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MALI LIVESTOCK SECTOR PROJECT

Project Number 683-0218

A Mid-Term Evaluation Report

prepared by the
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REPUBLIC OF MALI -- ADMINISTRATIVE REGIONS

MALI LIVESTOCK SECTOR PROJECT

Mid-Term Evaluation Report

TABLE OF CONTENTS

Preface	viii
Executive Summary	1
Component Summaries	5
Acronyms Used In This Report	16
I. Project Goal and Purpose	21
II. Introduction to the Project Components	22
III. Evaluation of the Project Components	25
A. Project Management/Administrative Support (JMC, MDST, and DPMC)	26
1. Objectives of the Component	26
2. Accomplishments to Date	30
3. Analysis and Conclusions	38
4. Summary	48
4. Recommendations for the Current Project	51
5. Recommendations for Future Project Support	52
B. Cattle Feeding Credit Program (ECIBEV)	54
1. Objectives of the Component	54
2. Accomplishments to Date	56
3. Analysis and Conclusions	61
4. Recommendations for the Current Project	92
5. Recommendations for Future Project Support	94
C. Forage and Livestock Production Research (INRZFH)	96
1. Objectives of the Component	96

2. Accomplishments to Date 99

3. Analysis and Conclusions 105

4. Recommendations for the Current Project 115

5. Recommendations for Future Project Support 118

D. Vaccine Production and Improvement of Diagnostic Skills (CVL) 120

1. Objectives of the Component 120

2. Accomplishments to Date 120

3. Analysis and Conclusions 128

4. Recommendations for the Current Project 138

5. Recommendations for Future Project Support 142

E. Improvement of Veterinary Services Delivery System (DNE) 144

1. Objectives of the Component 144

2. Accomplishments to Date 144

3. Analysis and Conclusions 147

4. Summary 164

4. Recommendations for the Current Project 165

5. Recommendations for Future Project Support 167

IV. Project Validity, Cross-Cutting Issues, Unplanned Effects, Lessons Learned and Recommendations of the Evaluation Team 175

A. Design, Strategy and Assumptions of the Project 175

B. Implementation Arrangements (MDST, JMC, and DPMC) 177

B. Cross-Cutting Issues Affecting Project Success 178

1. Sustainability 178

2. Training 180

3. Women and Development 184

C. Unforeseen Effects and Lessons Learned 186

1. Environmental Effects 186

2. Social and Economic Effects 186

3. Lessons Learned 188

D. Recommendations 189

1. For the Current Project 189

2. For Future Project Support 192

Appendix A: Beneficiaries Analysis Methodology 196

Appendix B: A Comparison of the Projected and Actual Project Implementation Dates 206

Appendix C: List of Persons Contacted 225

Appendix D: Report Bibliography 228

1. Literature Cited 228

2. Other References Consulted 229

PREFACE

American members of the mid-term evaluation team for the Mali Livestock Sector Project assembled in Washington, D.C. from 4 August to 8 August 1986 for an initial team planning meeting. Actual fieldwork was carried out in Mali from 11 August to 10 October 1986. Members of the evaluation team were as follows:

Sarah Brott-Smith, Anthropologist;

Leland E. Carmichael, Research Virologist;

Cheick Drame, Sociologist, Office Malien du Bétail et de la Viande;

Gurbachan S. Dhillon, Agronomist;

John H. Eriksen, Agricultural Economist;

Frank J. Moore, Development Consultant and Evaluation Team Leader; and

Thomas R. Whitney, Institutional Analyst.

The American consultants for the mid-term evaluation team were supplied under an Indefinite Quantity Contract work order by the Institute for Development Anthropology (IDA) of Binghamton, New York.

The findings and recommendations presented in this mid-term evaluation report result from the team's review of the available literature prior to their arrival in Mali and during their stay, from interviews and meetings with a large number of host country and donor agency officials (listed in Appendix C), and from discussions in the course of extensive travel to project sites in the First and Second Regions of Mali. Members of the team, individually or in sub-groups, traveled outside of Bamako for one to three days in order to observe:

- The cattle feeding and credit program (ECIBEV) in Banamba, Boron, and Segou;

- The forage research program (INRZFH) in Banamba; and

- The veterinary services delivery system (DNE) in Koulikoro, Dola, Nara, Nioro, and Kayes.

The team sociologists participated these trips and worked on problems related to the beneficiary analysis and social impact of the project activities.

The progress of the evaluation was discussed in bi-monthly work sessions of the evaluation team with the principals of the project:

officials of the Ministry of Natural Resources and Livestock, USAID/Bamako, and representatives of the Management Development Support Team. Findings were reviewed in separate meetings of the evaluation team with the Directorates of the Ministry directly charged with responsibility for specific activities under the project. Final oral reports of the team members were presented to debriefing sessions chaired by His Excellency The Minister of Natural Resources and Livestock, Dr. El Hadj Oumar Tall. A draft final report, as provided for under the work order, was submitted to USAID/Bamako on 10 October 1986.

The definitive mid-term evaluation report, edited by IDA staff on the basis of queries to consultants and comments from AID/Bamako and the Malian agencies involved in the project, was completed in Binghamton, New York in February 1986.

In presenting this mid-term evaluation report, the evaluation team members wish to express their sincere appreciation for the splendid cooperation they received from public officials and private persons in Mali. Without the insights these people generously shared with team members, it would not have been possible to measure progress towards the solution of problems in the livestock sector of Mali and suggest directions for future joint Ministry and USAID activities.

The evaluation team leaves Mali with hopeful and positive impressions and the conviction that the development of the livestock sector is gaining momentum. In the short time at their disposal, errors of fact or of interpretation may well have entered parts of this report. These reflect the evaluator's own shortcomings and they are in no way the responsibility of the many people who gave generously of their time in discussing livestock sector problems and activities.

EXECUTIVE SUMMARY

1. Viability of Livestock Sector Project Investment

The Mali Livestock Sector Project at mid-term is in good shape, with four of the five project activities where they should be on track of the four-phase 20-year program envisaged in the Project Paper. The evaluation team finds that the project investment is making a sound and continuing contribution to Malian development in terms of benefits to the national economy as well as to individual herd owners. With the exception of the on-farm cattle feeding credit program, which the Mission has already decided to terminate, all project components (management development, forage and livestock production research, veterinary research, and veterinary extension) are achieving their objectives. The project should continue, with certain necessary mid-course corrections as outlined below, and plans for a follow-on project should be made. As the largest foreign exchange earner, and an industry in which Mali has a comparative advantage, further investments in the livestock sector are justified.

2. Project Performance -- Accomplishments and Shortcomings

a. On-farm Cattle Feeding Credit Fund

The evaluation team fully supports the Mission Project Committee's decision to terminate further credit and operating funds for this component. Serious flaws in the management of this activity have resulted in the decapitalization of the credit fund and a failure to progress toward the objective of transfer of functions. The evaluators are aware of similar activities in the private sector that are successful and supported by credits from the National Bank for Agricultural Development, and they also find the cattle-feeding program itself to be sound -- at least in the narrow technical sense. Nevertheless, they conclude that neither the management performance nor the prospects for self-sustainability of this component warrant continued support. They further believe that the retrenchment of project activities with termination of this component will have a salutary impact on the progress of the rest of the work.

b. Management Development Support Team and Joint Management Committee

Project implementation efficiency and effectiveness have benefited immensely from the accounting, financial analysis, logistics, and work planning/control systems installed by the Management Development Support Team (MDST). The Malian Ministry of Natural Resources and Livestock (MRNE) now requests that similar systems be expanded to cover the entire range of Ministry operations. The high-level Joint Management Committee (JMC) is also a positive innovation in donor/recipient coordination. Shortcomings that should be addressed in the second half of the project include greater emphasis on the transfer of management skills, implementation of the management information system (MIS), reduction in management improvement costs, specification of the role of MDST as an

independent source of professional advice to the project, improved communication between the Mission and the Ministry on policy issues through strengthening the role of the JMC, and concomitant reduced preoccupation of the JMC with project details.

c. Forage and Livestock Production Research

Much research of excellent quality and quantity has been carried out in this component by the ILCA contractor in collaboration with the Malian National Research Institute (INRZFM). The farming systems research approach has identified the technical and economic problems in developing legume-based forage production packages for traction and feeding animals. Some promising legumes have been identified, and a sound basis has been established for understanding how integrated crop and livestock farming systems can be advanced. With the termination of project support for the on-farm cattle feeding program in the semi-arid zone, the research unit is expected to focus increasingly on the problems and needs of mixed farming and commercialized dairy operations in the sub-humid zone. Shortcomings include the normal array of difficult administrative arrangements, insufficient networking with other programs engaged in related research, non-supply of a Malian sociologist/anthropologist, and delay in supply of technical assistance by ILCA.

d. Veterinary Laboratory: Diagnostics and Research

The construction and equipment of expanded diagnostic and research facilities at the Central Veterinary Laboratory has gone well, with completion now expected in late 1987. Skills in the quality control of vaccines, research techniques, diagnosis, and epidemiology have been transferred. Shortcomings include the need to forge closer links between the diagnostic service and the veterinary extension field agents, to design an improved cash flow for medicine purchases, and to improve facility utilization.

e. Veterinary Extension Service

The vaccination of herds for rinderpest in the First and Second Regions has increased from an average of less than 30 percent in the three years before the project to an average in excess of 45 percent during the two project years; vaccinations reached as high as 55 percent in the First Region in 1985. This increase is the result of the proper equipping of the system with a cold chain, vaccination parks, and appropriate equipment and supplies under the project, and it suggests that the project goal of a 70 percent vaccination of herds is attainable. Shortcomings in performance to date include lack of a plan to reduce costs and further heighten effectiveness, absence of programs better to utilize the existing staffs' down time, insufficient attention to practical means of privatization of veterinary services without endangering national herd health during the transition, a need to perfect the flow of medicines to the field and users fees back to headquarters, requirements to improve the provision of diagnostic/curative services to owners by field agents, and

the feedback of scientific samples of diseases to the regional and veterinary laboratory research facilities.

3. Project Administration

Performance in the project on construction, commodities supply, training, and general and financial management have been fully adequate, and in some cases outstanding, particularly by the MDST which was staffed by both a private contractor (Chemonics) and the USDA. Shortcomings occurred in the procurement of USDA technical assistance with regard to timeliness and, occasionally, selection of personnel. The evaluation team feels that USDA does not have pre-eminent capability in fielding appropriate teams, and that open competition would yield more qualified personnel. USAID project management was marred by occasional problems in Mission/Ministry communications, in defining the roles and functions of short- and long-term technical assistance groups, and in monitoring the cattle feeding credit component. Ministry performance has been generally good, with the exception of the cattle feeding division.

4. Recommendations for Mid-Course Corrections

The evaluation team recommends that participation in the on-farm cattle feeding program by USAID should be ended, and that uncommitted credit funds should be reallocated among existing and new activities within the Livestock Sector Project. This reallocation should be conducted as part of a joint planning exercise by USAID and MRME through the JMC. The existing confusion over the role of the JMC as the ultimate decision-making authority of the project should be resolved by giving the minutes and recommendations of the JMC meetings the legal status of a PIL. As the procurement phase of the project ends, MDST should take on the enhanced role of independent advisory body and executive secretariat to the JMC, and it should also focus specifically on the management problems of the veterinary extension service (DNE). The evaluators recommend that in future solicitations of specialized expertise, the DPMC should be regarded as only one among many possible contracting alternatives.

The farming systems research of the forage and livestock production unit should be separated from its link with the on-farm cattle feeding program in the semi-arid zone. Research should be expanded or shifted to the sub-humid zone to the south, and it should focus on contributing to the commercialization of milk and meat production in the Bamako area and in preparations for an increase in the population of cattle in this zone as herders continue to migrate southward out of the sudan and sahel. Research should continue along established lines and include the addition of a sociological/anthropological component. Problems of research communication and coordination among disparate programs should be dealt with by organization of a high-level national agricultural research council.

Continued support should be given to the CVL to sustain the high level of investment already made and to prepare the way for the ultimate privatization of the Malian veterinary service. Recommendations range

from provision of a guaranteed water supply to the lab facilities, to expanded vaccine production and practical research programs in treatment, and to enhanced coordination with the DNE. Improvement of the veterinary services delivery system will require substantial technical assistance in management, either supplied directly by the MDST or by hiring a long-term specialist. Studies and planning are needed in the effort to move the system gradually in the direction of becoming financially self-sufficient. In addition to charging higher fees for its services, the DNE must expand the range of services it offers through a program of continued training of field agents in diagnostics and treatment. The project should support in-service training, the reactivation of the training center at Sotuba, use of the CVL diagnostic unit's new facilities and expertise in training, and an expanded program of short-term technical assistance in training.

4. Recommendations for Future Project Support

Any future use of credit funding should be channeled exclusively through an established and mutually acceptable banking institution in Mali and should be operated on criteria of strict and conservative banking practices.

The evaluators find that the JMC has the potential of becoming an effective management tool. With the proviso that both parties adhere to the principle of joint management and shared decision-making, it is recommended that the concept of a joint management committee should be continued in any follow-on phase to the current project. In order to obtain economies of scale, and to share the costs of project administration that now are excessively high, it is recommended that the MDST be instituted on a multi-project or mission-wide basis. It is also recommended that AID not use a PASA with USDA in any follow-on project.

USAID should continue its technical assistance program with the forage and livestock production research unit at least at the present level throughout the life of a follow-on livestock sector project. Research should be expanded in certain directions, for example to include small ruminants.

Support for research at the CVL should be continued in order to develop new vaccines and diagnostic and treatment methods. Arrangements must be made to alleviate the cash flow problems of the CVL, and the training programs offered to the DNE veterinary agents need to be continually expanded and upgraded. Continued funding should be maintained for the CVL and DNE over at least another decade or more, but such funding should be tied to the development of self-sustaining policies in anticipation of the time when AID project support for livestock wanes or is terminated.

COMPONENT SUMMARIES

1. Project Management and Management Skills Development (JMC, MDST, DPMC)

Officials at both the United States Agency for International Development (USAID) and the Malian Ministry of Natural Resources and Livestock (MRNE) are pleased at the speed with which the project has been implemented thus far. Within two years of the start of the project, most commodities and equipment have been purchased and are presently in place. Construction originally planned has been expanded and is, with the exception of the research laboratories, nearing completion. In addition, the administrative and financial support provided by the Management Development Support Team (MDST) has been very successful in lessening the normal burden of complying with USAID regulations and reporting procedures concerning procurement and financial management.

The Joint Management Committee (JMC) provides a forum for high-level policy planning and decision-making and also helps to coordinate project activities. Too often, however, JMC meetings become involved in details of project administration that could be better attended to at lower administrative levels. Perhaps as a result of this misdirected focus on details, the JMC has not been as effective as possible in monitoring the progress of the various agencies in achieving their objectives. As a result of poor communication, no firm understanding has yet been established between USAID and the MRNE concerning the role of the JMC as the ultimate decision-making body for the project. Resolution of the exact role to be played by the JMC is critical to its continued viability in this project and to its replicability to other USAID projects in the future.

The MDST plays an important role as a liaison among the various organizations in the project and as a conduit for the views of AID. In addition to the role of liaison, the MDST should now begin to function more as an independent advisory group for MRNE management.

The major emphasis during the first half of the project, as a logical and very necessary first step, has been on implementation. Due to this emphasis and to a shortage of personnel and resources, however, management development within the MRNE has been relatively neglected thus far. The MDST has developed systems for financial and some administrative management in the four participating Malian agencies, for which Malian counterparts have been trained. To date, however, little has been accomplished in improving the management systems and practices in the MRNE. The systems initiated have been limited to project-specific activities and do not cover all the activities of the agencies with respect to either finance or administration. In addition, with the exception of the work plans, the introduced management systems are specific to American accounting and procurement controls and procedures, and they differ from those of the Government of the Republic of Mali (GRM), which are based on the French system.

As the procurement and construction phases near completion, a reorientation in the MDST program is planned to concentrate on the development and transfer of improved management systems to the MRNE. The keystone of this reorientation in strategy is the development of a management information system that will concentrate initially on financial management and improvement of information flowing to Ministry decision-makers.

The role played by the United States Department of Agriculture (USDA), as the prime contractor under a Participating Agency Support Agreement (PASA), has been disappointing. As yet, USDA has supplied only one direct-hire technician from within its own organization. There have been long delays in supplying the rest of the technical assistance team, both short and long-term. The Development Project Management Center (DPMC) has been useful in its role of facilitator in project implementation, but has been less successful than had been hoped. It would be overly optimistic to expect any long-lasting impact from its management development seminars.

The MDST has been particularly successful in permitting a rapid implementation of the project through its role in direct management of procurement, contracts, finances, and vehicle maintenance. However, the cost of this unit (one-third to one-quarter of the project budget), although comparable to similar administrative units in other USAID-funded projects, is very high for administering a single project. In order to bring about savings of money and TA time in any follow-on project, the evaluators recommend that the overlapping aspects of management of several USAID projects be integrated under this unit.

2. Cattle Feeding Credit Program (ECIBEV)

The cattle feeding credit program, implemented by the Agency for Credit and Investment in Livestock and Meat (ECIBEV) under this project, is a carryover activity from the Mali I and II Livestock Projects. Since 1975, the program has conducted eleven annual cattle feeding campaigns. The objectives of these campaigns are to enable farmers to purchase thin adult male cattle during the annual dry season (January to April), when prices are low, and to feed and put these cattle on the market at a time when normal supply of cattle is much reduced and prices are therefore high. The farmers, hence, expect to derive their profits in feeding both from the actual weight gain in the cattle fed and from the seasonal fluctuation in cattle prices.

The compensatory gains of underweight but otherwise mature cattle depends heavily on the feeding of cottonseed residue supplements from the HUICOMA cotton gin and oil extraction plant. Few substitute concentrates are available in Mali and, therefore, the current program is vulnerable to increases in the price of the cottonseed supplement, which may sharply reduce farmer profits. Otherwise, from the perspective of animal feeding and health, the program is technically sound.

USAID and the GRM set forth three objectives in the Project Grant Agreement in carrying over the cattle feeding credit program to the current project:

- To transfer ECIBEV field support functions to three Rural Development Operations (RDOs) within the first three years of project implementation;

- To establish the financial self-sufficiency of the ECIBEV program, principally through improved credit fund operations; and

- To improve ECIBEV's capacity to provide credit and livestock marketing support to its client farmers.

In fact, ECIBEV has failed to transfer any field support functions to the RDOs within its zones of intervention - i.e., Banamba and Segou. The participation in cattle feeding operations by RDOs - i.e., in Opération Haute Vallée (OHV) and Opération Riz Ségou (ORS) - is limited to several small expansion zones not envisaged in the original project design. These two organizations -- at the end of their third cattle feeding campaign under this project -- now have programs which feed approximately 20 percent of all the cattle in the ECIBEV program. All these cattle are additions to, rather than replacements for, animals fed directly by ECIBEV.

The ECIBEV credit fund has shown marked improvements in financial reporting following the insistence of the MDST. However, in eleven years of operation, the credit program has succeeded in decapitalizing the USAID-supplied fund by 42 percent, and the effect of this decapitalization is increasing steadily with program expansion. The interest rate charged on loans is far below the actual opportunity cost of capital in the Malian economy, and the existing structure of loan administration further penalizes farmers who pay their loans back on time while encouraging late or non-repayment of loans. Finally, the administrative overhead fee on cattle feeding loans falls significantly short of the actual total of variable and fixed costs incurred by ECIBEV in operating its program. This has negated any real possibility that the organization could be financially self-reliant by the end of the third project year.

With respect to financial viability at the level of the farmer, project researchers calculate that net financial returns to participating farmers are highly variable from year to year and are increasingly suspect given sharply rising feed prices. At least 27.6 percent of participants in the 1984/1985 campaign -- which overall was the most successful to date -- did not make sufficient returns on the sale of their animals to cover their outstanding loans to the program. For the 1983/1984 campaign, this figure was 38.2 percent. Moreover, the present program excludes women from participation, except as unpaid laborers who may or may not derive some indirect benefits from the cattle feeding.

In summary, the ECIBEV program has consistently failed to achieve its objectives.

3. Forage Production Research (INRZFH)

Since its inception in 1984, the forage production research unit has operated within the structure of INRZFH. By financing ILCA, USAID provided a mechanism whereby ILCA is supplying technical assistance to the institute.

Farming systems research by the institute shows that the smallholders in the study area practice a subsistence-based cropping system in which millet, sown alone or in association with cowpeas, is the principal crop. Oxen are used for the preparation of seed beds and donkeys for transport, while small ruminants and cattle provide meat and milk. Chemical fertilizers are not utilized, but manure is applied to fields near villages. Further afield, a common rotation is five years of continuous millet cropping followed by ten years of fallow.

Since all weeding is done by hand, there is an acute labor shortage in the early crop growth period. Other constraints to forage production are low and uncertain rainfall, limiting soil fertility, the higher priority for millet as a subsistence crop, and heavy pre- and post-harvest losses to pests and to spoilage.

Past and present studies have led the research unit to conclude that more livestock deaths are caused by lack of forage in the dry season than by diseases. To develop a forage technology to meet this need, the research unit is focusing on legumes, which are soil-building crops that do not need nitrogenous fertilizer for normal growth. Two annual legumes --Lablab purpureum (dolichos lablab) and Vigna radiata (green pea) have shown promise as possible substitutes for Vigna sinensis (cowpea). Crotolaria juncea (sun hemp) also appears good as a green manure crop. Among perennial and perennating legumes, Clitoria ternatea has given good results with 400 mm annual rainfall and has a possibility of being included in the traditional millet - fallow rotation.

However, neither Stylosanthes, Centrosema, nor Macroptilium have done well under low rainfall conditions. Among legume tree crops, Leucaena leucocephala and Gliricidia sepium are under consideration for planting in 1987.

Trials of phosphatic fertilizers have shown low response to applied phosphorus even though the soils of the area are presumed to be low in this nutrient.

Other studies performed by the research unit concern feeding trials with cotton seed residues, methods of cowpea and dolichos hay preservation, cattle breed differences in weight gains, and the economics of on-farm feeding. The unit has also started a study on small ruminants as of late 1985.

After a step-by-step review of progress, the evaluators have concluded that the research has generally done well and produced a number of useful studies in the last two years. While USAID provided timely financial assistance, INRZFH provided nine researchers of whom two are about to leave for graduate training in the USA and another two are studying in France. ILCA provided two long-term experts, including the FSR agronomist who serves as the team leader, as well as the agricultural economist who left Mali last July after a two-year stay.

The Project Grant Agreement -- and the contracts between USAID, ILCA, and ILCA/INRZFH -- clearly state that the fundamental purpose of the agreements is the "integration of crop and livestock production systems of small farmers in Mali. The cooperative agreements program will be implemented in the sub-humid zone of Mali, characterized by an approximate annual rainfall of 800 mm or more where the "Embouche Paysanne" activity is operating." This strategy of coordinating with ECIBEV was designed to allow the ILCA researchers the opportunity to take advantage of a particularly favorable research situation.

Since the on-farm cattle feeding activities of ECIBEV were centered in the Bananba and Segou zones, that area was selected for the research study. And herein lies a problem: while the 50-year rainfall average for the zone is indeed essentially sub-humid - i.e., 745 mm - the mean annual rainfall at Bananba has dropped to 558 mm for the period 1975 - 1984. Due to this change in the project environment, the basic requirement of developing a forage production technology for the sub-humid zone has not been met. ECIBEV's on-farm cattle feeding zone is not sub-humid, at least not at present. The zone is in a semi-arid area of Mali, and the developing forage technology is more suited to semi-arid than sub-humid zones.

The evaluators recommend strongly that USAID and the MRNE make a decision to relocate the study area to a sub-humid area. ILCA has been developing and extending semi-arid zone technology at Niono since 1976 and another USAID-funded agronomic research project is also active in the Bananba area, while no such work is available for sub-humid zones in Mali. This step will help in the development of milk production for Bamako, will advance animal traction for sedentary small farmers, and will strengthen small ruminant production.

In the interests of better coordination, to avoid overlap, and to promote a coherent research program, GRM should establish a national agricultural research organization, with adequate funding and staff support, which would be entrusted with the task of defining a national science policy, assigning priorities, and distributing research areas among the three national agricultural research organizations, viz., INRZFH, CVL, and IER.

At present, there is some overlapping of research programs - i.e., in small ruminants. The three organizations should inventory all valuable equipment, train and organize a common care and maintenance service, and provide a system of access to qualified scientists.

MRNE should improve communication and coordination among its own agencies.

INRZFH should nominate alternate team members to replace ones leaving for studies in France in addition to adding an anthropologist/sociologist to serve as a permanent member.

ILCA should provide the already agreed upon 35 person-months of technical assistance by nominating three specialists in the areas of agricultural economics, soil fertility, and weed science.

The research unit should continue its important focus on legume-based forage production and should collaborate with other organizations in the identification of native West Africa legumes tolerant to local plant diseases and to low phosphorus soils. The unit should propose new crop rotations with introduced legumes.

Phosphate fertilizer trials should be reorganized as to timing and placement. Tilemsi rock phosphate should also be included in various trials.

The research unit should improve coordination with other research organizations and network with other scientists and better farmers.

The research unit should include more soil-related research and should organize a small soil testing capability to carry out simple physical and chemical tests.

Economic research should continue, using OMBEVI's study on small ruminants as a basic document. New work should be proposed to fill gaps in this study.

AID should provide funds for training the research unit in the use of an IBM/PC for data processing, statistical analysis, and word processing. A class in English training should also be organized at the level of two to three hours per week. In the future, new candidates for training in the U.S. should be selected from those who have studied the language for two to three years and achieved a good competency.

Research should continue at least at the present level in a follow-on livestock sector project.

4. Vaccine Production and Improvement of Diagnostic Skills (CVL)

The current Livestock Sector Project-supported program for improvement in the quality of vaccines and enhancement of diagnostic capabilities is a further extension of the original USAID/GRM "Rinderpest Vaccine Project," funded in 1962. USAID support for CVL activities has thus spanned nearly one-quarter of a century. The support has included construction, diversification, and expansion of CVL activities. The "original CVL" (Laboratoire du Vaccin) was a small laboratory adjacent to

the DNE, which now is the MDST office. Though small, it was effective in meeting rinderpest vaccine production requirements, which have not much changed today. The present, greatly expanded CVL complex was inaugurated in 1977 and shortly thereafter was separated administratively from the DNE. In addition to rinderpest vaccine, the new Production Unit was designed to produce a variety of viral and bacterial vaccines. Also provided were offices and laboratories for limited diagnostic and research activities, cages for small animals for vaccine testing and a building for equipment and supply storage, maintenance, and limited repairs.

The current project continued the expansion of CVL facilities as well as provided for improved vaccine quality control by funding the construction of a new Diagnostic and Research Unit (DR Unit) and a separate building for rabies work. Old buildings were refurbished as an experimental farm for housing large and small animals, and this facility has been enclosed by a fence. The current project also provides for infrastructural support and personnel training for monitoring vaccine quality control and conducting research in entomology as well as on several helminthic, protozoan, bacterial, and viral diseases of livestock.

The USAID project-supported activities involve construction, renovations, technical training, and hire of USDA employees or contract technical advisors. Comments have been made above on the role of the USDA as the prime contractor under its PASA (see section 1. Project Management Skills Development). Overall, the USDA effort has been only partially successful, and there should be improvement in the mechanism for screening and selection of technical advisors. The evaluators conclude that the objectives of improving the assurance of vaccine quality and the capacity of the CVL to conduct research in several areas of infectious and parasitic diseases of livestock have been achieved. These efforts are expected to result in the improvement of overall livestock health through provision of better immunity against rinderpest, pleuropneumonia, and other major infectious diseases of Malian livestock. New developments require research and development, and in this respect the project has greatly aided the CVL by providing the training, facilities, and equipment to accomplish these aims. The capacity exists, or will shortly, to develop and produce additional vaccines for diseases of cattle, small ruminants, and poultry.

It is expected that within one year there will be marked improvement in the capacity to diagnose virtually any disease of Malian livestock. Since rational therapy is based on accurate diagnoses, methods of treatment and control will as a result be placed on a firmer basis. The project, thus, clearly benefits livestock producers and the national economy in important ways.

The evaluators conclude that the project objectives thus far have been substantially met and that the CVL has been strengthened both physically and in its ability to carry out its intended functions: vaccine production, diagnosis, and livestock disease research. In addition, the CVL administration has implemented management changes that should improve its ability to cope with its large inventories of equipment

and the supply flux, as well as to plan more effectively for its future needs. It also has implemented organizational changes so as to administratively and physically separate vaccine production from quality control -- one of the important project-funded objectives. An independent study commissioned by the CVL revealed that unit production costs for vaccines are at least three times the amount received for each dose. Thus, production costs are essentially subsidized by the GRM. Project support was only for improving the capability of controlling vaccine quality. The evaluators strongly recommend additional, more extensive cost-analysis of all CVL activities by qualified professionals. There is little information concerning present or anticipated costs of operating and sustaining the DR Unit and the experimental farm. Such study should be done periodically to assist the CVL administration in its planning and to establish priorities. This might be done through close coordination with the HSDT.

Although the CVL is a remarkable "success" per se, it is virtually a fully subsidized operation. It is difficult to foresee any mechanism for financial self-reliance should external support be withdrawn. Vaccine sales, even if prices were increased substantially, are neither likely to support the DR Unit's activities, nor would they provide sufficient revenue for major equipment replacement. As the improvement of animal health is clearly beneficial to the Malian economy, it appears to be a legitimate public sector expenditure. To be sustainable, however, a phase-in of MRNE sustainable cost support should be scheduled over the coming years, and a phase-out of AID funds.

There is a clear and urgent need to better coordinate and integrate the functions of the CVL and DNE. An excellent diagnostic laboratory with highly trained personnel will shortly be in operation, but there does not seem at present to be any mechanism to utilize this facility in the manner envisioned. Its capacity now exceeds the present demand for diagnostic services. In 1982, when the ProAg was written, the major constraints to improved animal health delivery services in Mali were the difficulty of transporting personnel to the sites of disease outbreaks, especially in the outlying sections of Region I, and the difficulty of properly collecting and submitting diagnostic specimens. Transportation continues to be a major problem. Tissues from dead animals decay and pathogenic organisms die rapidly in the heat. On the other hand, the outgoing limb of the "cold-chain" - i.e., the delivery of vaccine - appears to be functioning adequately so as to achieve the proper distribution and storage of vaccine until it is administered to cattle. This is clearly an improvement over the situation at the start of the project.

Future consideration should be given to the training of field personnel from the various Regions at the CVL. The subject matter of training should be practical: for example, the proper collection and recognition of common bacteria, recognition of hemoprotozoan parasites, performing sedimentation rates and blood packed-cell volumes, examination of morbid anatomy (gross pathology), methods of fecal analysis for helminth eggs, etc. A start already has been made in this respect and efforts should be continued and expanded to all Regions. This would allow

diagnoses to be done in the field on many diseases and would obviate the need to submit samples to the CVL, ones that rarely arrive in suitable condition.

Research supported by project funds has focused largely on protozoan and parasitic diseases of cattle. Although these diseases are of great importance to Malian livestock, given the limited resources available research projects could be more balanced and with greater emphasis on bacterial and viral diseases, as well as on developing diagnostic methods that are simple to perform. The research in the DR Unit should support the sole income-producing unit (Vaccine Production) as a research and development resource when new products are warranted, i.e., any new vaccines for poultry, sheep, or goats. Research priorities should be discussed at least annually between a "Research Director" and the staff on a formal basis. In this respect, the advice of the USAID Chief of Party (COP), who is an experienced veterinarian, would seem useful, and more active discussions of project-related research with the COP than in the past would also seem beneficial to both parties involved. USAID might thus be more informed with respect to the progress made on activities which they support, and of significant problems that arise.

The activities of the CVL should receive continued USAID support for the foreseeable future. At least a decade, or even more, may be required to see tangible results in terms of better diagnostic services, delivery of medicines, and veterinary services such as treatment of sick animals and minor surgery at field posts in regions supported by the project. Priority should not be given to new building construction or additional expansion and diversification of CVL activities, unless there are unusually sound reasons for doing so.

The evaluators are encouraged by the administration's efforts to improve CVL management. They suggest that future funding be directed towards short-term management and technical training in needed subjects, expanding on-site training programs for regional veterinarians, technicians, and veterinary assistants, and on improving the CVL in ways that were overlooked in the initial design. Provision for adequate water and a road to the experimental farm, so that it may be reached during the rainy season, as well as the replacement of major equipment that is critical to the CVL's operation, have been noted as examples of some current needs.

5. Improvement of Veterinary Services Delivery System (DME)

At the end of two-and-a-half years of the Mali Livestock Sector Project, it is clear that the veterinary services delivery system is improving. The purpose "to expand those activities that have brought about increased production" is being achieved, in the sense that more effective prophylactic interventions reduce losses that otherwise would likely occur. In Regions I and II and in the Veterinary District of Bamako, the project has provided a wide range of equipment and supplies for the cold chain, as well as funds for recurrent expenses, that make it easier to carry out systematic immunization programs.

There are, however, many additional DNE problems that need to be addressed by management and training assistance. For example:

- The quality of supplies delivered has been uneven and complaints from the field have gone unheeded;

- Needs for supplies are mainly being met in the Bamako District and not further afield;

- The return of moneys for vaccine purchases from DNE to CVL is slow;

- The DNE field agents lack the pharmaceuticals and skills necessary for activities other than immunizations, and they are consequently underemployed outside the peak vaccine campaign seasons; and

- The DNE agents are getting very few diagnostic samples from the field back to the CVL.

A substantially increased level of project support, in terms of training programs and technical assistance in management, is required to solve these problems. Such support might also help address the less tangible and more difficult problems such as improving coordination with CVL. This support is also required to prepare the way for privatization of veterinary services and the eventual attainment of DNE financial self-sufficiency.

It is premature to expect that the DNE is ready to become self-sufficient in the near future. Project support has thus far been limited to commodity supply, and, in consequence, DNE agents provide few actual services beyond vaccination. The management and training problems of the DNE listed above are real and serious. A number of steps, however, may be specified to move the veterinary service gradually in this direction. The first step is to attain the project goal of vaccinating 70 percent of animals for rinderpest. This is an economically and epidemiologically justified goal that, once reached, could be taken as a sign of DNE maturity. Services could also be expanded as training programs are generated in cooperation with the CVL and with short-term technical assistance. As MDST time becomes freed with the end of the procurement phase and, perhaps, as ECIBEV moneys are released, technical assistance could also be devoted to solving the service's management problems.

At the same time, full-cost services could be initiated in the Bamako District and wherever cattle raising is done for an urban, commercialized market. The price for vaccinations given during government campaigns could be slowly increased to full cost over the medium to long term (i.e., a ten to twenty year period). Vaccinations given on demand outside the scheduled campaign times could be charged full cost. A requirement for fully paid vaccinations could be imposed on cattle entering or leaving

Mali. The DNE could be contractually obligated to pay the CVL for vaccines on receipt, on the basis of a line of credit or revolving fund.

Finally, much research, far beyond the scope of a mid-term evaluation, needs to be done before a complete shift to privatization could be contemplated. For example, have any other services, such as health clinics or pharmaceuticals, been privatized in Mali, and what was their experience? Is there comparable Senegalese or Burkinan experience? Exactly how much is being paid for services, and by whom? What is the beneficiary view of privatization? The DNE view? Can the RDOs or village associations be involved, for example to contract for veterinary services as a group?

ACRONYMS USED IN THIS REPORT

SIGLES UTILISES DANS CE RAPPORT

ADO	Agricultural Development Officer Responsable du Développement Agricole (AID)
AID	Agency for International Development Agence du Développement International
APHIS	Animal and Plant Health Inspection Service
ASIR	Activity Specific Intensive Review
BNDA	Banque Nationale du Développement Agricole National Agricultural Development Bank
BCEAO	Banque Centrale des Etats de l'Afrique de l'Ouest Central Bank for West African States
BIRD	Banque Internationale pour la Reconstruction et le Développement (Banque Mondial) International Bank for Reconstruction and Development (World Bank)
B.S.	Bachelor of Science Degree Matrise
CAC	Centre d'Assistance Cooperative Cooperative Assistance Center
CADE	Centres d'Apui au Développement de l'Elevage au Mali
CAF	Cellule Administrative et Financière Administrative and Financial Unit
CBPP	Contagious Bovine Pleuropneumonia
CCG	Comité Conjoint de Gestion Joint Management Committee
CIDR	Centre International pour le Développement et la Recherche International Development Research Center
CIPEA	Centre International pour l'Elevage en Afrique International Livestock Center for Africa
CILSS	Comité International de Lutte Contre la Sècheresse au Sahel International Committee to Fight Drought in the Sahel

CMDT	Compagnie Malienne de Développement des Textiles Malian Company for the Development of Textiles
CNRZ	Centre National de Recherches Zootechniques National Center of Animal Science Research
COP	Chief of Party Chef d'Equipe du Project
CRED	Center for Research on Economic Development
CVL	Central Veterinary Laboratory Laboratoire Central Vétérinaire
DEA	Diplôme d'Etudes Approfondies M.S.
DEF	Diplôme d'Etudes Fondamentales
DG	Directeur Général Director General
DGA	Directeur Général Adjoint Deputy Director General
DNE	Direction Nationale de l'Elevage National Livestock Directorate
DPMC	Development Project Management Center Centre pour le Développement de la Gestion des Projets
DRV	Direction Régionale Vétérinaire Regional Veterinary Office
ECIBEV	Etablissement de Crédits et d'Investissement du Bétail-Viande Office for Credit and Investment in the Livestock Sector
EOPS	End of Project Status Etat de Fin de Projet
ESDG	Equipe de Soutien au Développement de la Gestion Management Development Support Team
FCFA	Franc de la Communauté Financière Africaine West African Franc (mid-1986 value $1.00 = FCFA 330-335)
FED	Fondation Européen du Développement European Development Fund
FSR	Farming Systems Research Recherche sur les Systèmes de la Production Rurale

GRM	Gouvernement de la République du Mali Government of the Republic of Mali
HUICOMA	Huilerie et Cotonnerie Malienne Malian Cotton Gin and Oil Extraction Plant
IBRD	see BIRD
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IDA	Institute for Development Anthropology
IDRC	see CIDR
IER	Institut d'Economie Rurale Institute for Rural Economy
ILCA	see CIPEA
INRZFH	Institut National de Recherches Zootechniques, Forestières et Hydrobiologiques National Research Institute for Animal Science, Forestry and Hydrobiology
ISA	Ingenieur des Sciences Appliquées B.S. (Applied Sciences)
JMC	Joint Management Committee see CCG
LEP	Lettre d'Execution du Project Project Implementation Letter
LCV	Laboratoire Central Vétérinaire Central Veterinary Laboratory
MCDR	Ministère Chargé du Développement Rural Minsitry of Rural Development
MCRNE	Ministère Chargé des Ressources Naturelles et de l'Elevage Ministry of Natural Resources and Livestock
MDST	Management Development Support Team see ESDG
MIS	Management Information System
MPE	Major Project Evaluation
MRD	Ministry for Rural Development (predecessor of MRNE)

MRNE	Ministry of Natural Resources and Livestock see MCRNE
M.S.	Master of Science degree Diplôme d'Etudes Approfondies
NAC	National Research Committee
NADC	National Animal Disease Center
NFTA	Nitrogenous-Fixing Tree Association
OACV	Opération Arachide et Cultures Vivrières Office for Peanuts and Food Crops
ODEM	Opération pour le Développement d'Elevage a Mopti
ODIK	Opération Développement Integré Kaarta Office for the Integrated Development of the Kaarta Area
ODIPAC	Opération de Développement Intégré des Productions Arachidières et Céréalières Office of the Integrated Development of Peanut and Cereal Production
ODR	Opération de Développement Rural Rural Development Operation
OHV	Opération Haute Vallée Office for Development of the Upper Valley of the Niger River
OICD	Office of International Cooperation and Development (USDA)
OMBEVI	Office Malien du Bétail et de la Viande Malian Office for Livestock and Meat
ORS	Opération Riz Ségou Office for the Development of Rice in Segou
PACD	Project Agreement Completion Date
PAF	Plan Annuel Financier Annual Financial Plan
PASA	Participating Agency Support Agreement
PAT	Plan Annuel de Travail Annual Work Plan
Ph.D.	Doctor of Philosophy degree Doctorat 3º Cycle

PIL	Project Implementation Letter see LEP
PIO	Project Implementation Order
PIRT	Inventory of Land Resources Project Projet d'Inventaire des Ressources Terrain
ProAg	Project Grant Agreement Accord d'Intervention
PP	Project Paper Document du Project
PVM	Pharmacie Vétérinaire du Mali Malian Veterinary Pharmacy
PRODESO	Projet de Développement de l'Elevage au Sahel Occidental Western Sahel Livestock Development Project
RAC	Radio Communications System
RDU	see ODR
SAFGRAD	Semi-arid Food Grain Research and Development Program
SAPROSA	Corporation Sahelienne de Production et de la Santé Animale Corporation for Production and Animal Health in the Sahel
TA	Technical Assistant Assistant Technique
TAD	Technical Assistance Division (USDA)
TDY	Temporary Duty
TOEFL	Teaching of English as a Foreign Language
TRP	Tilemsi Rock Phosphate
UDPM	Union Démocratique du Peuple Malien Democratic Union of the Malian People
URSPA	Unité de Recherche en Systèmes de Production Agricole Agricultural Production Systems Research Unit
USAID	see AID
USDA	United States Department of Agriculture
USDA/ARS/PIADC	USDA Animal Research Service, Plum Island Animal Disease Center

I. PROJECT GOAL AND PURPOSE

According to the Project Grant Agreement for the Mali Livestock Sector Project - Project No. 688-0218 - the following are the goal and purposes for project activities:

A. Project Goal

"The goal of this program is to improve the income and well-being of Mali's livestock producers as well as of others wholly or partially dependent on the livestock sector, including owners of draft animals, and consumers and suppliers of milk and meat. National and foreign exchange will also benefit from increased production of the national herd."

B. Project Purposes

"The purposes of the first five-year phase of this follow-on program are to:

- Expand those activities that have brought about increased production;

- Continue testing those activities that show potential;

- Identify through systematic research improved technical packages through on-farm testing; and

- Develop the institutional capacity of Mali's public and private sectors to identify, plan, implement and evaluate viable livestock sector investments."

Toward these ends, the following activities were proposed for financing during the first follow-on phase: on-farm cattle feeding, animal health care, smallholder livestock systems research, and management support.

II. INTRODUCTION TO THE PROJECT

USAID support for the Malian livestock sector began in 1963 with a $2 million loan for the construction of a small laboratory and for the training of Malian specialists to produce vaccines for a Central Laboratory that had been created in 1938.

Major support for the livestock sector began only in response to the conditions created by the 1974 drought, as part of the overall U.S. and world-wide donor community response to the Sahelian crisis. In addition to continued support for the Central Veterinary Laboratory (CVL) (Project Number 625-0610), significant support was provided to improve livestock production technology.

Mali Livestock I (Number 688-0201, 1974 to June 1982) sought to increase production and marketing of cattle through on-farm and commercial cattle feeding in the Second and Fourth Regions. The on-farm feeding program led to the establishment of the Etablissement de Crédits et d'Investissement du Bétail-Viande (ECIBEV), which continues as one of the five components of the current Livestock Sector Project covered by this evaluation. Building on the experience of Mali Livestock I, and overlapping with it, Mali Livestock II (688-0203) sought to increase production and marketing through improved range management and expansion into new lands.

These three projects are the direct predecessors of the current Mali Livestock Sector Project. The project is based on a Project Paper that outlines a 20-year strategy for assisting Mali's livestock sector. It proposed an initial 5-year phase of activities budgeted at $35 million. In the course of successive reviews, the total amount was scaled down to about half this amount, without, however, corresponding changes being made in the Logical Framework.

The Grant Agreement for the Mali Livestock Sector Project (688-0218) was signed on August 31, 1982. The total funding for the life of the project is $18,220,000. The PACD was initially September 30, 1987. An Action Memo dated October 12, 1984 extended the PACD to September 30, 1989 to permit all participants to complete their study programs.

The Mali Livestock Sector Project supports five activities:

- Project management and management development in theGRM through the Management Development Support Team (MDST);

- A cattle feeding credit program (ECIBEV);

- Infrastructure and equipment support for improved cattle health activities of the National Livestock Directorate (DNE);

- Research on forage production and related socio-economic factors by the National Research Institute for Livestock, Forestry, and Hydrobiology (INRZFH); and

- The technical assistance necessary for improved diagnostic capability, lab construction, and farm renovation equipment support (CVL).

These five activities of the project are carried out by technical assistance provided under three separate contracts/agreements:

- A Participating Agency Services Agreement (PASA No. IML-0218-P-AG-3066) signed April 11, 1983, which provides three research scientists for the Central Veterinary Laboratory (CVL), three staff members including the chief of party to MDST, and an accountant to ECIBEV;

- An amendment to the PASA (No. IML-0218-P-AG-3066) was signed September 23, 1983 with USDA/TAD/DPMC for a series of short term visits to improve management practices and systems under the project. The DPMC team has already made several visits to Mali;

- Technical assistance is also provided under a contract with Chemonics International. The first contract (No.688-0218-C-00-3001) was signed on January 1, 1983 and extended through March 31, 1985. A subsequent contract (No. 688-0218-C-00-5057) was signed March 28, 1985, providing for the final 3 years and final 6 months, respectively, for the services of the Financial Director of MDST and a marketing specialist for ECIBEV; and finally

- A Cooperative Agreement signed on June 17, 1983 between AID and the International Livestock Center for Africa (ILCA) provides for technical assistance by an agronomist and an economist on long-term contracts and for 35 person-months of short-term services.

