cattle were the most important livestock species and internal parasites were considered the most significant health problem (IICA, 1989). However, Honduras has more dual purpose cattle than specialized beef or dairy operations. They also have no government programs for internal parasite control. This illustrates the difficulty of identifying priorities as well as the problem with developing programs in accordance with identified areas of interest.

Frequently the temptation arises to adopt a new technology rather than improving and building on the existing one. In the case of information systems, this can lead to over-burdening institutions with multiple and redundant systems that can hinder the maintenance and flow of information. Therefore, existing systems and institutions should be carefully reviewed for their potential to be used as a basis on which to build new systems. Working with existing, though

weak, institutions in many cases is preferable to starting up an entirely new organization. Information coming from existing systems must be assessed in terms of its quality and biases. For example, a reportable diseases information system may produce biased information from under-reporting disease frequency due to disincentives farmers face in reporting these diseases.

Another key issue is deciding what quality of information and what timing requirements are acceptable. Choices and trade-offs between quality and timing are inevitable. In some cases, it may be more important to receive poorer quality or less information quickly than to receive higher quality information too late.

2. Institutional Assessment

a. Commitment

An assessment of institutional strengths and weaknesses is key to determining how well new ideas can be transferred. A particular difficulty with respect to adoption of information systems is poor understanding of the value of information. Compared to technologies such as improved animal breeds with improved genetic potential, it is more difficult to demonstrate potential benefits from having functional information systems.

Information systems require long-term institutional commitment and consistent financial and human resource support. Benefits from the information may not be immediately evident, yet start-up of the system will require significant resources based on the expected gains in the future. Incentives, whether financial, career movement or other forms, play a critical role in the success or failure of technology transfer. Disincentives are equally important to recognize and eliminate if possible.

b. Staff Capabilities

Capabilities in areas of survey methods (sampling methodology, questionnaire development) are important for most information systems. Technical ministries may not be competent in these areas and may have to consider hiring new staff (unlikely), using Bureau of Census staff or hiring from the private sector. Many times, data collection is less of a problem than the subsequent analysis and identification of policy options resulting from the information collected. This problem is harder to resolve and is frequently the weak link in the success of information systems. In the short-term, such expertise can be hired from outside the agency, but the long-term solution is to provide training to agency personnel to build up analytical skills.

c. Institutional Arrangements

Relationships between institutions is another factor to consider. Objectives of information systems frequently include the dispersion of information to many institutions so that some action is taken. If linkages do not currently exist, the presence of an information system will not necessarily remedy the gap. If the linkages are important for the full utilization of the information system, institutional changes beyond the information system, will be necessary.

Forming specific committees for setting policy objectives and for daily oversight is often useful to ensure an organized approach to adapting an information system to perceived needs. Members of the committees should include qualified staff from organizations that will be responsible for implementing the system or have some interest in its results. These committees would be responsible for hammering out details relating to specific objectives of modifications and for providing technical advise when required.

3. Uses and Users of Information

Uses and users of generated information should be identified to ensure that the system meets their needs. However, in many cases, it may be necessary, at least initially, to limit the users to allow the system to develop its abilities gradually. Data collection and analysis can quickly grow out of hand as user demands increase in quantity and diversity. The term pilot project may thus mean limiting not only geographic area but scope and depth of the information system. If the generated information is of high quality, some users may be willing to financially support part of the system. A potential problem, however, is overburdening the system with diverse demands from too many users.

4. Infrastructure

Infrastructure is another critical component to consider in developing information systems. Data collection requires modes of transport be present so that enumerators can conduct interviews. Laboratories may play a key role in disease identification or diagnosis verification, and require reliable delivery of supplies as well as transportation and communication systems to receive samples and transmit laboratory results.

5. Participation

Most animal health information systems require data from the farmer level. Thus, farmer participation is critical to the success of data collection. Farmers must perceive some benefit from their participation. It is highly unlikely that a government could offer sufficiently high monetary incentives to obtain farmer participation, thus benefits could be in the form of improved production or productivity of their farm. This means extension has an important role in providing and maintaining farmers' incentives to participate.

Quality of data also depends on enumerators and the benefits they receive from participating, and some monetary bonus may be sufficient. As mentioned earlier, disincentives are as important to successful implementation as are positive incentives. Transportation and per diem can often limit travel which in turn affects data quality. Frequent feedback sessions and follow-up training sessions have been demonstrated to be effective in keeping field worker's morale high and provides additional incentive to maintain survey efforts (Kaneene and Hurd, 1988).

F. Summary and Conclusions

The transfer of a technology such as an information system from a developed country to an LIC is a complex and often lengthy process. This research has suggested an approach to outline some aspects for consideration when such a transfer is undertaken. As a first step, the information system that was proposed for transfer was evaluated to determine if it achieved its objectives satisfactorily. Weaknesses were identified and some suggestions proposed to correct them.

Following the assessment of the system, the needs, capacity and capability of the recipient country were assessed. The key question was whether information systems that were already present were functioning sufficiently to fulfill the information needs of the agencies involved. Gaps between perceived information needs and current systems were identified. The proposed system was then evaluated to determine whether it could meet the stated needs, and suggestions put forward identifying which components would be most useful and how to incorporate these into the existing system.

In general, it appears that information systems such as NAHMS require a high degree of institutional capability and capacity. Institutions must commit significant amounts of time and human and financial resources to mounting such a system. Serious consideration must be given to the real need and future use of information resulting from relatively sophisticated systems.

Many LICs would probably not have the ability to use the information resulting from this system effectively to make significant changes in their allocation of resources. This is especially true of an animal health information system in LICs which devote very few resources to their livestock sector, despite the relative importance of livestock to the rural population.

Honduras appears to have sufficient technical capability and infrastructural support to consider undertaking an information system such as Alternative 2 described previously. However, the final decision of whether to design and implement an information system cannot be made by donors or outside agencies alone. The need must be perceived and acted upon by DGG and other GOH officials. They must articulate their needs and priorities for developing information, and, working with donor agencies, come up with the best approach for improving the existing system. At this point however, it is doubtful that the DGG will initiate actions on an information system without encouragement from other agencies or donors. Thus, if an information system is to be considered seriously, a coordinator and communicator will be needed to bring all interested parties together in order to demonstrate to all participants that there is sufficient interest in this area. If Michigan State University is truly interested in improving the information system in Honduras, it will have to take the initiative to contact interested GOH and IDB officials in Honduras, and establish the first coordinating links in this effort.

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