High-level policy, program guidance, and management coordination are provided to the project through the Joint Management Committee (JMC), which meets twice yearly.

The MDST is responsible for project implementation activities such as budget preparation, financial management, local and international procurement, contracts, training, vehicle maintenance and control, fuel control, inventory systems, clearance of annual work plans, preparation of JMC documents and minutes, and quarterly progress reports. MDST is the main liaison between USAID and the GRM. It coordinates the implementation of all the project activities.

The implementing agency of the cattle feeding credit program is ECIBEV. Farmers involved in the program purchase animals when the price

is lowest (October, November, December), and feed them throughout the dry season, utilizing indigenous forages, crop residues, and cotton seed residues. The animals are sold in May and June when the price is at its peak.

The ECIBEV program started in 1975 under Project Mali Livestock I with 50 farmers and 107 head of cattle. In the 1984-85 campaign, 1,272 farmers were involved with 3,814 head of cattle. During the life of the project, it is envisioned that all ECIBEV functions - except credit delivery - will be transferred to rural development operations (ODR's) and to farmer associations. Financial self-sufficiency will be considered as a tangible proof of the viability of the program.

In Audit Report No. 7-688-85-5 dated March 27, 1985 two recommendations were made:

- To terminate the cattle feeding component and deobligate the remaining funds; and

- To terminate production research activities related to the cattle feeding program.

Subsequently, USAID/Mali succeeded in gaining approval for continuing the credit program with training funds alloted but no additional funds to be added to the credit activity. The research activity was also allowed to continue after an exchange of information which showed that the research was applicable to other types of animal needs, such as traction, small ruminants, and milk production. Both recommendations were closed after the signature of PIL No. 11, which transferred credit funds back into the general fund.

Technical assistance is provided to the INRZFH through ILCA to identify and test improved forage production packages and study associated socioeconomic factors. The researchers work with INRZFH counterparts and are training them in research techniques.

The Central Veterinary Laboratory produces rinderpest, pleuropneumonia, anthrax, blackleg, and pasteurellosis vaccines. The project activities related to CVL consist of improving diagnostic and research capabilities, conducting disease surveys, and improving quality control systems for the vaccines produced.

DNE is considered the most experienced agency in the livestock sector. Under this project, its activities are limited to Regions 1 and 2 and to the Bamako District. The project activities consist of improving program management and reporting, improving infrastructure, equipping veterinary posts, carrying out vaccination campaigns against rinderpest and contagious bovine pleuropneumonia, improving disease reporting, and coordinating diagnostic work with the CVL.

III. EVALUATION OF PROJECT COMPONENTS

We are aware of the multiplicity of documents bearing on the objectives of the Livestock Sector Project. These have been prepared at various times by virtually every stakeholder in this joint USAID/GRM activity, except perhaps the herders and farmers who are envisaged by all as important beneficiaries. These documents include:

- The original Project Paper of August 20, 1982;

- The Project Agreement eventually derived from it and signed by USAID and GRM on August 31, 1982;

- The documentation prepared by the MDST staff for the biannual JMC meetings; and, most recently,

- The evaluation carried out by OMBEVI, dated March 1986.

To a large extent, the objectives outlined in these documents are consistent with each other or, at least, compatible. To avoid judgmental bias in the review of achievements of each project component to date, we have chosen to rely solely on the Project Agreement which is the legal contract between AID and GRM.

A. PROJECT MANAGEMENT/ADMINISTRATIVE SUPPORT (JMC, MDST, AND DPMC)

1. Objectives of the Component

a. Management Coordination and Development Structures

In order to assure improved management coordination and development of USAID-funded activities, two special structures were to be established under the program, the Joint Management Committee (JMC) and the Management Development Support Team (MDST).

i. Management Coordination -- the JMC

The JMC was to be a primary instrument through which joint high-level policy and program guidance and management coordination would be provided to project management. Chaired by the Minister for Rural Development (or his representative), the JMC would include the Director of USAID (or his representative), the Directors of agencies in the livestock sector (ECIBEV, CVL, DME, and INRZFH), the USAID Agriculture Development Officer and his assistant for livestock development, the USAID Controller, the Directors of the RDOs under which the USAID-funded livestock sector activities would fall, and the Chief of Party of the technical assistance team.

(1) JMC Meetings

The JMC was requested to meet biannually, or more often if necessary, to review the USAID-funded program in collaboration with official USAID representatives. The Minister for Rural Development or the USAID Director could call special sessions of the JMC to review extraordinary issues. The format for these sessions would be agreed upon by the Directors General of the agencies involved in the livestock sector.

The JMC meetings were to be conducted according to present Ministry procedures. However, the minutes of the meetings would be submitted to and approved by both the appropriate Minister and the USAID Director. The JMC would receive direct support from the MDST. The MDST support would include, inter alia, organizing JMC meetings, coordinating the preparation of quarterly financial and implementation progress reports, the preparation of operation plans for the following quarter, and carrying out special problem-solving assignments, as agreed upon by the JMC.

(2) Agency Meetings

In addition to the biannual meetings of the JMC, periodic meetings were to be held between USAID and each of the Ministry for Rural Development (MRD) agencies directly involved in the program. These meetings would address administrative, financial, logistical, procurement, and technical issues encountered under the USAID-funded

activities for which a particular agency has implementation responsibility.

ii. Management Development -- the MDST

Management development activities would be carried out by MDST. Although MDST would have no technical or administrative authority over agency Directors or activity personnel, USAID required that it review and approve operations and financial plans and reports prior to their submission. MDST was also to be responsible for overall vehicle and equipment management.

Under its mandate to assist MRD agencies to improve their management performance, the MDST was to focus on four basic areas. First, it would provide administrative support for the meetings of JMC. Second, it would assist MRD agencies in developing improved management systems and procedures. Third, it would provide MRD managers and staff with training and consultation in the use and maintenance of these systems and procedures. Finally, it would provide specific administrative and logistical support aimed at lessening the workload flowing from the special requirements of USAID-funded activities. To carry out these functions, the MDST was to include two sections -- a management development section and an administrative support section.

(1) Improving Agency Management Capacity

The management development section was to focus on operations and financial management planning, management information systems, implementation monitoring, and management training. It would include a project management/information specialist and a financial management specialist; both specialists would be expatriates. The management/information specialist would also carry out the functions of the animal health programmer in DNE, to which MDST was to be administratively attached. These two responsibilities were combined because the primary problems with which the animal health programmer had to deal were managerial in nature - i.e., the major constraints to improved animal health services delivery in the First and Second Regions were believed to be inadequate planning and administrative/logistical support capacity. In addition, the management development section was to train approximately six Malian counterparts, selected to form a qualified, multi-disciplinary training and consulting team including such fields as management, accounting, marketing, animal husbandry, extension, and training.

b. Assist in Establishing Improved Management Systems

To accomplish the objectives of this component, it was necessary to develop at the agency and activity levels improved and standardized management systems for carrying out key management functions. Primary among these functions were:

i. Operations/Planning Management

The MDST management and financial experts were to introduce management information systems to track the physical and technical performance and progress of the projects. They were to work with MRD agency and activity-level planners and managers to develop work schedules and plans and to facilitate their systematic updating.

ii. Financial Planning/Management

The MDST management and financial experts were to introduce accounting and financial management systems that would be integrated with operations planning and management. The primary emphasis would be on maintaining reliable systems that would permit the tracking of expenditures for audit and control purposes and that would provide a record of categories of expenditures against performances so that the cost-effectiveness of various key activities could be evaluated.

iii. Commodity Management

The MDST would be responsible for developing a system for tracking and managing commodities from their point of arrival to their eventual use. Regulations for the use, operation, and maintenance of commodities would be established. Attention would be given to vehicle and equipment management to overcome problems of inadequate maintenance and to insure the proper use of vehicles and equipment.

iv. Management Training

The MDST would also be responsible for undertaking a management training program to reinforce the introduction of the management and information systems outlined above. The primary focus would be on giving both Malian and American personnel in USAID-funded projects the management and administrative skills required to operate the management systems and to improve performance by solving management problems. Upon request, it would also conduct action-training seminars, workshops, and consultations throughout MRD.

The objectives of the training were to improve activity performance and to increase management capabilities, especially with respect to operational and financial planning, management, and reporting. The training would be based on the proposed management systems and procedures and would be used to install and adapt these systems as needed. Some training areas which were initially defined include:

- Formulating strategy and identifying objectives;

- Using the planning process as a management tool;

- Designing and utilizing information systems;

- Managing and controlling human and material resources;

- Budgeting;

- Commodity procurement;

- Maintaining inventory and records;

- Financial accounting and reporting;

- Delegating authority and responsibility; and

- Using project documentation for project development.

c. Administrative and Operational Support

The expatriate administrative support section would include an administrative/logistical specialist, a vehicle mechanic/equipment maintenance specialist, and a construction management specialist. These specialists would be complemented by appropriate Malian staff, including a procurement officer who would assist in providing administrative support.

i. Administrative and Logistical Support

These responsibilities would be carried out by the administrative specialist. The Chief of Party was to have overall supervision of this section of the MDST. In this role he would be responsible for all administrative and logistical requirements of the MDST, including those for training seminars and workshops, travel, typing, reproduction, translation, etc. Additionally, he would be responsible for preparation of a manual of standard operating procedures, in collaboration with other members of the section, covering:

- Local and international procurement;

- Vehicle and equipment use, operation, and maintenance;

- Management of local and international procurement;

- Liaison with a procurement service agent in the U.S.;

- Preparation of all project implementation orders (PIOs) and arranging for their expeditious review, modification, and approval by appropriate offices within the MRD and USAID;

- Arrangement of clearance for project commodities through customs;

- Obtainment of licenses, visas, and vehicle registrations; and

- Provision of support to the JMC including handling logistical arrangements such as scheduling, agenda, approvals, and typing and distribution of minutes.

ii. Vehicle and Equipment Maintenance

One member of the MDST would be a vehicle maintenance specialist assigned to assist MRD in establishing a maintenance and spare parts center and sub-centers in the field, in managing and maintaining spare parts inventory systems for all USAID-funded vehicles and equipment, and in training Haitians in their operation.

iii. Construction Management

One member of the MDST would be an engineer responsible for supervising all engineering aspects of the project. He would collaborate closely with the GRH rural works office and the USAID engineer.

2. Accomplishments to Date

For all components of the project, implementation was delayed almost a full year after the schedule set out in the Project Paper (see Appendix A, "A Comparison of the Projected and Actual Implementation Schedules"). Although the PIO/T for technical services was ready by late October 1982, the PASA between USAID and USDA was not signed until April 1983. The result was that the Chief of Party/Director of Operations and the Director of Administration did not arrive until August and November 1983, eight and ten months, respectively, after the date specified in the implementation schedule.

According to the Project Grant Agreement, the Management and Administrative support component is responsible for the activities of management coordination and development as well as administrative and operational support.

a. Management Coordination

The Joint Management Committee (JMC) was created in order to assure improved management coordination of USAID-funded activities. Its purpose is to be the primary instrument through which joint high-level policy and program guidance and management coordination is provided to project management.

According to the report of the Ministerial meeting of 29 November 1982, the composition of the JMC is as follows:

- Minister in Charge of Rural Development (now MRNE);

- Director of USAID;

- Chief of Party/Director of Operations and the Director of Finance of the MDST;

- The Directors General of the four national agencies directly involved in the project (ECIBEV, CVL, DNE, and INRZFM), plus those of OMBEVI and PVM; and

- The ADO, Livestock Project Officer, and Comptroller from USAID.

Meetings of the JMC were to be held twice yearly, with both the Minister and the Director of USAID capable of calling additional meetings when necessary. To date, four regularly scheduled meetings have been held: March and October, 1984, and May and December, 1985. No special meetings of the JMC have yet been invoked. A Minister of the MRNE has attended only the initial meeting. A Director of USAID has attended only the first and fourth meetings.

In addition to the biannual meetings of the JMC, the Project Grant Agreement calls for periodic -- initially monthly -- meetings to be held between USAID and each of the MRNE agencies involved in the program. MDST, however, changed this format from four separate meetings with each of the four Malian agencies to one monthly meeting with the four Directors General as a group. The Director of Operations and the Director of Finance have organized these meetings to deal with the administrative, financial, logistical, and technical issues and problems of procurement. The monthly meetings have been held at MDST during this first half of the project. There have also been frequent individual contacts between members of the MDST team and either the Director General or the activity coordinator for specific problems involving a single project component.

Finally, in his role as management coordinator, the Director of Operations is to act as the liaison between the GRM and the project on the one hand and USAID on the other. To this end, according to a recommendation of the second JMC meeting in October 1984, quarterly reports were to be submitted to both USAID and the Ministry. These reports would outline, for each activity, the progress-to-date in project implementation relating to both work plans and financial plans. Although the financial reporting has been punctual, USAID has received only three quarterly operational reports.

b. Management Development

The second major activity of the management component of the project is to assist the Ministry agencies in improving their management performance. This is to be accomplished, first, by conceptualizing and developing improved and standardized systems and procedures for operations and financial planning, personnel, logistics, monitoring, and a management information system. Second, the MDST is to assist GRM/USAID managers, administrators, technicians, and support

staff in implementing the new systems and procedures. To date, most work in this area has been geared toward project-specific activities, rather than agency-wide management.

i. Development of Improved Management Systems

(1) Operations/Planning Management

It was foreseen in the Project Paper that, within six months of the start of the project, there would be a major program review to clarify project objectives, determine strategies, and make a life-of-project work plan to serve as a guide for implementation. We have not found any such overall work plan, nor have the original Project Paper and Logical Framework been revised, as was called for in the implementation schedule. While a life-of-project work plan was not formulated, the MDST and the DPMC have worked with agency managers to improve the planning and scheduling of project activities within each of the four national agencies. Annual work plans have been submitted and approved by both the MDST and the JMC.

(2) Financial Planning/Management

A financial and accounting management system has been developed for the financial budgeting and reporting of project-specific activities. Financial reporting has been computerized on an IBM PC system at ECIBEV. The same financial system, although done manually, is in use at CVL, DNE, INRZFH, and at MDST. Currently, monthly, quarterly, and annual financial reports are submitted to USAID and to the MRNE. These budgets and plans are first reviewed and approved by the Director of Finance of MDST.

(3) Commodity Management

A manual system for the tracking of commodity purchases and use is now installed at the MDST office. The list of commodities purchased has also been entered on the computer.

(4) Management Information System (MIS)

The main emphasis to date in the conceptualization and development of improved management systems has been on project-specific activities limited specifically to financial and administrative management. The Director of Finance of MDST has for several months been working on plans for developing a management information system and for methods of institutionalizing the system within the Ministry. The plan calls for a four-phase implementation schedule for the period February 1986 through September 1987, as follows:

I: Examine management needs and conceptualize the system;

II: Begin groundwork in systems development, training of computer operators and financial managers, and training of

personnel in the collection, presentation, and flow of information from the field to the Ministry;

IV: Begin second level of training -- of middle level managers -- in data manipulation and analysis; and

V: Begin educating top level management in writing reports, generating recommendations, financial reporting, and decision-making.

The program outlined above calls for a short-term consultant/ computer-training expert to train three or four persons in computer operations. These persons would then serve as the trainers for other computer operators and users within Ministry agencies who will be directly involved in the MIS program. Training in computer operations will eventually be conducted by OMBEVI, the agency which has overall responsibility for training in the Ministry.

The MRNE financial and accounting system is the first area of management to be targeted under the program. The system is to be set up in such a way that it will be capable of serving not only the specific requirements of the GRM -- based on the French accounting system -- but also the accounting requirements of the various donors.

Eventually, the plan is to extend the management information system to inventory control and personnel records. The program will also include monitoring of activities beginning at the field level and tracing the flow of information to the top levels of management. Emphasis in the first stages will be on the four agencies presently within the project, plus OMBEVI, PVM, and CAF.

In March 1986, an outline plan was presented at a meeting of the Cabinet and the four Directors General directly involved in the Mali Livestock Sector Project. As yet, a detailed plan has not been submitted for approval to the JMC.

ii. Training in the Use of Improved Management Systems

As the second step in the overall strategy for improving management performance within the Ministry, the MDST is responsible for undertaking a management training program to reinforce the introduction of the management and information systems mentioned above. The training provided either directly or indirectly through the MDST has been introduced by three methods: counterpart training, long- and short-term overseas training, and "action training" through periodic consultancies of the DPMC.

(1) Counterpart Training

Counterpart training is based on a close association of individuals working together on a daily basis. The Director of Operations of MDST has worked as counterpart to all four of the

Directors General of the participating agencies. While there was no formal training on this level, it was hoped that this close contact and the sharing of management problems and decision-making would lead to improved project performance.

The Director of Finance of MDST has worked with a Malian counterpart from the MRNE Administrative/Financial Division (CAF) who has essentially taken over the financial planning and reporting of project activities. In addition, the Director of Finance, his counterpart, and the accountant/technical assistant in ECIBEV have held four seminars with the Chief Accountants and their staffs of the four Malian agencies in the use of the financial management system. Financial budgets and reports conforming to USAID's regulations are performed on a monthly, quarterly, and annual basis on an IBM PC at ECIBEV, but manually in the other three agencies.

The Director of Administration of MDST has also trained a Malian, hired on a contractual basis from outside the Ministry, to take over his responsibilities. Training was essentially in USAID contracting and procurement regulations. The Director of Administration also conducted several seminars at the individual agencies on the rules and regulations concerning the procurement of project commodities that fall under the national agencies' scopes - i.e., purchases under $1,000.

(2) Training Overseas

Long and short-term management training in the United States includes one candidate from ECIBEV who is currently pursuing a Master of Science degree in management of agricultural credit. He is expected to return to Mali at the end of 1987. As of the end of August 1986, 14 Malians have participated in short-term training in management practices, averaging seven weeks per participant. Of these, ten have attended the Francophone African Development Management Seminar at the University of Pittsburgh, two have attended the Project Management Workshop at Texas Tech University, and two have received special management and commodity procurement training in Washington D.C. Of these participants, two are no longer associated with the Ministry or with the project. The remainder have resumed or will shortly resume their normal project activities.

(3) Action Training -- DPMC

Action training in management skills and systems was provided during the consultancies of a team from the Development Project Management Center (DPMC), which is a division of OICD in the U.S. Department of Agriculture. The DPMC participated in a pre-implementation phase of the project in November 1982. At that time, the present DPMC Chief of Party and another member of DPMC formed a working group to assist USAID and the GRM to satisfy the conditions precedent to the Project Grant Agreement to permit the initial disbursement of funds.

The DPMC officially joined the technical assistance team under a PASA amendment signed in September 1983. In the Project Grant Agreement and in the Project Paper, the MDST had been specifically given the responsibility of management development. Nonetheless, most of the actual in-country training other than counterpart and financial management training has been conducted by the DPMC. Since the signing of the agreement, DPMC has made five visits to Mali and has presented three of its action training seminars or workshops.

Action training is an approach to teaching that combines learning and doing in the same process. Counterpart or on-the-job training provides one example in which the person is taught while actually performing the new technique or method. Similarly in the action training seminars, instructors use actual project tasks, activities, and management problems as the subject of the seminars, rather than examining hypothetical management situations.

During the first visit of the DPMC to Mali, from 23 January to 19 March 1984, the two-person consulting team was instrumental in producing most of the documents necessary for the first JMC meeting scheduled for March. During this consultancy, several sessions were held involving at least one manager from each of the four Malian agencies participating in project activities. The purpose of these sessions was to review the goal, purpose, objectives, and strategic planning for each component of the project and to produce the first annual work plans and budgets for the meeting of the JMC.

In June 1984, the same DPMC consulting team returned to Bamako for a four-week stay. The specific purpose of this trip was to conduct a management needs survey and assessment within the project components. Meetings were also held during this second visit to determine the long-term training needs of each agency.

The third consultancy, scheduled for October 1984, was delayed until January 1985 at the request of USAID and the MRNE. During this visit, the DPMC presented the first action training seminar, the main focus of which was on project planning. Topics covered during the two week session included: project objectives, critical path analysis, Gantt charts, construction of a logical framework, and determining activity costs. Only one Director General attended any of the sessions. There were approximately thirty participants, including persons from the Malian agencies, MDST, and USAID.

The fourth visit of the DPMC management team was from 6 July to 19 August 1985. A self-critique of the 1985-1986 work plans was performed, and during a five day workshop the following topics were covered: the project cycle, written and oral communication, problem-solving, on-going evaluation, and an introduction to management information systems.

The last DPMC consultancy to date was held in May to June of 1986. Its major objective was to prepare the Malian agencies and the technical assistance staff for the present evaluation.

c. Administrative and Operational Support

The final major activity to be undertaken by the MDST was to provide administrative and logistical support to the project and to the individual components, including direct management responsibility for commodity procurement, contracting, vehicle maintenance and control, and supervision of all construction.

i. Administrative and Logistical Support

The Director of Administration of MDST, with the help of his Malian counterpart, prepared a manual of standard operating procedures which covers:

- Rules, regulations, and procedures for local and international procurement;

- Vehicle and equipment use, operation, and maintenance.

The administrative branch of MDST has also been responsible for all local contracts, procurement, clearance at customs, and vehicle registration and licenses. In addition, it has been in charge of the logistics, scheduling of agendas, typing, and translations of the documents and minutes for the four JMC meetings held thus far.

The MDST maintains an office staff of nine Malians, including three secretaries, three clerks in the accounting department, and three purchasing agents. The MDST staff also includes five drivers, five watchmen, and six mechanics. The Director of Administration and his assistant were responsible for all hiring and training of the MDST Malian office staff. Training for the Malian office staff has included computer operation and accounting and procurement procedures. The Assistant Financial Director, four of the drivers, and five of the mechanics have been provided by the MRNE. It was foreseen in the Project Paper that the Ministry would provide all Malian staff for the MDST.

In November 1985, the Director of Administration completed his two year contract. Both he and the Director of Operations concluded that the Malian counterpart was fully trained and competent to assume the duties of MDST administrator. However, in April 1986 the Malian administrator was suspended from his duties pending inquiries into certain actions within his scope of work. He has since been relieved of his duties. The MDST staff is currently seeking a Malian office manager. There are no plans to replace the technical assistant. In the interim, the duties of the administrator have been divided among the rest of the office personnel at MDST.

ii. Vehicle and Equipment Maintenance

Despite arriving ten months later than called for under the implementation plan, the technical assistant in charge of vehicle and equipment maintenance had a completed garage up and functioning only six months behind the original schedule. To date, six mechanics have received training in vehicle maintenance, including both classroom and practical on-the-job training. Five of the mechanics are from the MRNE and one is on contract. In addition, two apprentices are currently being trained. The technical assistant, who left the project in August 1986, had no Malian counterpart from the Ministry after the first year of the project. One of the mechanics is now in charge of the spare parts center.

After initial field visits, the maintenance specialist determined that there was no need for field maintenance centers. Only four vehicles in the project are permanently stationed more than 100 kilometers from Bamako. Normal work requirements bring them to Bamako on a sufficiently regular basis to provide for periodic servicing. In case of breakdowns in the field, mechanics are dispatched from the facility in Bamako.

A vehicle and equipment operation and maintenance manual has been prepared. A maintenance schedule is kept for each vehicle. Drivers of project vehicles received a short course in operation and preventive maintenance of the vehicle they drive, and for which they are responsible. A vehicle control system for the project was initiated in January 1985. A monthly computerized report indicates, for each vehicle, its fuel consumption, distances travelled, repairs, accidents, and breakdowns. Kilometer log books were also issued for all vehicles in January 1985. Reports for each project vehicle are compiled monthly and sent to each of the Directors General, indicating delinquencies in maintenance, abnormal fuel consumption, etc.

There are currently forty vehicles in the project: MDST has eight, DNE eighteen, ECIBEV five, CVL four, and INRZFH five. Of those from the Institute only one is serviced at the project maintenance center. Since the issuance of PIL No. 11, ECIBEV vehicles are still serviced by the center but the project no longer provides the necessary parts.

A Malian maintenance specialist has completed two months of short term training in the repair and maintenance of veterinary lab equipment.

iii. Construction Management

According to the Project Grant Agreement, the technical assistance staff of the MDST was to include a civil engineer assigned to oversee project construction over the long term. At the Ministerial Meeting of 29 November 1982, however, it was decided that short term technical

assistance would suffice. Hence, a short term consultant/engineer was used twice by the project for a total of four weeks. Plans for all project construction and renovation (the veterinary posts and vaccination parks of DNE, and laboratories and the farm at CVL) were drawn up by two private engineering firms. Construction designs were approved by the USAID engineer as well as the Public Works Department of the GRM. Construction supervision and final approval are also the responsibility of the GRM.

iv. Studies

The MDST has also been responsible for the logistical and financial support for several studies undertaken, or presently in the planning stages, at the request of the JMC:

- A review of the credit system at ECIBEV;

- A study on the impact of the drought;

- Management information system feasibility study;

- A livestock marketing study;

- A herd composition study;

- An annual evaluation of the Mali Livestock Sector Project by OMBEVI; and

- A study on the privatization of veterinary services.

3. Analysis and Conclusions

In this section, the order of presentation of the coordination, management development, and administrative and logical support activities has been altered from the previous sections. The administrative and logistical support activity is presented first; much of the project's progress to date has been due to the direct support provided by the MDST. This emphasis on implementation, although justified, has had an effect on the ability of the MDST to accomplish its other major objectives: to develop and transfer improved management systems.

It is in the role of providing administrative and logistical support that the MDST has been a success. The objective was to reduce the workload of both USAID and the GRM resulting from the particular rules, regulations, and reporting procedures of USAID-funded procurement and financial management. The three technical assistants in this division were responsible for direct financial and administrative management and vehicle and equipment maintenance.

a. Administrative and Logistical Support

Construction and renovation of the veterinary posts and vaccination parks at DNE were completed ahead of schedule and also below projected cost. As a result of savings due to the strength of the dollar, additional construction was approved by the JMC and is near completion. The construction of the research and diagnostic laboratories at CVL, although behind schedule, is expected to be completed by the end of 1987. In addition, all the materials and equipment originally called for under the Project Grant Agreement and those included in the original orders from the individual agencies have arrived and are either in the field or awaiting shipment. Again, due to savings mainly from a favorable exchange rate, additional orders for equipment have been made, and the project has been able to branch out into areas not foreseen in the original grant agreement. Most notable in this area has been the installation of six microcomputers among the various components. The computers have already had noticeable impacts in financial reporting, inventory control, and report writing. INRZFH will soon be using a microcomputer for the analysis of research data. To date, $1.76 million worth of equipment and commodities has been purchased under the project. Contracts worth a total of $2.17 million have also been let for construction at MDST, CVL, and DNE.

This rapid procurement and construction reflect a very positive accomplishment of this project. Much of the program for two of the Malian agencies, the DNE and CVL, are based on this construction and the provision of necessary equipment. It is not uncommon in other projects (for example under Mali Livestock II, the predecessor to this project) for final shipments of materials to arrive after the completion date of the project.

The MDST has alleviated much of the work load for both USAID and the MRNE by undertaking the burden of complying with the often complicated procurement and financial regulations and reporting procedures. Difficulties with these USAID regulations have often retarded and at time halted the progress of USAID-funded programs in Mali and elsewhere. Thus, it was not until a final audit was performed of the Mali Livestock II project that it became possible to determine the financial situation of the project. The system now in place at MDST maintains an up-to-date reporting procedure that enables USAID, the MRNE, and the individual agencies to know exactly where they stand in budgetary matters. This accomplishment has drawn the interest of more than one Director General and Chief Accountant from among the Malian agencies, who see the benefits of extending such a system to include all agency finances, rather than only those funded by this project. The manual of standard operating procedures developed by the Director of Administration is currently being used as a model for another USAID-funded project.

Finally, the fact that the maintenance facility is up and running and that the project's fleet of vehicles is in good operating condition

after three years attests to the success of the project garage. It is important to note that the Minister has recently commissioned the MDST to perform a study on the feasibility of starting a central garage for the Ministry, based on the model of the MDST maintenance facility.

Thus, due to administrative, financial, and logistical support provided by the MDST, the project has enjoyed a very rapid implementation in the areas of procurement and construction. The assumption of the responsibility for overall financial management has avoided many of the problems of previous projects. In its role as the administrative and support unit, the MDST has been a success. There are two other issues, however, which should be addressed in relation to these activities.

i. Transfer of MDST Functions to the MRNE

The evaluators fail to see how the administrative, logistical, and financial management functions can or should be transferred from the MDST to the MRNE. This part of the MDST was set up specifically to serve the needs of USAID. Although Malians have been trained and some are now capable of assuming these functions, we feel that the satisfaction of requirements of specific USAID procedures and regulations are probably not functions that the Ministry would want to assume permanently in the absence of guaranteed, long-term USAID-funded assistance.

Certainly, the maintenance facility and garage should be transferred to the Ministry. However, no effective attempt has been made to do this until now. The garage is still activity-specific, servicing only project vehicles. The previous technical assistant/ maintenance specialist did not have a counterpart for the past two years. If continued as is, the maintenance facility will not be transferred to the GRM; instead, in all probability, it will cease to function once technical assistance and funding are withdrawn. In its present form, there will be no long-lasting benefit to the GRM from the garage facility once the project ends. The Ministry is apparently also concerned about the sustainability of the maintenance facility; as mentioned above, MDST has been requested to undertake a feasibility study on the creation of a central garage within the MRNE.

ii. Cost of Maintaining the MDST

Although the concept of the MDST as an administrative and operational support team has proven successful in permitting quick project implementation and in providing the necessary procedural and accounting controls, the evaluators are concerned about the costs of maintaining such a team. The MDST component is one of the most expensive of the project, accounting for almost one quarter of the total budget ($4.2 million out of a total $10.2 million for the project). In effect, it is costing almost $1.00 of project funds to spend the other $3.00. Yet these administrative costs are not out of line with other projects. Two other large USAID-funded projects also

centered in Bamako, OHV and FSR, each has its own administrative and financial components. For the purely administrative functions, such as procurement, contracting, and financial management, it probably would have been more cost effective to create a single support unit for all three projects rather than duplicating the same functions. These administrative units in OHV and FSR are not involved in project coordination and management development, as is the MDST. The existence of a central or multi-project administrative support group would have permitted the MDST to concentrate more on other activities such as management development, rather than being tied down for at least the first two years with procurement, contracting, and administrative duties.

b. Management Coordination

i. The JMC

The concept of the JMC is a good one in that it provides a forum for top management - e.g., project, Ministry, and USAID - to monitor, correct, and reorient project design and implementation as events dictate. To date, the JMC has shown improvement in its ability to provide policy and program guidance to project management. The feat of bringing together the major decision-makers on a biannual basis must be counted as a success in itself. This has permitted -- on more than one occasion -- a meeting of the minds of all parties concerned, which otherwise may have taken months of memos and individual meetings before a general consensus could have been reached. The example most often cited by those involved in the JMC is the creation of the General Fund. Due to the strength of the dollar early in the project, implementation costs were below budget. Rather than remaining in the individual budget of the agency where the savings had occurred, a General Fund was created for these savings. The JMC jointly decides on the use of these funds. Among the uses to which these funds have been put include an increase in the number of participants in long- and short-term training and the construction of additional veterinary posts and vaccination parks for the DNE.

The JMC, according to its own documents and from the observations of some participants, has been too involved in the minutiae and details of the project. Many of these details and discussions should be worked out at a lower level, either through direct contact between project management and the interested parties, or at the monthly meetings of the Director of Operations of MDST and the Directors General of the individual components. According to existing minutes, the first three of these meetings averaged eight hours. The last was shortened to six. High-level policy meetings, properly focused, should not be marathon sessions.

In addition to its role as a forum for high-level policy discussion, the JMC was specifically given the task of reviewing and approving the annual monthly work plans submitted by the individual agencies. The evaluators find that these ECIBEV work plans have

consistently misstated the project activity objectives. Instead of the objectives found in the Project Grant Agreement (specifically the transfer of functions), the objectives of the GRM Five Year Plan of 1974-1978 (to improve farmer-herder incomes, to increase livestock production, and to retard rural exodus) were repeatedly stated as being those of the Mali Livestock Sector Project as concerned ECIBEV's involvement. This failure to clarify and to reach a common understanding as to the objectives of that component has contributed in no small measure to its failure. The responsibility for such a critical error cannot rest solely with the management of ECIBEV. Instead, it must be shared among, first, the MDST, which as the main coordinating body was responsible for initial review of work plans and project monitoring; and, second, by USAID and the MRNE, which both failed in their role as final overseers via the JMC to redirect the cattle feeding component activities toward the original project objectives. The JMC is beginning to take a more active role in reviewing the annual agency work plans. The work plan of the INRZFH was not approved at the most recent JMC meeting because it lacked sufficient detail to allow proper monitoring of research activities.

Ironically, the body that was initially set up to improve communication among the participants has ultimately become a source of misunderstanding between the Ministry and USAID. There was a misconception both within the MRNE and USAID that the joint recommendations of the JMC had the same legal status as PILs in making changes in the Project Grant Agreement. It was realized later that only PILs and other Project Grant Agreements are legally binding means of amending any Project Grant Agreement for purposes of AID project administration.

Despite attempts to clear up this misunderstanding and regardless of the problem of PILs, which is essentially a USAID procedural issue, there exists a very strong feeling within the Ministry that USAID has not totally accepted the idea upon which, to the Malians, the JMC is based: that of joint management of the project. There is a belief that USAID has, on more than one occasion, backed out of agreements jointly arrived at during meetings of the JMC. The most notable example is that of the proposed water supply system at the CVL. It had originally been agreed at an earlier JMC meeting to fund the system out of the General Fund. Events transpired later such that it appeared to the Malians as if USAID had unilaterally decided to not fund the water system. Officials at USAID maintain that they also believe the JMC to be the ultimate decision-making body for the project and that they have never knowingly reneged on an agreement reached at the JMC.

The important issue here is not what the two parties say with respect to the decisions of the JMC, but rather the perception held by each concerning the views of the other. This is essentially a question of communication among those participating in the JMC; specifically among USAID, MRNE, and MDST. Given the delay in execution of the JMC recommendation concerning the CVL water system, it is significant that USAID took over six months to notify the MRNE officially of AID's

position concerning the proposed system. In other instances, long delays between joint recommendations at the JMC and actual implementation have also given the impression that USAID has changed its mind. At present, the herd composition study has been delayed for three or four months, awaiting final AID approval. An agreement had been reached to write a proposal to conduct such a study at the last JMC meeting in February 1986. To the Ministry, joint recommendations of the JMC are executive decisions and directives to project managers. The feeling persists that USAID does not share this view, but, instead, maintains ex post facto veto power over these joint decisions. Thus, the lack of good communication over such delays in execution of JMC recommendations is currently an issue of no small importance.

ii. Monthly Meetings of the Directors General

The Project Grant Agreement called for monthly meetings between USAID, MDST, and each of the four Malian agencies in the project. This format, with the exception of ECIBEV, was changed to one monthly meeting between MDST and all four of the Directors General. At ECIBEV, monthly meetings were initially held between the Director of Operations and the Director of Finance of MDST while setting up the credit monitoring and reporting system.

These monthly meetings have succeeded in bringing together the four Directors General and their top assistants and in improving inter-agency communications. This also is a positive impact of the project. However, the criticisms of the JMC meetings - i.e., as being too long and too involved in minutiae - also extend in certain respects to the monthly meetings of the Directors General with the MDST. At times, long discussions ensue between the Director of Operations and one Director General over issues that do not concern the other Directors. It has already been proposed by the MDST that the schedule and format of the Director-level meetings be changed to conform with the original intention in the Project Agreement. It has been suggested that MDST meet with a different component of the project each week on a rotating basis, to monitor progress, identify problems, and plan appropriate actions for that particular agency. These meetings will include managers and technicians involved in USAID-funded activities within the component and will focus on those issues specific to the agency. Monthly meetings of the Directors will continue to be held to resolve programmatic issues of the project that involve more than one individual component.

iii. Project Liaison -- the MDST

MDST is charged with maintaining the liaison between the project and the Ministry on the one hand, and USAID on the other. According to Ministry officials, when a management problem arises the MDST often replies that they will check with USAID before rendering an opinion. This view has also been confirmed by some of the technical assistants as well as some officials at USAID. The Ministry believes that the MDST should be independent from both USAID and the GRM, acting instead

as a source of professional advice concerning project planning, policy, and implementation. It is felt that MDST should present its own recommendations for the solutions to problems, rather than acting simply as a conduit of communication concerning USAID rules and regulations. Evidence of this view of the HRNE is supported by two recent requests of the Ministry to have MDST help with an audit of the PVM and also to participate in the up-coming national livestock strategy sessions.

c. Management Development

The major emphasis of the project thus far has been on operations management - i.e., on implementation. Given that the MDST has not one, but three major responsibilities (administration, coordination, and management development) it was very logical and necessary to concentrate on implementation at the beginning of the project. The MDST is also limited in the amount of manpower and resources which it can allocate to these activities at any one time. Thus, out of necessity the development and transfer of improved management systems was relegated to a secondary activity throughout the first half of the project. As a result, little or no lasting impact has been felt in setting up and training in the use of improved management systems and skills. Although some work has begun in this area, it is important to determine not only the degree of acceptance of the changes, but also the applicability of these systems to Malian institutions. It was foreseen in the Project Paper and Project Grant Agreement that the transfer of improved management systems would be accomplished in three ways: counterpart training, short-term training overseas, and action-training seminars and workshops.

i. Counterpart Training

The Director of Operations of MDST did not have a counterpart. Instead, he worked with all four Directors General for the four project components. He could not be involved in the day-to-day management of the four organizations, especially considering his additional responsibilities to MDST, the JMC, and USAID. Although the Directors General may have gained some management skills through such an association, the work of the Director of Operations during the first three years of the project was concerned more with problems of implementation, rather than development of management systems and the transfer of management skills. As with the other technical assistants, the work of the Director of Operations vis-à-vis the Directors General and their agencies was limited to USAID-funded project-specific activities, not agency or Ministry-wide issues.

The MDST Directors of Administration and Finance have both developed management systems and trained their specific counterparts -- and other Malians -- in the use of these systems. The Director of Finance of MDST and the Technical Assistant/Accountant at ECIBEV have set up a computerized financial reporting program and trained the ECIBEV Chief Accountant and his assistants in financial planning and

reporting. The accountants of the other components were also trained in financial planning and reporting for project activities. The Director of Administration of MDST trained a Malian in procurement procedures and inventory control. In addition, he trained Malian administrators in the four agencies in the USAID procurement procedures for project purchases under their control - i.e., purchases up to $1000 each.

The main project beneficiary of the work of these technicians, however, has been USAID and not the Ministry. Almost all the training has been project-activity specific - i.e., the existing Malian systems for administrative and financial management have not been affected by the new systems and training. In addition, these new systems are limited to the administrative and financial reporting requirements of the American government. This was in large part the reason for setting up the MDST - i.e., to "provide specific administrative and logistical support aimed at lessening the workload flowing from the special requirements of USAID-funded activities" (ProAg, Annex 1, p.16, 1982). However, training in American regulations and procedures is not the type of management skills desired by the MRNE.

The Malian counterparts have undoubtedly gained valuable management experience from closely supervised, on-the-job training, for example in the concepts of planning and control. The specific systems with which they work, however, are not directly transferable. This is the case, for example, of the Assistant Financial Director of MDST whose project activities are very different from his normal duties as an accountant in the CAF of the MRNE. Even had the Director of Administration's counterpart continued with the project, the Ministry would not have benefitted from his skills and training since he was on contract and would not have entered any similar post in the Ministry. The lack of a counterpart for the maintenance specialist also means that the Ministry will not benefit to the fullest extent possible in the managing of the vehicle repair and maintenance facility.

ii. Action Training -- the DPMC

From the start of the project, the role to be played by the DPMC has been unclear, not only to the GRM but also to some members of MDST and to officials at USAID. The DPMC's role has not been completely clarified to the satisfaction of some Malian officials to this day. It was also surprising to the evaluators to read the Scope of Work for DPMC in the amendment to the original PASA with USDA. According to the amendment, the objective of the PASA is "to contribute to and facilitate the organizational, managerial, and administrative planning and implementation of the Mali Livestock Project Activities" (PASA amendment, p. 3). With such a mandate, it is no wonder that the Malians viewed the DPMC as "technical assistance to a technical assistance team." The specific Scope of Work for the DPMC covers many of the same duties specified for the Director of Operations and the Director of Administration of MDST in the original PASA with USDA.

Thus, it appeared as if two teams were effectively charged with the same responsibilities at yet higher cost to the project.

Although the DPMC team attempted to implement this original Scope of Work, their actions understandably met with resistance by both the GRM and the Director of Operations of MDST. It appeared to many that DPMC was there to assume direction of the project. Trip reports of the DPMC team and the draft of the Interim Country Assistance Report for the Mali Livestock Sector Project, a DPMC document, support this feeling of misconception, misunderstanding, and mismanagement of DPMC's relationship, not only with the GRM and MDST, but also with other agencies within USDA including OICD, TAD, and APHIS. As a result of these early misgivings about the role of DPMC, its scope of work was progressively narrowed from one of facilitator and actor in the implementation of the project in 1983 to one of teacher of improved management practices by mid-1985.

The training programs and seminars presented by DPMC have been directed mainly at the middle-level managers of the four activity components of the Mali Livestock Sector Project. Although the four Directors General attended the initial sessions, their attendance, with one exception, had fallen off sharply by the last session held in June 1986. Some of the participants are enthusiastic about these sessions, but more than one have commented that they themselves, as middle level managers, do not have any power to initiate any of the improved management concepts that they have learned, either in these sessions or in the management seminars in the United States. Given the hierarchial nature of the Malian agencies, most decision-making power rests with the Director General, and there is little hope of initiating any change without his agreement. Thus, the institutionalizing of management change rests on having the support of the Directors General, most of whom no longer attend the seminars of the DPMC. While it is true that at least some of those attending may eventually rise to upper management positions and may apply what they have learned at that time, it would be overly optimistic to expect any real changes in management performance in the present project because of these seminars of the DPMC.

There has been a general improvement in work plans as a result of the DPMC consultancies. Indeed, the Director General of the CVL has adopted the new work plan format for all CVL activities, not just those involving the project. There is little other evidence, however, that these work plans are actually being used as a management tool to allocate limited resources to the various tasks and activities or as a point of departure to monitor the activities over time. The example of ECIBEV work plans -- which is dealt with more thoroughly elsewhere (section A.3.b.i) -- is a case in point. By failing to reach a common and clear understanding as to the objectives of ECIBEV within the overall Mali Livestock Sector Project, the actual work plans based on different objectives have actually contributed to the failure to reach those goals.

Even without the initial confusion concerning DPMC's role, the evaluators question the potential of the action training methodology as it has been applied so far as a means of affecting change in management practices. As noted above, middle managers realize that change will only result in the present system with support from the top. DPMC failed to get this support from the Ministry, USAID, or MDST. The improvement of management skills for top managers, such as the Directors General, will not be accomplished in seminars held jointly with their own middle and lower level managers. The hierarchical nature of the Malian bureaucracy almost guarantees failure when all seminar participants are treated as equals in a classroom situation.

The appropriate method of gaining the support of the Directors General is through the Ministry at a higher level - i.e., through the Cabinet and even the Minister himself. To bring about a change at this level, there must be a perceived need. Although DPMC reports indicate that a needs assessment of management requirements was conducted, it is imperative that such an assessment come from the Malians themselves. It must be remembered that we are dealing with Malian institutions and Malian management systems that predate the project, and that the people with whom we are working have been in management for considerable lengths of time. For an outsider to suggest changes in the current management system, without a Malian need felt for such changes, is almost certainly doomed to failure from the start. Once a need has been expressed by the Malians, the design or modification of the present system must be done in concert by the Malians and the technical assistance team.

iii. The Management Information System

The evaluators support the idea of developing a management information system within the Ministry. From various reports and discussions, it appears that the Ministry recognizes the need for better and more timely information and communication at all levels. The plan also meets several of the concerns we have previously expressed about attempts thus far at management development. First, the system is not to be project-specific but instead will encompass all the activities of the agency. For example, it is proposed to cover all aspects of financial management in the Ministry, rather than just USAID-funded activities. Second, although the emphasis for the rest of this project will be on the four Malian agencies presently within the Mali Livestock Sector Project as well as the PVM, OMBEVI, and the CAF, the system envisioned would also be applicable to the rest of the agencies within the MRNE.

4. Summary

a. Administrative and Logistical Support

Up to now, the major benefit of the MDST has been in the timely implementation of the project by a specialized team that was able to operate much more quickly and efficiently than could the bureaucracies of either USAID or the MRNE. This is particularly true in the areas of contracting, procurement, construction, and financial reporting. This is a very important and positive contribution to the project for which credit should be given. USAID has benefitted since the MDST administrative and financial divisions have essentially taken over tasks usually performed by AID direct-hire personnel. The project and GRM have benefited by the rapid implementation thus far, especially with respect to procurement and construction. Of particular benefit has been the assumption by MDST of the duties of complying with the often burdensome procurement, contracting, and financial reporting requirements of the U.S. government, which have often slowed down and even halted the progress of other USAID-funded projects.

On the other hand, the MDST, rather than institutionalizing new management systems, has in essence created parallel structures that have circumvented the American and Malian bureaucracies. Thus, while the project has its own separate vehicle maintenance center, the Ministry maintains its own crew of mechanics with few tools and no spare parts to service the rest of the Ministry vehicles. The MDST has set up a financial management system for project budgeting and reporting, a system which is parallel to the established Malian system in each of the four agencies. Instead of diminishing the work load, the necessity of keeping two sets of books -- even if one is computerized -- obviously only adds to the staff time and energy expended. Similarly, the MDST Director of Administration has set up and operated a parallel, almost private, procurement and contracting office, which is independent of the GRM and its established procurement procedures.

The systems set up thus far are not directly transferable to the GRM. With the exception of the vehicle and equipment maintenance center, these are American systems set up specifically to deal with American rules and regulations. They have little, if any, specific applicability to the needs and problems of the Ministry.

Finally, in order to have a lasting impact and to institutionalize improved systems, the administrative and financial components of MDST must aim at a higher level. The financial planning and reporting of each individual national agency is not determined internally. The procedures and regulations are fixed and identical throughout the Ministry. In fact, in financial matters, these procedures are set by the Ministry of Finance and dictated to the line ministries through the CAF system. Thus, if changes are to be made other than simply computerizing the data to permit more rapid retrieval and report

writing, working solely at the agency level will not have the desired impact.

b. Project Coordination

The creation of the JMC has been a positive step for project management. Rarely do the top management personnel of a Ministry and USAID jointly discuss and make decisions about a project, let alone on a biannual basis as in the present project.

The failure to reach a clear understanding of project and component objectives at ECIBEV was a serious error. Had the project and all components adhered to the guidelines of the implementation schedule in the Project Paper, some of these problems may have been avoided.

It is not evident with whom the ultimate responsibility of project monitoring rests. Perhaps this is most clearly illustrated in the case of ECIBEV. Notwithstanding the problem of unclear objectives, the poor rate of recovery of credit funds should have set off alarm bells at all levels of the project as early as 1983. This does not appear to have happened. In this regard, USDA must share some of the responsibility for taking more than a year to provide a credit specialist, who was first requested in April 1984. Finally, it was USAID, not USDA, that found the consultant who eventually arrived in April 1985.

The structure of the project does not lend itself to easy coordination. Communication among the myriad organizations involved has not been good. There are at least thirteen different organizations directly involved in the project, including five Malian: DNE, ECIBEV, CVL, INRZFH, OMBEVI; plus MDST, ILCA and the Cabinet; as well as six American organizations or companies, including USAID, OICD, DPMC, TAD, APHIS, and Chemonics.

The role of the USDA in the project has not lived up to expectations. Thus far, USDA has supplied only one direct-hire person under its PASA, although its contract was sole-sourced, without any competition, on the basis that all requisite skilled personnel could be supplied from existing USDA employees. The rest of the "USDA" personnel have been hired on contract, exactly as any private consulting firm would have done. It took almost a year to supply a sorely needed credit specialist. At present, of the five slots for which USDA is to provide technical assistants, three remain unfilled.

There exists a misunderstanding concerning the role of the JMC. Much of this misunderstanding is a result of poor communication between USAID and MRNE.

Reading of project documents supports the view held not only by the Malians but also by some technical assistants that the MDST is to act as an independent advisory organization, capable of giving its own recommendations, suggestions, and interpretations, while at the same

time fulfilling its function as liaison. By this is not meant that the MDST should no longer act as financiel and administrative managers of the project. The MDST has been very successful in this role, and it should be continued. In other areas of project management, however, staff of MDST should act as independent management advisors to the MRNE, rather than as go-betweens for USAID. In the coming months, most of the technical assistance staff will have changed. This is an opportune moment to assure such a reorientation of the role of the MDST.

c. Management Development

Any attempt at improving management skills and systems must come at the request of the Malians within the Ministry. Without such a recognized need, which presumably should come from the highest level, we hold little hope for a lasting impact.

While a transfer of skills at the level of the Directors General cannot be accomplished through seminars and workshops, it can often be accomplished through close association and sharing of day-to-day problems and decision-making. Given the emphasis on implementation to date and the other demands on the time of the Director of Operations, and due also to the fact that he had not one but four counterparts, this close association has not yet been achieved.

The focus of management development during the first half of the project has been on project-specific activities. The management and personnel of the Malian agencies, however, have additional concerns and tasks in running their organizations, which are not limited to project activities. Although the attempt to have an impact first at the project activity level may have been a good first step, in order for the management development program to have a lasting impact it must be enlarged to cover all activities within the agency. As an example, the financial budgeting and reporting system, if it is desired by the Ministry, should be expanded to all financial management, and not be limited to USAID-funded activities. The Director of Finance of MDST already has plans in this direction, which we support should they be accepted by Malian officials.

The aim or target of management development has thus far been too low. Changes of this nature, which affect the operation of an institution, must of necessity come from the top. Although the MDST and Director of Operations should continue to work closely with the Directors General, the MDST should also work closely with the Director of the Cabinet and his technical advisers within the Ministry. If the need for change in management techniques and systems is felt, then the targets should be on a Ministry-wide basis, rather than at the agency level.

The credibility of the DPMC has been severely compromised by its actions to date, and the evaluators question the advisability of its continued participation in the project. The seminars on improved

management techniques, although valuable for middle level managers, will probably have no noticeable impact on project performance without the support of top management. Moreover, if these seminars are to continue, they would be much more effective if conducted by resident members of the MDST, rather than the occasional visiting specialist from the DPMC.

Now that the major procurement and construction phases have been completed, the MDST should be able to concentrate its major emphasis over the final two years of the project on the development and transfer of improved management systems. The MIS and financial management systems are to be the key components for this reorientation in strategy.

5. Recommendations for the Current Project

1. The confusion over the role of the JMC as the ultimate decision-making body of the project must be resolved. To this end, it is recommended that either:

- A PIL or amendment to the Project Grant Agreement be issued to the effect that, henceforth, the minutes of the JMC when signed by the Director of USAID and the Minister of the MRNE, will have the same legal effect as a PIL; or

- A PIL be written, signed, and attached to the minutes of each JMC meeting, indicating that the joint recommendations contained in the minutes are thereby covered by that PIL.

2. Also with regard to the meetings of the JMC, it is recommended that the minutes clearly state:

- Which person or organization is responsible for the execution of each of the joint decisions concerning implementation; and

- What is the time frame within which execution is to be completed.

3. The staff of MDST must play a more independent role with regard to its function as a project management specialist team. It must provide sound professional advice and recommendations for the project and not act simply as an annex of USAID/Bamako. The MDST should assume this more independent and dynamic role, while continuing to act as the liaison among the various participants and as the financial and administrative manager.

4. The scope of the current project has been too narrow with respect to the development or transfer of management systems and skills. This scope should be broadened in two ways. First, the management systems introduced thus far, and those to be developed in the final two years of the project, should be broadened to include all

agency activities for a particular management system, rather than being limited only to those activities funded by USAID. Second, where applicable as in financial management, the introduction of improved systems -- although centered on the present four agencies currently in the project -- should be developed in accordance with Ministry-wide norms with a view to eventual expansion to other agencies within the MRNE.

5. Regarding the development of the management information system within the MRNE, the evaluators recommend that

- A comprehensive plan of the proposed MIS be drawn up by a joint committee composed of members of the MDST, OMBEVI, and the Cabinet;

- The plan include a detailed budget, indicating the resources, commodities, technical assistance, and training that will be needed during the remainder of the project;

- The plan also include a life-of-project work plan and a logical framework stating the indicators necessary to evaluate progress at the various stages; and, finally,

- This program be approved by a joint resolution of the JMC before implementation begins. Given the time constraints, if necessary a special session of the JMC should be called.

6. With regard to the management information system, the evaluators also recommend that a training program be started for field agents and other personnel involved in data gathering with the objective of improving the quality of information being sent to project and Ministry decision-makers.

7. The mechanism for soliciting specialized expertise to deal with particular management or technical training problems should be broadened so that the DPMC becomes only one among many contracting alternatives for securing desired short-term assistance. Furthermore, the Director of USAID should make more direct use of his delegated contracting authority for contracts up to $100,000 to secure necessary personnel.

6. Recommendations for Future Project Support

1. The Joint Management Committee has the potential of becoming an effective management tool. With the proviso that both parties adhere to the principle of joint management and shared decision-making, and that both parties also take the necessary steps to ensure the proper legalities for guaranteeing that joint decisions are respected, the concept of a joint management committee should be continued in any follow-on phase to the present project.

2. The costs of maintaining an administrative and support team such as the MDST for a single project are excessive. However, the MDST has proven very effective in permitting rapid implementation of project activities through the use of a specialized team for procurement, construction, and financial management. Such costs are also not limited to this project, but are similar in other USAID-funded projects. If USAID wishes to delegate administrative responsibilities, then it is recommended that it explore further the possibility of instituting such a mechanism as MDST on a multi-project or mission-wide basis. The costs of supporting such a team could then be born by three or four different projects, thus spreading the overall administrative costs among projects and also allowing technical assistants to devote more time and energy to the particular problems and issues of their projects.

3. Based on the results achieved to date, USAID should not use a PASA with USDA in any follow-on to the present project.

B. CATTLE FEEDING CREDIT PROGRAM (ECIBEV)

1. Objectives of the Component

a. Transfer ECIBEV Field Support Functions

The Project Grant Agreement for the five-year follow-on phase of the Livestock Sector Project calls for all ECIBEV functions, except credit delivery, to be transferred to Rural Development Operations (RDOs) and to farmers associations and other entities within the private sector. These field support functions -- referred to as the on-farm cattle feeding program (Fr. Embouche Paysanne) -- include:

- Introducing the concept of livestock feeding to farmers;

- Preparing dossiers on farmer applicants;

- Providing farmers with cottonseed residue cake and other feed supplements;

- Providing participant farmers with animal health services;

- Providing technical guidance to participants; and

- Assisting in the marketing of feeder and fed cattle.

i. Developing the Capacity of the Operations

Three RDOs were to be included under the on-farm livestock feeding program over the five years: Opération Haute Vallée (OHV), Malian Textile Company (CMDT), and Opération Riz Ségou (ORS). The transfer of functions to them was to take place gradually. Although the length of time required would vary according to each RDO's previous involvement with the program and the familiarity of its extension staff with livestock feeding, it was envisaged that the transfer could be completed in most cases within three years.

The smooth transfer of the responsibilities required that experienced ECIBEV field agents be assigned to the RDOs in order to:

- Provide on-the-job training for RDO agents and veterinary agents;

- Manage the credit program; and, if necessary,

- Assist farmer participants in the marketing of livestock.

ii. Development of Farmer Associations

ECIBEV and RDO extension agents were to encourage the formation of farmer associations, by outlining for participants the potential

efficiencies that could be achieved by this means and by taking participant leaders to visit the established Banamba Association.

Positive incentives to encourage farmers to form associations included the offer of progressive reductions in service fees as participants formed an association and as the association assumed increased responsibility.

b. Establish Financial Self-sufficiency of the Program

In addition to expanding the role of the private sector, it was considered necessary firmly to establish the financial self-sufficiency of both ECIBEV and the RDOs if the program was to achieve long-run viability. This required that sufficient funds be generated under the program to cover the recurrent and capital costs incurred by these entities. To do this, a charge was imposed for the goods and services provided. This charge was to reflect actual costs, and it was to be adjusted by the Joint Management Committee (JMC) prior to the start-up of each annual campaign.

The transfer of ECIBEV's field support activities to the RDOs would involve the transfer of certain recurrent operating costs associated with these activities as well. Such costs, on a pro-rated basis, were to be reimbursed by ECIBEV with funds generated by the program, with the actual percentage being set by the JMC. However, it was expected that ECIBEV would cover its own operating costs as it transferred its support functions to the RDOs and farmer associations.

c. Improve ECIBEV's Capacity to Provide Credit and Marketing Support

i. Credit Support

A major emphasis during this five year follow-on phase was to improve ECIBEV's institutional capacity through training its personnel. The objective was to train a few people well. These specialists were then to train lower-level support staff as needed. Further, with high level training and some experience, these specialists would then be able to provide advice to the GRM on questions related to livestock credit. With this goal in mind, four persons were to be trained at the Masters degree level in several fields including agricultural credit and economics.

ii. Marketing Support

(1) Procurement of Feeder Cattle

If requested, the cattle feeding program would collaborate with participants in villages or associations to schedule the timing and location of the procurement of feeder cattle. This would limit the increase in demand at a particular location and thereby minimize upward pressure on prices. ECIBEV would also encourage participants to buy their cattle as a group. As a last resort, it would contract with private traders to deliver fixed quantities of feeder cattle to prearranged

locations for sale to farmers. This, however, was envisaged as only a temporary expedient for any given geographical area or group of farmers.

(2) Sale of Fed Cattle

The basic strategy for reducing farmer risk in the sale of fed cattle included:

- Optimizing information flows within the private sector marketing system;

- Organizing marketing activities in such a way as to optimize farmer options; and

- Encouraging and facilitating participation by the maximum feasible number of traders in the marketing of fed animals.

In this context, the ECIBEV support program was to work closely with participants and the RDOs to stagger the marketing of fed animals over several weeks, arranging for special sales at particular villages or groups of villages within a certain radius. The program would also ensure that these sales were well advertised among cattle traders operating in both the domestic and export (Ivory Coast/Liberia/Ghana) markets. Initially at least, the program would transport Malian traders to the various marketing sites. The program would also encourage farmer associations or participants within a village or cluster of villages to arrange treks to the major market at Kati near Bamako.

If the above steps were to prove inadequate to ensure a fair market price for fed animals, the program was to buy the fed cattle of the partnership - i.e., in any one location ECIBEV could find it necessary to buy up to 100% of the animals for sale. This was not to suggest, nor did the project envisage, direct ECIBEV participation in the marketing system on a permanent basis. Rather, this would be a temporary measure -- at most three years for any particular village -- which would be employed only if all other efforts to ensure competition and efficiency in the marketplace were unsuccessful.

2. Accomplishments to Date

a. Introduction

The first observation which must be made with respect to ECIBEV, as the principal executing agency for the cattle feeding program, is that it continues to exist eleven years after its creation as a pre-condition to the Mali I Livestock Project. Despite the Livestock Sector Project's specific objective of phasing-out all implementation activities except for the limited credit function, the organization continues to conduct its annual on-farm cattle feeding campaigns in its two project zones of Segou (which has two sub-zones of Diouna and Bouawere) and Bamamba (which has six sub-zones of Touba, Bamamba, Sirakorola, Boron, Niamina, and Kolokani). Within these zones, the campaigns have been executed in up to

121 villages with a maximum farmer participation of 1,271 in the 1984/1985 campaign. Table B.1 (below) presents the details of the ECIBEV cattle feeding campaigns over time.

b. Transfer of ECIBEV Field Support Functions to the Rural Development Organizations (OHV, ORS, and CMDT)

With respect to the first objective in the Project Grant Agreement, ECIBEV, in collaboration with OHV and ORS, created new zones of intervention for the cattle feeding program. Within this context, OHV now has a cattle feeding program which served 73 participating farmers during the 1984/1985 campaign and 152 farmers during the 1985/1986 campaign. During these two campaigns, the OHV farmers fed 293 and 500 head of cattle, respectively. These participating farmers were organized in producer organizations (Fr. groupements) for the purposes of implementing the OHV cattle feeding activity. There were 10 of these organizations in 1984/1985 and 23 of them in 1985/1986. In addition, OHV itself feeds a group of cattle annually at its cattle feeding training center.

ORS has also started a new cattle feeding activity in its zones and has received credit for the feeding of 211 cattle in the 1984/1985 campaign and 255 cattle in the 1985/1986 campaign.

A third RDO -- CMDT -- was also slated for participation in the cattle feeding operations under this project. To date, however, CMDT has not agreed to participate with ECIBEV but instead has mounted its own cattle feeding program in cooperation with the BNDA, which also provides the organization with its normal credit funding for agricultural activities and annual operations.

As of the 1985/1986 campaign, the OHV and ORS combined handled 20.9 percent of all cattle fed under the ECIBEV credit program. However, all of these cattle have been included as a result of program expansion and are in new zones of intervention. Within the established ECIBEV zones of Banamba and Segou, the number of cattle in the program in fact expanded from 1609 head before the project to a maximum of 3310 head in 1984/1985 and a total of 2863 head in 1985/1986. Within these ECIBEV zones, no transfer of functions to the RDOs has occurred.

c. Development of Farmers Associations

With respect to this objective, the ECIBEV program has actually formed four producer organizations since the start of this project. As of the 1985/1986 campaign, these four organizations were receiving group credit for cattle feeding activities. Five additional producer organizations are in the process of formation and are expected to be ready to receive group credit for the 1986/1987 campaign.

OHV, since its participation in the campaigns began in 1984/1985, has formed 23 producer organizations with 152 participating farmers. All credit operations for OHV cattle feeding activities are channeled through these organizations.

Table B.1

Implementation of the ECIBEV Cattle Feeding Program
1975/1976 to 1986/1987

Campaign Years	No. of Participating Farmers	Total No. of Cattle	ECIBEV Cattle	RDO Cattle
1975/76	48	107	107	0
1976/77	110	208	208	0
1977/78	N/A	479	479	0
1978/79	160	426	426	0
1979/80	159	834	834	0
1980/81	432	1343	1343	0
1981/82	992	2049	2049	0
1982/83	848	1609	1609	0
1983/84	869	2989	2989	0
1984/85	1267	3814	3310	504 1/
1985/86	1105	3618	2863	755 2/
1986/87	-	3500 3/	2300 3/	1200 4/

Sources: ECIBEV, USAID, and OHV project records.

Footnotes:

1/ Of which OHV had 293 head of cattle and ORS had 211.

2/ Of which OHV had 500 head of cattle and ORS had 255.

3/ ECIBEV provisional figures projected for 1986/87 campaign.

4/ Of which OHV is projected to have 1000 head of cattle and ORS 200.

ORS, since the 1984/1985 campaign, has formed five producer organizations with 97 participating farmers. As of the 1985/1986 campaign, all five of the organizations were receiving group credit for cattle feeding activities.

d. Establishing Financial Self-sufficiency of the Cattle Feeding Program

The objective here was "to firmly establish the financial self-sufficiency of both ECIBEV and the RDOs if the program is to achieve long-run viability." This was seen to require that sufficient funds be generated under the program to cover the recurrent and capital costs incurred by these entities - i.e., all variable and fixed costs of ECIBEV and the RDOs with respect to on-farm cattle feeding activities.

In response to this objective, ECIBEV has set up accounting procedures to determine the program's degree of financial self-sufficiency during and at the end of each annual cattle feeding campaign. A system of review and planning meetings has also been organized. In these sessions, the financial outcome of the preceding campaign is among the factors taken into consideration in planning the next campaign. The principal adjustment to date in the financial structure of the credit loans issued annually by ECIBEV has been an increase in the administrative fee charged as a sub-component of the loan. There has been no change in the annual rate of interest charged on the loans although the penalty charged for late repayments has been increased slightly.

e. Improvement of ECIBEV's Capacity to Provide Credit and Marketing Support

i. Credit Support (Training)

To date, three degree candidates from ECIBEV have completed or are currently engaged in long-term training financed by the project. Two of the candidates were initially funded under the Mali II Livestock Project, with the present project completing funding for the last two years of each program. This training has included one Masters candidate in management of agricultural credit, one Masters recipient in animal science, and one Bachelors recipient in accounting. A fourth participant was scheduled to leave for a Masters program in animal science, but his training was cancelled due to his failure to pass the TOEFL competency examination in English.

The Bachelors recipient in accounting is no longer working in ECIBEV, while the Masters recipient in animal science is currently working as the head of ECIBEV's marketing section - i.e., in an area in which he has not been formally trained. The third degree candidate -- in economics and credit -- is still in the United States and is expected to return to Mali in December 1987.

Four persons from ECIBEV have participated in short-term overseas training totalling 4.5 person/months. The ECIBEV Director General

recently attended a course in development project management at Texas Tech University. Two others -- including the current ECIBEV Deputy Director General -- attended an international seminar on smallfarmer agricultural credit, which was sponsored by USAID/Haiti and implemented by Development Alternatives, Inc. From June to August 1985, ECIBEV's chief accountant attended a course of planning and management of rural development at the University of Pittsburgh. The Deputy Director General also attended this course during his second short-term training session under this project.

Three of the four participants in short-term training are still at ECIBEV in their former positions. One participant has left ECIBEV and now works for the Ministry of State Enterprises.

In addition to the short-term training already implemented, two more training sessions are planned for mid-1987. They are to be for three months each in forage production and agricultural credit.

With respect to in-country training of ECIBEV personnel, a total of eleven ECIBEV staff members have participated in one or more of the management development "action training" sessions sponsored by the DPMC. Moreover, the ECIBEV chief accountant received extensive on-the-job training from his technical assistance counterpart, as did all members of the accounting department. Finally, a number of subject-matter seminars held by the MDST financial director have been attended by ECIBEV staff. The project technical assistant responsible for livestock marketing also had a Malian counterpart whose technical training is in animal nutrition. The content of his in-country training was unclear from our interview with him.

ii. Marketing Support

(1) Procurement of Feeder Cattle

The cattle feeding program has received no requests to intervene directly in the initial purchases of animals for the feeding program. It has, however, relied heavily on private traders to deliver fixed numbers of cattle to prearranged locations for sale to participating farmers. Although this practice was viewed in the Project Agreement as a "temporary phenomenon for any given geographic area or group of farmers" and a practice of "last resort," its use is now widespread in all project zones but Segou, and it appears to be accepted by both ECIBEV and OHV as a permanent fixture in their marketing programs.

(2) Sale of Fed Cattle

With respect to interventions in marketing of fed cattle, the ECIBEV program has:

- Transported potential cattle buyers to villages to view fed cattle;

- Monitored local cattle markets to collect price and quantity information on seasonal cattle flows and communicated this information to farmers through informal means and on the radio;

- Conducted survey tours of the major coastal markets for Malian cattle in order better to inform themselves and the participating farmers of export possibilities;

- Negotiated marketing agreements with the Ivorian livestock production and marketing organization, SODEPRA, to facilitate purchases of cattle in lots for export to the Ivory Coast markets, chiefly Abidjan; and

- Conducted research into existing impediments to intra-regional trade in live cattle and meat.

3. Analysis and Conclusions

a. Technical Analysis

i. The Cattle Feeding Program (Embouche Paysanne)

The objective of this section is to provide a technical assessment of the ECIBEV cattle feeding program. In order to do so, however, it is necessary to define precisely what the feeding program is attempting to do in its annual campaigns. Although it is often referred to as an on-farm fattening program, the cattle feeding activity is, in fact, not a fattening program in the sense commonly accepted in the United States- i.e., it does not attempt to provide terminal fattening for immature feeder animals to bring them to market weights with a certain degree of finish. The cattle used in the program are exclusively Maure and Fulani breeds of bulls or steers that are seven years of age or older, which is overage by Euro-American standards. As such, the animals have already attained full skeletal development and mature size. In growth characteristics, therefore, they are more akin to mature dairy bulls than to beef feeder cattle.

Since the cattle in the program are deliberately selected for large conformation and "thinness" - i.e., they may already have lost up to 20 percent of their mature body weight between the end of the rainy season and the date of their purchase for the feeding program, the objective of the activity is actually to feed for compensatory weight gain during a single feeding cycle of approximately three months duration.

The cattle feeding program, as proposed, consists of on-farm feeding of these cattle for a ninety-day period starting approximately the first of February of each year. The animals would be fed through April and sold in May. Farmers would then reap the benefits of putting fed cattle on the local markets when all other range cattle would be in a thin and weakened state, having gone through the long dry season on short rations. Additionally, benefits would accrue from the speculation on a rising price market for any cattle - i.e., cattle presentations in the local markets

decline starting in November of each year and prices rise throughout the dry season to a peak in April, May, and June. Most farmers participating in the ECIBEV program have in fact followed the timing of the proposed feeding period fairly closely -- in spite of labor difficulties-- although there have been instances each year of individual farmers getting their cattle later than expected and of others who stopped feeding early to take advantage of perceived marketing opportunities.

For the 1984/1985 ECIBEV feeding program, the sample of 120 cattle actually weighed by Bauer and Sissoko (1985, p. 2) were purchased at average liveweights of 339 kg/head. These animals were on feed for an average period of 81 days. The average sales weight for the cattle was 386 kg liveweight - i.e., for an average liveweight gain of 47 kg per head during the feeding period, or 580 g/day (Bauer and Sissoko 1985 p. 28).

The research results also indicated a significant difference in daily gains between the Maure and Fulani breeds under on-farm conditions. The Maure cattle observed had average daily liveweight gains of 770 g/day, whereas Fulani animals averaged only 440 g/day. The reasons for this difference have not yet been determined by the researchers.

The feeding rations utilized by farmers in the ECIBEV program are uniform only with respect to use of a cottonseed residue supplement and salt blocks. The types and compositions of the roughages actually fed depend upon the individual farmer's ability to grow or collect them. For the animals monitored by Bauer and Sissoko, the principal components of the daily ration were: millet and sorghum stalks, "bush" hay, and the cottonseed residue supplement. These items together accounted for 84 to 97 percent of total feed intake. Stabled animals in the program had average feed intakes consisting of 7 percent millet stalks, 10 percent sorghum stalks, and 35 percent bush hay. The most important element in feed intake was the cottonseed residue supplement, which varied between 40 to 60 percent of total intake. This amounted to an average of 3.2 to 3.7 kg of supplement per day, depending on whether or not animals were allowed to graze.

With respect to animal health, the cattle entering the ECIBEV feeding program are given routine vaccinations for rinderpest and contagious bovine pleuropneumonia (CBPP), anthelminthic treatments for gut parasites, and prophylactic treatments against trypanosomes by ECIBEV or DNE field agents. Curative animal health treatments are undertaken by these same agents as necessary during the feeding program. These vaccinations and treatments are covered by the farmer's initial loan. Mortality among the animals on feed has been held to 3 percent or less over the life of the project, while usual estimates of steer mortality at this age are between 3 and 5 percent exclusive of offtake for slaughter.

In general terms, there are relatively few technical problems with the cattle feeding campaigns as currently run by ECIBEV and the RDOs. The monitored daily liveweight gain per head closely approximates what one would expect from research trials previously conducted in Mali and elsewhere in the Sahelian countries. Mortality rates for the cattle on feed

are also as good or better than would have been predicted from research reports. The technical finding of substantial breed differences between the Maure and Fulani cattle with respect to feed/daily gain relationships is new and somewhat at variance with feeding trial results from the experiment station at Sotuba. This finding should be further investigated and confirmed by INRZFH/ILCA monitoring of cattle feeding activities.

ii. Feeding Efficiencies, Alternative Feeds, and Other Types of Animals

The principal technical problem at the moment is the vulnerability of the cattle ration to changes in the availability and price of the cottonseed residue supplement supplied by CMDT and HUICOMA. Current feeding performance in the cattle is closely tied to this supplement, and thus the entire feeding program relies on its availability on time and at acceptable cost. Major price increases for this supplement during the 1985/1986 campaign have clearly put the farm-level profitability of a feeding program based on its use in serious question.

Moreover, it is not clear at present whether there are technically and financially viable alternatives to the present cattle ration. Research within the project has recently suggested some possible adjustments in the base ration centered upon use of molasses, urea, and farm-grown legume forages -- chiefly peanut and cowpea haulms (stems). While these research results are interesting, we must note that the same argument now advanced for use of molasses was advanced for the use of cottonseed residues in 1975. That is, that Mali has a potentially valuable feed resource that can be used for cattle feeding at low cost. Problems with this argument are that:

- The available stocks of the potential feed component are extremely limited - e.g., the molasses from sugarcane processing appears to be in even shorter supply than the cottonseed residues from the CMDT cotton program; and

- Even if the potential feed is available in some quantity, its market price is always a function of current demand. A feed component that has a low market price when no one is interested in it suddenly becomes a financial opportunity for the parastatal controlling it when a potential buyer appears on the scene. Malian parastatals are currently under extreme pressure to become more financially viable, and it is unlikely that any holder of molasses stocks would hesitate to exploit an ECIBEV market, as CMDT and HUICOMA have done with their stocks of the cottonseed residue supplement.

Use of urea as a feed component -- though technically efficient -- is even more problematic than use of molasses at present because it would compete directly with use of urea on crops. The GRM has consistently encountered difficulties in supplying farmers with fertilizers for agricultural use, and it is doubtful that any substantial quantities of urea would be allocated to cattle feeding activities in the near term.

And were such allocations to be made, farmers would be sorely tempted to divert the urea to crop use, in a manner similar to the diversions to other animals in the farmer's possession already experienced with the cottonseed supplement.

Finally, increased use of farm-grown forages is also a possibility for change in the cattle ration. However, in many situations it would require basic reorientations in existing farming systems. Such revisions may be useful and may eventually be brought about, but we see relatively little hope for any breakthroughs in time to address ECIBEV's immediate problem of the rising cost of cottonseed supplement. INRZFH's finding--discussed in section C.2.a.ii.(2) -- that good weight gains can still be achieved with reduced amounts of cottonseed supplement offers perhaps the only viable direction for the program to go at present.

Another technical problem area with respect to animal feeding is that of relative feeding efficiencies between different classes of animals and between different age groups of the same livestock class. Given the narrow focus of the feeding program on steers and bulls, the project might in fact be wasting a valuable and limited resource on animals that are relatively poor converters of the feed. It is entirely possible that the cottonseed supplement, if fed to other types of livestock and at different seasons, could yield technical efficiencies and financial benefits equal to or greater than those currently being derived. In this respect, some consideration might be given to expanding the scope of the INRZFH and ILCA animal feeding trials to include research with sheep, goats, cull cows, and steers younger than seven years old.

b. Financial Analysis

This section raises three basic questions about ECIBEV's financial situation:

- Is the ECIBEV credit fund operation likely to be on a financially sound basis by the end of the project?

- Is ECIBEV, as an implementing agency, likely to be able to cover all of the variable and fixed costs of implementing the cattle feeding credit program by the end of the project, without further subsidies from either the GRM or USAID?

- Is the financial profitability of the cattle feeding program at the farm level sufficient to sustain a high degree of participant involvement in a largely private sector activity by the end of the project?

i. Credit Fund Operations

In the context of the current project, ECIBEV has progressed in planning, budgeting, and properly documenting all transactions. As a consequence, this evaluation report has been able to draw upon the detailed monthly project financial records, the synthesis reports of

Anderson (1986) and Rofe (1985), and other ECIBEV documents. These sources have been supplemented by in-depth interviews conducted with ECIBEV staff at all levels.

To put the evolution of the ECIBEV credit operation in perspective, the details supplied by Anderson (1986, p. 8) are incorporated in Table B.2.

Table B.2

Evolution of the ECIBEV Credit Operation 1975 to 1986

Annual Campaign	Loan per Head of Cattle	Loan for Inputs per Head	Total Interest Charged	Loan Total Advanced	Percent Reimbursed
1975/76	27,500	5,400	-	3,520,300	100.00
1976/77	27,500	9,400	-	7,675,200	75.41
1977/78	27,500	9,400	-	17,675,100	80.90
1978/79	30,000	8,500	-	16,401,000	77.45
1979/80	30,000	8,500	-	32,109,000	91.00
1980/81	40,000	10,950	-	68,425,850	82.00
1981/82	40,000	12,020	-	106,588,980	90.60
1982/83	40,000	12,020	-	83,700,180	73.28
1983/84	45,000	15,000	1,200	164,805,000	77.55
1984/85	45,000	16,275	1,225	233,702,850	85.20
1985/86	45,000	19,215	1,285	234,256,320	47.40

Note: For the 1985/86 annual campaign, the percent of loan total reimbursed was recorded as of 20 August 1986.

The following pertinent observations are derived from these figures:

- The ECIBEV credit operation in nominal loan volume terms has expanded enormously in the eleven years of its existence;

- The amount of loan per head of cattle purchased has also

expanded with a commensurate increase in the debt burden assumed by each farmer participant;

- With the single exception of the first annual campaign, ECIBEV has never achieved full reimbursement for the total outstanding loans;

- Losses on credit operations over the entire period, exclusive of the 1985/86 annual campaign, now total 128,138,962 FCFA in nominal terms due to the non-reimbursements. Many of these non-reimbursements remain uncollected despite the fact that the debtors are known and readily accessible to ECIBEV officials;

- Losses due to outstanding non-reimbursements through April 1986 for the first two completed credit campaigns under the current project stand at 36,998,723 FCFA for 1983/84 and 34,588,022 FCFA for 1984/85. In nominal terms these are the two largest annual losses incurred to date; and

- Given that ECIBEV lays out cash for the purchases of the cottonseed supplement, salt blocks, and veterinary products supplied to the program, and that the cattle purchase is also a cash payment by the farmer, it is clear that 100 percent of any non-reimbursement impacts directly on the fees ECIBEV needs to collect to run its support operation and thereby directly threatens ECIBEV's continued existence as an institution.

With respect to the rate of interest charged on the loans, the intention of the Project Paper seems to have been to have a rate of at least 12 percent per annum compounded monthly on the loan balance over the entire period for which the loan principal is outstanding. What is happening in the present ECIBEV program, however, is that an interest rate of 6 percent per annum is assessed over a four month loan period, without monthly compounding on the outstanding loan balance and without regard to the fact that all or part of the loan principal is usually still outstanding after the end of the four month loan period.

This rate of interest, even considering the additional fees ECIBEV charges to participate farmers, is not commensurate with the real opportunity cost of capital in the Malian economy, and it is much below the rates of institutional lenders in the Malian banking system. BNDA, for example, charges 12 percent interest on loans to CMDT farmers for exactly the same type of cattle feeding program, and many of the banks charge still higher interest rates for other types of commercial and consumer loans.

Additionally, the ECIBEV rate of interest makes no allowance for the average rate of inflation in the economy and, thus, for the time value of the money distributed in farmer loans. Consequently, participants in the cattle feeding program start by getting loans with a negative real rate of interest and then pay them back six months to three years later in deflated FCFA francs.

This situation with respect to the credit fund is shown in Tables B.3 and B.4 below. The first of these tables presents a reconstruction of what the ECIBEV loan structure and implementation for the 1985/86 campaign should have looked like on the basis of the Project Paper. The second presents the actual implementation of the loan arrangements for the same

Table B.3

The Theoretical 1985/1986 ECIBEV Loan Program
Based Upon Project Paper Assumptions

Loan Month	Cattle Purchase Sub-loan	Fee for Inputs and Overhead	Amount Outstanding if the Loan is Not Reimbursed	Effective Annual Rate of Interest if Loan is Reimbursed
1	45,000	19,215	64,857 1/	12.00
2	45,000	19,215	65,506	12.06
3	45,000	19,215	66,161	12.12
4	45,000	19,215	66,822	12.17
5	45,000	19,215	67,490	12.24
6	45,000	19,215	68,165	12.30
7	45,000	19,215	68,847	12.36
8	45,000	19,215	69,535	12.43
9	45,000	19,215	70,231	12.49
10	45,000	19,215	70,933	12.55
11	45,000	19,215	71,642	12.62
12	45,000	19,215	72,359	12.68

Footnote:

1/ Interest calculated at 12 percent per annum compounded monthly on the outstanding unpaid balance. Unpaid balance includes capital outstanding and accumulated interest charges, assuming repayment is made in one lump sum at the end of the loan month in question.

Table B.4

The Actual ECIBEV 1985/1986 Loan Program
Based Upon ECIBEV Records

Loan Month	Cattle Purchase Sub-loan	Fee for Inputs and Overhead	Amount Outstanding if the Loan is Not Reimbursed	Effective Annual Rate of Interest if Loan is Reimbursed
1	45,000	19,215	65,500 1/	24.00
2	45,000	19,215	65,500	12.00
3	45,000	19,215	65,500	8.00
4	45,000	19,215	65,500	6.00
5	45,000	19,215	65,500 2/	4.80
6	45,000	19,215	65,500	4.00
7	45,000	19,215	65,500	3.43
8	45,000	19,215	65,500	3.00
9	45,000	19,215	66,000 3/	3.70
10	45,000	19,215	66,500	4.27
11	45,000	19,215	67,000	4.73
12	45,000	19,215	67,500	5.12

Footnotes:

1/ ECIBEV currently assesses the loan with a fixed interest charge of 1,285 FCFA during the first four months of the loan period.

2/ For the fifth to eighth months of the loan period - i.e., 1 June to 30 September assuming the loan is issued to the farmer on 1 February - ECIBEV currently has a loan moratorium period during which no additional interest and no penalties are assessed on the unpaid loan balance.

3/ Starting with the ninth month after the loan was issued - i.e., starting 1 October for a loan granted on 1 February - ECIBEV is currently assessing a penalty of 500 FCFA per month on unpaid loan balances. This penalty is a lump sum per month assessed irrespective of the size of the loan balance outstanding.

period. For simplicity, the presentation is based on a loan administered for one animal.

These tables show that not only does the current ECIBEV credit operation deviate from the expectations of the Project Paper and Project Grant Agreement, but also that:

- The credit operation actually provides inducements for farmers not to reimburse their loans on time - i.e., at the end of the four month loan period. The best interest rate is obtained if the loan is repaid at the end of the eighth month. Moreover, farmers who fail to repay until the twelfth month are still better off financially than those who honestly repay their loans after the fourth month. Furthermore, the larger the loan, the more a dishonest exploiter of the situation may benefit at the expense both of farmers who repay their loans on time and of farmers who have smaller initial loans.

- Additionally, those farmers who might astutely calculate their maximum benefits from the cattle feeding program and decide to sell their animals after less than ninety days would be severely penalized by the effective interest rate if they attempted to repay their loans before the end of the fourth month.

Other problems with ECIBEV are its excessive costs of operation and its ineffective, even non-existent collection efforts that have permitted decapitalization of credit funds.

According to the latest information supplied by the MDST for the ECIBEV credit fund as of 31 July 1986, the total assets of the fund were 382,759,816 FCFA. These assets included 221,748,515 FCFA in working capital and the following receivables:

- Government of Mali - 38,103,460 FCFA;

- Long-term bad debts - 47,221,351 FCFA;

- Unpaid loans from the 1983/1984 campaign - 36,492,130 FCFA;

- Unpaid loans from the 1984/1985 campaign - 23,630,760 FCFA; and

- Other miscellaneous receivables - 15,563,600 FCFA.

A high rate of unpaid loans can also be anticipated for the 1985/86 campaign. Unpaid receivables of doubtful collectibility thus total at least 161,011,301 FCFA -- or 42 percent of all ECIBEV credit fund assets. The credit fund is being decapitalized, with at most 58 percent of the original USAID funding remaining.

An additional comment on the ECIBEV financial structure is that, as currently conducted, the annual campaigns seem to have no legal terminal

date of completion. There is no fixed date at which time the accounting books for one campaign are officially closed and the books for the next campaign are opened. The books remain open on all outstanding debtors, and this has the obvious consequence that no true end-of-campaign balance sheets can be established by ECIBEV and verified by an external source. Instead, ECIBEV carries its bad debts over from year to year and is always in the position of still trying to collect on past due loans, although it must by now realize that there are no effective ways of actually ever securing many of these outstanding reimbursements.

Finally, there are many weaknesses, pointed out by the Rofe report, in the actual daily implementation of the ECIBEV credit operation. Some of the recommendations put forth by Rofe have been accepted by ECIBEV and some actions have already been taken to correct deficiencies. More actions are expected in the planned 1986/1987 campaign. However, even if all of the Rofe suggestions were to be fully implemented, this would not affect the core structural problems of the present credit program or the real social and legal difficulties of obliging farmers and traders to pay back their loans on time and in full.

In summary, then, the ECIBEV credit program is financially unsound at present, given that the same problems have persisted throughout the eleven years of its existence, including the two-and-one-half years of the current project. The project's accounting and financial records are in good order and allow close monitoring of the financial plan for each campaign, and that ECIBEV's financial report system and internal controls have improved substantially under the project. Nonetheless, the burden of the loans not recovered precludes the attainment of self-sufficiency. Given the past record and the dimensions of the problems that remain, the prospects for fundamental changes being made before the expected end of the current project are also slight.

ii. Progress Toward Financial Self-sufficiency

Since reimbursements to the ECIBEV credit fund are the organization's only actual source of revenue for the on-farm cattle feeding program -- as opposed to subsidy grants from the GRM and USAID -- the issue of financial self-sufficiency is directly linked to the viability of the credit operation. Yet there are clearly insufficient revenue flows within the ECIBEV on-farm cattle feeding operation to pay all of the annual program expenses and simultaneously maintain the credit fund, without continued access to external subsidies. This being the case, senior administrators at ECIBEV are effectively faced at present with four financial options:

- Fully reimburse the credit fund to keep it from decapitalizing and, thereby, be unable to cover all of ECIBEV's annual operating expenses;

- Cover all of ECIBEV's annual operating expenses and, thereby, decapitalize the credit fund over time;

- Hedge on full payments to either account; or

- Find another external source of subsidies, in place of those already provided by the GRM and USAID, to keep the annual operation going at its present level.

Unfortunately, these options all run counter to the objective of self-sufficiency. This simple economic principle states that: to be financially self-sufficient any business enterprise must generate receipts sufficient to cover all of its variable and fixed costs. To show that short-run progress is being made toward this objective, a business enterprise must be able to demonstrate that its receipts are sufficient to cover all of its variable costs and to contribute to the payment of its fixed costs in the short-term.

Since this project started, ECIBEV, with the help of the technical assistance accountant, has improved its financial analysis and now presents monthly accountings. This effort is clearly one of the most positive aspects of project implementation to date, but we find two problems with the accounting system as it now stands:

- First, costs are not clearly defined as variable and fixed expenses but, rather, as direct and indirect costs; and

- Any calculation of financial self-sufficiency must be based on the actual variable and fixed costs incurred by ECIBEV in the course of each annual campaign -- and not upon expense approximations.

In order to demonstrate an appropriate format for future presentations, the financial data found on page 6 of the July 1986 ECIBEV monthly financial report are reorganized into variable and fixed costs. Table B.5 below presents this reorganized format.

Total ECIBEV expenses for the 1985/1986 campaign through 31 July 1986 amounted to 236,912,112 FCFA. Of this total, ECIBEV had accumulated 223,507,393 FCFA in variable cost expenditures and 13,404,719 FCFA in fixed cost expenditures.

As of the same date, ECIBEV had in hand 98,023,104 FCFA in actual receipts from loan reimbursements and interest on capital in local accounts during the campaign period. This amounted to a loan reimbursement percentage of 41.41 with two months to go until the end of the project's fiscal year on 30 September 1986. An index of financial self-sufficiency for the 1985/1986 as of 31 July 1986, therefore, would be 41.38 percent. As of 31 July 1986, then, ECIBEV could be said to have covered 43.86 percent of the 1985/1986 campaign's variable costs but to have made no contribution whatever to its fixed costs.

Table B.5

Revised Format for Presentation of ECIBEV Financial Data
1985/1986 Cattle Feeding Campaign: 1 October 1985 to 31 July 1986

Actual Costs of the Campaign as Incurred by ECIBEV (in FCFA)	
1. Variable Costs	
a. Credit advanced for cattle purchases	163,880,000 1/
b. Purchases of cottonseed residue supplement from HUICOMA	22,364,550 2/
c. Purchases of salt blocks from the Veterinary Pharmacy	3,780,000 2/
d. Purchases of veterinary supplies from the Veterinary Pharmacy	5,512,950 2/
e. Gasoline	5,815,935 1/
f. Vehicle maintenance and repair	636,833 1/
g. Transportation by hired trucking of cottonseed residue supplements	17,739,625 1/
h. Farmer loan reductions due to cattle mortality	3,777,500 1/
Sub-total	223,507,393 3/
2. Fixed Costs	
a. Salaries of ECIBEV program personnel 4/	5,387,337 1/
b. Employee field benefits	2,427,890 1/
c. Vehicle insurance	344,600 1/
d. Office supplies	121,060 1/
e. Shared administrative costs at ECIBEV headquarters in Bamako 5/	1,866,737 1/
f. Miscellaneous expenses	377,095 1/
g. Amortization on ECIBEV vehicles 6/	2,880,000 1/
Sub-total	13,404,719 3/

Footnotes:

1/ Figures taken directly from the July 1986 ECIBEV financial report.

2/ Figures supplied by the ECIBEV Chief Accountant from actual invoices.

3/ As of 31 July 1986.

4/ May not reflect actual percentages of certain employees time spent on the cattle feeding program.

5/ This is a negotiated percentage figure and may not reflect actual costs.

6/ Calculated by Government of Mali regulations and may not reflect the actual replacement costs of the vehicles involved.

The major point of this example is to show a different method of presenting the available ECIBEV financial data that is more appropriate to immediately indicating ECIBEV's progress -- in each annual campaign-- toward the goal of financial self-sufficiency. If each monthly financial report contained a similar table, all parties to the Project Grant Agreement could see immediately what ECIBEV's financial progress was toward this stated objective.

iii. Financial Viability of Cattle Feeding at the Farmer-level

In the series of INRZFH/ILCA monitoring reports produced by Bauer and Sissoko, the gross financial margin received by ECIBEV participating farmers is defined as: the sale price of the fed animal minus the purchase price of the same animal. They report in Bartholomew et al. (1986) that these gross margins averaged 20,370 FCFA in the 1983/1984 campaign and 31,800 FCFA in the 1984/1985 campaign. In both campaigns, however, they found that as many as 20 percent of the sample animals were sold for reported prices resulting in gross margins less than the required loan repayments - i.e., less than 16,200 FCFA in 1984 and 17,500 FCFA in 1985. In addition, they found no statistically significant relationship between the realized gross margin on the animals fed and farmer debt reimbursement - i.e., farmers with unpaid loans at the end of the season are not necessarily those who lost money on cattle feeding during the campaign.

Bauer and Sissoko further define the net financial margin for their studies as: the gross financial margin minus the sum of required total loan repayment plus farmer-incurred cash costs. The range of these net margins is presented in Table B.6 below.

The sample sizes for this study are low, and it is admittedly difficult to acquire accurate information on transactions from informants. Nonetheless, these figures strongly suggest that while the majority of

participating farmers turn a profit, a certain large percentage of them do not.

Table B.6

The Range of Net Financial Margins for Sample Farmers in the ECIBEV Cattle Feeding Campaigns 1/ All ECIBEV Zones: 1983/1984 and 1984/1985

Net Financial Margin	Campaign 1983/1984 2/	Campaign 1984/1985 3/
(FCFA)	(%)	(%)
< 0	38.2	27.6
0 - 4,999	44.1	20.7
5,000 - 9,999	11.8	3.4
> 10,000	5.8	48.3
Total	99.9	100.0

Footnotes:

1/ Exclusive of participating ECIBEV-sanctioned cattle dealers.

2/ Sample size of 34 farmers.

3/ Sample size of 29 farmers.

Bauer and Sissoko's 1984/1985 studies also showed that there is a strong relationship in marketing between the actual liveweight of the animal being sold and the total sales price. This is to say, cattle buyers effectively buy animals by estimated liveweight for a reasonably stable price per kilogram, even though they do not actually weigh the animals.

This being the case, the researchers found that the gross financial margins recorded during the 1984/1985 campaign could essentially be disaggregated into two principal components: the price component, due simply to seasonal fluctuations in the general level of cattle prices; and the weight component, due to the actual liveweight gain of the animal during the feeding period. The first of these components accounted for 67

percent of the gross financial margin; the other for 27 percent. The interaction term between these two components accounted for 6 percent of the gross financial margins recorded. Thus, there is a strong seasonal price component to financial margin, as well as a less substantial but still significant weight component. There is, however, no evidence for existence of an end-of-dry season "quality" market for cattle.

This analysis shows that farmers in the feeding program, by putting fed cattle on the market at a specific time of the year, are able to profit substantially from the seasonal price fluctuation in the cattle market. This demonstration of the importance of seasonal market changes reinforces earlier findings on Malian livestock conditions by CRED/ University of Michigan (1980), Lichte (1978), and Eriksen (1977).

Bauer and Sissoko conclude that lowering the costs of cattle feeding per unit of liveweight gain, in combination with better fed-cattle marketing strategies, would significantly improve the financial viability of the cattle feeding program. Since local meat prices in Mali are officially regulated, the possibility for augmenting farmer returns through increases in domestic retail meat prices is limited.

The Bauer and Sissoko work to date has been excellent, and the evaluators agree with their conclusions. It is certainly true that major gains in farm-level profitability in the present feeding operations can only be attained by lowering the unit costs of liveweight gains in the animals fed. Unfortunately, there are few prospects for such progress in the context of the present program, which has emphasized subsidized production over marketing. Specific conclusions with respect to further monitoring of the ECIBEV cattle feeding program are that:

- INRZFH/ILCA researchers should be given adequate resources to expand their sample size for monitoring purposes to at least five percent of all participating farmers, including those in the OHV and ORS sub-programs.

- More attention should be given to monitoring the actual financial costs incurred by participating farmers, in addition to the ECIBEV loan itself. In this regard, the following items are of particular importance: farmer cash contributions to the actual purchase prices of animals; the costs of all feeds supplied in addition to the cottonseed residue supplement; the costs of provision of water for the cattle; any actual herder payments for cattle allowed to graze; and any miscellaneous payments that may be incurred in securing cattle, animal health treatments, or other services during the feeding campaign.

- Some calculation should be made of the estimated interest foregone on farmer capital invested during the cattle feeding program, particularly related to the value of the cattle fed but also with respect to capital purchases - e.g., oil drums for water, feeding troughs, and other items.

- Attention must be paid to actual person/day allocations of unpaid family labor related to the feeding campaign, including forage and water collection, animal management, manure collection and spreading, and other such activities.

With regard to the last item, unpaid family labor costs could be a critical determinant in the viability of the cattle feeding program at the farmer level (see the Beneficiary Analysis below). Even though it is not easy to attach a direct cost to this labor, a more appropriate indicator of the farmer's net marginal "profits" from the cattle feeding could be derived as a net margin per person/day of labor expended in the operation. This indicator could be calculated by dividing Bauer and Sissoko's net financial margin by the actual number of person/days of labor expended in the cattle feeding operation. Such an indicator would more appropriately reflect the farmer's own perceptions of his "profits" and, additionally, would allow direct comparisons with similarly estimated net margins per person/day expended in alternative labor activities, including migrant labor earnings and small-scale trading, which may conflict with the cattle-feeding season.

Finally, the following observations on the present situation complete this section.

- The farm-level profitabilities in the ECIBEV program are clearly highly variable from one year to the next and between participating farmers in the same year. Moreover, it appears that much of the variation in inter-annual results is caused by factors exogenous to either the farmer or the ECIBEV situations. These factors include the prices for cottonseed residue supplements and all potential substitutes; transport costs for hired trucking; rainfall conditions in the project zones affecting both forage and water availabilities; and the lagged impacts of changes in livestock markets, which affect prices for fed cattle.

To take the last of these factors as one example, if the regional livestock markets in 1985 were in the process of lagged adjustment to drought-induced cattle sales in 1983 and 1984, then one could conclude -- as Bauer and Sissoko have done -- that increases in farmers' net financial margins that year were more heavily influenced by unusual livestock marketing conditions than by any factors within the ECIBEV program itself. Therefore, improved margins are not necessarily indicative of any improvements in the cattle feeding program per se during the inter-annual period.

- As the researchers have pointed out, net financial margins are heavily influenced by seasonal price fluctuations in every campaign. That is, cattle prices are influenced on the supply side primarily by the gross liveweight of all cattle presentations in any given month, and on the demand side by the state of effective consumer purchasing power in both Mali and

the coastal countries. Under these circumstances, one must ask at what point does further expansion of the cattle feeding program have significant price-depressive effects in local markets and become self-defeating for the farmers involved in it?

The evaluators have no definitive answer to this important question, but would strongly advise all parties involved in cattle feeding not to proceed on the facile assumption that the local or export markets for Malian beef on the hoof are infinitely expansive -- or even that they are likely to expand at a rapid rate in the near-term. On the contrary, the limited available evidence at present would lead to the conclusions that Mali (1) is likely to continue to have a difficult time maintaining its existing market shares for live cattle in the coastal markets and has virtually no short-run chance of exporting butchered beef to those markets; and (2) is likely to see contractions in its local markets for beef, given the real declines in effective Malian consumer purchasing power in the continuing domestic economic crisis.

- If the GRM in the future makes the adjustments in its livestock marketing policies that have been advocated by so many analysts - i.e., decontrol of retail meat prices, removal of border controls on livestock exports, lowering or cancellation of taxes and regulations on livestock producers and traders, etc. - we suspect that the primary consequence might simply be a substantial redirection of the existing cattle trade toward the coastal countries, as traders search for higher coastal price advantages, and a modest rise of meat prices in Bamako, coupled with a lowering in the quality of meat available to local butchers. This may, indeed, also result in marginal increases in revenues to producers and cattle traders if they can sell their existing animals in the more affluent coastal markets; but it almost certainly does not imply that the total flows of cattle can be expanded without significant effects on all cattle prices -- and, hence, the incomes -- received for these animals.

- Given all of the uncertainties in the current situation, the final conclusion is that livestock feeding in general -- and cattle feeding in particular -- should be carried out in Mali in a much more flexible manner in the future than has been the case in the ECIBEV program. Private livestock producers should be given more effective scope for decision-making in both production and marketing; and their financial requirements should be met by some mechanism other than direct credit through a government bureaucracy, with all its entailed rigidities.

c. Management Analysis

Overall project management and management development activities for the Mali Livestock Sector Project are discussed in much greater depth in

the management section of this report. The present section focuses specifically on management expenses within ECIBEV and, more specifically, within the on-farm cattle feeding program.

i. Financial Management

Through counterpart training, short-term management seminars in the United States, and the "action training" consultancies of the DPMC, the financial management for the cattle feeding component has shown a significant improvement over previous USAID-funded activities in the Mali livestock sector. The accounting department now furnishes monthly, quarterly, and annual financial plans and reports that meet the requirements of USAID-funded project financial reporting. The system has been computerized on an IBM PC system and the Malians have been trained in the operation of the accounting program.

It should be pointed out, however, that the financial accounting training and computer applications are limited to the AID-funded activities within ECIBEV - i.e., the on-farm cattle feeding program - and do not extend to overall ECIBEV financial management. Thus, the Chief Accountant is obliged to keep two sets of books, one computerized for cattle feeding program for USAID and the other done by hand for all ECIBEV operations, including the same cattle feeding program, for the GRM.

ii. Credit Fund Management

The data concerning the cattle feeding credit fund have also been computerized, and ECIBEV now uses the computer to track farmer loans and repayments. Financial records and reporting of the credit program have thus markedly improved over the three years of this project -- whereas, for the 1982/83 and previous campaigns, no master list exists at ECIBEV of the farmers who received credit. Thus, a better element of control has now been introduced, at least at ECIBEV headquarters.

Data from previous completed campaigns - e.g., 1983/84 and 1984/85 - have also been entered. This permits, in theory, the control of outstanding debts and provides a list of farmers who should no longer be permitted new loans due to their failure to repay previous debts. Unfortunately, field activities are not monitored in this way, and some farmers continue to receive new loans without having repaid past debts.

The Rofe report in 1985 discovered that there were considerable discrepancies between farmer-claimed reimbursements and the amounts actually paid into the credit fund at ECIBEV headquarters in Bamako. A subsequent internal investigation by ECIBEV revealed the embezzlement of over 5,000,000 FCFA by one of the field supervisors. More stringent controls over field activities have since been instituted to prevent such abuses.

iii. Overall Project Management

The Chief of Party/Management Specialist of MDST has acted as counterpart to the Director General of ECIBEV, as well as the counterpart to the Directors General of DNE, CVL, and INRZFH. Although no formal training was conducted at this level, it was hoped that close contact and the on-the-job sharing of management problems and decision-making would introduce new -- or reaffirm existing -- management practices and would lead to improved project performance.

The Director General of ECIBEV returned in August 1986 from a short development management workshop at Texas Tech University. The Deputy Director General of ECIBEV, who is the coordinator of the cattle feeding program, also received management training at the Francophone African Development Management Seminar at the University of Pittsburgh in 1985.

To date, the DPMC has presented three "action training" seminars. The focus of these seminars has been on the introduction of improved management systems, skills, and methods. At various times as many as eleven managers from within ECIBEV have participated in these seminars. The subjects covered thus far include:

- Clarification of program objectives;

- Formulation and use of work plans;

- Gantt charts and critical path analysis;

- Monitoring project implementation; and

- Project evaluation.

As a direct result of these seminars, the work plans of the cattle feeding program have shown a marked improvement since their initial presentation to the first JMC meeting in March 1984. The work plans now include a calendar of activities, although it is not always clear in them who is responsible for specific tasks. It is the responsibility of the MDST to review and approve the work plans and reports of the individual project components before they are submitted to the JMC for final approval.

iv. Management Problems

Despite the improvements already mentioned in financial and credit fund management and work planning and scheduling, important weaknesses remain that continue to plague management within ECIBEV and that have had a significant role in limiting the results achieved thus far.

(1) Component Objectives

The Project Grant Agreement very specifically states that ECIBEV component objectives include the transfer of all field support functions to the RDOs. Yet, OHV officials informed the evaluators that their offer to take over ECIBEV activities in the zone of Bananba, which is a sub-area within OHV's wider geographically defined responsibilities, was refused by ECIBEV. Although it is unclear that OHV actually had the manpower on hand at the time, a gradual relinquishing of activities in the Bananba area would be a logical first step in the transfer of all of ECIBEV's field activities. The transfer of these functions was expected to be completed by year three of the project.

This failure to implement project goals effectively negates the practical benefits that might have been derived from improved management. Although the quality of the work plans has noticeably improved in the past two years, without a clear agreement upon objectives (as is discussed more fully in section A.3.b.i) the planning process reduces to an academic exercise.

(2) Project Monitoring

Although there has been an improvement in the record keeping of ECIBEV's credit fund, the monitoring of field activities has been inadequate. In addition to the examples cited above, no attempt has been made to control whether farmers actually purchase the number of cattle for which they have received credit or to determine whether the program recommendations are being followed or are being diligently promoted by field agents. To date, no attempt has been made by ECIBEV itself to examine the full and actual costs and benefits to farmers for participating in the cattle feeding program. It is essential to have such information from the farmers to determine, first, whether or not the program is on track - i.e., if farmers are following the program - and, second, if the program recommendations are having the anticipated impacts.

(3) Management Information System

Closely related to the project monitoring is the flow of information or communication within ECIBEV. The information system within ECIBEV reflects the hierarchical nature of the organization. Information -- whether adequate or not -- tends to flow from the bottom up, with little or no feedback from the top down. For example, mid-level managers at ECIBEV complain of being uninformed concerning the work plans and reports of the forage and farming systems research component at INRZFH/ILCA. Yet these documents are regularly submitted to the JMC and are circulated to all the Directors of the individual components.

(4) Personnel Management

Roles and responsibilities within ECIBEV are sometimes poorly defined. For example, it is unclear who has primary responsibility for

the credit program in ECIBEV, and the evaluators received conflicting information on this question. Recently - i.e., in July 1986 -a head of the credit program was named, although he is listed in at least one ECIBEV document as head of credit recovery only, rather than head of the whole program.

Most decision-making in ECIBEV remains with top management, with little or no delegation of authority. Thus, the interest rate to be charged to the farmers was, according to the Project Paper, to be set initially at 12 percent and subject to annual JMC revision. The rate, however, continues to be set unilaterally by ECIBEV at 6 percent. It has not been reviewed by the JMC, despite the efforts of the accounting specialist to have it raised.

Qualified personnel are underutilized at ECIBEV. Personnel who have received long-term training are too often employed in positions very different from their formal training. And despite their advanced training, they are not granted the freedom to exercise responsibility, thus contributing to a generally low moral among project personnel.

v. Management Summary

In sum, the cattle feeding component in ECIBEV has benefitted from an improved financial management system that is limited, however, to project-specific activities. The system is also limited in that it is, at present, applicable only to American accounting and financial reporting procedures. Given past problems with the financial management of USAID-funded projects both in Mali and elsewhere, the results to date are very positive.

As discussed in the section on overall project management, the main emphasis of the project thus far has been on implementation, with much less emphasis given to management development within the MCRNE. The failure to clarify the specific objective of transferring the cattle feeding component right from the start has greatly contributed to the lack of progress toward this goal. Other weaknesses of management may be due to the lack of formal training. There are plans underway to incorporate further training -- in the final two years of the project -- that will deal specifically with some of these problems, the management information system being the most prominent example.

d. Beneficiary Analysis

The financial and managerial aspects of ECIBEV are not the only considerations in evaluating the farmer feeding program. Benefits to farmers such as the introduction of cattle feeding and improved animal husbandry practices are potential outcomes of the program that should not be overlooked.

i. Farmer Use of Net Profits from the ECIBEV Program

Farmers who participate in the cattle feeding program make a considerable amount of money if they happen to fall in a zone that is administered correctly. One informant estimated his profits at approximately 45,000 FCFA. This sum was earned on three bulls although he actually took out a loan for four animals. Perhaps the most successful farmer interviewed made 55,000 FCFA per bull. Another farmer with ten bulls had made a total profit of 149,000 FCFA or about 15,000 FCFA per animal. Most farmers probably receive between 75,000 and 200,000 FCFA per year in remittances from their sons working in the south - i.e., in Bamako, Abidjan, Sikasso, etc. Thus, the cattle feeding program profits are a substantial addition to what is often the only other cash income the farmer can count on -- the earnings of the family's young men. However, development projects seem to have a bad reputation in the ECIBEV project area. Farmers say they hesitate to participate in such projects because of the risk of increased indebtedness.

The fears of the average farmer are compounded when one considers the abuses and rumors of abuses on the part of the ECIBEV cattle buyers (Fr. mandataires). These have been to some extent documented in the Rofe (1985) report, and village interviews confirmed that the problem was real. The ECIBEV cattle buyer system is not amenable to close monitoring and should not be continued. In some areas, as Boron, efforts have been made to end the cattle-buyer system.

When the net profitability of the cattle feeding program for the farmer is considered from a longer-term point of view, several important issues present themselves. Since the ECIBEV zone in Banamba has suffered severely in the recent drought, most farmers are currently in debt for purchases of grain. These local debts were partially paid -- up to 50 percent in some cases -- with the 1985 harvest, but most farmers still owe several years worth of the debt. Farmers also regularly sustain high debts for traditional expenses - e.g., marriage payments. Informants confirmed that the first thing a participating ECIBEV farmer does with his profits is to pay off these debts. Thus, the first few years of participation in the cattle feeding program enable him to acquit himself of his debts.

After the first two or three years, one might expect the participant farmer to begin to use his net profits to buy cattle for feeding on his own and to attempt thereby to change his overall economic situation. But only one of ten persons talked to did this. The first problem is that, in an ongoing semi-famine situation, most of the ECIBEV profits continue to be eaten up in expenses for food purchases. The second is that the participant believes that he can always obtain continuing loans for more cattle from ECIBEV, so there is no motivation to risk his net profits in his own cattle. Finally, most farmers prefer to spread out their income over a number of related risks. They may buy millet for trade, they may make up the differential between the standard loan amount and the actual

purchase price of a feeder bull, or they may acquire sheep or goats, which show greater resilience in drought years.

Thus, the ECIBEV profits are a positive benefit to the farmer in the sense that they serve to finance ongoing costs of farming, including food purchases in years of shortage, but they do not seem to provide him with a substantial fund of new working capital.

ii. Women and Children

No effort was made in the ECIBEV program, or specified in the Project Paper, to extend credit for any type of livestock feeding activity -- cattle, sheep, or goats -- to women. However, interviews in the field indicated that:

- Women and children contribute substantial amounts of labor to the feeding and watering of the cattle fed under the ECIBEV program;

- They receive no direct individual benefits from their labor (but may of course benefit at the household level - i.e., in the sense of decreased household indebtedness or increased availability of grain during times of famine); and

- Women who may wish to have access to credit have so far been given no means of acquiring it.

(1) Women and Cattle -- The Traditional Investment Strategy

The ECIBEV design seems to have been based on the universal farmer response that "cattle belong to men and sheep and goats to women." Superficially, this is true, and men certainly bear the major responsibility for cattle feeding and care. However, women and cows are linked by complex rules of property and inheritance that effectively act to guard the integrity of an extended family's capital. On marriage, a girl receives from her father a cow. Heifer calves are her interest on this capital and are inherited by her children upon her death. Bull calves immediately become the property of the animal's caretaker, whether husband or father. As long as the woman lives "her" cows and heifer calves can be sold only with her permission, and she has rights to the milk and any money received from milk sales.

In times of stress - e.g., famine - the woman's voice is an important deciding factor in whether or not the animal should be sold. Furthermore, her husband is restrained from using the cow or its offspring to marry a subsequent wife. The capital belonging to the first wife should not be used to marry a second wife.

These rules, which are more complex than this brief description suggests, act as brakes which guarantee that the unending cash demands of an extended family will not dissipate its capital - i.e., its cows and

calves. Women know that their own security during widowhood and divorce, as well as the future welfare of their children, depends on maintaining the integrity of their herd. They are extremely reluctant to assent to the sale of any of their own cattle. The traditional investment system banks on this to preserve enough capital to enable the next generation to survive. Because many cows belong to women and because women are notoriously reluctant to agree to their sale, cattle are often regarded as long-term investments. Such a complex of associations does not dispose the ECIBEV participant to use his profits to buy more bulls or steers for feeding and resale. In fact, the one informant who bought cattle with his net profits purchased breeding cows in order to form a herd under his own control.

The creation of cash capital -- which is liquid and cannot be conserved by the farmer because no cultural norms stop its dissipation -- does not mesh well with the traditionally sanctioned strategy of capital investment in cattle, unless such cattle are viewed as "belonging" to ECIBEV and are manipulated for short-term profits. This, along with the ready availability of cheap credit, may be an important reason why the project has not stimulated farmers to embark on buying and feeding cattle with their own money. It may, however, indicate a successful ECIBEV effort to establish a more fluid pattern of short-term cyclical use of cash.

Given this general background, one cannot assume that women are uninterested in owning cattle -- two cases of women buying cows with sale profits from small ruminants were cited in the course of interviews -- or that they are unfamiliar with their care. What is clear is that cattle are a link between men and women and that they cement extremely complex social and financial relationships. It would be foolhardy to design a project that extended cattle credit to women without involving men. In this society, men rather than women generally perform the "heavy" work of gathering forage for the animals, and women are culturally constrained from owning bulls. Yet it is equally inappropriate to design a credit program that does not take into account the major contributions women make to the care of fed cattle, the circumstances under which they do own and manage cows, and their widespread ownership of small ruminants. One should further observe that encouraging the ownership of bulls and their feeding does not improve the supply of milk available to women and children, and that there is no evidence to suggest that women directly share in the profits gained from the sale of the animals fed under the program.

(2) Women and Credit

Given the above analysis, it might seem desirable to extend any future credit program to women. Yet one needs to be wary of the secondary effects of such a program. The ECIBEV Banamba zone is Muslim and patriarchal. Under the circumstances, it would be well to design a credit program that would, on the one hand, include both men and women in a joint enterprise but that, on the other hand, would not overtly challenge the traditional structure of family life.

Extending credit to the women of a farmer's household for small ruminants, while simultaneously offering him the possibility of participating in a cattle feeding program, might resolve many of the inequities inherent in the current ECIBEV credit system. Such credit might especially be extended to elderly women in the household - i.e., aunts, mothers - who are perhaps better credit risks and who may already play important decision-making roles in household finances. Other criteria for determining creditworthiness of women might include prior ownership of smallstock. The existence of a suitable market for a smallstock feeding program, of course, remains to be determined.

(3) The Beneficiary View of the Problems with the Current ECIBEV Feeding Program

Of the problems cited by the farmers interviewed (tardiness of the cottonseed supplement delivery, excessive ECIBEV fees), the most revealing was the indication that the amount of the current loan for cattle purchase - i.e., 45,000 FCFA - is in fact below what a suitable bull for feeding costs. Most farmers were obliged to add between 5,000 and 20,000 FCFA to the ECIBEV credit in order to buy a suitable animal.

This suggests, first, that the credit structure is not sufficiently flexible to cope with large variations in the market price of cattle. Farmers consequently sometimes buy only three bulls with the money intended for four, a practice which ECIBEV agents seemingly do not try to suppress. Second, it indicates that farmer capital input is required for the program to work, and as such the program is evidently not reaching the "poorest of the poor." Finally, however, farmers are not compelled to participate in the cattle feeding program. The fact that they are willing to supplement loans with their own funds must be taken as a positive sign of their confidence in achieving some return on their investment.

iii. Technical Problems

(1) Feeding

The feeding regime of 4 kg of cottonseed residue supplement per day recommended by the cattle feeding program may not be strictly adhered to, as farmers may try to stuff the animals -- delivered late -- for a hurried sale. Farmers tend to worry about the extent of their debt to ECIBEV for as long as the cattle are in their charge. The farmer's response to this anxiety is to stuff the animals with food in order to hasten the date of sale and of repayment. Cattle are expensive animals, and no one wishes to have them on their hands for an extended period of time if they do not own them.

(2) Feeding and Forage

Farmers reported much higher manpower costs for forage collected than was foreseen in the program design. Natural forage has been increasingly difficult to obtain during the last four years of drought, with the

exception of 1985 which was a superlatively good year. Some farmers observed that they had to go 20 to 20 km to find bush hay. Collecting such forage can become extremely expensive. Farmers who initially reported that they had few problems obtaining forage subsequently revealed major expenditures for cattle feed. In one village, respondents first said that forage was not a problem, and then they reported that they spent 15,000 FCFA for the labor to collect it. This is two months salary for one laborer at 7,500 FCFA per month. This expense roughly equals the expected profit on one animal. Problems concerning estimating the cost of collected forage are mentioned in the Bauer and Sissoko report (1986, p. 26-27), but they provide no estimates. The design of the cattle feeding program seems to have been based on the premise that natural forages are cost-free, perhaps on the unjustified assumption that an extended family's young men will take over the work of collecting them -- at no real opportunity cost. As stated, young men in this area commonly engage in migrant wage labor and are unavailable for this task, which consequently falls on the shoulders of the elder men to do themselves or to hire the labor to perform.

Farmers express no reluctance to growing forage for animals. Rather, it is the labor consumed by these fields which presents problems. In one village near Boron, farmers reported that they grew white sorghum exclusively for animal forage. One participant estimated that he spent between two and four days planting this crop, using a plow and seeder. He also calculated that weeding the forage fields consumed between two and four days if done with a plow and at least five days if done by hand. The village council concurred with his estimates. For a farmer who does not already own a plow, the 3,000 FCFA daily rent may make forage growing prohibitively expensive. Farmers confirmed that growing forage took a significant amount of time away from subsistence production at moments when labor could least easily be spared. It emerged that only elderly men with considerable manpower at their disposal could afford to devote their own time to forage crops, while their sons tended the subsistence fields. In an area where growing enough grain to feed oneself has become a constant preoccupation, it may not be feasible to grow forage, even if the technique is known and accepted. Even in good years, the labor costs of growing and/or harvesting a forage crop may be prohibitive, unless economies of scale can be achieved by feeding a moderately high number of animals. Forage gathering and growing is certainly technically feasible and socially acceptable in the ECIBEV area. Whether it has an economic payoff is another question.

(3) Water

The increasing unreliability of rainfall in the ECIBEV area has affected the availability of natural forage. It has also placed many households in a situation in which most -- if not all -- of the profits are spent on food. One farmer in Boron reported that he has had to buy grain for the last nine years in order to feed his family. Such pressure inevitably makes the participant more dependent on continued participation in the cattle feeding program for basic subsistence. Such a dependency implies that the project helps a farmer by guaranteeing his subsistence

under drought conditions, rather than by increasing his economic level or capacity for investment.

In addition to these general problems, certain villages suffer from a poor water supply during the dry season. They have difficulty guaranteeing drinking water for people much less for animals. Water supply problems do not occur exclusively in the north of the Banamba zone. In one village, just to the east of Sirakorola, there are between twenty and twenty-five surface wells but no deep well (Fr. forage). During the dry season, the women draw water throughout the night and some walk several kilometers to nearby villages for water which they carry home. All the animals possible are watered at neighboring villages. As one can well imagine, the recent introduction of the cattle feeding program -- which fed 80 animals in this village in 1984/85 -- has accentuated the pressure on an already insufficient water supply. Villagers agreed that if the water supply were more plentiful, they could more easily feed their animals.

While this village provided the most striking example of water supply problems, it is clear that drawing water for the fed cattle is by no means an easy task and that it adds an enormous labor burden to the tasks allotted to women and children. It may be that the extra work required to water these cattle is the most damaging aspect of the cattle feeding program with respect to women and children.

When female labor is not used to water cattle, the farmer may incur other expenses. Several farmers noted that those without their own well had to buy empty oil drums for 6,000 FCFA apiece in order to transport water for their cattle from neighboring wells. This work is extremely difficult and requires young male labor, which may have to be hired. This practice is widespread. In Boron, for example, more than half the participating farmers were obliged to purchase oil drums and hire labor in order to transport water for their animals. Watering costs, like forage collection costs, may well render the cattle feeding program uneconomic for the farmer and cause him to drop out.

(4) Animal Health Treatments

Farmers reported that the ECIBEV veterinary agents responded quickly to calls of distress, and some at least believed that the medicines administered were effective. But farmers noted that the program had no effect on the health of small ruminants, a particularly important matter at a time when more and more farmers are investing their own money and ECIBEV profits in goats and sheep. Farmers pointed out that cattle were far more susceptible to the effects of drought than goats and sheep and that the need for effective small ruminant health interventions had become that much more important.

Farmers were agreed that the general level of animal health care provided by the ECIBEV agents was good. The low mortality rates documented by Bauer and Sissoko and by Rofe bear this out.

(5) Village Associations

Villagers are quite capable of forming their own self-governing associations. One village that had refused to participate in the ECIBEV program had formed a committee of ten farmers. They had examined the benefits and risks of the ECIBEV program and decided that the level of administrative malfunctioning was such as to make the program too risky for them. Nearby villages had subsequently entered the ECIBEV program with negative results, confirming the accuracy of the first village's evaluation.

Despite the obvious capacity of the villagers to organize themselves, it was clear that no ECIBEV agent had informed villagers of the increased credit opportunities and the decreased costs that would result if groups of participating farmers were formally organized to receive group credit (see above section B.1.a.ii.). It is evident that ECIBEV agents have no incentive to put themselves out of business at the village level. The ECIBEV program has not fulfilled its mandate to establish group credit and to withdraw its field staff after village associations have learned the skills needed to negotiate directly with headquarters. This failure alone would question the future of the ECIBEV credit program, even were there no other problems.

A comparison of the Banamba zone ECIBEV program with that supervised by ORS in the Segou region suggests that the absence of village associations and group credit may be critical factors affecting the rate of loan repayment. An overview of the Segou region ECIBEV-ORS program gives a very different picture of the cattle feeding project.

A key factor in the success of the Segou ECIBEV program is that loans are always made to groups, cooperatives, or tons[1], rather than to individuals. As the farmers themselves say, it is safer to spread the risk of non-repayment among a group of farmers than to rely on individual successes. The radical difference in the rates of repayment between Segou and Banamba suggests that all future cattle-feeding credit operations should be directed towards groups, rather than individuals. This is in fact already the policy of the BNDA in funding traction oxen in the Segou area.

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[1] Cooperatives are associations with members from several villages. For example, the Dioro cooperative comprises 363 farmers from four villages and one hamlet. Cooperatives handle many farming problems - e.g., seed, equipment, traction animals, etc. In contrast, tons -- the Bambara word which designates a traditional association of men who eat together -- are associations whose members generally come from the same village. Tons are formed with one specific objective in view -- for instance, the purchase of traction animals -- and seem to be more recent institutions. Some ORS cooperatives have many years of experience behind them.

Most traditional savings, such as the collection of goods for ritual feasts, the amassing of monies and goods to pay dowries, and the payment of fines, were organized and amassed through collective pressure - i.e., secret associations, enforcement of taboos, etc. Even in modern times, individuals respond to economic pressure from their own peer group. The farmer who will never pay a debt to a particular individual will go to great lengths to reimburse a debt that dishonors him in the face of his peers and threatens him with social exclusion.

Interviews with both ORS administrators and participating ECIBEV loan recipients strongly reinforced our opinion that credit should not be extended for specific, rigidly defined goals. ORS farmers use the ECIBEV credits to obtain traction animals, not to feed cattle for sale. Farmers explain that the profits from rice growing are so "enormous" that they would be foolish to sell fed oxen at the beginning of the cropping season - i.e., in May and June. They use the ECIBEV oxen to extend the hectarage they can prepare for rice growing since seed loans are partially based on the amount of land a farmer has prepared. Their need for plough oxen continues unabated until approximately November when they either sell the oxen (in which case they lose the considerable training time it takes to get a team of yoked oxen to work effectively together) or keep them and use the substantial advance they receive from ORS on their rice harvest to make a late loan repayment.

Application of the ECIBEV repayment schedule in the ORS area fails to take into account the specific needs and the economic priorities of the rice farmer. In the ORS region, the farmer who reimburses ECIBEV on time is seen not as honest, but foolish.

ORS farmers demonstrate that the cattle feeding techniques can be learned very quickly when extension work is done well. Farmers with only two years of ECIBEV program experience and no previous knowledge of animal feeding told us that they now understood the feeding technique and would use it to improve their traction animals, even if ECIBEV loans were withdrawn. They emphasized the importance of buying suitable animals at the beginning of the feeding period; many farmers added as much as 25,000 FCFA to the 45,000 FCFA provided by ECIBEV in order to obtain the best animals possible. Farmers also spent 2,000 FCFA per 100 kg sack for rice bran and 1,800 FCFA per 100 kg sack for rice millings in order to provide their animals with supplemental feed. Whether they were able to obtain higher percentage returns than farmers who bought "bargain cattle" is perhaps in doubt; the primary advantage seemed to be the ease with which they were able to market their animals, often being able to take full advantage of the seasonal price fluctuations before the end of the feeding phase.

Labor costs did not appear to affect farmer expenses significantly, since the ORS area does not suffer the same wage labor migration of the young as does Banamba. Most farmers used the labor of young men or women to water and feed their cattle.

To summarize, ECIBEV loans have allowed ORS farmers to purchase additional traction animals and, thus, to increase their rice production. Farmers feel that this is a much more important economic contribution than the cash to be gained by selling the feed animals for meat according to the ECIBEV schedule. With rice harvests worth as much as 1,000,000 FCFA per farmer, this calculation is hardly controversial. ECIBEV loans have promoted important and successful extension work on the part of ORS agents. ORS farmers appear to have learned feeding techniques very quickly and they seem to have little hesitation in using them to improve their own traction animals.

ORS administrators seem pleased with the contribution the ECIBEV loans have made to the rice growing efforts, but they are emphatic in saying that they do not wish to administer credit. The Director General of ORS made the important point that traditional farmers are cautious enough that they will soon lose faith in any extension service that acts as an intermediary for credit, whether or not the service is well administered. He added that the point of extension work was to enable farmers to seek credit on their own, to administer it themselves, and to bear the full repercussions of their investment decisions. It seemed clear that ORS farmers are both financially and technically in a position to take on this responsibility.

iv. Positive Spread Effects

(1) Relations with Transhumant Herders

When asked whether the selling of cattle for the feeding program had aroused resentment among the Maures who traditionally raise cattle throughout the Bananba zone, farmers replied that this was not the case. On the contrary, the Maures time their arrival in the zone at the beginning of the dry season to coincide with the availability of ECIBEV credit for cattle purchases. They then sell suitable animals to the Bambara, Khasonke, and Maraka villagers who participate in the program. There seems to be an extremely efficient information system through which the Maures learn whether credit has become available. Direct interviews with Maure herdsmen were not undertaken, but, apparently, the Maures do not regard the massive sales of fed cattle in June and July as a threat to their livelihood. Rather, the program has indirectly benefitted them by transferring the cash provided by ECIBEV to them. The ECIBEV credit has given the Maures a dependable market for many of their animals -- as feeder cattle -- and this has acted to improve social relationships between the farmers of the Bananba area and the transhumant herders.

(2) Manuring of Fields

Nine farmers from seven villages, and the village council of an eighth village, were asked to list the benefits of the ECIBEV program in order of importance. In two villages, participation in the program was recent enough that informants could not evaluate the benefits accurately. In the six villages with longer participation, one-half of the informants listed the manure from the cattle fed as the most important benefit of the

program. One farmer observed that the increase in his yield using manure from the program cattle in one year was such that his family "could not eat all the grain." A fourth village interviewee listed increased manure -- approximately one hectare's worth per participant -- as the second most important benefit after the primary benefit that he no longer had to work as a wage laborer. Only two informants did not list manure at all.

These data confirm the observations by Rofe and Bauer and Siasoko that additional manure and resulting increases in grain production may be one of the most important benefits of the ECIBEV program. As Toulmin (1983) has pointed out, access to manure for the light, sandy soils of the 400 to 500 mm rainfall zone north of Bamako can make the difference between wealth or poverty and survival or flight. Manure is reputed to increase the yield of short-cycle millet eightfold (ibid, p. 9).

In a zone where purchases of supplemental food are often necessary, the value placed on the manure from ECIBEV program cattle is understandable. Many farmers seem to regard the program as valuable whether or not they profit from it financially, because the manure is such a critical contribution to their subsistence farming effort. This may be one reason why farmers who have lost money with ECIBEV continue in the annual programs. If the program were to end, one of the greatest losses to the farmers would be the diminished access to manure.

v. Negative Effects

(1) Personal Involvement in Cattle for Feeding

Implicit in the design of the project is the hope that farmers would appropriate the technology of feeding out cattle and begin to buy their own bulls and steers for feeding. This has not occurred except in ORS/Segou. This failure to spark individual investment in cattle feeding is due to two factors:

(a) Poor Choice of the Animals to be Fed

Cultural norms in the Bananba zone endorse the fattening of sheep, not cattle; the cultural value of cattle lies in their capacity to safeguard an extended family's wealth over long periods of time. For most farmers, the cash earned by feeding cattle is inevitably spent in a very short time and does not contribute directly to long-term security. The farmer who invests in feeding cattle on his own has no culturally endorsed way of keeping his capital intact throughout the rainy season -- when demands for additional food are highest -- so that he can reinvest it at the beginning of the dry season. Unless such money is invested in cows, whose sale is not culturally sanctioned, it is almost impossible for the farmer to maintain or increase his original stake. By limiting the availability of credit to investment in cattle, especially steers and bulls, the Project Paper unfortunately precluded the adoption of livestock feeding as a strategy which could be readily integrated with traditional farming practice. Farmers already buy and feed their own sheep for sale at specific times of the year. Both credit and technology for this

purpose might have brought about a far more important change in the local economy than has hitherto occurred.

(b) Extension of Credit to the
Same Farmer Year After Year

Farmers have learned that the ECIBEV credit is available and that they can make money by taking advantage of it. However, the farmers also perceive cattle feeding as an opportunity dependent on the whim of an outsider group: the Americans. They believe that the credit will be available so long as it pleases the government and the foreigners. Most of them have not anticipated the eventual end of the program and have not planned to use its benefits to start feeding cattle themselves -- except apparently in the unusually well-administered areas of the ORS Segou zone. Farmers generally now regard access to subsidized credit as their due and will resent its withdrawal. While farmers are perhaps not consciously aware that the ECIBEV cattle feeding program is heavily subsidized, their tendency to reinvest their profits in small ruminants and cows reflects an awareness that the real costs of the program are prohibitive without subsidies and that the exercise is uneconomic.

In part, the program has encouraged dependence on subsidized loans by failing to enforce a time limit on the number of years a farmer can obtain credit. One farmer interviewed had fed cattle for all eleven years of the ECIBEV program without making livestock investments in his own right. ECIBEV and the cattle feeding program have never pushed the farmer to consider the possibility that he might be obtaining loans in order to begin a successful cattle feeding activity of his own. There are no sanctions or incentives to use the benefits of the ECIBEV program credit for anything other than short-term improvements in daily life. The farmer has been allowed to assume that credit will always be available to him.

4. Recommendations for the Current Project

1. Given the continuing weaknesses in the ECIBEV cattle feeding program after eleven years of operation -- its poor management, failure to collect on loans, failure to supervise field agents, failure to transfer functions, high cost of feeding supplements, and marketing problems -- the evaluators cannot in good faith recommend a renewal of USAID support for the organization. On the contrary, they recommend that USAID/Bamako cease any further financial support to ECIBEV.

2. This being the case, it is recommended that all project funds shifted from the ECIBEV program to the project's general fund -- as per PIL No. 11 -- remain in that fund. It is further recommended that these funds be reallocated among existing and new activities within the Livestock Sector Project -- exclusive of any reallocations to ECIBEV -- as part of a joint planning exercise between the MRNE and USAID. Finally, such a reprogramming of moneys in the general fund should be undertaken in time to permit their effective use before the end of the current project.

3. Given that ECIBEV was -- from its charter in 1975 as a precondition of the Mali I Livestock Project -- a joint Malian/American creation, we believe that, if the GRM were to decide to disband ECIBEV, USAID should bear joint responsibility in closing down the operation, including sharing in the costs of a complete and independent audit of all ECIBEV accounts regarding the on-farm cattle feeding program. This audit should be conducted by a private international accounting firm with impeccable credentials that is acceptable to both parties.

4. The continued institutional survival of ECIBEV, post-USAID funding, is essentially an internal issue for resolution by the GRM. We understand that the MRNE is currently conducting an independent internal evaluation for the purpose of deciding ECIBEV's future. The evaluators have no specific recommendation to make with respect to this internal decision, other than the programmatic criticisms presented in the analysis and conclusions section above. They note, however, that

- As much as 58% of the original project funding remains in the ECIBEV credit fund. This is sufficient to continue the program at least during a phase-out period;

- Production and marketing activities -- however flawed -- have been established under the program that might be lost irretrievably were support abruptly withdrawn;

- The cattle feeding program itself -- in the narrow technical sense -- is sound and perhaps merits continuation; and

- Other worthwhile accomplishments of the project include the training of ECIBEV staff, the administrative improvements in accounting and work plans, the transfer of technology to farmers, the decrease in farmer debt burdens, and the manuring of farmers' fields.

5. Should GRM decide that a continuation of ECIBEV based on its remaining funds is worthwhile, we recommend that ECIBEV

- Incorporate further improvements in management practices and systems -- under close ministerial supervision -- as outlined in the Rofe report and in this evaluation, including the more accurate accounting of costs, the closer supervision of field agents, the imposition of time limits for borrower participation in the program, and the more careful delineation of lending qualifications;

- Resolve to make the necessary collection effort to recover lost capital;

- Expand and accelerate its lagging efforts to transfer support functions to RDOs. This also requires addressing and resolving the RDO reluctance to take on lending functions;

- Insist, as a precondition to further loans, that villages or sub-zones form associations that will be responsible for the distribution of inputs and for the loan repayments;

- Develop and institute efforts to lower the costs of cattle feeding, such as through forage production research and by pursuing the policy of decreasing fees charged to participating associations;

- Squarely address the issue of the increased and uncompensated labor burden on women by working out revised animal husbandry practices in cooperation with the forage research program at INRZFH.

- Improve fed-cattle marketing, for example by acting as agent for the associations in negotiating sales, by organizing sales at the end of the feeding period, and by encouraging farmers to purchase, feed, and sell their animals in a timely way to take optimal advantage of seasonal price fluctuations; and

- Develop a more flexible loan structure that (a) frees the farmer to make better purchasing and marketing decisions, (b) includes the provision of loans to qualified women borrowers, and (c) provides loans for smallstock purchase and feeding and for purchase and feeding of traction animals.

6. Given the uncertainties in the current livestock marketing situation in the region and the importance of marketing impacts on the livestock sector in Mali, the proposed livestock marketing study, designed by Dr. William Duggan, should be implemented. A component of this study should focus on the existence of a market for a smallstock feeding program, including the relationship between seasonal market fluctuations and the demand occasioned by Islamic feasts, which follow a lunar calendar and are not linked to the seasons. However, there is little possibility that such a study can be successfully executed without the active and willing cooperation of OMBEVI, as the designated marketing research organization for the MCRNE. Nor should it be, given the desirability of building up a strong Malian capacity to design and implement such studies. The evaluators, therefore, recommend that the terms of reference for the study be fully and completely negotiated with OMBEVI, as soon as possible, and that lines of authority and control over the study be made perfectly clear to all interested parties.

5. Recommendations for Future Project Support

If a follow-on joint USAID/GRM livestock project is designed to be implemented after 1988 and if credit funding is envisaged to play any significant role in that project, we make the following recommendations:

1. All such credit funds should be channeled exclusively through an established and mutually acceptable banking institution in Mali. This would require securing these relatively high risk loans in a more

effective way than has been accomplished to date - i.e., via the associations - and also addressing the personnel and administrative problems that the banking institution taking on this task will face.

2. Such credit should be authorized to cover a broad range of possible private activities in the livestock sector, and it should not be directed by the lender to a narrowly defined, a priori list of interventions.

3. The criteria set up for such loans should be directly tied to the creditworthiness of the loan recipient(s) -- not restricted by sex of the applicant(s) -- and the technical and financial feasibility of the specific loan proposal advanced. Such a credit program should not be based upon any predetermined pattern of credit allocations dictated by either the GRM or USAID.

4. Ad hoc project credit funds should not be set up outside the banking system or operated under criteria other than those of strict and conservative banking practices.

5. Finally, to the extent that a broadening of the clientele population served by the banking system can be affected by USAID support, allocations should be made to strengthen such financial and technical service capacities.

C. FORAGE AND LIVESTOCK PRODUCTION RESEARCH (INRZFH/ILCA)

1. Objectives of the Component

a. Production Research

The proposed farming systems research component, as stated in the Project Grant Agreement, was to consist of a number of coordinated activities.

i. Initial Problem Analysis

An initial problem analysis was to be carried out to describe selected production systems and to identify possible development paths. This was to include literature study, consultation with experienced specialists, and field surveys. The field research, based on interviews with farmers and direct measurements of baseline parameters, was to involve an intensive farm-level data collection and analysis effort including sub-samples of different classes of farmers. The data collection effort was to focus on developing a sound understanding of the following production factors:

- Land use and access to resources, including changes over time;

- Farming systems, including cropping patterns, agronomic practices, and yields;

- Livestock dynamics, including size of livestock holdings, disease incidence, and estimates of productivity and mortality based on observed herd structures;

- Household economics, including family size and composition, subsistence needs, and labor availability; and

- Economic factors, including marketing facilities and prices of inputs and outputs.

Information on these factors would serve to identify the more obvious nutritional and disease constraints on livestock feeding as well as the relationship between animal and crop production, including the area required for subsistence crops and, hence, that available for forage introduction. The prevailing socio-economic conditions were also to be identified, including a preliminary appraisal of the labor and cash available for the introduction of innovations.

The objective was to complete this phase in 6 to 18 months, and the data collection and analysis effort was to take place concurrently with the testing of basic interventions. It was anticipated that data collection would take place in one or two case study areas, which would be selected on the basis of an initial reconnaissance survey that would include an inventory of a number of villages. About 30 production units

would be closely studied. In addition, occasional informal studies of other villages would broaden the base of the information and verify whether baseline villages were representative.

ii. Formulation and Testing of Interventions

Based on the initial problem analysis and a review of available technology, a list of likely innovations was to be formulated, taking into account the land, labor, and capital constraints. The testing of interventions was to be projected as a research sequence and research requirements were to be identified for each stage.

The initial emphasis was to be on forage production technologies, including improved traditional technologies. This would allow an evaluation of the benefits of the innovations and the identification of priorities for further research. Among the technologies that were to be introduced in concurrence with the initial problem analysis were the following:

- Interseeding in final crop year before the fallow;

- Growing more intensive crops which produce more straw - e.g., attempting to increase density from, say, 20,000 plants/ha without fertilizer to 50,000 plants/ha with fertilizer;

- Utilizing cottonseed cake more efficiently - i.e., by introducing improved rations with the objective of obtaining highest weight gain at lowest cost;

- Improving procedures for selection of feeder animals with the objective of identifying those with the most weight at the lowest cost;

- Improving hay preservation techniques for legumes - e.g., peanuts, cowpeas, and pigeon peas; and

- Improving minimum animal health care procedures.

Funds would be included under this activity for studies to be conducted in cooperation with other organizations - e.g., International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) or a U.S. institution. The topics covered were to include specific problem areas related to the cattle feeding program - e.g., marketing constraints on the procurement and sale of feeder and fed cattle, farmer capacity to handle input delivery, constraints to the formation of farmer associations, etc.

b. Institutional Arrangements

i. Administrative Structure

The farming systems research (FSR) activities outlined were to be carried out within the structure of the INRZFH. The research team would

include approximately ten Malian researchers in the following fields: forage agronomy, animal science, and animal husbandry. These researchers would be made available from staff. In addition, the Malian team would include a sociologist and an economist who would be provided from within the MRD. Only as a last resort would research staff be hired from outside the Ministry. Although a very small administrative support office would be located at Sotuba, the unit's primary operations would be at field locations. It was anticipated that required field facilities would be rented. The unit would also include a secretarial support staff.

ii. Role of ILCA

The project would provide financing for an expansion of ILCA's current accord with the GRM, thereby expanding its mandate in Mali to include a sub-humid zone program of mixed livestock/crop production research. Thus the project would finance the full-time services of a FSR specialist/forage agronomist and an agricultural economist. The project would also finance the short-term services of an animal scientist with experience in smallholder mixed livestock management and nutrition, an anthropologist experienced in farming systems analysis, and a survey design specialist. These and other short-term assistants would be provided from ILCA's sub-humid program staff. In addition, it was expected that current in-country staff of ILCA would provide professional guidance and support, both technical and administrative, for the research effort described herein.

Clearly, with the number of agencies involved, it was essential that their activities be adequately coordinated. A National Research Committee already existed with responsibility for research coordination. However, given the number of agencies involved, the NRC was necessarily obliged to deal very broadly with research questions. Furthermore, there was no central organization that dealt simultaneously with livestock and crop research activities. Therefore, the existing livestock research coordinating committee was to invite participation by various crop research organizations that were engaged in livestock-related research.

c. Develop and Extend Improved Forage Technology

Primarily in support of the on-farm cattle feeding program, assistance would be provided to the animal husbandry, forestry, and aquatic biology research institute (INRZFH) through the International Livestock Center for Africa (ILCA) to enable it to identify and test improved forage production packages. The major objectives of forage research dealing with cattle feeding were to:

- Identify the major agricultural production systems in the cattle feeding areas and the major constraints to increasing the production of forage for feeder and traction animals under those systems; and

- Field test improved technologies for growing protein and energy-rich forages that would eliminate or reduce participant reliance on agro-industrial by-products.

d. Pilot Small Ruminant Feeding Effort

Because of the lack of specific reliable data regarding the procurement, care, and marketing of small ruminants, the first step was to study thoroughly small ruminant production in Mali's semi-humid zone. Thus the research effort to be carried out by the INRZFH through ILCA and the Central Veterinary Laboratory (CVL) would focus inter alia on identifying the technical and socio-economic constraints to increasing small ruminant production and the means to overcome these constraints. Based on this information, if warranted, a pilot small ruminant feeding program, designed to take advantage of cyclical changes in consumer demand for and prices of small ruminants, would be developed. The size, duration, and modalities of the pilot project were to be agreed upon by AID, Ministry for Rural Development (MRD), and ILCA.

2. Accomplishments to Date

a. Production Research

i. Background

A five year contract between ILCA and INRZFH was signed on 17 February 1983. It called for a collaborative research effort and expanded an earlier agreement of 20 September 1980 between the GRM and ILCA to include research in the sub-humid zones of Mali, the area which receives at least 800 mm of annual rainfall. The area actually selected for operations was one in which ECIBEV was already carrying out its on-farm cattle feeding activities.

On 17 June 1983, USAID concluded a parallel cooperative agreement with ILCA to provide assistance to INRZFH in the integration of crop and livestock production systems of smallholders in the Malian sub-humid zone. Out of a total cost of $1,875,000 estimated to carry out the component program, USAID obligated a sum of $1,126,000 for the first three years of ILCA's operations.

According to these agreements, INRZFH was required to provide a team of ten research personnel. ILCA had the responsibility of fielding an agricultural economist and a FSR specialist/forage agronomist as long-term support personnel, as well as 35 person-months of interdisciplinary scientific support on an as-needed basis.

These agreements and financing by AID paved the way to start research activities. In late 1983, INRZFH nominated a team of researchers who formed a research unit and submitted a work plan for the period November 1983 to February 1984. At that time, ECIBEV was conducting its 1983-84 on-farm cattle feeding campaign. The research unit sent two missions to

the study area - i.e., the ECIBEV Bananba zone - and, concurrently, started literature search and review.

In February 1984, the FSR specialist/forage agronomist arrived in Mali. He was followed in July 1984 by the agricultural economist. By May 1984, the research unit was partially operational with the use of vehicles borrowed from MDST; the unit's own vehicles were received by the end of July. Field trial sites were finalized in the interim and, with the provision of office facilities by the INRZFM in September 1984, the unit became fully operational.

ii. Research Approach

According to the Project Grant Agreement, the first activities to be undertaken were:

- Initial problem analysis; and

- Formulation and testing of interventions.

(1) Initial Problem Analysis

As stated earlier, the study area defined in the ProAg is where ECIBEV is conducting its on-farm cattle feeding activities - i.e., in the Bananba and Segou ECIBEV zones, located about 140 and 240 kilometers, respectively, northeast of Bamako and lying on both sides of the Niger River. In 1986 the Segou trials were discontinued due to logistical problems. The Segou and Bananba zones are effectively separated by nearly 550 kilometers; moreover, well over 90 percent of all animals in the ECIBEV program were in the Bananba area. At present all trial plots are in the Bananba area and in the surrounding villages.

The purpose of the initial problem analysis is to provide the research unit with a set of baseline data to enable the unit to arrive at possible interventions for research station and on-farm trials. A time frame for achieving this objective was suggested at 6 to 18 months.

With respect to land use and resources, an ILCA plane was used for one day in August 1985 to take aerial photographs of an area of approximately 240 square kilometers in the Bananba ECIBEV zone. The photography included the villages of Bougounina, Touba, Kalembougou, Bougouba, and Sikouna. As many as 250 color slides of the area are now available. Before these slides can be used for photo-interpretation and ground-proofing purposes, however, they have to be processed as stereoscopic pairs and a mosaic map prepared. At present, there is no experienced and qualified photo-interpreter in the research unit. At this time, therefore, no quantitative data are available, although the research unit has made some approximations for certain key indicators.

With regard to farming systems research, a preliminary survey, performed by the research unit from October 1983 to May 1984, was directed specifically at the smallholder ECIBEV cattle feeding participants. This

system operates in a broader context of a millet/cowpea-based subsistence cropping system. The other systems operating in the area, as recognized by the research unit, are:

- The animal traction system, based on the use of oxen and donkeys;

- The small ruminants system, based on sheep and goats mainly used for meat; and

- The milk production system, based on cows, sheep, and goats.

In investigating local cropping patterns and farming practices, the research unit surveyed 107 smallholder operations, of which 71 operations are in the ECIBEV Banamba zone and 36 in the Segou zone. The survey showed that millet is the principal cultivated crop. It is often sown in monoculture, but is sometimes intercropped with cowpeas, with the latter about 5 percent in the mix. Farmyard manure is often applied to fields lying close to the villages. Further afield, land is planted to millet continuously for five years followed by ten years of fallow. While oxen are used for preparing seedbeds, most weeding is done manually. Donkeys are used for transport.

Data on smallholder livestock herds were obtained during a survey conducted in May and June 1984. The survey figures, however, were based on apparently inaccurate census data, and subsequent field checks revealed wide discrepancies. Consequently, a supplementary survey was mounted in November 1985 and direct counts were made from a random sample of 34 smallholders involved in ECIBEV on-farm cattle feeding activities. These figures were compared with data collected by ILCA in the Niono area during 1976 to 1982. The results of the two surveys were in general agreement with each other.

The research unit did not collect data concerning the dynamics of herd structure - i.e., births, deaths, sales, etc. It feels that reliable data already collected by ILCA are relevant to the study area and that a duplication of effort is unwarranted. We agree with this conclusion.

An investigation of livestock diseases in the area was undertaken by a veterinarian who joined the team in February 1986 and who performed in-depth studies during the dry season of this year. His preliminary report is expected shortly. In general terms, it is the research unit's perception that the cattle bought for the ECIBEV program are healthy when acquired, are adequately checked by ECIBEV veterinary agents, and are better fed than cattle outside the program. Earlier studies by an ILCA veterinarian have demonstrated convincingly that more deaths in Malian livestock are caused by malnutrition than by disease.

Statistics on family size, composition, and availability of family labor were collected from the population of smallholder participants in the ECIBEV cattle feeding program. A follow-up study to assess the

validity of these data with respect to the entire population of the study area is in progress.

A detailed study of smallholder economic factors was done, and the results made available. However, the subsistence requirements of smallholders have yet to be investigated. A study on grain sales and purchases by smallholders is in the planning stage. Market studies have been conducted, and seasonal price changes of various classes of livestock and animal feed supplies have been assessed.

(2) Formulation and Testing of Interventions

The ProAg proposed testing of specific technologies concurrent with the initial problem analysis -- improving fallows and increasing forage production through intercropping and fertilizing. With respect to these proposed interventions, the research unit has tested interseeding with about 40 lines of the following perennial and perennating legumes:

- Macroptilium atropurpureum (Siratro);

- Stylosanthes spp. such as S. hamata, S. humilis, S. guyanensis, and S. scabra;

- Centrosema spp., such as C. pubescens, C. pascuorum, and C. haitiense;

- Clitoria ternatea; and

- Cajunus cajan (pigeon peas).

With respect to plant densities, plant populations of legume crops in Mali are low compared to other areas of Africa. A study was made of the effect of different seed rates of Vigna sinensis (cowpeas) and Lablab purpureus (dolichos), at two sites in Sotuba and Banamba. Increasing the seed rate of cowpeas from 30,000 to 60,000 seeds/ha produced increases in dry matter yields of over 30 percent at both sites. Application of 50 kg of elemental phosphorus/ha also increased yields, but these results were not statistically significant.

In another trial with Pennisetum typhoides (millet), an increase from the traditional 16,000 hills/ha to 32,000 hills/ha gave increases of 21 percent in straw and 26 percent in grain yields.

In an effort to cut costs by reducing farmer dependence on cottonseed residues, an experiment was conducted to compare supplemental levels of four kg of cottonseed residue cake/day to two kg/day with free choice of bush hay. The reduction to two kg reduced daily liveweight gains from 1.06 to 0.86 kg/day. The reduction in daily liveweight gain, however, was more than compensated for by the reduction in ration cost. The research unit has concluded, therefore, that a recommendation to reduce the daily cottonseed residue is financially justified. A report is under preparation.

Village observations by Bartholomew et al. of cattle fed under the ECIBEV program showed that males of the Maure breed gained weight more rapidly than those of the Fulani breed - i.e., 0.77 and 0.44 kg/day, respectively. Further investigations of this apparent breed difference in response to feed supplements are underway.

A trial was undertaken in the 1985 crop season to investigate the effect of different methods of drying and storage of cowpea forage. This study is currently being expanded to compare the problems of conservation of cowpeas and dolichos.

The veterinarian on the staff of the research unit is in the process of assessing losses caused by internal and external parasites.

iii. Cooperation With other Organizations

Formal cooperation with other organizations has been non-existent. Informal contacts, however, have been established with staff of the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). As a result of these contacts, data that ICRISAT had collected with millet-cowpea cropping were shared, and a duplication of the same work by the research unit was avoided.

iv. Institutional Arrangements

(1) GRM's Contribution

The farming systems research activities are being carried out within the structure of INRZFH. The MRNE had supplied six Malian staff by late 1983. The staff included expertise in agronomy, animal husbandry, and agricultural economics. In January 1986, one researcher in agronomy and another in animal husbandry were selected for participant degree training in the United States. At present, they are preparing for their English language competency examination to be held in October 1986.

To replace the two participant trainees, an agronomist and an animal husbandry researcher were attached to the research unit in November 1985. A socio-geographer was with the research unit on a short-term assignment from March to May of 1985. Since February 1986, a veterinarian has been attached to the research unit. This brings the total Malian staff of researchers and support personnel to seven persons actively engaged in local research, with two more in Masters degree training.

(2) ILCA's Contribution

To date, ILCA has supplied two long-term experts to the research unit. The FSR specialist/forage agronomist arrived in Mali on 6 February 1984. He was joined in mid-July 1984 by the agricultural economist. In November 1984, the farming systems research specialist/forage agronomist was named team leader of scientific work. On completion of his two year tour, the agricultural economist left Mali on 11 July 1986.

In addition to the two long-term experts, ILCA is contractually obligated to provide up to 35 person-months of short-term technical assistance on an as-needed basis. Little of this short-term expertise has been provided to date. As backstop support, an agricultural economist and an agronomist from ILCA's sub-humid zone research program at Kaduna in Nigeria visited Mali for two weeks in February 1984 for discussions in project planning and orientation for the newly arrived forage agronomist. Continued backstopping has been supplied by the economist stationed at ILCA headquarters in Addis Ababa, Ethiopia, who visits Mali every six months.

v. Forage Technology

(1) Major Constraints to Increased Forage Production

The research unit has concluded that the fundamental causes of forage shortage in the zone are:

- Low rainfall and inadequate soil moisture;

- Low levels of soil fertility;

- Crops that are low in productivity, proteins, and palatability;

- Limited availability of labor;

- Priority expressed for production of subsistence crops and hence small area devoted to forage cultivation; and

- Problems due to pre- and post-harvest losses resulting in depressed yields and nutritional content.

(2) Field Testing Improved Forage Technologies

The research unit is pursuing the following lines of research:

- The effect of land form on crop yields;

- The effect of seed placement on top, middle, or bottom of ridges;

- The effect of seeding rates on forage and grain yields;

- The effect of phosphate application on forage legumes;

- Varietal screening of a range of perennial and perennating legumes;

- Improved weed control techniques for subsistence grain crops;

- Testing of various forage conservation techniques;

- Productivity assessment of perennial legumes;

- Assessment of soil fertility build-up by short cycle legumes; and

- On-farm testing of introduced short-cycle cowpea varieties.

b. Pilot Small Ruminant Feeding

A preliminary survey in 1984, conducted by the research unit, provided data on small ruminant holdings by the smallholders. An in-depth study, started in November 1985, is now in progress. This investigation has already provided data on flock structures, common feeding practices, and weight changes during the dry season. A feeding program is to be based on the study.

3. Analysis and Conclusions

a. Technical Analysis

i. Production Research

The ProAg calls upon the researchers to conduct research following a "farming systems research approach." The meaning and the implications of the FSR approach need explaining:

- FSR is an approach to problem-solving rather than an end in itself. It takes the smallholder and other agents engaged in cattle production as the primary clients;

- FSR recognizes that the interactions between different sub-systems in the cattle production system may require a multi-commodity approach;

- FSR is interdisciplinary, requiring close collaboration among technical and social scientists;

- The aim of FSR is to improve the efficiency and relevance of the system especially in terms of increasing the productivity and income stability of the smallfarmer household while preserving the resource base;

- FSR is best carried out through complementary on-station and on-farm research with small farmer perceptions playing an integral role in technology design and development;

- The farmer's participation in the on-farm research is a unique way of understanding the existing operating systems, of identifying research opportunities and constraints to progress,

of testing appropriate interventions, and of monitoring acceptance of introduced technologies;

- FSR research is based on a close association between the scientist and the smallholder. This is especially important for the urban-born and -educated scientists currently active in research who may have had no close personal contact with farmers' problems.

The research unit is successfully pursuing a program of FSR as set out in the ProAg guidelines. After pursuing an initial phase of problem identification, the investigation evolved into a secondary phase of component research and an orientation toward the goal of attaining efficiency. Once a potential intervention appears technically and economically sound on the basis of on-station research, its validity is checked on smallholder farms as a tertiary phase. The research unit follows an interdisciplinary and inter-commodity approach. It is now broadening its scope of investigation beyond the single system of smallholder cattle feeding to include traction animals, milk production, and meat production from small ruminants.

ii. Evolution of Forage Production Technology for Sub-humid Zones

The Project Grant Agreement -- and the contracts between USAID, ILCA, and ILCA/INRZFH -- clearly state that the fundamental purpose of the agreements is the "integration of crop and livestock production systems of small farmers in Mali. The cooperative agreements program will be implemented in the sub-humid zone of Mali, characterized by an approximate annual rainfall of 800 millimeters or more where the "Embouche Paysanne" activity is operating." This strategy of coordinating with ECIBEV was designed to allow the ILCA researchers the opportunity to take advantage of a particularly favorable research situation.

Since the on-farm cattle feeding activities of ECIBEV were centered in the Bananba and Segou zones, that area was selected for the research study. And herein lies a problem: the fifty year rainfall average for the zone is indeed essentially "sub-humid" - i.e., 745 mm (although in the last quarter-century, the annual rainfall in the region has exceeded 800 millimeters only three times). For the period 1975 to 1984, however, the mean annual rainfall at Bananba has dropped to 558 mm. Due to this change in the project environment, the basic requirement of developing a forage production technology for the sub-humid zone has not been met. ECIBEV's on-farm cattle feeding zone is not sub-humid, at least not at present. The zone is in a semi-arid area of Mali, and the developing forage technology is more suited to semi-arid than sub-humid zones.

iii. Component Research

The component research is being conducted in the two major areas of forage technology development and livestock production.

(1) Forage Technology Development

With respect to the introduction of legumes in forage production, plants of the family Leguminosae have a capacity to provide their own nitrogenous fertilizer through bacteria that live in a symbiotic relationship in the nodules of the host plant. These bacteria convert nitrogen gas from the air -- which is 79 percent nitrogen -- into soluble compounds that the plant can absorb and utilize to grow and produce amino acids and protein. As a result, legumes generally require no additional nitrogen for average or normal growth. This is advantageous because nitrogenous fertilizers are now extremely expensive in Mali.

The total number of species in the family Leguminosae is unknown, and the choice is necessarily somewhat subjective; scientists consider 600 species to be of major potential, 300 of these as top ranking, and 200 ready for immediate exploitation.

A large number of legume species may yield more than one product useful to Mali and can improve the lives of the rural poor. Legumes grow in habitats where other plants grow poorly - i.e., in arid lands, swamps, slopes, and toxic soils. The greatest variety grows in the tropics and sub-tropics.

The research unit has emphasized increased legume production in the study area. This focus is based on the observation that the bush hay and millet stalks fed to cattle during the November to June dry period contain no more than 2 to 3 percent digestible protein. This is only one-quarter of what is required to maintain weight and promote growth. At least 7 percent protein must therefore be supplied as supplemental feed. Bush hay is derived from standing dry grasses such as Andropogon gayanio and Pennisetum pediccellatum. The composition of the hay varies according to season, rainfall, and geographic location.

An introduction of legumes will be conducive to the integration of crops and livestock production in the study area because of their contribution to soil fertility and resultant increased crop yields of cereals and gramineous crops.

(2) Intercropping Cowpeas with Millet

Development of traditional cowpea/millet cropping systems is one way of encouraging forage legume production. In recent years, both ILCA and ICRISAT have performed considerable on-station and on-farm research in the Niono and Cinzana areas of Mali, where the annual rainfall is in the 300 to 650 millimeter range. The research unit chose not to duplicate this research and accepts its validity for the study area. The unit has concentrated instead on cropping pure stands of introduced legumes that may fill a similar ecological niche to that of cowpeas.

(3) Some Promising Legumes

Two possible legume substitutes for cowpeas have been identified by the research unit. After screening a range of legume species, they selected two as the most promising for the study area.

Lablab purpureus (dolichos, lablab) shows promise as a forage legume. It is drought-tolerant, but good soil moisture is needed for crop establishment. Its dense growth suffocates most weeds. A well-established plant has a deep root system, often penetrating to water sources more than two meters below the soil surface, permitting a long production season at a time when many other herbaceous plants desiccate. Dried seeds of lablab contain 20 to 28 percent crude protein with high lysine content -- 6 to 10 percent -- and moderately well-balanced amino acids, good for human consumption as a complement to cereal diets. Its leaves are rich in protein -- up to 28 percent -- and, among beans, are one of the best sources of iron. It appears to yield well. In Queensland, Australia, a commercially registered variety called "Highworth" provides pastures for grazing 60 to 80 days after planting with yields of 5 to 11 tons dry matter for forage/ha and protein content between 13.5 and 22 percent depending on the season. In Tamil Nadu, India, the cultivar CO.9 has been bred as a green vegetable crop and yields 7.5 or more tons of pods/ha.

The other promising legume identified by the research unit is the green pea, Vigna radiata. This is a dual-purpose crop and a direct functional replacement for cowpeas, Vigna sinensis, but with a very short life cycle of about 55 days from sowing to harvest, which is a point of vital importance in a semi-arid zone. This presents a possibility not only of grain harvest in the dry season but also of haulm (stalk or stem) production.

(4) Soil Fertility Problems and Fertilizer Use

Past and present research has revealed low fertility in Malian soils. This necessitates use of fertilizers for high yields and nutritive forage crops. The soils of Mali are generally coarse textured and reportedly low in phosphorus, nitrogen, and cation exchange capacity, but they are usually adequate in terms of base saturation. Furthermore, they are generally acid and have low capacity for retention of phosphorus. For intensive cropping systems, Mali relies on imported fertilizers.

The research unit is fully aware of the low nitrogen status of the study area soils. However, only two experiments include nitrogen applications. The research unit justifies this on the ground that fertilizer use by the farmers in the area is prohibited by high prices (185 FCFA/kg or $530/ton) and that the legumes under study are soil builders. This argument is justified since legumes generally do not need nitrogen fertilizers. We do suggest, however, that the use of inoculants for the introduced legumes should be a subject of research.

The trials on applied phosphorus have shown inconsistent results so far. We recommend that the unit revise its approach on methods and times of fertilizer application. It should include experimentation with Tilemsi rock phosphate (TRP) which is a commercial-size national resource of Mali. Earlier Mali-based research clearly showed that TRP could be directly used. An application rate of 80 kg/ha phosphate (300 kg TRP), incorporated by late plowing at the end of the rainy season, was recommended on the fallow. In 1982, the Agronomic Research Division of the Ministry of Agriculture recommended application of 200 kg TRP/ha on the fallow. More recent work by SAFGRAD has demonstrated the efficacy of TRP on farmer's fields at 300 kg/ha.

With technical support from IDRC and funds allocated by the World Bank, the International Fertilizer Development Center in cooperation with IER has initiated an ongoing station-based and on-farm research project on the use of TRP fertilizer as of 1986. The research unit should coordinate with these organizations in planning and developing research on TRP for forage crops.

It is well known that different legumes have varying nutritional needs and fertilizer requirements. For instance, Stylosanthes is accepted as the genus for low soil fertility, and genera such as Centrosema, Desmodium, and Macroptilium for somewhat higher levels. Within the same genus, species also differ in their nutritional requirements. Field research elsewhere has shown that among Stylosanthes species, only S. capitata is found on extremely acid and phosphorus-deficient soils, while S. viscosa and S. scabra grow on less acid soils. S. humilis and S. guianensis need more neutral soils. Further research on introduced legumes should clarify these particular plant requirements.

(5) Green Manuring

The research unit has investigated the value of green manuring with Crotolaria juncea (sunhemp) for millet crops. Results of the first trial will be available after the 1986 harvest. Green manuring as practiced in the alley cropping systems of the sub-humid and humid zones has not been tested.

The evaluation team supports the approach of using Crocolaria juncea as a green manure crop. It can be used as a dual-purpose crop since it supplies excellent fiber that makes ropes with great tensile strength, and it is also quite useful to smallholders in cattle production. It is easy to grow from seed -- seedlings appear above ground in about three days and rapidly produce a thick ground cover that smothers competing weeds. The roots nodule freely and, given adequate phosphate, one hectare of sunhemp can add up to 300 kg of nitrogen to the soil. Green manure yields of 18 to 27 tons/ha are average. However, green manuring in years of drought is a doubtful proposition, as is the probable efficiency of alley cropping in the low rainfall conditions prevailing in the Bamamba and Segou zones.

(6) Perennial Cropping with Legumes

In view of the labor constraint to expanded forage production, particularly with annual legumes, some investigation of the potential of various perennial and perennating legume crops needs to be made.

A study is underway of productivity and management of selected lines of Clitoria ternatea (butterfly pea). The genus is closely related to Centrosema and to Periandra and is a member of the tribe Phaseoleae, which includes Glycine, Phaseolus, Vigna, and Dolichos. It is also an exquisite flowering plant.

Clitoria ternatea has shown good results in 1985. The standing crop this year looks promising, in on-station trials, in terms of its capacity for establishment under low rainfall - i.e., 400 mm, for survival up to eight months of dry season, and for regenerating itself the next year. C. ternatea is seen as a good candidate as both a forage crop and for improving soil fertility during fallow years in the traditional millet/fallow rotation.

The Stylosanthes species, on the other hand, did not perform well. The establishment was poor under low rainfall in 1984. Subsequently, little effort has been expended on this genus by the research unit.

In view of the extraordinary performance of this genus elsewhere, and ILCA's own success with Stylosanthes guianensis in the sub-humid zone in Nigeria and with S. hamata as a dry season forage crop, the research unit should perhaps place more emphasis on Stylosanthes cultivars. The unit should rethink the strategies available to it. Different species are adapted to different soil and climatic conditions. In Australia, with soils in the neutral pH range, both S. capitata and some forms of S. hamata fail, while S. scabra and the acid-loving form of S. hamata survive and are selected for commercial distribution. In the Llanos of South America, with soils of very low pH, S. capitata thrives, but the alkaline form of S. humata performs poorly, and S. scabra is decimated by stem borers. The point is that it is a genus of choice for infertile soils. Its species have done well on soils ranging from pure sands to heavy clays with pHs from 4 to 9, and over a wide range of climatic conditions -- from less than 400 to more than 4,000 mm of rainfall annually and in areas with maximum temperatures of 40º C to those with minimum temperatures below 0º.

Similarly, Centrosema and Macroptilium were not impressive either at Banamba or at Sotuba. It is difficult to make broad generalizations about the adaptation of Centrosema because many of the species are adapted to contrasting environments and because the species that have been well studied each contain diverse forms. For many species, information is extremely limited and selection of those having commercial value or, at least, some agronomic potential, requires some judgement. The Australian experience, field trials in the United States, and unpublished reports from Colombia, Malaysia, and Thailand provide some confirmation of the view that, of the commercially developed species, C. pubescens, C.

plumieri, C. pascuorum, and C. virginianum may become commercially useful in the sub-humid tropics. Breeding work is undoubtedly required to combine the desirable features of various forms to develop species commercially suited to semi-arid tropical environments. Overall, the research unit should neither forget the genus nor make it a pursuit of active immediate interest.

Almost the same remarks apply to Macroptilium atropurpureum. Scientific studies indicate that Stylosanthes has been accepted as the genus for low soil fertility and genera such as Centrosema, Desmodium, and Macroptilium for somewhat higher levels.

(7) Forage Tree Crops

Preliminary comparisons of the establishment parameters of varieties of Leucaena leucocephala and Gliricidia sepium are underway during the 1986 cropping season. For 1987, a collaborative effort with ILCA is anticipated by the research unit. A standard set of 25 to 30 legume tree species, supplied by the Nitrogen-Fixing Tree Association (NFTA), will be sown at each of three sites - i.e., Niono, Banamba, and Medina Diassa - under a range of rainfall regimes. Establishment and productivity of the different species will be assessed.

While tree research is very promising, the research unit is advised to pursue this work on a limited basis. The rationale behind this recommendation is that it will take several years for the research to show tangible results and even more time to conduct livestock feeding trials and ultimate integration into the local production systems. Moreover, watering during dry months and protection against animals will be needed during the first two or three years.

iv. Economic Research

The economic research conducted so far has pursued two basic themes:

- The description and analysis of the economic functioning of the smallholder cattle feeding program with ECIBEV; and

- The evaluation of the economic and financial impacts of possible technological changes.

The data used for analysis were derived from the ECIBEV cattle feeding campaigns of 1983/1984 and 1984/1985. Data are also available for the 1985/1986 campaign. At present, however, no report is available for this campaign, nor is there any single comprehensive document which analyzes the cumulative results of these three campaigns. This is the case because the principal researcher concerned with economic analyses finished his initial two year tour and left the project and Mali.

The preparation of a synthesis of the three campaigns is just one element in the continuing study of a range of research on livestock

systems. The economic work to date has only presented a part of the overall systems picture.

An agricultural economics input will be needed on a continuing basis to plan, monitor, and evaluate project interventions. The recruitment of an expatriate agricultural economist is required as a member of the interdisciplinary research unit.

v. Small Ruminant Production Study

In 1983 OMBEVI completed a USAID-funded "Small Ruminants Project" with short-term technical assistance from Tufts University. The project resulted in a substantial analytical framework for sheep and goat production at the village level and in pastoral and transhumant production systems. Baseline data, gathered since 1979, were collated and analyzed by a joint Malian/Tufts team. A preliminary draft was ready toward the end of 1983. OMBEVI has since produced a final version in three volumes.

Since this detailed small ruminant study is now available, the research unit should use it to the extent possible instead of undertaking a completely separate study, as called for under the ProAg, which might duplicate parts of the previous work. The results of the OMBEVI/Tufts study plus the research unit's own findings should serve as the basis for designing a plan of action to be submitted for approval to AID, ILCA, and the GRM.

b. Training

Training of Malian research workers in modern research techniques is of paramount importance to ensure sustainability of the development of livestock production. We see it as consisting of three components:

- In-service day-to-day training;

- Short-term special topic-oriented workshops; and

- Overseas participant training, both short- and long-term.

With respect to in-service training, competence in research is best obtained through first-hand work experience with a qualified scientist over a number of years. We believe the Malian workers have gained experience working with their expatriate colleagues in collecting data, conducting surveys, analyzing data, and writing reports. The depth of their acquired knowledge will depend on their dedication and basic education. Learning is a two-way process in which the teacher and the student must both be involved. We would urge the experts to explain carefully to their counterparts a systematic research approach, consisting of a statement of objectives, description of apparatus requirements, recording of observations, analysis of data, drawing up of conclusions, and preparation of a published report.

With regard to short-term topic-oriented workshops, it would be highly desirable if funds can be made available to arrange short-term workshops in which Malian colleagues would be given step-by-step instruction in:

- Use of an IBM/PC computer system for recording and retrieving data;

- Word processing;

- Statistical methods for research workers;

- Use of statistical programs on computer systems;

- The soils of Mali;

- Crops; and

- Principles of weed control.

We believe that knowledge of English is necessary for a scientist as so much of immense importance is published every month in English. A scientist should acquire at least a reading knowledge of English.

With regard to overseas participant training, we believe that in selecting Malian professionals for further training to the Masters or Ph.D. degree levels, emphasis should be placed not only on an adequate TOEFL score but also on background in science and mathematics, as specified in PIL # 2.

b. Management Analysis

Overall management of the Mali Livestock Sector Project is discussed elsewhere in this evaluation report. The present analysis is limited to management systems, practices, and problems which are specific to the INRZFH and to the research component funded by USAID under the project.

i. Institutional Arrangement

The institutional arrangement for implementing the research component has been a source of confusion and friction almost from the beginning of the project. The three parties involved, ILCA, USAID, and INRZFH, are linked by two contracts, which do not clearly specify the roles and responsibilities of the various participants. Under the first contract between ILCA and INRZFH, ILCA agreed to provide the two long term technical assistants for the Systems Research Unit, as well as thirty-five person-months of short-term assistance as needed. ILCA, according to the contract, was also to provide the technical and administrative backup for the research unit.

A second contract links USAID and ILCA, wherein USAID agreed to pay the salaries of the technical assistants and various allowances for the

Malian staff working on the project. In addition, USAID contracted to pay the technical and administrative operating expenses of the research unit. After submission of an annual budget and work plan to the MDST, the research unit was to receive their operating budget, which was to be administered by ILCA. Instead of paying these operating funds directly to ILCA, however, the money was first sent to INRZFH to be channelled to ILCA. Control of these operating funds soon became a source of conflict between ILCA and INRZFH. ILCA, on the one hand, could be held legally accountable for this money under its contract with USAID and, therefore, insisted that the funds remain under its control. INRZFH, on the other hand, believed it should supervise the funds. INRZFH is the Malian institution in the project and, as the Director General correctly pointed out, one of the major objectives of the Mali Livestock Sector Project is to improve the financial management of Malian institutions.

A compromise was reached whereby a separate account was set up specifically for the research unit. This account was jointly managed by the team leader of the ILCA technical assistance team and his Malian counterpart. The ILCA team leader is also the agronomist of the research unit, while his Malian counterpart is the supervisor of the research unit. This arrangement lasted until December 1985. As a result of the extraordinary demands required by USAID accounting and procurement procedures, the team leader and his Malian counterpart were soon spending over fifty percent of their time on administration.

This administrative burden increased to the point that the research work began to suffer. The team leader finally refused to continue to serve as both the administrator -- for which he was neither trained nor hired -- and researcher. For four months, the Administrative Director of the ILCA office in Bamako took over the administrative supervision. A second compromise was worked out, and the contract between USAID and INRZFH was amended transferring control of the operating fund to INRZFH.

There have been other, more minor, problems which have resulted from the contractual relationship linking USAID, INRZFH, and ILCA. Again the source of these problems has been the ill-defined roles and responsibilities of each of the participants. The net result of this contractual and administrative confusion has been a slow start and a weakening of the research component due to the severe demands made on the time of the ILCA agronomist and his Malian counterpart. Although the ILCA technical assistant has now been relieved of the administrative duties, those of his Malian counterpart have, unfortunately, increased with the signing of the contract amendment.

The contract between USAID and ILCA is also in the process of being amended. Hopefully, this will resolve most of the remaining problems among the three parties and permit the research team to operate more smoothly and devote its full energies to the research effort. Every attempt must be made, however, to alleviate the administrative burden which has shifted from the ILCA Chief of Party to the Malian Director of the Research Unit.

4. Recommendations for the Current Project

After a step-by-step review and evaluation of the progress since the start of this project, the evaluation team concludes that the research component has generally gone well. USAID provided leadership and timely support, and both INRZFH and ILCA have been effective partners. The research unit was well chosen. Over the last two-and-one-half years, it has completed an impressive number of usually well-written studies, and it is continuing to progress at a healthy pace. The expatriate technical staff have proved themselves worthy of ILCA's reputation of high technical competence.

Some issues, however, remain unresolved. The recommendations that follow are generally based on these issues and are directed at the level of USAID, MRNE, INRZFH, ILCA, and the research unit.

1. The Project Grant Agreement clearly stated that "the project should provide financing for an expansion of ILCA's mandate in Mali to include its sub-humid program of mixed livestock/crop production research." Subsequent agreements between INRZFH and ILCA and between USAID and ILCA specifically required that ILCA develop and extend improved forage production technology to provide assistance to INRZFH "in the integration of crop and livestock production systems of small farmers of Mali. The cooperative agreements program will be implemented in the sub-humid zone of Mali, characterized by an approximate rainfall of 800 millimeters or more where the "Embouche Paysanne" activity is operating." This strategy allowed the ILCA researchers to commence work in a favorable research situation.

The Embouche Paysanne, however, was located in the Bamamba/Segou area. The 50-year rainfall average for the zone is indeed essentially "sub-humid" - i.e., 745 mm (although in the last 25 years the rainfall has exceeded the criterion of 800 mm only three times). From 1975 to 1984, however, the mean annual rainfall dropped to 558 mm. Thus, the technology currently being developed in the study area is for semi-arid and not for sub-humid zones.

In view of the fact that ILCA has been carrying out its semi-arid zone research in Mali at Station du Sahel at Niono since 1974 (and later extended to the Fourth, Fifth, and Sixth Regions), the evaluators suggest a relocation of the study area further south in the sub-humid zone. If funds permit, however, research could simply be extended to the south (rather than completely relocated) thereby permitting a continuation of the ongoing research that has already begun to achieve useful results.

The sub-humid zone technology has the potential to be developed rather rapidly (in contrast to the necessarily slow development of semi-arid zone technology) given higher rainfall and a higher number of crop growing days per year. Some recent studies also reveal the trend that with a better control of tsetse infestations and more available browse the northern pastoral herds are gradually moving into the sub-humid zones of West Africa. While the broad implications and the environmental

consequences of such a move are uncertain at this time, the possibility of rapid resource decline following an influx of migrant cattle-herders to the region has been raised (see Nyerges 1987). It therefore appears prudent that forage production research and programs be in place to meet this impending challenge. An improved sub-humid forage production technology would also be a major support to increased milk and meat production for Banako cattle and small ruminants. This would have a direct and immediate commercial impact.

It is recommended that the GRM and USAID resolve this issue at an early date and provide a clear mandate and a firm goal to the research unit by considering a shift or expansion of the study area to the sub-humid zone.

2. As a corollary to recommendation 1, research should be seen as an independent pursuit which exists in its own right and not as an adjunct to the Embouche Paysanne. Research is conceived in the Project Grant Agreement as serving all animals, cattle or small ruminants, and not only the cattle fed each year under that program. This fact should be clarified at a high level once and for all.

3. The research unit should continue its focus on legume-based forage production research. Supplementing the nutrition of livestock with legume forages should be considered as a critical step in improving the productivity of smallholders.

4. In addition to continued work on introduced cultivars, the research unit should put an emphasis on identification of native West African legume species that are tolerant to local plant diseases and to low-phosphorus soils. ILCA, in cooperation with the International Board for Plant Genetic Resources and other international research organizations has already conducted preliminary testing of indigenous forages in Mali, finding that applications of phosphorus at 50 kg/ha can increase yields of dry forages up to 300 percent.

5. Generally, intercropping of legumes with a grain crop reduces yields. However, a grain crop in rotation with a forage legume increases grain yields. The research unit should propose and introduce possible crop rotations in the study area.

6. Since imported phosphorus fertilizers are very expensive and as Mali has its own commercial-size Tilemsi rock phosphate (TRP) deposits which have provided good crop response on Malian acidic soils, the research unit should include TRP in their trials.

7. So far the research unit has conducted no basic resource studies such as soils, hydrology, and land use. This line of research should start as soon as possible, to the extent that the research coordinating council (see recommendation 14) decides that it has not been adequately covered by other organizations.

8. The research unit should identify prevalent local weed species and devise cultural and other practices to eradicate them in cropped areas.

9. The research unit should continue with studies of household economy -- covering such topics as farm budgets, unit costs of production, marketing practices, subsistence needs, and sales and purchases by smallholders.

10. The research unit should carefully take into account the in-depth studies on small ruminants that have been conducted by OMBEVI in cooperation with Tufts University, and it should discontinue any part of the on-going small ruminant research that duplicates the previous studies. Generally, the research unit staff should be careful to make use of available studies and reports as base documents before undertaking any new work, in this and other areas.

11. In the past the research unit has not coordinated with other research organizations such as IER, SAFGRAD, ICRISAT (which have already coordinated with one another), and other projects run by USAID. It should network with other research organizations within and outside Mali and actively collaborate with both scientists and better farmers.

12. INRZFH had agreed to provide a sociologist/anthropologist to the research unit in contract agreements, but the position has not yet been filled. A full-time sociologist is needed to ensure that actual forage interventions are in accord with researcher expectations and local perceptions. The sociologist's terms of reference, might include

- Interview and participant observation studies of potential beneficiaries on their current productive activities, perceived needs, and goals for development;

- Screening and monitoring of interventions for possible negative impacts, such as excessively increased labor burdens on women, children, and the elderly, or other opportunity costs of land, labor, and capital resources;

- Promoting the formation and cooperation of RDOs and tons by explaining advantages and mediating disputes;

- Monitoring beneficiary compliance in the integration of recommended improvements;

- Determining if the interventions are having, or are likely to have, the desired impact on smallholder income; and

- Ensuring feedback from the smallholder to the research scientist.

13. INRZFH should also name two researchers to the research unit to replace those recently nominated for two years study in France.

14. At present, ILCA has only one expatriate expert in the research unit and has still to furnish approximately 35 person months of technical support to the INRZFH. This commitment should be fulfilled without further delay. ILCA should nominate the following specialists for approval by the MRNE and USAID:

- Agricultural Economist -- up to 24 months;

- Agronomist/Soil Fertility Specialist -- up to 10 months; and

- Weed Specialist -- 3 to 4 months.

The exact duration of stay of each specialist should be decided by MRNE and USAID with advice from the Director General of the INRZFH.

15. At present, agricultural research in Mali is conducted by IER in the Ministry of Agriculture, and INRZFH and CVL in the MRNE. There is often an overlap and duplication in the research programs. Communication and coordination could be improved if the GRM organized a high-level national agricultural research council with staff and financing to act as a central coordinating body. This organization should define a national science policy, goals, priorities, and distribution of functions among the various ministries. The Director Generals of IER, INRZFH, and CVL should be members of this organization. We note that, in the creation of INRZFH, Law 86-10 foresees a coordinating council composed of the Directors General, as well as a number of inter-agency technical commissions. We recommend that MRNE promptly move to activate these coordinating bodies.

16. As a follow-on to recommendation 15, the three agricultural research organizations should prepare an inventory of all valuable scientific equipment in their possession, retain a communal service of trained personnel in repair and maintenance, and organize a system of access to equipment between the qualified scientists in various organizations.

17. During the course of this evaluation, the team noted that coordination and communication between various agencies of MRNE, and even within the same agency is not always good. This problem should be solved rather soon.

5. Recommendations for Future Project Support

1. USAID should continue its technical assistance program with MRNE in the area of research at least at the present level throughout the life of a follow-on livestock sector project.

2. The present multi-disciplinary and multi-commodity farming systems research approach should continue. It should be aimed at the integration of crop and livestock production of smallholders in the sub-humid zones of Mali. However, it should recognize and directly address the problem of the added labor burden -- especially on women and children as emphasized in section B.3.d.ii. of this report -- that such development inevitably

entails. Earlier FSR work on the labor problems of mixed-farming, as summarized in Delgado (1979), should be carefully examined for lessons learned.

3. Another focus of research should be the integration of small ruminants in the farming systems of smallholders.

4. A reorientation of research from the present semi-arid to sub-humid zone will result in a sharpened emphasis on milk production for Bamako and on animal traction, which is crucial to the sustainability of sedentary agriculture in the sub-humid zone.

5. Research should continue concentrating on the development of low input legume-based forage production and on legume fodder banks (in small fenced areas) for selective feeding. It should propose new crop rotations with legume crops.

6. Forage technology development and interventions should remain the basis for livestock production. We suggest that the new research take advantage of ILCA's sub-humid zones research at Kaduna in Nigeria and include tree forage legumes in the program.

7. Soil science, and a small functional soil testing laboratory capable of performing straightforward testing of soils, water, and plants, should be considered as part of the multi-disciplinary approach. Full use of Landsat and other land use data now available with the Inventory of Land Resources Project (PIRT) should be fully exploited.

8. The high priority now assigned to the training of Malian counterparts should be seen as crucial to the institution-building in the INRZFH. This policy should remain in full force throughout the life of a follow-on project.

D. VACCINE PRODUCTION AND IMPROVEMENT OF DIAGNOSTIC SKILLS (CVL)

1. Objectives of the Component

a. Central Veterinary Laboratory Support

At the outset of the project, vaccine quality tests at the CVL were limited to laboratory analysis and small-animal testing. Additional quality control requires tests in the final host species. To improve this testing, the CVL farm facilities were to be remodelled and repaired and provided with electrical power and necessary fencing. This would afford adequate facilities for the rearing and maintenance of experimental animals as well as permit the improvement of existing CVL pastures.

b. Building a Diagnostic Capability

The project was to finance the construction and equipment of diagnostic facilities as well as the training of Malian professionals in their use in accordance with accepted laboratory standards. Technical assistance was to include a veterinary diagnostician.

c. Diseases and Animal Health Research

Research was to continue in the higher rainfall zones and expand to cover the problem areas of:

- Diseases transmitted by ticks;
- Detailed mapping of the tick zones;
- Detailed mapping of the tsetse fly zones;
- Continuation of the study of trypanosomiasis; and
- Study of infectious diseases of cattle, sheep, and goats.

Information developed through these research activities was to be used as a guide for determining future research priorities.

For successful continuation of research at the CVL, additional facilities and equipment were required. Plans for construction included facilities for the entomology and protozoology section. Technical assistance was to include a microbiologist and a parasitologist.

2. Accomplishments to Date

The accomplishments cited in this section relate to the defined objectives of the Project Grant Agreement as they concern the Central Veterinary Laboratory (CVL). We must state at the outset that we were favorably impressed with the pride exhibited by the administration and staff of the CVL in its continued development and progress toward

achieving its aspirations. This is reflected in the physical appearance of the buildings, as well as in the general tidiness, cleanliness, and appearance of activity going on within the various production and diagnostic/research areas. Given the long working hours of the CVL staff, the long distances necessary for most to travel to work, and the lack of on-site living quarters, the CVL administration should be congratulated for the high level of staff esprit de corps, one not as commonly observed elsewhere. The cooperation of the CVL administration in sharing information and in providing candid opinions is greatly appreciated. Information in the form of document study, interviews, and personal observations were the principal bases for this evaluation.

a. Construction, Facilities, and Equipment

Construction for the new diagnostic and research laboratory complex is now approximately 30 percent completed. Electrical conduits are in place and the primary structure, except for the roof and doors, is finished. The roof and internal furnishings and finishings are not completed. The progress on the separate rabies diagnosis building appears more advanced. The contract calls for completion of construction by September 1986, but an optimistic occupancy date would seem to be late 1987.

To cope with increased responsibilities, the CVL administration has installed an IBM XT computer system, set up a computerized inventory system for all supplies and equipment, and established the foundation of a library that is catalogued and well maintained.

All project-funded equipment has arrived and is securely stored either in sealed container vans or at the newly refurbished, but as yet unoccupied, experimental farm approximately two km from the CVL facility proper. The experimental farm fence is in place and the entire area is now protected.

Laboratory animals are currently housed in what appears to have been designed as a garage or storage area. Cages are in poor condition with animals somewhat crowded even though it is evident that attempts have been made to keep them reasonably clean. However, new cages have been purchased, and they will be installed when the facility is occupied. The experimental animal facility currently maintains 94 cattle, sheep, goats, horses, and donkeys. It also has 126 small laboratory animals - i.e., mice, rabbits, etc. - and 180 chickens that are used to provide antisera and eggs for viral growth.

b. Training and Technical Assistance

i. Training

The technical training of Malian professionals has progressed satisfactorily. There is evidence of substantial benefit to the project through the greatly enhanced capacity of CVL staff to conduct diagnostic tests. The staff also is now better prepared to address research problems

of Malian livestock in most, but not all, areas. Virology and helminthology still require considerable reinforcement.

The Project Grant Agreement authorizes both long- and short-term technical training. With respect to long-term training, at least five individuals have received -- or are receiving -- degree training totalling 204 months of USAID-sponsored study. One person is a candidate for the Bachelor of Science degree in microbiology at Iowa State University and three are Masters degree candidates at Texas A & M University in protozoology, entomology, and acarology. All of these candidates are expected to complete their studies by 1987. The fifth individual is scheduled to complete the Ph.D degree in biochemistry/pathology and immunology in December 1986.

With respect to short-term training, three Malians have received a total of approximately 19 months of technical training at various locations in the United States where the most appropriate expertise and training opportunities are available. Practical training has included one or more individuals in:

- Food microbiology in Minneapolis, Minnesota;

- Project management at Texas Tech University;

- Repair and maintenance of veterinary laboratory equipment in Boston, Massachusetts;

- Development management at the University of Pittsburgh;

- Bacteriology, serology, pathology, mycoplasmology, diagnostic virology, and quality control of bacterial and viral vaccines at the National Animal Disease Center (NADC) in Ames, Iowa, and at the Plum Island Animal Disease Center, New York; and

- Anaerobic bacteriology at San Bernardino, California.

In addition to those individuals approved for or now receiving training, six more are scheduled but have not yet departed, or been confirmed, for short-term training. This training is to be in the areas of bacteriology, mycoplasmology, anaerobic bacteriology and food microbiology, diagnostic virology, quality control of bacterial and viral vaccines, civil engineering, and tick-borne parasitic diseases and immunology.

Third country short-term training has been proposed for one individual in library management and information storage and retrieval, but approval has not yet been granted.

English language training was completed by one individual and a second person is scheduled for 1986. Two proposed CVL training positions were not filled and funds for them were returned to the project. An additional individual selected for training left the CVL and another, with

one year of prior residence in the United States, will be tested to determine his need for further training.

The control of viral and bacterial vaccines was removed from the CVL Production Unit and transferred to the Diagnostic and Research Unit as a separate section, independent of production. This was accomplished in September 1985. In this regard, a Malian microbiology technician has assumed chief responsibility for the control of bacterial vaccine purity and quality - i.e., testing for adequate immunizing agent. She is advised by the USDA contract technical advisor in microbiology.

ii. Technical Assistance

The Project Grant Agreement provides for long-term technical assistance in microbiology, parasitology, and veterinary diagnostics, including virology. Individuals are recruited and hired on contract by the USDA, or are direct-hire USDA employees on leave from their regular positions. During the period of the current USDA contract (1982-86) the following advisors served in Mali:

- The current contract microbiologist has broad training in diagnostic microbiology - i.e., bacteriology and serology - and has served at CVL since 1984. His duties include serving as the chief microbiologist in the Diagnostic and Vaccine Production Unit where he coordinates the training of CVL personnel in diagnostic microbiological techniques, supervises the diagnostic microbiology laboratory, and advises the chief of the Vaccine Production facility with the organization and scheduling of work, production procedures, and, most importantly, quality control for which he has prepared a manual of procedures. His USDA contract expires at the end of 1986.

- A USDA/PASA parasitologist, with expertise especially in the area of helminth parasites and parasitic infections of the gastroenteric tract, served as supervisor of the research and training program in parasitology. A major portion of his activity was devoted to research on mapping the distribution of enteric parasites in Malian livestock. His Malian associate directed the research and diagnostic work on hemoparasites. The parasitology advisor returned to the United States in mid-1986.

- The virology advisor, who recently departed Mali, was a USDA/ARS/PIADC veterinary virologist. His duties were to coordinate the training of the virology laboratory staff in disease investigations, post-mortem techniques, and the collection and submission of specimens, especially for the diagnosis of viral diseases. He also was to advise and assist CVL staff, jointly with the microbiologist, in viral diagnostic techniques and in the preparation and storage of diagnostic reagents - i.e., antigens and antisera. The virologist was expected to stay for four years but left Mali in June 1986 at the end of his two-year contract.

c. Diagnostics and Research

With respect to diagnostic and research accomplishments within the CVL, each section has sent or has planned to send qualified individuals for specialized or advanced training in the United States or elsewhere. At the present time, five of the eight specialized sections have professionals with university training that varies from the Bachelor of Science through Ph.D. degree levels. Some sections have clearly been more productive than others. The diagnostic virology section, in particular, has shown little progress in meeting its goals since it was established in 1984, notwithstanding the presence of an American technical advisor for two years.

i. Diagnostic Effort

Though capable of performing a variety of tasks in several areas - e.g., bacteriology, food microbiology, parasitology, and protozoology - the Diagnostic Unit has been underutilized. Table D.1 below illustrates the number of samples examined/year by categories, and the total numbers of samples. If these totals for the four-year period are divided by four, the average numbers of samples examined per year (by field) are: medical bacteriology, 58; serology, 2,400; helminthology, 224; protozoology, 310; virology, 54; and food bacteriology, 320. Such numbers are very low for a diagnostic laboratory the size of the CVL.

ii. Research

Research, exclusive of diagnostic activities, is listed below under categories which describe the principal current projects:

(1) Bacteriology

- Epidemiological studies on pasteurellosis of sheep and cattle;

- Serological surveys of bovine and ovine brucellosis;

- Etiology of respiratory diseases of livestock;

- Development of procedures and protocols for fluorescent antibody diagnosis of various diseases;

- Etiological studies of bacteria that cause reproductive tract diseases in livestock - i.e., Brucella species, Campylobacter species, Leptospira species, etc; and

- Studies in food bacteriology concerned with the development of protocols for the examination of food and milk products and diagnostics.

Table D.1

Number of Samples Supplied for Examination in the CVL Diagnostic Laboratory by Veterinary Field and by Year1/

	1982	1983	1984	1985	Total
Medical					
Bacteriology	44	29	74	85	232
Serology 2/	1,674	572	1,337	6,173 3/	9,756
Helminthology	339	419	19	119	896
Protozoology	545	422	74	200	1,241
Virology 4/	58/58	47/47	47/56	41/55	193/216
Food					
Bacteriology	49	853	243	136	1,281
Total	2,709	2,342	1,803	6,768	13,622

Footnotes:

1/ Source: CVL Annual Reports: 1982-1985.

2/ Serological tests for antibodies against *Brucella abortus* and *Brucella ovis*, rinderpest, CBPP, *Pasteurella* species, and Tuberculin tests (in 1985 only).

3/ 512 ovine sera were also tested for bluetongue viral antibodies.

4/ Total number of samples include rabies submissions plus diagnosed cases of rinderpest, peste des petits ruminants, and sheep and goat pox.

(2) Helminthology

- Publication of two volumes describing the regional distribution of important gastroenteric parasites in Mali;

- Distribution and prevalence of *Fasciola gigantica* and *Dicrocoelium hospes* in Mali;

- Pathogenicity of *Gaigeria* sp.; and

- Limited studies focused on: the prevalence of schistosomes and *Gaigeria pachyscelis* in small ruminants, the prevalence of adult cestodes in sheep, and the occurrence of bovine and ovine parasites in different localities.

(3) Protozoology (including tick-borne parasites and vectors)

- Identification of diseases transmitted by ticks;

- Ecology of tsetse flies in Mali, including prevalence and regional mapping of fly distribution;

- Distribution and mapping of trypanosome species;

- Control of trypanosomiasis, including treatment strategies with trypanocide drugs, vector control, and study of the genetic basis of resistance. The latter is being performed by means of a field evaluation of two n'dama cattle lines that have been bred for relative resistance and relative susceptibility to the disease;

- Study of trypanosomiasis of camels in the Sahel;

- Etiological studies on hemoparasites other than trypanosomes;

- Development of immunodiagnostic tests for the diagnosis of trypanosomiasis and fascioliasis; and

- Surveys of hemoprotozoean parasites in village cattle in the Sikasso region (preliminary to chemotherapy trials -- a cooperative research project).

(4) Vaccine Quality Control

The quality of vaccine is important not only for the protection of Malian cattle, but is also a highly significant factor if external sales are contemplated in countries that contract with FAO to provide them with vaccines.[1] The quality of rinderpest vaccine has not been in question, but constant surveillance of all vaccines is a matter of great importance. With the new facility, vaccine potency and sterility will be controlled.

(5) Virology

Virtually no research has been accomplished in virology. It was estimated that only 5 percent of the research/diagnostic goals were obtained. Principal objectives were the development of viral diagnostic reagents and determination of which viral diseases are important to livestock in Mali. Activities focused on diagnostic assistance with herd outbreaks of disease.

iii. Training Seminars and Manuals

A considerable amount of effort in the Section on Diagnostics and Research was devoted to developing seminar materials and procedural manuals for field veterinarians, as well as protocols for internal use at the CVL. Seminars were held in 1985 for Heads of Sectors (Regions I and II) and also for veterinary nurses. The project-funded seminar prepared

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[1]Expert Consultation to the Improvement of Animal Health Services in CILSS Countries, Banjul, The Gambia. June 1986. FAO, Rome.

for field veterinarians at the CVL consisted of lectures and also of some practical demonstrations. In addition, a manual of more than 100 pages was prepared, presenting a general but detailed course on the major infectious diseases of livestock in Mali, their diagnosis and treatment, and the practical aspects of specimen collection and submission. Additional practical manuals have been prepared, or are in various stages of preparation. Their purpose is to train field veterinarians and technicians in how to recognize common intestinal parasites, in practical techniques of fecal analysis for parasite eggs, and in methods for collecting appropriate samples. This is the first stage of a broader program which is expected to be implemented in the future. Field staff have been sent to the CVL from the Mopti area (World Bank, ODEM) for training in field diagnostic methods. The ultimate goal is to offer similar training to all regions of Mali. Two veterinary technicians recently spent eight months in training at the CVL and have just returned to the Mopti area.

iv. Vaccine Production

Although vaccine production per se is not a function sponsored under the present project, it seems appropriate to remark that the status of the Vaccine Production Unit is generally good. The CVL now produces six types of vaccine with a combined total production in excess of six million doses/year, although amounts differ somewhat from year to year. The CVL also performs research and diagnostic functions that were previously done within the DNE.

Vaccines are currently being produced for rinderpest (peste bovine "V.T."), CBPP (T.1), pasteurellosis of cattle (PASTOBOV) and sheep (PASTOVIN), "blackleg" or symptomatic anthrax (SYMPTOVAC), and anthrax (ANTHRAVAC). Most equipment is operational, and production capacity exceeds demand. It was noted that production of bacterin (killed bacterial products) and attenuated bacterial vaccines is limited by the number of large glass fermenters on hand and, occasionally, by the availability of water. Although supplies seemed fully adequate at the time of our visit, it was remarked that supplies of media are sometimes wanting when needed. Also, one lyophilizer (REPP freeze-dryer) is now non-functional and needs replacement. The small Edwards freeze-dryer supplied with FAO funds is inadequate for the use to which it is now being put for production.

A detailed cost analysis of vaccine production was commissioned by the CVL administration.[e] It revealed that average current production costs of 30 FCFA per dose are about the same as production costs in the U.S., but vaccines are sold at only around one-third of their direct costs.

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[e]Societé d'expertise comptable Diarra. Laboratoire Central Veterinaire: Etude du Prix du Revient des Vaccins. Bamako, Mali, 10 Juin 1985.

3. Analysis and Conclusions

a. Technical Analysis

i. Historical Perspectives

Rinderpest and contagious bovine pleuropneumonia (CBPP) vaccines have been produced continuously in Mali for more than 20 years. However, vaccine quality, quantity, and supply were generally inadequate until the initiation of the "Rinderpest Vaccine Project," which was originally funded in 1962 following a joint agreement between USAID and the GRM. This was implemented in 1965 by the completion of the small but modern vaccine laboratory in Bamako adjacent to the DNE, by overseas training for Malian veterinarians and technicians, and by the provision of American advisors. The first modern tissue culture vaccine in West Africa was developed, tested, and introduced by this laboratory. In August 1965, the Laboratoire du Vaccin was claimed to be capable of routinely producing 500,000 doses per month.[3] Production of rinderpest vaccine ("V.T." or vaccin tissulaire) has continued up to the present time and production capacity now exceeds more than 4 million doses per year.

The envisioned goal was that the CVL would be a West African resource for standardized vaccines, especially against rinderpest. Originally, several neighboring African countries expressed interest in CVL vaccine, but this interest has apparently diminished as a consequence of economic and political considerations. Production capacity now greatly exceeds the needs of Mali. There is, however, guarded reason for some optimism with respect to the possibility for future sales outside of Mali. A recent FAO Commission[4] strongly recommends against the construction of any new vaccine laboratories in CILSS countries. There are sufficient African vaccine production labs already in existence, including the CVL. The current need is to make these labs more self-reliant and, ultimately, self-supporting at least with respect to direct costs in the production of safe and effective vaccines. Otherwise, if it continues to be necessary to purchase vaccines produced outside of Africa, little economic benefit will have accrued from the African labs. The Commission makes strong recommendations for improving quality control of vaccines and for conducting serological tests to monitor immunity responses in vaccinated cattle. The FAO Commission further recommends that each country should pay special attention to the cold-chain delivery systems and to the monitoring of vaccine storage units and of vaccine consignments during shipment. Such recommendations are in full accord with the current project goals.

With rinderpest again a serious problem in many areas of West Africa, it is expected that the pan-African campaign against rinderpest and CBPP

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[3]Memo from MTG to USAID, August 1965.

[4]Expert Consultation on the Improvement of Animal Health Services in CILSS Countries. Banjul, The Gambia. June 23-27, 1986. FAO, Rome.

will be strengthened and accelerated. It appears, however, that donor agencies - e.g., FAO or the World Bank - would require any African laboratory producing the necessary vaccines to establish standard production and quality control measures and to accept monitoring by an outside laboratory, such as the one currently being set up by FAO in Dakar. It is recognized that livestock owner/herder participation is essential to any success in mass immunization programs. A cost analysis of services provided by the CVL should be done and results explained to the livestock owner/herder beneficiaries. Integral to a successful program is the strengthening of the veterinary services, which is recognized as a critical problem in virtually all CILSS countries. These recommendations also are consistent with the goals of the project.

ii. The Present Status of the CVL

(1) Activities

Continued USAID support for construction, equipment and supplies, and personnel training at CVL has prompted expansion as well as diversification. When the new Diagnostic and Research Unit is finally finished, it would seem that virtually all necessary construction will have been completed, an expanded water supply notwithstanding. The emphasis of the present project has been on expansion of diagnostic and research capacities, rather than on vaccine production. The latter was correctly assessed to be adequate by the designers of the current project. Indeed, one current CVL problem appears to be an excess in productive capacity, not in any inability to produce vaccine in necessary amounts.

It would seem that project design input from parasitologists substantially influenced the research priorities of the present project. Tsetse fly, other biting flies, and ticks were considered especially important because they are vectors of several diseases. Initially, the various insect species and their distributions had not been determined. To this end, the project-funded focus from 1977 through 1981 (Texas A & M University contract) was on the detailed mapping of tick and tsetse fly zones, continuation of the study of trypanosomiasis, and limited exploration of treatment strategies.

There also was "study of infectious diseases of cattle," but those studies were not defined and they amounted mostly to investigation of individual or herd problems. Further research in infectious diseases caused by bacteria, mycoplasma, and viruses is needed. It is expected that information gained through such research will be used to bring about practical results. With respect to helminth parasites, development of a data base for determining which parasites are where and in what quantities, together with information on how best to control them through practical treatments, would directly benefit livestock health as well as guide future research. But, drugs to treat parasites are essential if livestock health is to benefit.

Additional facilities, including a new diagnostic laboratory complex and the equipment for it to function effectively were provided in the

project to meet these diverse goals of diagnostics, research, and vaccine quality control. Provision was made for technical assistance, additional training through overseas study, and for expatriate counterpart advisors. The USDA was awarded the contract for long-term advisors; it also provides facilities, such as at the PIADC in New York and the NADC in Ames, Iowa, for overseas training of selected CVL personnel. The general level of diagnostic competence and quality control of vaccine has improved greatly, but training still should continue. It should focus especially on the short-term training of professionals and technicians in specialized subjects that have been determined essential to carrying out the diagnostic and research functions.

Mechanisms for the utilization of the Diagnostic Laboratory are urgently needed, and they must be developed. The transport system for Regions outside the Bamako District and neighboring areas of Region II is woefully poor. The reality is that the number of samples currently received by the CVL are insufficient to justify the present, much less the expanded, Diagnostic Unit. Also, when samples are received, they usually arrive in unacceptable condition. This is frustrating to CVL staff, to the field veterinarians, and to the owners/herders who not only need, but clearly want, definitive diagnoses. Potentially, the CVL could serve as a national resource for diagnostic assistance, and also as a central training facility where practical demonstrations could be given in simple diagnostic methods for implementation at the various field stations. Lectures and seminars are easy to prepare, but practical demonstrations and laboratory training, though more tedious, are the most important to field post veterinarians and could be done readily at the CVL. There already has been a start, as noted above.

The CVL evolved to its present form through decisions initiated in 1962. Growth continued over the succeeding 24 years, and has been implemented by building on the existing systems with the optimistic view of achieving financial as well as material self-sufficiency in vaccine production. Vaccine is in adequate supply, but financial self-sufficiency is still an elusive goal. Benefits to the livestock producers and, indeed, the "national herd" would be expected to occur through improved vaccine distribution and the assurance, through quality control measures, that susceptible cattle would be properly immunized.

It seems inappropriate to measure Livestock Sector Project success solely in terms of the individual elements - i.e., the performance of the CVL or the DNE. Rather, it should be gauged with respect to the ultimate benefit to the livestock producers. The successes of CVL activities are related not only to the quality of the vaccine and the ability to render diagnoses, but they are fundamentally linked to the vaccine and diagnostic sample delivery system, the latter being in the domain of the veterinary extension service administered through the DNE. The success of the project, indeed the viability of the CVL, is dependent on the performance and the administration of the DNE as well as CVL administration and field personnel. Vaccine quality, delivery, and correct administration to livestock are critical and essential elements; each is an important determinant of ultimate project success.

Physically, the CVL is an impressive complex of administrative, laboratory, and technical buildings. The administrative, vaccine production, and research/diagnostic facilities were exceptionally clean and equipment appeared well maintained and in working order. There appeared to be ongoing activity in all areas. Most construction and refurbishment goals appear to have been met, except that water shortages during drought periods still have to be dealt with. The present water supply system is inadequate to meet current needs, much less those that will occur when the new Diagnostic and Research Units are operative.

(2) Staff and Technical Assistance

Approximately 114 people are employed at the CVL. Of these, the professional and technical staff numbers 55 employees in addition to 12 specialists -- i.e., botanist, mechanic, secretary, chauffeurs, and field research assistants -- who are hired under contract by the project. The current heads of sections and many of the technical assistants appear very well trained and the CVL will have a full complement of professional expertise upon the return of those veterinarians now in training in the United States. There is a continuing need, however, to provide additional short-term training for technicians in specialized subjects.

With respect to long-term technical assistance, the current USDA contract microbiologist advises, directs training, and conducts clinical research. He is an exceptional individual in that he is a skilled microbiologist in addition to being an effective and patient communicator. Under his supervision, a variety of technical manuals and protocols have been prepared and reprinted for the staff. He also advises and trouble-shoots in a variety of areas, including vaccine production (bacterins), diagnostic bacteriology, and food bacteriology. The microbiologist has been instrumental in assisting in the setting up of vaccine quality control measures with the collaboration of Malian associates. He also supervises limited research projects, mainly bacteriological and serological surveys of pasteurellosis, vibriosis, Campylobacter sp., leptospirosis, and brucellosis; the latter four pathogens being important genital tract bacteria that affect reproduction. His Malian counterpart is now on study leave in the United States and is expected to return to his post after completion of a three-month training course at the USDA-NADC laboratory in Ames, Iowa. Individuals with the qualifications and determination of the present USDA contract microbiologist are the sort that the project should endeavor to attract and retain for as long as Malian needs continue. Experience gained by such individuals also strengthens the capacity of the USDA to cope with possible introduction of African livestock diseases to America.

Provision was made in the project for three American experts, but there was a void in technical assistance until the appointment in 1983 of a parasitologist and a diagnostic virologist.

The parasitology advisor conducted research and technology transfer in the area of gastrointestinal parasitology in the helminthology section.

There has been improvement in the area of helminth diagnosis and a slight increase in the number of diagnostic samples received and examined. Submissions however, are still disappointingly few in number. Several research projects are currently underway under the competent direction of the Malian head of the helminth parasitology section. In addition, the American parasitologist recently provided CVL with two excellent and bound studies that map the distribution and importance of gastro-intestinal parasites in different region of Mali. He was considered a great asset to the project and to CVL efforts. Nevertheless, continuation of work on the distribution and density of parasites, though important, would seem to warrant a somewhat lower project priority at the present time. Other needs seem to be greater - i.e., research on parasite treatment and control programs that would directly benefit the producer. There is, for example, little ongoing research in small ruminants. This is surprising in view of the large populations of sheep and goats in Mali and of their considerable economic value.

The USDA direct-hire virologist -- a well-qualified laboratory scientist who was able to provide the CVL with several useful diagnostic reagents from the U.S. -- experienced great difficulty in his work as a result of a lack of the equipment and office space necessary to carrying out his mission. Indeed, lack of water during the period of the virologist's stay in Mali severely frustrated the efforts of all CVL personnel to work effectively.

(3) Facilities

Although the present diagnostic/research facility at CVL seems reasonably adequate for the work being conducted at present, completion of the new laboratory complex under construction, including a separate building for rabies diagnosis, will greatly enhance diagnostic capabilities. The building is well under way, with construction about 30 percent completed. It is spacious and will be furnished with modern equipment, which is now stored in cargo containers and in the newly redesigned and refurbished animal quarters. Unfortunately, no provision was made to provide a road to the farm and access is difficult, especially during the rainy season.

It appears as though the potential water problems at the CVL were not considered in the project design, but the fact is that the problem is real and serious. The problem was especially acute during the drought period in 1984-85, and it had a profoundly inhibitory effect on virtually all CVL functions, including vaccine production.

With completion of the facilities now expected no earlier than late 1987, the CVL would seem to be in an excellent position to carry out all of its mandated functions and to conduct a broad range of diagnostic and practical research activities. It was noted that the CVL lacks electric lights, which could pose a problem with respect to work that may be required at night and, more importantly, creates a security flaw. Also, certain of the older buildings would be improved with minor alterations of some doors and walls. These problems are a consequence of some initial

project design flaws (which are normal!) as well as some later changes in use of the facilities.

(4) CVL and DNE

The above achievements notwithstanding, major problems still exist with respect to the degree of cooperation and coordination between the CVL and the DNE. This is especially evident in

- The training of DNE field veterinarians to collect appropriate samples in serious herd outbreaks;

- The ability to insure that the samples will reach the diagnostic laboratory in suitable condition; and

- The reasonably prompt reporting of results back to the field.

Such problems, if not resolved, will severely affect the success of the project and of the ongoing efforts to improve national livestock health. At the moment, it seems that only in Region V, where work is funded by the World Bank, is the goal of integrating diagnostic assistance from the CVL to the DNE being implemented, but on a more or less informal basis. This initially successful effort should be monitored, and, if it bears out, should serve as a model for future integrated activities. In Region V, one small laboratory will shortly be supplied with essential equipment to facilitate the field diagnoses of several diseases. A detailed list of essential equipment and supplies has been compiled by CVL and DNE personnel and costs have been estimated; technical staff also are currently being trained at the CVL. A similar program is planned for the Gao Region. Activities such as these improve not only the regional diagnostic capabilities but they also utilize CVL resources. This type of training and supply of equipment for field diagnostic work would be especially beneficial in project Region I where transport of samples to Bamako is slow and expensive. The currently inefficient means of sample transport, for which there appears little hope for improvement at the present time, jeopardizes the success of the CVL's efforts.

The Regional Headquarters in Kayes has been partially renovated, but the roof still leaks and laboratories are empty. Equipment and supplies were not in evidence, and we were informed that obtaining the necessary materials to make this facility functional is an extremely slow and frustrating process.

(5) Vaccine Production and Quality Control

Although the Vaccine Production Unit is not within the present project, its activities and performance are linked to other functions of the CVL, such as diagnosis and research, and also to the DNE. The Production Unit is the only income-generating element of the CVL. Present income, however, seems insufficient to maintain the costs of production, much less to sustain the costs of other CVL operations such as diagnostics, training, research, or maintenance of equipment.

Vaccine development and quality control are the focus of a significant segment of Diagnostic and Research Unit effort and are included in the project. For example, the Project Grant Agreement calls for the development and implementation of methods to ensure vaccine potency and safety. Also, a vaccine production of adequate volume, quality, and variety is essential to the maintenance of livestock health. Rinderpest and CBPP vaccines must especially be produced in quantity. Vaccine availability is integral to the activities of the DNE, since one of its important functions is to deliver vaccines to the field in sufficient quantities and in appropriate condition to meet the needs of livestock producers. There also is the epidemiological requirement that approximately 70 percent of cattle be vaccinated against rinderpest. In 1983 the GRM instituted a mechanism to reimburse the CVL for vaccines delivered. This was indeed encouraging and salutary, but the current fee schedule, though helpful in offsetting costs, is hardly adequate to sustain on-going CVL operations, as can be seen in Table D.2.

Table D.2

Costs, Prices, and Losses Per Unit of Vaccines Produced at CVL (in FCFA)

Type of Vaccine	Cost	Sales Price	Estimated Loss
Rinderpest (V.T.)	31	10	21
CBPP (T.1)	30	15	15
Blackleg (SYMPTOVAC)	31	13	18
Pasteurellosis (PASTOBOV)	32	13	19
Sheep Pasteurellosis (PASTOVIN)	30	13	17
Anthrax (ANTHRAVAC)	31	13	18

Source: Societé d'expertise comptable Diarra, Laboratoire Central Veterinaire: Etude du Prix de Revient des Vaccins. Bamako, Mali, 10 Juin 1985.

Discussions and evidence presented by the administrative officers of the CVL indicate that ways are constantly being sought to reduce vaccine production costs without sacrifice of vaccine quality. Priorities with respect to the ordering of supplies and equipment are now being more carefully considered. Nevertheless, vaccine receipts fail to meet production costs and hardly can be expected to cover present and anticipated operating costs of the Diagnostic and Research Unit. Costs are currently subsidized by the GRM and, directly and indirectly, by the project. USAID has contributed in a substantial way over more than 20 years to the growth and diversification of the CVL, and it clearly bears considerable responsibility for its continued existence. The viability of the CVL is but one matter. Its success as an institution beneficial to Malian livestock producers, as noted above, is joined to the success in

the efforts of the DNE to deliver vaccines in adequate amounts and in good condition to the field and to administer them to cattle. Transport of diagnostic samples in an expeditious manner is also an important ingredient for project success as well as for the other efforts to improve livestock health services in Mali.

With respect to quality control of vaccines, the objective of separating control from production has been achieved. As of September 1985, control is now under the direction of the Diagnostic and Research Section. Effective tests have been instituted for the control of batch purity - i.e., freedom from contamination. This has been accomplished for all six vaccines produced, but potency tests are currently available only for bacterins (killed bacterial products). Control of purity for viral and CBPP vaccines is done independently of production personnel, an accomplishment that required management foresight as well as additional technical training. With the completion of the new diagnostic facility and the anticipated arrival of an American counterpart virologist, it is expected that all vaccines will shortly be controlled for both purity and potency. At the present time, vaccine potency tests are limited to laboratory studies in small mammals - e.g., rodents and guinea pigs. The completion of the experimental farm should allow further tests to be done on final target species provided that a road is built to facilitate access during the rainy periods. An alternative might be provision of a 4-wheel drive vehicle.

In regard to the renovated experimental farm at Sotuba, which is expected to be occupied shortly, the facilities will provide needed space to hold cattle for vaccine testing - i.e., challenge and serological response studies. The facility also will be a valuable asset for diagnostic antigen/antisera production. This should provide conclusive evidence to doubters (several exist within FAO and in neighboring countries that are potential vaccine clients) of the CVL's ability to produce safe and efficacious vaccines of high quality. And this recognition is absolutely essential if external markets are to be exploited.

b. Management Analysis

Overall project management is discussed in detail in the management section of this evaluation report. In this section, management systems and problems specific to the CVL are presented. This is not intended to be an overall analysis of management at the CVL. Instead, it concerns issues of management that relate to the participation of the CVL in the Mali Livestock Sector Project.

i. Management Development

Although the first seminar of the DPMC was well received, it was quickly perceived by top management at the CVL that biannual visits, each consisting of two to three weeks of seminars, were too much. With the established production schedules, and processes that require constant supervision over several weeks, it was very difficult to release CVL

managers for such extended periods of time. Nonetheless, the CVL represents an agency in which at least some of the ideas presented either by the DPMC or by MDST have taken hold. The laboratory is now standardizing the work plans of all divisions to conform to the model used for the project.

In other areas of management, there appears to be a persistent trend of the CVL nudging the MDST to help improve CVL management, rather than the reverse. Faced with a project inventory of commodities valued at over $800,000, the laboratory requested a microcomputer to help control these stocks. Although quickly granted by the MDST, CVL management found it necessary to find and hire their own computer expert for training, having waited for three months, to no avail, for MDST to provide the training. The inventory control program -- written by CVL staff -- is now up and running, and will soon be expanded to include all inventory for the laboratory, whether project-funded or not. The CVL has also requested a second computer to help meet the demand not only for inventory control, but also for research and statistical analysis and for recording diagnostic results. The financial division has shown interest in the proposed computer-based system currently in the planning stages at MDST for financial planning, budgeting, and reporting.

ii. Personnel -- Evaluation of Technical Assistants

CVL management and Malian counterparts are pleased with the work and training provided by two of the three long-term technical assistants supplied under the project. The third, however, did not perform satisfactorily. CVL personnel are concerned by the lack of an effective system at either USAID or MDST for evaluating the performance of the technical assistants. After the technical assistants had been on the job for 21 months, the Director of Operations of MDST came to CVL to have a joint evaluation of their performance. This "evaluation" consisted of a meeting of the MDST Director of Operations, the Director General and his assistant of CVL, and the technical assistant himself to discuss the latter's job performance. The Malians had been consulted neither about the method nor the criteria to be used for such an evaluation, and they did not feel they could be completely open in such a situation.

iii. Coordination with DNE

The DNE is the largest single user of CVL vaccines, accounting for 36 percent of total sales in 1984 (see Table D.3, below). Yet the coordination between these two organizations within the MRNE does not seem as good as that between CVL and other purchasers of vaccines. For purposes of production planning, the CVL requests estimates from each buyer of their expected needs for the year. These estimates are approximations, but those of the DNE consistently exceed by a considerable margin the amount they will actually use in a year. This leads to what are generally very high levels of overproduction at CVL. Since vaccines can be stored until the next campaign, overproduction does not entail any material loss for the laboratory. Financially, however, it is very costly

Table D.3

Major Users of CVL Vaccines (1984)

Organization	Percent of total deliveries
DNE	36
Mali Sud Sikasso	27
ODEM	17
ODIK	6
CMDT	5
Prodeso	4
All others	5

Source: Data provided by Dr. B. Seck, CVL.

to maintain such high inventories, and this results in a severe cash flow problem. At times it is impossible to purchase necessary inputs for further production because of a lack of funds.

The cash flow difficulties at CVL are compounded by the fact that payments by DNE for vaccines are made only after the vaccines have been used in the campaigns, some six months or so after they have been delivered. Payment from other purchasers are usually received within a few weeks of delivery.

iv. Financial Management -- Sustainability of CVL

There is increasing concern both within USAID and the GRM over the costs of maintaining development projects and institutions once funding is withdrawn. The involvement of the current project in the CVL is limited to three areas: research, diagnostics, and quality control for vaccines produced. It is recognized by officials at both USAID and the CVL that the research and diagnostic facilities, which were essentially created under this project, cannot not be financially self-supporting. It does not appear, however, that such was ever the intention during the project design. Thus, it would seem to be both unnecessary and unrealistic to tie the survival of these two new divisions too closely to vaccine production and sales.

Although the current project is limited to research, diagnostics, and quality control, USAID involvement extends over the past 20 years of direct or indirect support of vaccine production at the CVL. For many years, at the request of USAID, vaccines were distributed to cattle owners free of official charge. It is only since 1983 that vaccines have been sold to the development agencies which, in turn, pass on these charges to cattle owners. The current prices in no way reflect the full CVL costs of production, and they were not set by the CVL. Wholesale prices were set in 1981 by the Ministry of Finance and Commerce. User charges for

vaccinations were set by the Ministry in Charge of Economic Planning at 2.5 FCFA above the wholesale price. According to the 1985 accounting study on the costs of vaccine production, cited earlier, the average cost of production is 30 FCFA, compared to an average wholesale price of about 12 FCFA. Not only is CVL unable to support on its own the addition of two new divisions created during this project, but, under present pricing policies, it is losing close to 20 FCFA on each unit of vaccine produced. Thus, barring a significant change in policy, the CVL will continue to be dependent on government subsidies and financial support from external donors.

c. CVL Summary

The potential exists for the CVL to become a veterinary diagnostic, research, and vaccine production center without equal in sub-Saharan Africa, if it receives wise project input and if the GRM addresses its responsibilities. The facilities are currently excellent and the Diagnostic and Research Unit, which will be completed shortly, will provide the capacity to meet foreseeable needs in the areas of quality vaccine production, disease diagnosis, and research on livestock diseases. The professional staff is, or soon will be, exceptionally well trained and competent. The CVL administration also is capable and highly motivated to succeed in its mission. In addition to an adequate infrastructure, senior administrators have established the foundation of an excellent library and have installed a sophisticated IBM XT computer system. An inventory of equipment and supplies has been done and the information is organized and stored on the computer. Initial cost analyses on vaccine production have been completed by an independent consulting firm (cited above), and more detailed financial analyses are planned. Additional management and computer training is also planned. Project funding for these CVL efforts is well spent and should be sustained.

The prices of vaccines should ultimately reflect at least their real production costs, but even if this were to occur the CVL could not be expected to sustain itself financially. Diagnostic work is rarely a cost-effective enterprise, even in Europe and in the United States where charges are very high. Benefits from research are almost impossible to measure in monetary terms and research is expensive. Benefits, therefore, must ultimately derive from improvements in animal health.

4. Recommendations for the Current Project[5]

a. The evaluators strongly recommend continuing support for the CVL as essential to its survival. Whether this support will be required for 10 or even 20 years is difficult to predict. The GRM and USAID conceived and promoted the continuous development of the CVL to its present form, one that exceeds the current Malian requirements. The Diagnostic and Research Unit, to be completed soon, is of special concern since it could

[5]Recommendations are unranked, since none involve major new construction and all seem to us essential to project success.

become a "white elephant" unless serious thought and action are given to its planned use. This does not seem to have been adequately considered by AID or the CVL. We found no evidence that support would not continue, but impressions suggest that there now is a growing view towards "CVL self-sufficiency." This is of concern to us since we can conceive of no way that the DR Unit laboratory and its various operations could become financially self-reliant. A present and future task in laying the groundwork for ultimate sustainability of operations is to capitalize upon the existing resources of the CVL - i.e., vaccine production - to reduce the financial burden created by the diagnostic and research services. Expanded production of various types of services or vaccines - i.e., for poultry and small ruminants - might aid this effort. Continued training of Malian animal health personnel in the newer techniques of mass production of vaccines, and in the necessary research and development that precedes any new vaccine would seem essential. It is evident, however, that the CVL cannot continue its present activities, much less prosper, without continued and substantial subsidies. The evaluators recommend continued project assistance for specialized training in methods of vaccine production and in dealing with those new pathogenic microorganisms for which new vaccines appear necessary.

b. Present income from vaccine sales and other sources is insufficient to sustain the CVL's operations. Solution of this problem through gradually increasing the prices of vaccines or the volume of sales would seem to be the primary responsibility of the GRM; but USAID has a stake in the CVL and it seems to us that there is an obligation to continue project assistance in the area of management training and cost analysis. The extent and focus of such assistance would have to be determined after assessment of priorities as this project period draws to an end. The evaluators suggest strongly that GRM develop a policy of "future self-sufficiency" with respect to the CVL. USAID also should consider its long-range policy strategy with respect to the CVL. A detailed cost-analysis of all CVL activities should be commissioned for all project-related operations - i.e., in Vaccine Production as well as the Diagnostic/Research Unit. This will prepare the way, ultimately, for an orderly phase-out of AID assistance in research and development, and lead to sustainable recurrent cost support by the GRM.

c. Benefits to the livestock industry will become apparent only when the flow of vaccines and services commences to all regions of the country. Once owners/herders realize that the CVL/DNE effort is concerned with their problems - i.e., provides answers to questions of "what killed my animals?" and "what should I do about it?" and makes vaccines available to cope with diseases they will demand such services. To reach this state requires time and better organization and integration of the activities of the CVL and DNE. Key areas for improvement lie in work planning, budgeting, and control systems as well as in regard to utilization of the diagnostic facilities under construction. At present, vaccine seems to be getting out to the field in adequate amounts, and in time to meet campaign needs. Administrative collaboration is a general problem in most countries, and Mali appears to be no exception. However, if the project goals are to be achieved, there must be closer linkage and a greater

mutual understanding of the problems faced by both the CVL and DNE, and a genuine effort by both of them to work together to strengthen their relationship. They must endeavour to utilize such resources as are available for the benefit of an integrated and efficient animal health system in Mali. The utility of the CVL is bound to the successful delivery of vaccines, to its capacity to train the field veterinary staff and technicians, and to its ability to render useful diagnostic services and research results. These, in turn, influence the efforts of DNE staff to immunize livestock successfully and to diagnose and treat disease in a rational way. Although we were requested to provide "specific recommendations for implementing closer coordination," this matter must be resolved between the parties concerned. The issue is chronic and complex.

d. There must be an improved mechanism for orderly collection of fees paid for vaccines and more prompt payment to the CVL. It might be useful to consider development of a revolving fund, or some sort of account, into which CVL receipts or other monies, such as those from the project general fund, could flow. This would ameliorate some of the cash-flow problems, especially in times of serious need. We leave solution of this problem to those more experienced in such matters. Probably the MDST would be in the best position to make initial suggestions and, with the increasing capability of the MRNE staff, this responsibility should be shifted to them.

e. The evaluators recommend the continued training of CVL professional and technical staff, but with greater emphasis on short-term visits that have specific and defined objectives. Such visits might include scientific workshops with focused aims such as learning new techniques applicable to ongoing or proposed work or acquiring expertise outside a degree program in a particular subject - e.g., a brief internship in pathology. There is a need at present for short-term training in necropsy techniques (post-mortem pathology) and in microscopic diagnoses (histopathology). Other subjects might include: new or specialized vaccine production methods (bacterial and viral vaccines); methods for mass cell cultures; hematology; specialized computer techniques applicable to maintaining diagnostic records and submission of reports; management; advances in chemotherapy/antibiotics; and infectious diseases of cattle and small ruminants in tropical countries.

f. The research activities of the CVL should be practical in nature and focused on problems related to Malian livestock. It is recommended that research continue at the applied level and that it emphasize the laboratory identification of infectious diseases and the development of vaccine or treatment methods for the most important diseases. Continued monitoring of herds in various areas by serological means is useful to identify the most prevalent diseases and to recognize new infections. Such studies will point the way for rational determinations of vaccine needs.

g. The parasitology effort might give greater emphasis to newer treatment and control methods and to serodiagnosis of protozoan diseases, as well as extending training to the field posts. Knowledge of treatment

methods is valuable only when appropriate drugs are available. The evaluators recommend increased project emphasis on diseases of small ruminants and poultry. Study of putative genetic resistance to trypanosomiasis in n'dama cattle also warrants study. Support of tsetse fly work is justified on scientific grounds, but it is expensive and the priority of further mapping and distribution studies within the project should be assessed in light of other research needs. This is not meant to imply that tsetse work is unimportant, as the presence of various species of Glossina determines the success of cattle raising in many areas, and the Glossina distributions apparently change periodically. We recommend, however, that the effort to map and ultimately eradicate tsetse and trypanosomiasis in the sub-humid zone be closely linked with forage and animal production research in that area by the INRZFH. This will ensure that ecologically sound systems of animal husbandry are in place before any influx of cattle occurs into a newly tsetse-cleared zone.

h. The Diagnostic and Research Section should support the vaccine production unit as a "research and development" section when additional vaccines are found to be required, for example for small ruminant or poultry diseases. The limited brucellosis surveys in this project, and those that have been done by others in Mali, suggest that Brucella abortus is a serious problem. Vaccination may be warranted. Brucellosis in sheep and goats caused by both B. ovis and B. melitensis should be examined further. Also, testing of vaccines in the target host - i.e., cattle rather than mice or guinea pigs - will be possible with the new animal facility. This work is necessary because some of the products currently being produced may not adequately protect the intended species. Such work is expensive.

i. The project supported the development of vaccine quality control separate from production. This was a wise administrative decision as well as a potential political asset. Any future sales of vaccines outside of Mali will require rigid quality control and will undoubtedly be required by FAO or other organizations that are vitally concerned with rinderpest. This disease became an even more serious problem during the period of the drought. Continued support is recommended for the development of additional vaccines for diseases that research reveals to be important.

j. Great caution is recommended in considering any new major construction at the CVL, beyond the completion of work underway. The exception to this is the provision of a guaranteed water supply to all of the facilities at CVL and Sotuba. The specific recommendations for implementation of this task are left to USAID and the MRNE, but an assured water supply is essential. This matter is apparently already under serious examination, but it is sufficiently important to mention again. Additional recommendations include improving the CVL building's electrical supply, making slight alterations in the internal building configuration for efficiency, and improving the track to the experimental farm for ease of access.

k. Finally, additional provisions must be made in the project for replacement of major equipment essential to continued project success -

i.e., freeze-dryers (lyophilizers), fermenters, centrifuges, large sterilizers, boilers, and other such expensive equipment that was originally funded by USAID. Thus far, equipment has held up remarkably well, and it appears to have been carefully maintained. Surprisingly, the REPP freezer-dryers are still operating, one having broken down only recently.

5. Recommendations for Future Project Support

a. There should be close consultation between the CVL research staff, the field veterinarians, and the USAID/COP veterinarian on how best to establish and justify major research priorities. Research should be supported only if it is clearly of economic significance to livestock and to the objectives of the project. That is, funding of "basic research" is not recommended, but continued support of study is recommended in such areas as vaccine development, refinement of relevant diagnostic tests, training of personnel, and development of methods for the treatment and control of infectious diseases. It is not within the evaluator's scope to suggest research projects; this must be done by CVL staff and in consultation with USAID technical advisors (i.e., the COP) with respect to AID-supported work.

b. There should be more emphasis on small ruminants. Sheep and goats are a significant element in the Malian livestock economy, and they have, until now, been largely ignored. Relationships between nutrition and disease in these animals would seem important to investigate unless such data are already available for Mali.

c. It would seem useful to establish a revolving fund for the purpose of ameliorating the cash flow problems of the CVL during periods when they are not receiving payments. Cash from whatever source obtainable could be placed in interest-bearing accounts and used in times of acute need. Future support for management training, and implementation of existing management aids - i.e., computers and accessories - would be useful and beneficial.

d. Funds to replace major equipment breakdowns should continue to be made available as required (not necessarily as requested). Also, minor renovations should be considered in the future. Vaccine production is the backbone of the CVL, and vaccine needs change as the epizootiological situation changes or becomes better known. USAID and the GRM should be prepared to meet such contingencies.

e. Support should be considered for training programs for field veterinarians and technicians, and for conducting seminars that enhance utilization of the CVL facilities. Such courses should be very practical and should consist of laboratories and demonstrations in subjects that field veterinarians could use to assist in the diagnosis of diseases - e.g., necropsy techniques, practical fecal examinations (coprascopy), proper taking of blood samples for hematology and hemoparasite study, etc. Such activities are excellent morale builders. They also demonstrate, to

field veterinarians and livestock owners alike, that accurate diagnoses are not only possible but are essential to disease control.

f. Educational opportunities exist for veterinary nurses at the CVL. Since most students do not have adequate or, indeed, any practical training upon graduation they would benefit greatly from practical courses in, for example, diagnostics. The CVL is very near the veterinary assistant/nurse school and transportation would pose no problem in this regard.

g. Continued funding should be predicated upon the development of self-sustaining policies by the GRM in anticipation of the time when USAID project support for livestock wanes or is terminated. We do not recommend considering cessation of funding for another decade at least, unless USAID and GRM consider their investment over the past two decades to have been a failure. To the contrary, we feel that this segment of the Mali Livestock Sector Project has been exemplary of the type of effort AID was created to perform.

E. IMPROVEMENT OF VETERINARY SERVICES DELIVERY SYSTEM (DNE)

1. Objectives of the Component

The AID-funded Project was designed to bolster the DNE vaccine delivery system through a program of technical and training support. Long-term technical assistance was to be provided to assist in planning and implementing a more cost-effective animal health delivery system. In addition, short-term specialists were to be brought in as needed to deal with a variety of financial, logistical, administrative, and technical questions over the life of the project. Long-term training in animal health delivery systems planning and management would also be provided.

In the area of logistics support, an initial survey was to be conducted in the First and Second Regions to determine specific requirements for upgrading existing facilities, for building and equipping new facilities, for improving transport, and for reducing the cost of animal health services. Upon completion and analysis of survey findings, a decision would be made to strengthen the system in the Second Region, with subsequent expansion into the First Region in the third project year. Final construction and procurement plans would also be developed.

2. Accomplishments to Date

a. Background

The National Livestock Directorate (DNE) is one of the fourteen directorates or equivalent administrative units in the Ministry of Natural Resources and Livestock (MRNE). Within DNE, responsibility for the Mali Livestock Sector Project activities was assigned to the project and Program Division. The Chief of this Division is the Coordinator for the project. He is also responsible for the preparation of annual work plans and serves as contact and liaison with the Regional Directors in all matters concerning the project.

DNE fieldwork is carried out through Regional Veterinary Directorates (DRV) in the seven administrative regions of Mali and in the District of Bamako. The activities under the project are limited to the First and Second Regions, headquartered at Kayes and Koulikoro, respectively, and the Veterinary District of Bamako. In technical and professional matters outside the project, the DRVs report directly to the Chief of the Animal Health Division; in project matters such as reports and requests for services, they deal with him through the Chief of the Project and Program Division. The DRVs operate through Veterinary Sectors where the activities of Veterinary Posts are directed. The posts are the operating units for field activities in livestock health. These activities are carried out principally at vaccination parks that were constructed primarily for use in vaccination campaigns against the major diseases: rinderpest and contagious bovine pleuropneumonia. Each vaccination park consists typically of a corral and cattle chute made of concrete blocks,

but is at times built by the community out of local materials. Water is available at some of the parks, but this is the exception.

Animal health treatments, including endoparasite medications, may be given during the principal campaigns, which generally are in October through March - i.e., during the dry season - or during supplementary campaigns in the summer months. The staff of the veterinary sectors and posts also provide certain clinical services. They are increasingly expected to participate in disease surveillance, to collect and prepare samples and specimens for laboratory analysis, and to obtain information on pasture and water availability at wells and on the movement of herds.

In order to carry out their functions effectively, the regional veterinary services must be properly equipped. Essential equipment consists of such items as freezers, cold storage containers, portable ice chests, and proper syringes and needles to administer vaccines to livestock. Vaccine must be kept cold (the reason for the "cold chain") during transport from the CVL to its destination, the animal.

The cold chain must be supported by adequate transport. Practicing veterinary agents must be supplied with fuel to operate their vehicles, usually mobylettes, as well as vaccines, medicine, and syringes and needles to administer them. They also need equipment and supplies for minor surgical procedures such as wound repairs, removal of broken horns, castrations, and for performing field necropsies.

b. Training

i. U.S. and Third Country

(1) Long-term

Seven members of the DNE professional staff were selected for long-term training. Of these, one dropped out for personal reasons, and another failed the TOEFEL test which is required for admission to most American universities. Two candidates have successfully completed their language training and are expected to complete 24 months of study for Masters of Science (MS) degrees by the end of 1987. One will study Agricultural Economics at New Mexico State University and the second will major in Animal Science at California State Polytechnical University at San Luis Obispo. Two students are now in English language training. Following completion of the program, they will study for 24 months in MS programs at New Mexico State University -- one in Agricultural Economics, the other in Range Management. The fifth degree student already has carried out research in Mali and has been accepted at Michigan State University for Ph.D study in Livestock Marketing. He is expected to return to Mali in June 1988. These students are scheduled to return to positions in the DNE.

(2) Short-term

Eight DNE staff members have completed short-term training assignments in the U.S. Five of them attended the two months Francophone African Development Management Seminar at the University of Pittsburgh. Three senior officials participated in a two-week study tour of the U.S. The focus of their visit was the private practice of veterinary medicine and delivery of veterinary services. Similar tours also were conducted in Morocco, Senegal, Ivory Coast, and Kenya. One person from DNE attended a ten-week program in veterinary epidemiology and economics at Reading University, U.K.

ii. In-country

(1) Training Given by TA Staff

Special workshops were given by the technical assistants for selected members of the DNE senior staff at each of the periodic visits of the DPMC team. The purpose was to gain practical experience in the application of concepts and procedures on the themes presented in the general sessions. The most recent seminar/workshop took place in June of this year, and it focused on preparations for the present mid-term evaluation.

(2) In-service Training by Local Staff

The following training programs were supported by project funds. Participants were drawn from both Regions I and II and from the Veterinary District of Bamako.

- A training course for fifteen Veterinary Sector Chiefs was held from 27 August to 1 September 1984. Lectures consisted of major epidemic diseases of Malian Livestock and practical topics in diagnosis - e.g., taking blood samples, performing field autopsies, specimen preservation, and specimen transport; and

- A seminar for Chiefs of Veterinary Posts took place from 30 September to 5 October 1985. The seminar dealt with cattle marketing, range management, legislation, food inspection, cattle feeding, drawing and forwarding blood samples and other specimens for laboratory analysis, outbreaks of epidemics, principal contagious diseases in Malian livestock, maintenance and use of vaccines, and work planning.

Additionally, a National Livestock Seminar for twenty participants, funded by FED, was held on 1-7 July 1984. Subjects were animal health, monitoring herd health problems, cattle feeding, livestock marketing, and milk production.

c. The Cold Chain

i. Needs Assessment

As stipulated in the Project Grant Agreement, a survey was conducted in Regions I and II to determine the specific requirements for building and equipping new facilities, upgrading existing facilities, improving transportation, and reducing the cost of animal health services. The survey was undertaken by a joint GRM/USAID team, which included senior DNE staff, the AID Livestock Project Manager, and a representative of MDST. The survey team travelled extensively in both regions in May 1984.

ii. Commodities

On the basis of the May 1984 field survey, a detailed list of the veterinary supplies, equipment, and vehicles needed for the cold chain was prepared. With only a few exceptions, most of the required commodities were purchased in bulk ahead of time under a favorable exchange rate and are now in storage in Bamako or distributed to field locations. Sufficient supplies were in place in the field for the 1984-85 vaccination campaign. The precise quantities and distribution of materials, by category and region of assignment, are shown in Tables E.1a-c. The information in the tables is discussed below in the technical analysis.

iii. Technical Assistance

Short-term technical assistance under the project was provided through the training activities of DPMC. No long-term specialists were provided.

3. Analysis and Conclusions

a. Technical Analysis

i. Cost-effectiveness of the Delivery System

Only two vaccination campaigns have been completed under the project. It is therefore too early to speak of trends, although the figures to date are encouraging. For Region I, Table E.2 and Fig. E.1 show that, from an average of 20 percent of cattle vaccinated against rinderpest in the 3 years before the project (1981-1983), these figures have reached 44 percent in 1984 and 55 percent in 1985. Region II, starting from the higher average figure of 38 percent in the years 1981 to 1983, went up to 43 percent in 1984 and 50 percent in 1985. These data, of course, must be considered as approximations because of the difficulty in accurately estimating cattle populations; analysis of the figures is also complicated by sharp year-to-year changes in cattle population size - i.e., 1985 cattle estimates are only 57 percent of 1984 figures and the absolute number of vaccines dropped concomitantly. Nevertheless, the data suggest that the planned target of 70 percent of cattle vaccinated against

rinderpest is realistic and can potentially be achieved before the current project ends.

It should be noted that only the figures in the annual reports are considered official. The monthly data, shown in Fig. E.2, tends to lag a bit. It is given to illustrate the distribution of vaccinations throughout the year and to give some indication of year-to-year fluctuations, as changes in rainfall determine the pattern of herd movements.

ii. The Delivery System

The cold chain concerns primarily the flow of vaccines from the CVL to vaccination sites. It was envisioned initially that the same containers could be used to facilitate submission of diagnostic samples - e.g., sera, blood, or tissues - from the field to the CVL. This was an interesting, but flawed, expectation. Transport is too slow; it is also expensive if only one or a few samples are involved.

iii. The Accounting System

The system whereby the CVL is paid for vaccine makes effective accounting very difficult. There is no point at which available records permit effective control, nor indeed do they provide useful information on what actually occurs. The CVL accounts are "balanced" when delivery receipts cover the quantities of vaccines issued to the DRV. There appears to be no systematic attempt to translate this paper "balance" into an actual cash flow. Clearing of the DNE accounts by cash returns from the field centers lags by about six months. Vaccines are generally stocked by the Veterinary Posts in August and September, before the principal dry season campaigns, and payments are made after the peak of the campaign in March.

This DNE practice differs from the payments made by other agricultural rural development organizations (RDOs) for vaccines obtained from the CVL. Thus, the RDOs have budgets or lines of credit which permit them to make cash payments for CVL deliveries. If similar arrangements could be made for DNE, this would ease the CVL cash flow problem, since deliveries to DNE account for more than one-third of all CVL vaccine sales.

There seems to be no clear relationship between the quantity of vaccines issued and the number of vaccinations reported from the field. Typically, the amounts of vaccines delivered far exceed the number of actual vaccinations given. Among the reasons given for this are:

- The need to keep adequate stock on hand at the DRV and veterinary sector levels to meet changing needs; and the fact that

- Vaccines are supplied in bottles that contain 50 or 250 doses, so that there often is wastage. Less than the full amount is

often utilized at the time a bottle is opened, especially one that contains 250 doses - e.g., when small herds are vaccinated. This is more common when vaccinations take place in individual herds outside the campaign days at vaccination parks.

Arguably, it would reduce waste and improve control of the system to supply vaccines in containers of about 20 doses in addition to the 50 and 250 dose bottles now in use, and this change would be cost-effective to the herder. Nevertheless, it would not seem practical to change the present bottling system at the CVL, since each bottle has a similar unit cost regardless of size and the cost of the bottle, cap, and stopper is much greater than the cost of the vaccine. Although needed in the field, the problems in production, in procurement of appropriate vials, and in added costs with fewer doses/bottle are excessive.

iv. The Cold Chain

(1) Vaccination Parks

A typical park is a concrete-enclosed corral with a capacity to hold 150-200 cattle, and a chute in which animals can be immobilized during vaccination or treatment. Such parks greatly facilitate the vaccination process, and they afford an opportunity to administer other medications.

The construction and renovation program under the project is completed, and the project-funded parks are functional. Nevertheless, some veterinarians in Region I complained that no provision was made for shade or for supports for vaccine containers. It would seem that such problems could be solved locally with four sticks and a cover. But, such complaints do suggest low morale and poor motivation to do anything that is not specified, even it is to one's own benefit and comfort.

To the evaluator's knowledge, only two of these parks (Dioilo and Kayes) are unsuitably located; almost all of them lack a supply of water, except certain posts in Region II and in Bamako. Wells are badly needed at posts, especially in Region I. Conversations with both DRV staff and cattle owners reveal frustration in what is perceived as a failure to involve them in decisions that affect them. The siting of the vaccination parks is one complaint, but there were others as well. For example, the long delays between requests for services and equipment and acknowledgment from officials in Bamako. It does appear, however, that vaccine requests in August are met by the time vaccine is needed in October -- the Regional offices send people to Bamako (CVL) to procure it.

(2) Transportation

There is no regular delivery route or schedule for the distribution of vaccines. Nevertheless, vaccine generally always reaches the veterinary posts in time for campaigns because the Regional centers dispatch couriers to draw upon vaccine stocks in advance of need.

Land Rovers and mobylettes provided under the project have greatly facilitated the operation of the cold chain; however, fuel is not always available when needed, especially in Region I. Eight Land Rovers have been assigned to Region II, four to Region I, and two to Bamako. The 100 mobylettes supplied by the project have been distributed in approximately equal numbers between Regions I and II, and eighteen have been assigned to the Veterinary District of Bamako. This provides transport for about one-quarter to one-third of the field agents. At the peak of the campaigns, the Land Rovers are used to take personnel lacking transportation to vaccination parks.

The mobylette shortage - i.e., the failure to provide a mobylette to each field agent - has been cited by some agents as a "failure of the project" to meet the basic requirements of the veterinary health delivery system. The evaluators believe, however, that more significant and pressing weaknesses lie in staff underemployment beyond the peak campaign periods.

Conversations in the field with DRV staff confirm the observation in a June 1984 MCDR report that there is "obvious underemployment of staff with only 9,000 interventions (vaccinations mainly) per agent per year, that is only three months work in meeting total prophylactic needs."[1]

Under these circumstances, there is at present no compelling reason to provide additional mobylettes. As needs expand, they could be accommodated by the revolving fund that was established for the purchase of the mobylettes. Procedures are defined by the ministerial meeting of 29 November 1982.

At present, a clear and more important need is practical training for field agents in order to prepare them to provide a wider range of services than only the vaccinations. This issue of training for the field agents is discussed below.

(3) Fuel

Fuel allocations for vehicles, mobylettes, and kerosene-powered refrigeration equipment seem very inadequate. This has been mentioned on several occasions and at different locations. It appears to be a major constraint to more effective use of the cold chain. This limited fuel supply must accommodate administrative errands as well. Also, the purchase of fuel must often be done far away from the field post and may itself require as much as one-half the monthly fuel ration. Even more may be consumed for this purpose at very distant posts, such as are common in Region I. Not all mobylettes are being used effectively because of inadequate fuel. Agents may fail to receive budgeted money for fuel from the Regional Offices. Thus, some problems may originate in the Regions, rather than centrally.

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[1]MCDR. Note sur la privatization de la médecine et de la chirurgie veterinaire, Bamako. June 1984.

(4) Radios

Recently, DNE installed a 2-way radio communication system (RAC) with project funds. It links DNE to all but two of the veterinary sectors in Regions I and II, thereby substantially reducing administrative travel. Only Kati and Kayes, served by PRODESO, are not yet part of RAC.

(5) Equipment for the Cold Chain

Items purchased under the project are listed in Tables E.1a-c. They include:

- Freezers and refrigerators to stock vaccines;

- Refrigerators with some freezer capacity for Veterinary Posts;

- Ice chests and coolers to maintain cold temperatures in transit between CVL and storage at the DRVs and, throughout the day, at vaccination corrals; and

- Well-insulated "thermo-type" containers small enough to be carried by agents on mobylettes.

On the whole, the stipulated project needs appear to have been met. However, considerable concern has been expressed in periodic reports of the DRV about the unsatisfactory quality of the "EDA" brand coolers provided with project funds. They are said to keep ice for only a few hours rather than for a period of two or three days, as had the older models in service before the project started.

It must be noted also that both equipment and supplies, as shown in Tables E.1a-c, are unevenly distributed relative to cattle population. Thus the Veterinary District of Bamako, which is much smaller than either Regions I or II, has been allocated a disproportionately large amount of available materials. While it is fair to say that equipment needs are being met in the Bamako District, there is no indication that all DRV needs in the First and Second Regions have been met. In addition, the stocks retained at DNE itself appear to be inordinately high. In particular, few of the refrigerators have been assigned to posts, and there are indications of other unmet needs in Region I.

(6) Other Minor Equipment

The quantities of syringes and injection needles for direct use in vaccination campaigns have been adequate. However, the quality and suitability of these items supplied by the project are extremely poor so that they are virtually useless. Dismay bordering on anger correctly describes the attitude of the field vets with respect to the syringes/needles provided by the project. This is obviously not a trivial matter, for needles/syringes are the link between the vaccine producer and the immune system. Specifically:

- The syringe plungers are not calibrated and cannot be readily adjusted for rapid injections of measured doses of vaccine. Efficiency is thus poor; and

- The injection needles are much too long and fragile. They should be 15-gauge 3/4 inches for subcutaneous injection. The present ones are prone to break. Some posts have already "used up" their entire stock of needles; at others, the needles are cut and beveled prior to use -- a useless waste of effort.

A review of the minutes of the relevant meetings of the HRNE/MDST equipment selection committee (22 March 1984 - 31 March 1984) reveals that award was restricted to a single brand, "GENIA," with which the field staff was said to be familiar and which it thought was good because of past satisfactory performance. Among the suppliers of GENIA, however, the award was not given to the lowest bidder (see Table E.3). Finally and most importantly, the syringes and needles that were ultimately delivered did not meet specifications. No notice was taken of this, and there was no follow-up on the vigorous complaints that were registered from field veterinarians/vaccinators.

(7) Diagnostic Equipment

Minor equipment such as scalpels, forceps, scissors, alcohol dispensers, autopsy knives, and other materials to obtain blood and tissue samples for diagnosis have been received by the DNE. Distribution to the field is in progress.

It would also be desirable to provide some further laboratory support, at least at the DRV level. It would seem useful to examine this question on the basis of overall budgetary needs.

(8) Vaccines

Clearly, the single most important requirement of the campaigns is adequate vaccine. As noted above, delivery and administration of vaccines appears to be satisfactory, and the CVL has a large, even excessive inventory of all six vaccines produced. However, occasional field shortages may occur, as was said to have happened in Region II this past season. It is unclear whether these delays in receipt of vaccines were due to the failure to requisition vaccine early enough or to lack of coordination between the CVL and the DNE. Generally, however, there are no serious complaints about inadequate or untimely vaccine deliveries.

Table E.2 and Fig. E.1, which summarize the campaigns, suggest a 50 - 55% coverage for rinderpest in the last campaign. These data differ from information in the documentation prepared for the fourth JMC meeting that reports a 72% coverage in the 1984/85 campaign and projects vaccinations (all kinds) of 1,200,000 head of cattle as a realistic target for 1985-86.

Even so, there has been a marked project impact on the percentage of animals vaccinated. Also, it is reasonable to believe that the cold chain helped to safeguard the potency of the vaccines. Thus, the investments in the cold chain have contributed to vaccine efficacy. Field interviews indicated that rinderpest has not been a problem in areas that have received CVL vaccine, even though there have been sporadic outbreaks elsewhere in Mali.

Veterinary agents have become increasingly mobile and have been able to establish closer and more frequent contacts with herders. According to the DRV quarterly reports, mobility of the agents has also enabled them to become better informed about the movement of the herds and thus able to plan their work schedules more effectively.

The project has emphasized the need for better organization in the delivery system. But implementation of changes to meet several recognized needs is far from complete. This is especially evident in regard to the collection, transport, and delivery of diagnostic specimens to the CVL, the training of field veterinarians in simple, but useful, diagnostic techniques, and the availability of medicines. The latter, however, is a matter between the field vets and the Veterinary Pharmacy, and does not concern the project.

v. Infrastructure Development

The project has funded the construction or renovation of a total of 34 veterinary posts and 16 vaccination parks. All but seven have been completed, and construction of these will begin as soon as PIL #12 is signed by MRNE. They should be finished by mid-1987.

The current status of the construction program is summarized in Table E.4. Targets set for completing the Veterinary Posts have been reached ahead of schedule and below budget.

Evaluators were informed of only two vaccination parks (Dioilo and Kayes) that were poorly sited. Conversations with both cattle owners and DRV field staff reveal discouragement at not being consulted on the choice of sites. The sites typically are assigned by the local administration, but the basis on which sites are chosen is unclear; maps of exact site locations were not available.

The Veterinary Posts visited are relatively simple and consist of living quarters for the Chief, an office, and sanitary facilities including running water from a roof-high tank filled by means of a hand pump. The posts visited in Region II had adjacent wells and were wired for electricity that might at some future time be obtained from a small generating unit. In the office, there is a metal cabinet with some instruments and medical supplies and a freezer or refrigerator. There is no treatment area or restraining frame for cattle. These could easily be made from posts anchored in concrete footings.

At the local level, development committees establish priorities and schedules for funds that are allocated to them. A detailed description of the operation of this development fund goes beyond the scope of this evaluation. It is, however, relevant to the planning of the veterinary services delivery system, to any discussion of community contributions, and to the establishment and maintenance of services. Needs of migratory owners and herders must continue to be met from public funds, at least for now.

vi. Staff Development

There is no evidence that the selection of candidates for long-term training was related to a clearly defined DNE staffing program, nor does it seem that any attempt was made to train personnel for anticipated needs, as stated in the PP. Defined needs were:

- A health-programming specialist at the national level;

- Regional health-operations planners;

- Cold-chain equipment service managers at the national level;

- A regional cold-chain equipment service manager;

- Regional-level vehicle maintenance specialists; and

- Other specialists.

Although the PP reflects a higher level of proposed funding than was eventually provided for the project, some training along the lines originally envisaged could have been done with the available funds. Evaluators believe that this would have benefitted the project.

vi. Training

Project-supported M.S. and Ph.D-level training in such areas as Agricultural Economics and Range Management has bolstered the DNE technical capacity. DNE's pressing need now, however, is for practical training in management and in veterinary skills. To this end the evaluators strongly recommend greatly expanding the present short-term and in-country program of training. The value of attendance at the Francophone African Development Management Seminar at the University of Pittsburgh needs to be reassessed, as does the value of the DPMC's action training seminars, such as the most recent one in preparation for the present mid-term evaluation. Nevertheless, other aspects of the training effort (summarized above in E.2.b.i.(2)) have been more useful, including, for example, the week-long training course given for Veterinary Sector Chiefs in epidemic diseases and practical methods in diagnosis.

In addition to vaccination, DNE agents are involved in market and food product inspection, animal health clinics, and water supply inspection. These activities have not yet received active project

training support. Support could include extension or scheduled course activates in areas such as animal nutrition, herd management, milk production, and cattle marketing. The specific training required for the field agents could consist of frequent and short practical sessions given at Regional Offices or at Veterinary Posts. There should be a minimum of theory, as is commonly presented now. Those who would be responsible for the field training could receive instruction in Bamako. They could perhaps be accommodated at the Sotuba Center near Bamako -- established under Mali Livestock II -- which is largely unutilized at present. Training also could take place at the CVL where there is a large conference room that is conveniently located adjacent to the current diagnostic laboratories and necropsy room. Demonstrations could thus be set up easily.

The CVL could offer practical training in diagnostic methods at an applied level and demonstration of the methods used for field diagnoses and necropsies. This would be an excellent use of the new Diagnostic Unit's facilities. Such a program, which would help integrate the new unit with the DNE extension effort, would deserve project support. Short-term technical assistance could contribute to the training. Funds appropriated for such use have remained essentially unused.

viii. Technical Assistance

A budget for technical assistance to the DNE seems to have been prepared only because it is a usual component of a grant. There is no evidence that any consideration was given in the project in regard to the use of funds available to DNE for technical assistance. Technical assistance in management, however, is of first priority for the DNE. This need might be met by MDST or, alternatively, by a separately hired TA specialist.

b. Financial Analysis

Two basic and related questions are addressed in this section. They are:

- Sustainability of the health delivery system and, by implication, the replicability of the activities funded under the project; and

- Privatization of all or part of the system and possible ways to move in that direction.

i. Sustainability

(1) Costs

The direct costs of the vaccination campaigns exceed the user fees introduced in 1983. By increasing the number of animals vaccinated the burden of the subsidy continues to increase. Unit costs of production of the six vaccines produced by the CVL, GRM fixed sales prices, CVL losses,

and DNE/DRV sales prices are listed in the CVL section of this evaluation report (see D.3.a.ii.(5), Table D.2, and D.3.b.iv). To summarize these data briefly, the average cost of vaccine production is somewhat in excess of 30 FCFA per dose, compared to an average subsidized wholesale price of 12 FCFA, to which is added a user charge of 2.5 FCFA per vaccine. Thus, at best 50% of direct vaccine cost is being met at present.

(2) User Fees

For the time being, funds generated by the small service charge per dose are being held in a special DNE account. A decision is pending on whether and how they will be distributed to meet operating costs in the field. In the aggregate these funds exceed by far the typical budget allocation for recurrent expenses which averages no more than 20,000 FCFA per quarter for a veterinary sector. If the amounts collected from the service charges could be allocated to the implementation of field programs, this could go a long way toward relieving the financial bottleneck that now virtually cripples animal health services for cattle owners and herders.

(3) User Acceptance of Fees

Introduction of fees in 1983 may at first have counteracted GRM/DNE efforts to encourage herders to have their cattle vaccinated against the major epidemic diseases. However, people ask for vaccinations when they feel that their livestock are threatened by outbreaks of diseases. It is said that movements into Mali of cattle from Mauritania, which are often thought to be unvaccinated or improperly vaccinated, seem to trigger immediate increases in requests for vaccinations.

(4) Costs to Users

There is no reliable information on actual costs to users. Estimates of costs of vaccinations to herders vary, but there is general agreement that the official DNE/DRV prices are minimum prices. At best, they pertain to scheduled mass vaccinations in vaccination parks, when only minimal travel of agents is required and there is very little wastage of vaccines.

Vaccinations outside the pre-arranged schedules involve additional costs that agents charge to users. As already discussed, lack of fuel for travel of field staff is a severe constraint. When agents are requested to vaccinate animals at times and locations other than those scheduled at vaccination parks, the cattle owner must pay travel costs. Typically he is also expected -- and probably himself expects -- to provide for the agent's sustenance. There is probably also some sort of payment for special services provided beyond the agent's ordinary duties. There is no reason to believe that these payments are not kept within acceptable limits by social and cultural pressures.

Furthermore, vaccines are packaged by CVL in bottles that usually contain 50 or 250 doses each. When vaccinations involve fewer animals

than can be serviced with a single bottle, the herd owner generally pays for the full flask. This seems reasonable since the veterinary post is accountable and financially liable for all vaccines. Once opened, vaccine should not be used again later. This is important for both live viral vaccines as well as bacterins for which maintenance of sterility is difficult in the field.

Even at the official price of 10 - 15 FCFA per dose, not including the 2.5 FCFA per dose fee, vaccinating only 20 animals from a 50-dose bottle would cost the owner up to 37.5 FCFA per head, or more than twice the official price. If the bottle contained 250 doses the cost would be 187.50 FCFA/head.

There is no information to suggest that abuse of vaccination fees is widespread or that these fees are unreasonably burdensome on cattle owners. In fact, the evaluators were told on several occasions that some efforts have been made to organize mass vaccinations outside the scheduled campaigns in order to minimize vaccine wastage and reduce the costs of vaccination to owners of small herds.

(5) Fee Policy

At present, while many of the wealthier cattle owners may regularly pay far more for vaccinations than the official price, there is no evidence to suggest that the majority of owners are able to pay sufficient fees to make the system self-sufficient. Clearly, there might be considerable risk in rapidly increasing fees to a level of self-sufficiency, as such an effort could lead to actual declines in total revenue and in the numbers of cattle vaccinated. This problem certainly should be studied further before any action is taken, although at least a gradual raising of fees over time is probably necessary. The way could be paved with a graduated fee structure in the more commercialized livestock activities, such as milk production and feedlot operations, which are sufficiently concentrated and sufficiently profitable to permit the collection of fees.

c. Privatization

In July of this year, the GRM passed enabling legislation for the private practice of veterinary medicine.[*] The purpose of the law is to:

- Reduce the Government payroll;

- Create opportunities for qualified veterinarians who cannot be absorbed into the civil service;

- Increasingly delegate responsibility for the protection of animal health to owners of cattle; and

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[*]Law No. 86-64, July 1986.

- Give formal recognition to what, in effect, is already a common practice among wealthy, commercially oriented cattle owners, especially in the Bamako area, of making private arrangements for veterinary treatments and routine animal health maintenance.

Matching legislation is also pending for the privatization of trade in veterinary pharmaceuticals.

These two laws are the first steps in the direction of limiting the role of Government in the veterinary field to an essentially regulatory and public health function.

This impending privatization of the Malian veterinary service carries with it the evident expectation of CVL/DNE and Veterinary Pharmacy self-sufficiency. It should be emphasized, however, that the Livestock Sector Project has thus far limited its support for the DNE essentially to commodity supply. At present, the DNE field agents are able to perform few veterinary services for cattle other than immunizations, and there are virtually no services for smallstock. Extension outside Bamako District and Regions I and II is also problematic. At this point, any push to self-sufficiency would seem to be premature. And on the other side of the coin, most herders are unlikely to be able to afford the cost of a fully self-sustaining service at present, as the cost of unsubsidized vaccination is apparently as much as ten times the cost of government-mandated immunization.

Nevertheless, it is possible to specify a number of careful steps to move the veterinary service on the road to self-sufficiency. The first step is to attain the project goal of vaccinating 70 percent of animals for rinderpest. This is an eonomically and epidemiologically justified goal that, once reached, could be taken as a sign of DNE maturity. Services could be added and training programs generated, such as are recommended here and in the CVL section. As MDST time becomes freed with the end of the procurement phase and, perhaps, as ECIBEV moneys are released, technical assistance could be devoted to solving the service's management problems.

At the same time, privatization could be initiated in the Bamako District and wherever cattle raising is done for an urban, commercialized market. The price for vaccinations given during campaigns could be slowly increased to full cost over the medium to long term (i.e., a ten to twenty year period). Vaccinations given on demand outside the scheduled campaign times could be charged full cost. A requirement for fully paid vaccinations could be imposed on cattle entering or leaving Mali. The DNE could be contractually obligated to pay the CVL for vaccines on receipt, on the basis of a line of credit or revolving fund.

Finally, much research, far beyond the scope of a mid-term evaluation, needs to be done before a complete shift to privatization could be contemplated. For example, have any other services, such as health clinics or pharmaceuticals, been privatized in Mali, and what was

their experience? Is there comparable Senegalese or Burkinan experience? Exactly how much is being paid for services, and by whom? What is the beneficiary view of privatization? The DNE view? Can the RDOs or tons be involved, for example to contract for veterinary services as a group?

d. Economic Analysis

The cost/benefit ratio of animal health delivery service is difficult to measure precisely. However, gains in health of the national herd almost undoubtedly more than offset the cost of health improvements through their direct impact on offtake.

e. Management Analysis

The Livestock Sector Project places great emphasis on effective management. Overall management has been reviewed and evaluated above. Here, management is considered only as it relates to project activities in the DNE.

For simplicity in presentation, each of the three principal parties -- AID, GRM, and MDST -- is examined separately. All are involved in management of the delivery system, and they have joint responsibility within the framework of the JMC.

i. AID

The PP statement "...expand those activities that have brought about increased production" correctly identified the need for further development of the veterinary services delivery system. The PP and the derived Logical Framework, however, do not provide an adequate structure upon which the program could be built. It gives little detailed guidance and is not useful as an instrument for measuring achievements. It was never adjusted to the realities of a budget scaled to less than half of that derived from the PP.

A provision for long-term technical assistance to help DNE in planning and implementing a more cost-effective health delivery system was dropped. Instead, a footnote in the ProAg Annex on improving management capacity states that

> The management/information specialist should also carry out the functions of the health programmer in DNE. These two responsibilities were combined because the primary problems with which the health programer must deal are managerial in nature. Administrative/logistical support and planning for the activities of the animal health delivery system is a major constraint to improved service (p. 17).

Later on, even that position was dropped. The responsibility for monitoring the building of an infrastructure and equipment procurement was assigned to the Chief of Party. This seems to have been a poorly considered decision, and time has borne this out. An infrastructure

without provision for strong management generally fails, and the AID/DNE portion of the project became essentially an "equipment drop."

It appears that the removal of the long-term technical assistance in management was never adequately discussed within AID. Neither the Ministry, DNE, nor AID seem to have considered the implications of this change. The matter seems never to have been raised in the JMC. Whatever the actual situation may have been, the project direction changed substantially, and without notice. This suggests to us a clear failure in AID management. The long-term technical management assistance should be reconsidered in light of our observations.

Once the project became fully functional, AID had turned over the daily management to MDST. AID's current involvement is essentially limited to its statutory responsibilities and participation in the JMC.

ii. MDST

The principal MDST management problem with respect to DNE activities seems to be the lack of staff to assist in improving the DNE's operating efficiency. This has been discussed above in the Management section.

As discussed above, MDST also apparently failed to maintain the integrity of standard management procedures such as competitive procurement.

There is a clear need to improve the utilization of the manpower available for field service in the DRV. MDST should play a more active role in assisting the DNE administration with the organization of an effective program to train and deploy veterinary assistants, who are inactive between vaccination campaigns. Short-term technical assistance could play an important role in such a program, and funds for this are provided in the project budget.

MDST also should play a more active role in preparing the JMC agenda with respect to DNE reports, construction proposals, campaign results, etc. Quarterly reports from the DRV were sent to the MDST, but were not utilized. For example, MDST should have noticed and been more conscious of field complaints about unsuitable equipment supplied with project funds.

iii. GRM/DNE

Our concerns about management derive primarily from matters raised in the other analyses of this section. They are briefly reviewed here.

With respect to coordination of DNE activities, conversations with DNE staff in Bamako and in the field gave us the impression that coordination could be greatly improved among the DNE Divisions directly involved in the delivery of livestock health services. There also appears to be considerable uneasiness and, indeed, frustration among some DNE staff who feel that they have been neglected at their posts and overlooked

when the time comes for travel, training programs, or participating in decisions related directly to their field responsibilities.

As already noted in the review of CVL activities, there could be better coordination between DNE and CVL efforts. The Chief of Party might act as a catalyst in this effort.

With respect to the cold chain, vaccine appears to reach the field in good order, but the return of money from vaccine sales is inordinately slow. A mechanism to accelerate payments to the CVL would be salutary. This is a problem to be solved by DNE management in concert with the CVL administration. Perhaps the MDST could be of assistance in this matter.

iv. JMC

The JMC should become more actively involved in long-range planning and establishment of priorities for DNE. Project records suggest that, rather than following a clearly articulated project construction policy, the DNE construction budget rises and falls according to the dollar exchange rate. Also, funds were budgeted for training activities, but as yet there is no clear projection of training needs nor, for that matter, of needs for technical assistance.

The evaluators find that the ad hoc decisions JMC is called upon to make at present may not lead to the best use of limited resources. Nor will this system encourage the necessary staff work by DNE and MDST to plan in the long-range.

f. Beneficiaries Analysis

An analysis of the services provided by DNE to beneficiaries is complex; the evaluation team focused its study on the following important aspects:

- Willingness of cattle owners to pay for vaccination;
- Effectiveness of vaccination;
- Costs of vaccination; and
- The use of the veterinary parks provided by the Livestock Sector Project.

Informants agreed that cattle vaccination was important and that they were prepared to pay for it if they had the cash. Given that cattle owners have been accustomed to obtaining free vaccinations for their livestock, this is a major step forward in the GRM's push to recover its costs and to privatize veterinary medicine. The general attitude seemed to be one of philosophic resignation to the implementation of vaccination fees. All informants also agreed that Malian-produced vaccine was effective. No cattle owners pointed to cases of disease after vaccination except in reference to animals coming into Mali from Mauritania. Given

the enormous problems in distributing an effective vaccine to outlying bush areas, this is a significant achievement for both the DNE and the CVL. There is no question but that the distribution and effectiveness of Malian vaccines has continued to improve during the Livestock Sector Project.

However, this achievement of a quality controlled and successful vaccination program must be balanced against the very real economic costs to cattle owners. It may well be that the cattle owners get more than value for what they pay, but some owners still complain that the costs of vaccination are too high. Specific details on actual costs, however, were difficult to obtain (see the Beneficiaries Analysis Methodology in Appendix A). For example, the herder interviewed in the presence of the Regional Director of the Kayes Regional Veterinary Laboratory flatly refused to discuss how much he paid for either vaccinations or treatments per head of cattle. Furthermore, many cattle owners and herders do not differentiate vaccinations from other treatments -- the common word for both being "injection" -- thus creating an added problem in an already difficult interview situation.

One informant, a practicing veterinary engineer in Bamako, established a vaccination -- not treatment -- cost of between 200 and 500 FCFA per head of cattle (sheep and goats are generally not vaccinated at the present time). Another interview with a moderately wealthy farmer and his professional herder suggested the existence of a sliding scale for vaccinations. In the case of vaccinations mandated by the GRM, a large number of cattle are immunized at once and costs were estimated at about 50 FCFA per head. However, if an individual farmer calls upon his local veterinarian to vaccinate a small number of cattle - i.e., ten head or less - the cost is said to be as much as 300 to 350 FCFA per animal. A third interview with a Banamba zone farmer provided a 250 FCFA per head cost for cattle vaccinations, a figure within the range of 200 to 350 FCFA suggested by the two previous interviews. This farmer also noted that GRM-mandated vaccinations cost much less than vaccinations on demand. A fourth interview with the Chief Veterinarian of a bush post indicated a cost of 20 FCFA for government-mandated vaccinations. On-demand vaccinations of small groups of animals were not discussed. The respondent in a fifth interview declined to discuss vaccination costs, while a sixth informant noted that the vaccination cost per head of cattle had risen from 200 FCFA in June of 1985 to 250 FCFA in July and August of the same year. He had not yet vaccinated his animals this year, due to a change in the veterinary agent's travel circuit.

Farmers and veterinarians thus concur in reporting vaccine cost figures considerably above official prices. These actual costs would seem to reflect the original cost of the vaccine plus its delivery and other service costs - e.g., fuel, drug wastage, personnel time, and other treatments. Whether the charges to farmers reported here are reasonable reflection of these expenses cannot be determined in this report. This issue should remain under study in view of the approaching privatization of the Malian veterinary services.

To summarize, government-mandated vaccinations in response to an epidemic situation vary in cost between 20 and 50 FCFA per head and that on-demand vaccinations for small numbers of cattle range between 200 and 500 FCFA per head. The lack of a literate and well-informed user population may certainly account for some confusion relating to vaccine costs. However, the informant who provided the 200 to 500 FCFA vaccine cost figures was a veterinary engineer, and he would not have confused treatment fees with vaccination costs. Such information suggests that the problem of vaccine costs should be closely scrutinized in the future.

The comments received during this evaluation on the location of the Livestock Sectoral Project veterinary parks illuminate another emerging problem in veterinary service/cattle owner relations. At Kayes the wealthy cattle owner summoned to our interview complained that he has been obliged to ferry his animals across to the north bank of the Senegal River so that they could be vaccinated in the park. The park had been built on land allocated by the Governor, not by the DNE authorities, and turned out to be on the opposite side of the river from most of the cattle. A number of animals have died in the course of these ferry trips, and the inaccessibility of the park has not contributed to its use. In such a situation, it is easy to see how local cattle owners could blame DNE agents for the unfortunate location of the veterinary park without understanding that the choice of location might be beyond the agent's control. Furthermore, this example highlights a certain level of ongoing tension between the veterinary agent and the cattle owner. Privatization seems to be increasing this distrust, particularly with respect to professional herders.

In the past, vaccination was free and the veterinary agent could be perceived as aiding the herder in the care of animals entrusted to him by the absentee owner. Now, the veterinarian is often viewed as a competitor for the cattle owner's cash. This is especially true in cases (which are very frequent) in which the professional herder is responsible for ensuring that animals are vaccinated and paying for the vaccinations without any guarantee of repayment by the cattle owner. The herder often believes that the veterinarian downgrades the herder's traditional wisdom and his contribution to animal health. He may also be convinced that the veterinarian, however well intentioned, is convincing the cattle owner of the inefficacy of traditional remedies and, in a certain sense, is alienating his affections. The herder may fear that the cattle owner may contract with the veterinary agent for animal health care and that his sum will be deducted from the herder's fees. Whether it is true or not, such a belief does not motivate the professional herder to consult the local veterinary agent.

One inquiry with a veterinary agent produced the following example of a contract for animal health services between a wealthy cattle owner and his veterinarian. The veterinarian described an animal health care package for which he had been contracted in 1986. The wealthy Bamakois who was his client owned twenty-four head of cattle which he herded 25 km from Bamako. For 10,000 FCFA, the veterinarian agreed to visit these cattle at least once every two weeks, vaccinate them with a full range of

vaccines, and administer parasite treatments. He expected to vaccinate and treat the cattle twice in the six months contract period. Emergency visits were not covered under this oral contract, although it was agreed that any services not provided for in the contract would cost an additional 5,000 FCFA. During the six-month contract period, the cattle owner spent 38,000 FCFA for vaccines and drugs. When the 15,000 FCFA maximum cost of veterinary services is added, total costs of veterinary care for the herd were 53,000 FCFA. This is a large sum of money, and it is not surprising that a professional herder might view such expenditures as cutting into his own fees. This is especially true if he senses that his traditional medicinal knowledge is being downgraded by the institution of a modern health care system for cattle. One can only conclude that herder/veterinarian relations should be carefully monitored as privatization of the GRM veterinary system progresses.

4. Summary

To summarize, this evaluation has highlighted the success of both DNE and CVL in regard to quality control of vaccine and widespread immunization. The Livestock Sector Project has aided the DNE effort through provision of commodities required to make the cold chain operational. There are, however, many other DNE problems that need to be addressed by management and training assistance. For example,

- The quality of supplies delivered has been uneven and complaints from the field have gone unheeded;

- Needs for supplies are only being met in the Bamako District and not further afield;

- The return of moneys for vaccine purchases from DNE to CVL is slow;

- The DNE field agents lack the medications and skills necessary for activities other than immunizations, and they are consequently underemployed outside the peak vaccination campaign seasons; and

- The DNE agents are getting very few diagnostic samples from the field into the CVL.

A substantially increased level of project support, in terms of training programs and technical assistance in management, is required to solve these problems. Such support might also help address the less tangible and more difficult DNE problems such as the failure to coordinate and cooperate with CVL. This support is also required to prepare the way for privatization of veterinary services and the eventual attainment of DNE self-sufficiency.

5. Recommendations for the Current Project

In general, the activities of the veterinary services delivery system have benefited from the added commodities supplied under the project, but further development and strengthening is vital. The following recommendations, therefore, are directed primarily toward using the funds available during the remaining period of the project to accomplish this purpose.

1. DNE management needs to be improved. The MDST, newly freed from its responsibilities for procurement, should aggressively tackle the DNE's administrative problems. Implementation of the MIS, which will allow the DNE to know accurately what is happening in the field and to pass useful information on to the CVL, will vastly assist this effort and should be instituted without further delay. Should MDST be unable to devote the time necessary to DNE, JMC should consider hiring a long-term technical assistant in management to carry out this effort.

2. The concepts and priorities of the veterinary services delivery system need to be reviewed and defined more precisely in terms of main objectives and resource limitations. The objectives are the vaccination of at least 70% of the cattle in Regions I and II and in the District of Bamako against rinderpest, the provision of adequate protection against other major diseases, and the assumption of all direct costs of vaccination by livestock owners.

This review should be undertaken by the JMC, and studies should be initiated to assess the possibility of the system becoming self-sustaining -- the evaluators believe that this can only occur with careful planning and stepwise development over the long run. Relevant experience and information to accomplish this aim already exists in OMBEVI. This experience should be mobilized using project funds and should be supplemented, if need be, with technical management assistance.

3. As a corollary to recommendation # 2, JMC should consider full cost vaccinations for Bamako District commercialized cattle-raising, a steady price increase over a ten to twenty year period to full cost for vaccines given during government campaigns, full cost vaccinations for on-demand services, and full cost vaccinations for cattle crossing Mali's borders.

4. As a second corollary to recommendation # 2, an independent socioeconomic analysis should be commissioned to examine the veterinary extension service, and its possibility of becoming self-sustaining, from the perspective of beneficiaries and the various rural organizations that might be involved. Specific questions include: Have any other services, such as health clinics or pharmaceuticals, been privatized in Mali, and what was their experience? Is there comparable Senegalese or Burkinan experience? Exactly how much is being paid for services, and by whom? What is the beneficiary view of privatization? The DNE view? Can the RDOs

or tons be involved, for example to contract for veterinary services as a group?

5. Procedures should be established for defining standard specifications for equipment and supplies needed by field personnel, who should be regularly consulted on this issue.

6. There should be continued training of field staff to broaden the range of information and DRV services to cattle owners. Such services might be in the areas of animal nutrition, herd management, and cooperation. Long- and short-term technical assistance in management would seem appropriate to translate the pragmatic needs of the DNE staff into specific training programs. Also, DNE and CVL staff share responsibility in the area of diagnostics and both should coordinate with the field vets in determining the best way to meet training needs in order to bolster diagnostic capabilities in the field. Thus, although the new Diagnostic Unit is technically a part of CVL, it should act, in terms of disease diagnosis and training, as a crucial link between the two agencies.

The field veterinarians appear to be mostly occupied with vaccinations. Their efforts to provide other treatments are thwarted by the lack of medicines and appropriate skills. It would be beneficial to emphasize other aspects of veterinary services such as the value of accurate diagnosis, which goes along with the above comments. Practical training could be carried out through CVL, and this would be a good use of the diagnostic lab facilities that have recently been built. This not only would increase the quality of veterinary services provided to livestock owners/herders, but it would also bolster the morale of field station veterinarians and staff by providing a basis for increased confidence in their ability to diagnose, and thus to treat, disease.

7. Project funds should be used to purchase at least two small 4-wheel drive vehicles for durability and serviceability tests under Region I and II field conditions. Costs, performance, and operating and maintenance expenses should be compared with those of the larger vehicles now in use, and for which fuel is expensive and often in short supply, especially in the North. Fuel must also be made more readily available to the field vets for use in the mobylettes and other vehicles in the existing fleet.

8. The RAC network should be extended to serve veterinary posts, especially those that are least accessible by road.

9. Portable spray-rigs for applying acaricide chemicals are recommended because of their mobility and efficiency in acaricide application. Consideration should be given to supplying vaccines in small, 20-dose bottles.

10. Money should be budgeted to make small, functional improvements in the Veterinary Posts, and above all to supply them with water sources.

11. Given the importance of sheep and goats in the Malian livestock economy, greater consideration should be given to health services for small ruminants in the remaining project period.

6. Recommendations for Future Project Support

The original Project Paper for the Mali Livestock Sector Project II envisaged a long-term collaborative effort (20 years) by the GRM and the donor community. The Program Objective and Strategy section of the PP suggested that the first 5-year follow-up phase to the current project should seek to move toward more production and productivity-oriented livestock activities.

Our recommendations are consistent with that strategy and those objectives:

1. The capacity of the system to become self-financing needs to be developed as a long-term possibility. This is essential for the privatization of animal health services which is a policy objective of the GRM. The efforts to improve the financial viability of the system should look in two directions. One is to lower the cost of services by increasing their efficiency, for example by training of field vets in diagnostics that could be done locally at the field stations. The other is to increase user charges. In this respect, the carrot will work better than the stick, and it will be preferable to tie such increases in charges to prior increases in herder/cattle owner incomes derived from increases in productivity demonstrably rooted in improved livestock services.

This process will be facilitated by the development of an effective year-round livestock extension service that will help herders and cattle owners to identify and implement practices to increase the productivity of their activities. To this end, substantial investments in training programs should be directed at all levels of the veterinary field staff. In this connection, it would be desirable to reactivate the Sotuba Training Center.

2. Within the framework of an increasingly private system of animal health services, priority attention must be given to the establishment of an efficient system for the distribution of curative medicines. As part of the design process for a follow-up project, some thought should be given to promoting the availability of veterinary medicines for veterinarians in the field, to ensure the overall goal of improved livestock health.

3. Technical assistance in management should be provided to the DNE over the life of any future project.

Table E.1a
Veterinary Supplies Assigned to DNE
by Category, Item, and Region
and as Percent of Total

EQUIPMENT & SUPPLIES	VETERINARY REGION						Tot. Purchased
	REGION I *		REGION II		BAMAKO		
	N	%	N	%	N	%	
Syringes (20cc)	60	12	100	20	181	36	500
Syringes (10cc)	60	12	100	20	181	36	500
Needles (s/c)	120	8	200	13	362	24	1,500
Needles I.M. (boxes of 10)	60	12	100	20	181	36	500
Castration pliers (boxes)	11	18	35	58	13	22	60
Clover pliers	11	11	35	35	13	13	100
Stethoscopes	8	20	19	48	11	28	40
Thermometers	7	4	11	6	9	5	200
Complete vet. surgical kits	7	23	11	37	9	30	30

* Until early 1986, the project served only 3 of 7 veterinary sectors in Region 1.

Source: For Distribution: OMBEVI, document No. 126, March 1986, pp. 29 ff and DNE inventory record of September 10, 1986

Table E.1b
Cold Chain Equipment Received and Delivered to DRV, Sectors, and Posts in Regions I and II

	KEROSENE		ELECTRIC	
	RECEIVED	DELIVERED	RECEIVED	DELIVERED
Freezers	76	43	12	2
Refrigerators	10	1	10	4

	RECEIVED	DELIVERED
Ice chests 52L	40	27
Isotherm 28L	102	93

Table E.1c
Vehicles by Type and Region of Assignment

	REGION I	REGION II	DIST. of BAMAKO	TOTAL
Land Rovers	4	8	2	17
Mobylettes	31	34	18	100

Source: For Distribution: OMBEVI, document No. 126, March 1986, pp.29 ff and DNF inventory record of September 10, 1986.
For total purchased: PIO/C 688-218-4-20071 of 2/6/84, except for 26 refrigerators and 40 mobylettes ordered subsequently.

Table E. 2
Estimate of Cattle Population
and Number of Cattle Immunized
in Region I and II
1981-1986

REGION I

	1981	1982	1983	1984	1985	1986**
Cattle Population	745,000	801,000	732,000	920,000	525,000	N.A.
Rinderpest	226,429	151,327	84,571	404,934	287,970	90,041
Pleuropneumonia	232,783	178,893	95,671	54,695	111,190	25,259
Blackleg	146,016	75,501	65,280	53,863	40,212	10,109
Bovine Pasteurellosis	91,927	84,658	66,830	31,517	31,102	8,260
Sheep and Goat Pasteurellosis	N.A.	N.A.	N.A.	N.A.	7,773	N.A.

REGION II

	1981	1982	1983	1984	1985	1986**
Cattle Population	787,000	838,000	739,000	1,218,000	658,000	-
Rinderpest	315,624	309,304	263,914	522,662	331,284	156,425
Pleuropneumonia	341,304	313,911	221,155	280,143	242,461	33,190
Blackleg	125,829	124,547	116,037	71,393	83,126	36,219
Bovine Pasteurellosis	203,473	310,067	104,995	113,364	91,007	17,128
Sheep and Goat Pasteurellosis	N.A.	N.A.	N.A.	N.A.	24,338	17,128

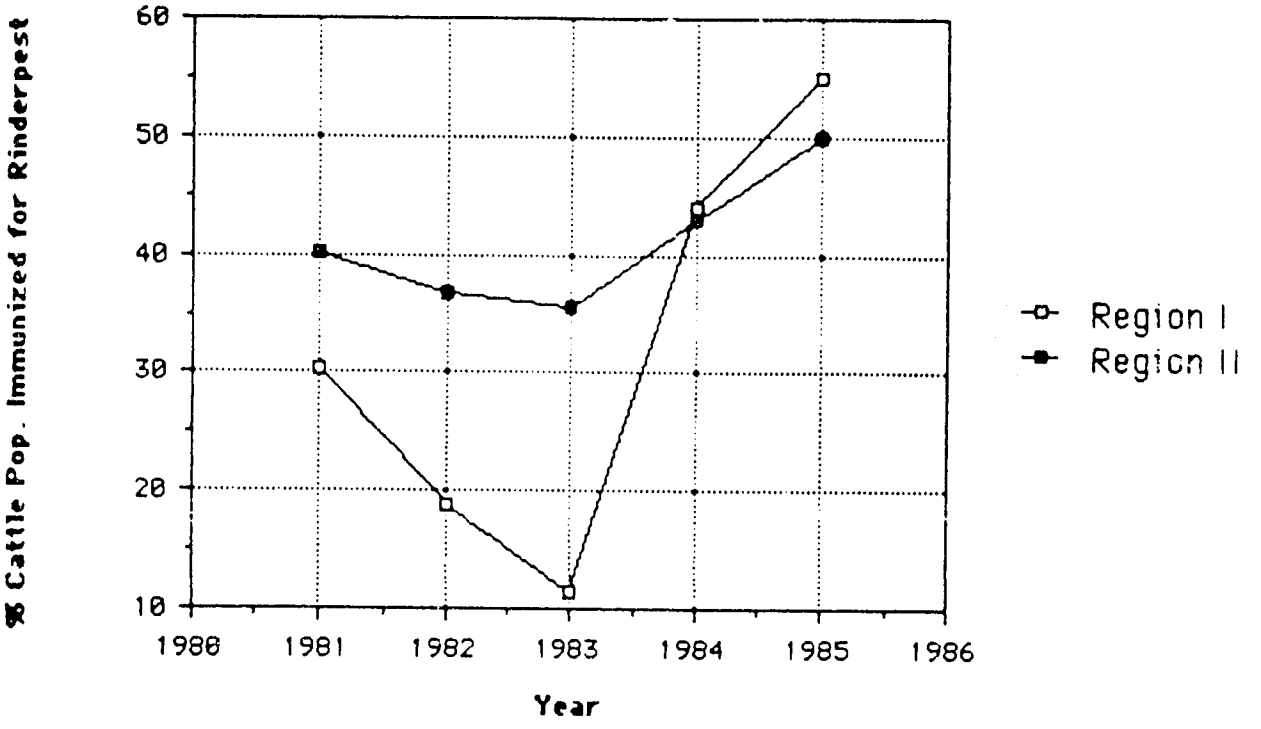
Source: Data compiled by the DNE, Animal Production Division from annual reports for 1981-1985; for Region II, and 1981-1984 for Region I. Region I data for 1985 and 1986 data (January through July) for both regions taken from monthly reports.

* Including Veterinary District of Bamako
** January through July

Fig. E.1.

Percentage of Cattle in Regions I and II
Vaccinated Against Rinderpest.

The Livestock Sector Project
Covers the Years 1984-1985



Source: Data from Table E.2

Fig. E.2 Rinderpest Vaccinations Regions I & II

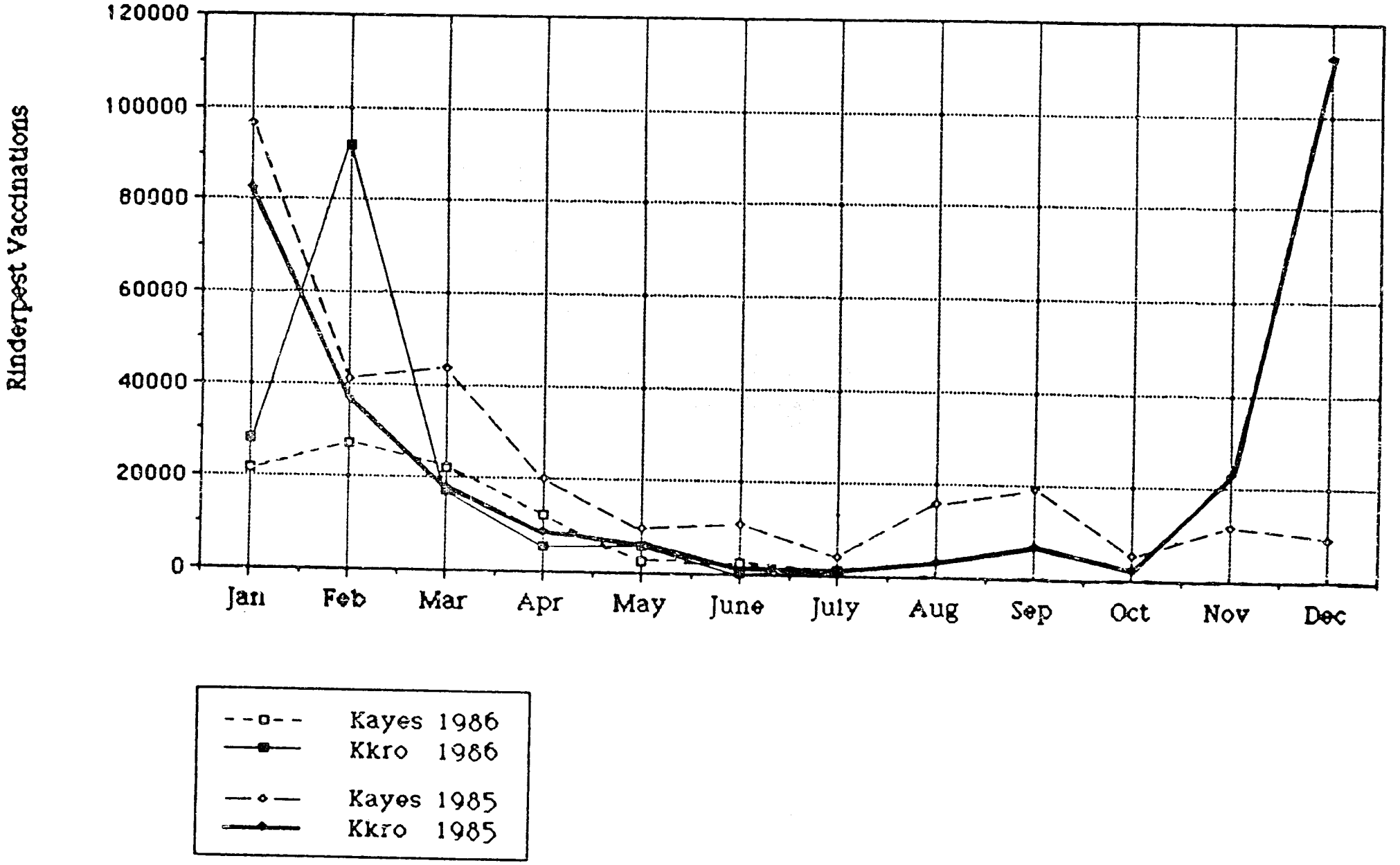


Table E.3
Selected Offers Received in Response to Request for Bids
for Veterinary Equipment and Supplies *
(C.I.F./in 000 FM)

		SUPPLIERS					
Description	Quantity	PVM**	SAPROSA	DEBAMAS	AMERICAN HOUSE	STE BOLIBANA	UNIMEX
Syringe 20cc	500	10,368.0	10,250	8,300	8,000	2,932	1,360
Syringe 10cc	500	9,801.0	9,650	8,300	8,000	2,657	1,292
Injection needles, s.c.	1,500	4,860.0	4,290	5,390	5,200	3,585	2,452
Injection needles, I.M.	500	1,620.0	1,430	1,750	1,700	1,350	817
Castration pliers 48cm	60	4,587.0	4,398	3,412	3,268	4,960	2,302
Castration pliers 25cm	60	3,645.0	3,600	2,758	2,650	4,140	1,818
Bredin punches	100	4,438.8	4,000	1,590	1,530	7,080	2,626
Vet. Stethoscopes	40	1,179.3	1,160	508	492	748	326
Vet. Thermometers	200	388.8	360	780	740	768	762
Surgical kits	30	2,532.9	2,520	3,910	3,766	3,135	1,648
TOTAL	2,990	33,052.8	31,408	28,398	27,346	28,423	14,043

Source: MDST files
* All bids meet published specifications.
All, except UMIMEX, offer 'GENIA' brand
** Bid awarded

FM : Francs Meliens
2FM = 1FCFA

Table E.4
Number of Veterinary Posts and
Vaccination Parks Constructed (C) and
Renovated (R) Under the Project
by Region and Year

	Veterinary Posts and Vaccination Parks	Before 1984	1984	1984	1985	1985	1986	1986	TOTAL	TOTAL	Scheduled for 1987*	1987*	Plans for 1988 and beyond	
			C	R	C	R	C	R	C	R	C	R	C	R
DRV I	Posts	7				5	2		2	5	3*	2	10	
Kayes	Parks	12					7		7					
DVR II	Posts	18					7	20	7	20	4*	1	1	
Koulikoro	Parks	19					7	2	7	2				
District of	Posts													
Bamako	Parks													
DRV III	Posts	21											20	5
Sikasso	Parks	30											2	6
DRV IV	Posts	13											9	10
Segou	Parks	52											22	22
Total	Posts	59				5	9	20	9	25	7*	3	40	15
	Parks	113					14	2	14	2			24	28

Source: DNE, Projects and Programs Division, August, 1986
* Funded on the basis of PIL # 12 now pending
** Unfunded as of now.

IV. PROJECT VALIDITY, CROSS-CUTTING ISSUES, UNPLANNED EFFECTS, LESSONS LEARNED AND RECOMMENDATIONS OF THE EVALUATION TEAM

A. DESIGN, STRATEGY AND ASSUMPTIONS OF THE PROJECT

The Mali Livestock Sector Project goal and purposes, which are restated in section I of this report, remain valid and viable today. With continued project support, and revisions in component activities as outlined in this evaluation, there is every reason to expect measurable progress to be made toward achieving these ends during the life of the project.

Perhaps the most important aspect of the project design is its long-run strategy. This strategy, as defined in the Project Paper of August 1982, calls for a twenty-year commitment to assist Mali's livestock sector in bringing about "...gradual shifts in investment modes and emphases aimed at minimizing the management and budgetary support demands on the GRM while maximizing production efficiency" (pg. 27). This was to be achieved through 4 five-year phases of a sector program designed to move gradually from a focus on improved planning, implementation, and evaluation of USAID-funded sector activities toward greater emphasis on integrated livestock/crops investment; from grant to loan financing; and an eventual shift from public to private sector emphasis.

These goals are largely attainable. Nevertheless, they are broad, and the project would benefit from a degree of retrenchment and streamlining. Thus, the present mid-term evaluation recommends termination of activities related to the ECIBEV credit program, for reasons related to its ineffective management and resultant decapitalization of funds. The elimination of this activity should enable USAID/Bamako to focus its funds and redirect its efforts to the crucial management development, forage and livestock production research, and veterinary laboratory and extension service components. The evaluation team expects this narrowing of activities to have a salutary impact on the progress of work.

As regards assumptions, GRM remains committed to the ultimate goal of increasing livestock production and rural producer welfare. In Mali, the demand for draft animals continues to grow, and the risk to rural producers decreases as animal health delivery services improve with continued material and technical assistance under the project. Within a twenty-year time frame, however, it is not possible to make assumptions with respect to climatic conditions. Droughts certainly will reoccur, as they have in 1984/85, although their impact may be mitigated as planning and management improve. It is also not possible to make long-range assumptions about market conditions, especially abroad, that are beyond Mali's control and, indeed, are in some cases subject to the market policies of developed countries - e.g., agricultural marketing strategies of the European Economic Community.

The component evaluations indicate where the team has found expectations -- stated or unstated, major or minor -- that need to be re-examined either because of flawed initial logic or because of changing project environment. The major points include the following:

- The ECIBEV on-farm cattle feeding program -- and with it the general project goal of promoting mixed farming -- depends on the assumption of rural underemployment. This preconception, however, is not fully borne out in regions of wage-labor migration, where labor-intensive development interventions place a severe, even onerous burden of unpaid work on the women, children, and elderly men who remain behind. While mixed-farming may remain a desirable goal, it must be pursued in future on the basis of the revised assumption of an actual labor shortage.

- The Malian environment has been changing in ways not fully anticipated. Thus, with desertification and famine in the sahel and sudan, pastoralists are now increasingly migrating south to the semi-humid zone where browse is more available and trypanosomiasis and onchocerciasis vectors are being eradicated. This change undercuts the original project logic that linked the forage research to the ECIBEV project area in the Bananba/Segou region, which has now become essentially semi-arid. In order to prepare for the predictable consequences of this changing pattern of land use, a sub-humid zone forage and animal production technology is now an ecological and economic necessity for Mali.

- There is no valid reason to assume that the newly created CVL Diagnostic and Research Unit will ever be financially self-sustaining -- it should be noted that livestock diagnostics in the U.S. is a tax-supported function. Nor is it evident that the veterinary extension service can be privatized on the basis of its present capacities. AID/Bamako should assume that an additional ten- to twenty-year commitment will still be necessary to develop the veterinary service into a viable, self-sustaining investment.

- Finally, the changing U.S. political environment, as reflected in the passage of the Gramm-Rudman Act, creates the reasonable expectation that future allocations of funds for foreign assistance, including livestock development projects, will be severely scrutinized and perhaps cut. Pressures to accelerate privatization will increase as a consequence. Nevertheless, the evaluators continue to support the long-term strategy of the Project Paper as offering the only realistic hope of maintaining and continuing the progress that has been achieved to date.

The overall view of the evaluation team is that there is every reason to honor the AID commitment to assist Mali in addressing the problems of transition of a traditional pastoral system toward one of increasingly

settled livestock operations and mixed farming. Recommended changes in the project should be implemented, but generally the team finds that AID should continue the support envisaged in the Mali Livestock Sector Project, because most components of the project are moving, as planned, and in essentially the right direction.

B. IMPLEMENTATION ARRANGEMENTS (MDST, JMC, and DPMC)

A series of highly negative evaluations and audits of USAID/Mali projects in the period 1978-82 resulted in the creation of MDST. The MDST structure now provides a "front line" of controllers and contract business managers to catch and deter any improper utilization of project funds. It has proven to be an excellent device for maintaining a high standard of financial accountability, and it has enabled the Mali Livestock Sector Project activities to be implemented at an impressive rate by providing a specialized team for procurement, construction, and financial management.

However, the AID accounting requirements are burdensome, and it costs approximately one-fourth to one-third of the entire project budget simply to run the implementation arrangements. The high value of what has been achieved is not in doubt, but neither is its high cost in terms of both money and time. In the management section of this evaluation report it is suggested that, in a follow-on project, the management functions of the MDST should be expanded to a multi-project or mission-wide basis in order to achieve economies of scale and to spread overall administrative costs among several projects. Costs of administering each project separately are high, and this recommendation should be explored before the replication of MDST to other contexts is contemplated.

The specifically AID-required budgetary management procedures now performed by the MDST should not be transferred to or institutionalized in the GRM. Indeed, the MDST has been preoccupied thus far almost entirely with the details of project implementation, to the virtual exclusion of the transfer of management skills and improved accounting procedures to Malian agencies. It would be ironic to begin by transferring these project-specific tasks rather than by improving the performance of established ministry activities. Key steps to take in order to improve the management development function, as already recommended in the management section of this evaluation, are to

- Clarify the role of the JMC as the ultimate decision-making authority of the project by giving the minutes of the JMC meetings the legal status of a PIL;

- Clarify the status of the MDST as an independent advisory body and executive secretariat for the JMC, in addition to its role as financial and administrative manager and liaison between GRM and USAID; and

- Strengthen MDST on-the-job, long- and short-term training activities by broadening training to include all agency

activities for a particular management system and to proceed with development of the MIS in MRNE.

Finally, the evaluators find that the contribution of the DPMC through its periodic, technical assistance visits and action-training seminars does not warrant continuation. With it, the involvement of USDA under its PASA might reasonably be terminated.

C. CROSS-CUTTING ISSUES AFFECTING PROJECT SUCCESS

1. Sustainability

With wise project support, the goals of the Mali Livestock Sector Project can be achieved and, ultimately, sustained after financial support is withdrawn. It bears reiteration, however, that this can only be envisaged as part of a long-run strategy in which AID commits itself to supporting and improving the various structures it has created and developed. The ECIBEV credit function is the sole unsustainable part of the project, and it has been a drain on AID funds since its inception. The other project activities, however, have the potential for developing into integral, self-supporting components of Mali's livestock sector. The forage and livestock production component is well on the way toward producing a steady stream of improvements that are assimilable at the farmer level. The management component has also proven itself in the implementation of the current project. The MDST now needs to turn its efforts to training and to enhancing the Malian institutional capacity to manage projects, while the JMC needs to take on a more formal directorial role. The CVL and the veterinary extension service are the remaining problematic components. In order to bring the project investment in these activities to fruition, it is strongly recommended that AID continues to support the excellent CVL facility it has built up over the last two decades. The soon-to-be-completed diagnostic laboratory significantly strengthens Mali's veterinary capacity, but it exceeds present needs and cannot be expected to become self-supporting anytime in the foreseeable future. However, it is likely that other aspects of the CVL's vaccine production capacity and the DNE's animal health care delivery system can ultimately be put on a financially sound basis. For the CVL, maintenance of a high degree of quality control over vaccines is essential for purposes of eventual international sales. For the DNE, sustainability of its efforts and, through it, growth of the CVL's internal Malian market will require a substantial new injection of project support. It is recommended that financial and management assistance should now be given to the DNE in order to improve its delivery of veterinary services to the field and coordination with CVL. A clearly defined system of training should be established by which field veterinarians are regularly recalled to Bamako for training and upgrading of skills. The training program should be devised and conducted as a cooperative exercise between USAID, CVL, and DNE on the basis of the specific recommendations advanced in this evaluation report.

Other issues that relate to the general topic of management improvement and project sustainability are as follows:

a. Financial Viability

Increasingly efficient use of resources will necessarily reduce the cost of services and will, to that extent, improve the prospects of their being financed through user charges or through allocations from the regular budget without donor assistance. Discussion of user charges must consider that the Malian livestock sector is a significant net contributor to the national budget, so that the question of user fees becomes essentially whether the charges to users will be indirect and derived from their current tax burden or direct and supplemental to current contributions of cattle owners.

b. Coordination

In the evaluation of each of the project components, attention has been drawn to the need for and the possibilities of coordination and collaboration between the executive agencies responsible for the activity and other agencies working along related, parallel, or at times even identical tracks. Both human and financial resources in most developing countries are so scare as to make the cost of duplication of effort prohibitive in terms of lost opportunities.

Thus, there is great potential for collaboration between the research organizations of MRNE and the Ministry of Agriculture, in ways that take advantage of scarce specialized skills that may be vested in one or the other of these centers. Similarly, there would seem to be scope for the sharing of facilities. For example, multi-purpose field staff could be trained at Sotuba to serve the needs of mixed farming. They would then be backed, to the extent required, by subject-matter specialists drawn from among the professional staff of the relevant Ministries.

The need for coordination is not restricted to GRM agencies. Duplication of activities also occurs among various donors, as indicated in the evaluation of the research component. It also appears that the ready availability of funds under grants may reduce the pressure to use them efficiently. However, it would serve both the GRM and the donors best if the grants were employed as catalysts to foster coordination among GRM agencies and donors.

Finally, it should be pointed out that coordination also has costs in terms of perhaps the scarcest of all resources available for development -- that of competent technical and executive staff time. Any plans for enhanced coordination must take this into account. Thus, where the evaluators find the need for coordination to be overwhelming, such as in forage research projects in Mali and in the relationship between DNE and CVL, specific funding or technical assistance has been recommended to make this feasible.

c. Technical Assistance

Effective long-term Technical Assistance is dependent both on the availability of local professionals qualified for training, and on the availability of qualified persons to undertake long-term TA assignments. This latter may well be a limiting factor, because quite often the best qualified persons are neither willing nor able, for a wide variety of reasons, to accept extended tours of duty in developing countries. Serious consideration must, therefore, be given to the alternative of structuring TA on the basis of short-term assignments of highly qualified persons under contracts that provide for their "on-call" or periodic services over a number of years.

In any event, the use of short-term TA, wherever possible, would in our view generally be most practical, useful, and cost-effective. It has been noted throughout the activity evaluations that the project, by and large, does not appear to have made as extensive use of funds provided for short-term TA as would have been desirable.

d. Research

The evaluation has discussed, in general terms, the need for research coordination both by the Malian organizations and donors individually and as a group. Appropriate mechanisms are said to exist, but there is no evidence that they function effectively in fostering agreement on priorities in the allocation of scarce resources, or that they provide for adequate on-going monitoring to develop information for interested researchers.

The coordinating function in the MRNE is the responsibility of OMBEVI. Within the framework of the pending MIS, it would be useful to provide funds to test what would be required to establish a practical system for research coordination planning, implementation, and eventual application.

In connection with the proposals also for MIS, there is an urgent need for the development of a consensus among potential users of the system on that minimum of data required to make sensible decisions or to reach actionable conclusions.

2. Training

The following summarizes the training of Malian students by the Livestock Sector Project:

a. Long-term

Under the project, seventeen Malians have been offered long-term training in the United States. Of these, fourteen were projected to study for an M.S. degree, one for a B.S .degree, and two for the Ph.D. As of June 1986, one student has finished his M.S. and is now employed by

PRODESO. Two M.S. students failed to meet the TOEFL minimum requirement of a 500 score and their scholarships were cancelled. Four M.S. students are currently in the middle of their program in the U.S. and five other M.S. students have been extended for a third year of study. Two M.S. students have not yet left for the United States. The B.S. student should complete his training in the fall of 1986. One Ph.D. student has been extended from a deadline of 1 January 1986 to 31 December 1986. The other Ph.D. student has completed his field study in Mali and is preparing to leave for the U.S. to write the thesis.

Four M.S. candidates and two B.S. candidates were funded by a combination of moneys from Mali Livestock II and the current Mali Livestock Sector Project. Three of the M.S. students and the two B.S. students have completed their degrees and are now working in Mali. The fourth M.S. student did not accept the thesis topic proposed by his university and returned to Mali without obtaining his degree.

b. Short-term

The Livestock Sector Project has provided short-term training for thirty-four Malians. Such short-term training is designed to respond to the immediate needs of the different components of the project and does not involve competitive selection. Training has ranged from the quality control of bacterial and viral vaccines to the Francophone African Development Management Seminar at the University of Pittsburgh. Of the short-term trainees, fifteen have returned to Mali, six are still completing their training in the U.S. and ten have not yet left for the United States. Training for three candidates was cancelled, one due to illness, one due to scheduling conflicts, and one because he was suspended from MDST.

c. Third-country and English Training

The Livestock Sector Project has also provided some third-country training. Two candidates for the DEA (Diplome des Etudes Approfondies -- the equivalent of our M.S.) have been approved for study in France, but they have not yet left Mali. So far, eight Malians have returned from third-country short-term training, while a ninth has not yet left for training. In addition to third-country training, in-country English language training has been offered to eighteen Malians under the Livestock Sector Project.

d. Coordination and Planning of Training

Table IV.1 (below) shows the percentage of funds earmarked for training spent by activity as of June 30, 1986. The data suggest that a consistent effort has been made to use the funds earmarked for training and to achieve the training goals of the project. Given the emphasis the present evaluation places on the need for training, however, there is now a clear requirement for Malian and U.S. project planners to evolve a more fully comprehensive training strategy. Up to now, each project activity has sought to meet its own training needs without necessarily relating

them to those of the other components. While there is on occasion some cooperative planning, and people are being trained in areas designated as appropriate by both GRM and USAID officials, the Livestock Sector Project does not benefit from a unified program to fill gaps in available expertise throughout the sector. The evaluation team strongly supports the current MDST effort to integrate the planning of training into a more coherent whole.

Table IV.1

Training by Activity and Percentage of Money Spent
to June 30, 1986

Component	% Money Spent
MDST	68.35
DNE	66.08
ECIBEV	53.60
CVL	83.28
INRZFH	89.11

Overall % of money spent	71.26

Source: MDST files

In the selection of students for long-term training under the project, the competitive process specified in PIL #2 does not seem to have been consistently followed. At times, only one candidate was proposed for each training slot. Occasionally, candidates were accepted for training who failed to fulfil prerequisites - i.e., a candidate for an M.S. had failed to complete the baccalaureate. And few candidates, if any, were submitted from field positions, apparently because the personnel system is not sufficiently flexible to permit their long-term release. Plausible reasons may exist for certain of these deviations from project procedure, such as the need for upgrading the training of an individual occupying a specific position. It bears emphasis, however, that the potential mistake of allowing apparently unqualified Malian candidates to represent the USAID training program would seem to be detrimental to AID's objectives.

The issue of trainee selection is of sufficient importance to merit prompt attention as the second half of the project begins and as, perhaps, any unallocated ECIBEV training funds are redistributed to the other activities. In this matter of training, the MDST representative and the Project Officer share responsibility.

An additional area of concern is the employment of trainees after their return. Students find that they are not usually promoted immediately after they return. Indeed, some may even return to a position below that which they occupied before their departure, and it may take a while for them to regain their former statuses. They generally do not receive salary increases commensurate with their increased expertise, and they may find that their American degrees do not accord them the status of the equivalent French degrees. A report by Anderson (1986), which was made available to the evaluation team in draft form, further suggests that the job satisfaction of returned trainees declines from pre-training levels.

Observations of participants in long-term training once they have returned to Mali suggests that at times conflicting cultural factors influence their behavior after training. Most candidates function in an atmosphere in which study in the United States is viewed as highly prestigious. Thus, the successful trainee has achieved a longed-for status symbol -- a U.S degree -- but this very experience may have to some extent driven a wedge between the trainee and her or his colleagues. She or he may not know how to put the principles learned abroad into practice without risking loss of social acceptance by bucking the status quo. The United States system of long-term training does not provide the participant with any guidelines as to how to play a traditional role while also practicing what she or he has learned abroad. In some sense, this failure to combine the traditional and the modern results from the absence of any Americans who can link traditional and modern procedures during the training. New techniques are taught in a cultural vacuum with little comprehension of the problems that may face Malian participants once they return home. It is perhaps not surprising that only too little gets put into practice.

Short-term on-the-job training avoids many of the cultural problems attached to long-term training. A certain amount of short-term training has been conducted by the project, although this approach has perhaps not yet been sufficiently emphasized. It is clear that the ILCA researcher considers the field training of INRZFM personnel one of his major contributions to the project, and observation of his team in the field corroborates his assessment. Such side-by-side training in the Malian milieu has also worked very effectively at MDST (see the management section of this report). However, Malians trained at MDST are not members of the government bureaucracy. It is suggested that the project should examine ways to improve on-the-job, short-term training for Malian officials.

Every effort should be made to give practical training to field agents. DNE field personnel have already asked for short-term seminars in laboratory techniques to be conducted in the field rather than in Bamako. This may be less costly and more effective in terms of short-term

improvement in services, and it would also answer the field agent's perennial complaint about being passed over for training.

In conclusion, it is strongly recommended that the training implementation plan and activities be reviewed and that the several suggestions of problems with this effort, contained herein, be seriously considered.

3. Women and Development

a. Women's Labor in the On-farm Cattle Feeding Program

Women receive few benefits, and to a certain extent are harmed by, the development activities of the Livestock Sector Project. While the Project Paper notes that small ruminants are an important part of the Malian livestock sector, and that they are usually owned and managed by women, it did not earmark any credit moneys for small ruminant production. The credit arm of the Livestock Sector Project, ECIBEV, was purely concerned with the extension of credit to male heads of extended families for the on-farm feeding of cattle. As discussed in the ECIBEV beneficiary analysis (section B.3.d.ii.), women contributed substantial amounts of labor toward the care and watering of fed cattle, but they did not have any control over the use of the profits from this enterprise. Male heads of extended families made all decisions as to the use of ECIBEV loans. This does not mean that women never benefited from the cattle feeding program, as decreased levels of household indebtedness and increased cereal availability during several famine years probably benefited the women in at least some ECIBEV participant families. Likewise, there is no doubt that the cows bought with earnings from the program by one ECIBEV participant brought cash from milk sales to his wives. However, women had no independent access to credit for cattle or small ruminants, and they had no control over the economic surplus that was frequently obtained through their labor.

Womens' lack of control over profits from their labor not only contradicts hopes for improving the condition of women in developing countries, but it also runs counter to traditional practice. While much of womens' labor was traditionally placed at the exclusive disposition of their husbands, certain strategic products - e.g., rice, vegetables, and milk - were the exclusive property of women. By co-opting the time women have disposable for their own activities, one can legitimately say that the cattle feeding program was harmful to the economic status of women as individuals within the extended family. Furthermore, the cattle feeding program imposed no social restraints upon male heads of extended families to divide profits with women household members who provided much of the labor necessary to accomplish cattle feeding. In an exclusively traditional situation some restraint would have been placed either upon the use of such labor or the use of profits from this labor so that women received some direct reward for their work.

The ECIBEV example demonstrates what may occur when labor inputs by women are ignored in the economic analysis of project benefits. Yet one

can hardly criticize ECIBEV agents or the GRM for "not improving the status of women" when the design of the project did not acknowledge the value of their labor and when no credit was ever planned to be directed toward women. Insofar as the project worked in the field, it worked with men, but the design did not mandate otherwise.

It is more difficult to assess the extent to which women have benefited from the other components of the Livestock Sector Project. To the extent that the availability of reliable vaccine is an important adjunct to cattle health, women as owners of cows (see the ECIBEV section) have benefited from the DNE and CVL components. However, no health measures have been initiated for small ruminants, commonly owned by women, under the current project.

b. Female Personnel in Malian Agencies Associated With the Project

With respect to the hiring of personnel in the GRM agencies involved with the project, it is noteworthy that the CVL seems to have practiced equal opportunity in hiring women. The chiefs of the Section Bacteriologie Alimentaire and of the highly important Section Controle Vaccine are both women. Both are exceptionally competent and direct a number of technicians. The DNE also has a number of mid-to-senior level women professionals.

The CVL has treated women equally in the use of project funds for training. A three month course in Diagnostic Virology and the quality control of bacterial and viral vaccines has been projected for the female head of the Section Controle Vaccine. The laboratory also programmed one woman for training in Food Microbiology. Unfortunately, illness prevented her from undertaking the training, and a request has been submitted for training another CVL female employee in this subject. In addition, the CVL would like to train another woman in Library Management through a third country short-term course. DNE has sent two women to the Francophone Management training seminar at the University of Pittsburgh. One woman employed at the Bamako slaughterhouse also went through this course, as a result of a DNE nomination. These examples suggest that, at CVL and perhaps also DNE, it is efficiency and expertise which determine the allocation of training funds, not the sex of the candidate.

It is a success of the current project that women in the CVL have not encountered discrimination in access to training. Anderson's (1986) survey of returned trainees includes only five women out of the total of one hundred and twenty-three trainees interviewed. This is about 4 percent of those interviewed, a discouragingly low figure. The ongoing Livestock Sector Project should keep such figures in mind when reviewing candidates in the future, since not all components seem to have been as active as the CVL in proposing female candidates for training slots. Furthermore, no women in any component, including CVL, have had access to long-term training through the Livestock Sector Project. To sum up, CVL has done an excellent job of giving women short-term training, but long-term training remains the prerogative of men in all components.

c. Summary

The ECIBEV credit program enabled some women to benefit from an increased food supply and a decreased household debt burden, but it also cost them the control of a large portion of their labor. The ECIBEV credit program clearly discriminated against women in regard to access to credit. To the extent that they are cattle owners women benefited equally with men as a result of better and more widespread vaccination. In regard to training, support of female veterinary employees is an important achievement. Nevertheless, one should note that women do not yet seem to have access to long-term training in any of the four components of the project. Future proposals of candidates for long-term training be carefully monitored with regard to sexual bias. One can only conclude that it is almost fruitless to assess the positive effects of the project on women when the project design excluded them (whether or not this was due to lack of funds does not matter -- the fact remains that they were cut out of the Livestock Sector Project) and advise that future projects offer equal opportunities to both male and female members of the farming family and professional community. Without such a balanced approach, any development initiative will not benefit men and women equally.

C. UNFORESEEN EFFECTS AND LESSONS LEARNED

1. Environmental Effects

There were no unforeseen environmental effects resulting from project activities. It should be noted, however, that environmental change has resulted in a project-supported forage production research more applicable to the semi-arid than to the sub-humid zone (see section C.3.a.ii.). The sub-humid zone of Mali, however, can anticipate an ever-increasing influx of cattle in the years to come as conditions continue to decline in the sudan and sahel. The potentially negative environmental consequences of increased grazing in this zone, without compensatory improvements, are readily foreseeable (see Nyerges 1987). Prudence dictates that research be put in place promptly to meet the impending challenge.

2. Social and Economic Effects

Within the Banamba zone, interviews with farmers suggest that several unforeseen negative effects have resulted from the Livestock Sector Project activities. These effects are both economic and social and will hamper any future projects in the Banamba area.

a. Subsidized Credit and Dependent Farmers

The ECIBEV section of this report has already pointed out that farmers have been offered heavily subsidized credit (given current interest rates) as well as subsidized feed in order to turn a profit on cattle feeding. Subsidized credit may often be a legitimate and useful development tool. Participant farmers in the ECIBEV program report, however, that most of them have used a substantial proportion of their subsidized profits to buy food in years of semi-famine (1982-1985). This

implies that farmers have learned to depend on the subsidized profits in order to feed themselves in deficit harvest years. Habituating the farmer to purchase food on the basis of such a subsidy is a questionable procedure in a high risk rainfall area such as Banamba. Withdrawal of subsidized credit will then affect not only the general economic level of the average farmer, but his food security as well. And if and when credit is withdrawn the farmer may lose more than a yearly windfall; he may very well be unable to return to the survival strategies of a pre-credit era. Simultaneously with reducing the farmer's ability to survive a famine situation, the extension of credit may have inadvertently increased economic dependency rather than self sufficiency. With his increased expectations the participant farmer may be more vulnerable economically after participation in the credit program than before.

b. Implications for Future Projects

Development projects do not leave participants at the same point, either economically, socially, or psychologically, at which they started. If they fail they do far more long-term damage than is generally realized. The creation of an economic dependence is one of the more obvious manifestations of failure; changes in both participant and non-participant attitudes towards future development projects, and indeed any officially sponsored intervention, are other consequences that may be far more difficult to document but that are of much greater significance for long-term development.

The ECIBEV credit program has created specific attitudes towards credit programs, and indeed all development interventions, in the minds of its participants. First of all, farmers are very well aware that there have been problems in the administration of the ECIBEV credit program. They observe that the mandataires have been able to manipulate the buying of cattle on behalf of other farmers in order to make substantial profits. They note with relief that they are now allowed to buy cattle without the intervention of the mandataire, but they are also angry because eight years is too long a time period for such an abuse to continue. They cannot understand why they were not permitted to buy their own cattle sooner. Given this type of field situation, it is not surprising that the average farmer regards the ECIBEV cattle feeding program with suspicion. Such negative perceptions lead the farmer not only to reject the ECIBEV credit program under discussion, but also to distrust any other development projects that might cross his path. These attitudes are readily spread throughout the society. Thus, a badly administered development program can affect farmers' willingness to participate in projects over a far larger area than the zone in which the mistakes occurred.

A badly administered project, therefore, is far from innocuous -- to use a Bamana term, it "spoils" the ground for future projects. It is an unfortunate long-term effect of the Livestock Sector Project that many less fortunate Banamba area farmers will judge any development project they encounter according to their experience with the administration of this credit program. This does not mean that "development" is now

impossible in this area; it is merely much more difficult than before the credit program was instituted. To paraphrase discussions with several farmers -- "we decided not to participate in the credit program after looking it over very carefully, and several years later the results our neighbors got (who participated) proved that our decision was sound." The same farmers were careful to specify that they have had excellent experiences with credit in the OACV program which formerly existed in the Banamba region and that they were not biased against credit in and of itself.

c. Summary

To summarize the unforeseen effects of the Livestock Sector Project, the project did not result in any ecological damage in the First, Second, or Bamako Regions of Mali, although research is needed to forestall the consequences of an impending, specifiable, environmental change. The project did, however, unrealistically increase the economic expectations of participant farmers by providing what effectively and inadvertently became subsidized loans. Such loans also reduced the small farmers' ability to develop a famine strategy and increased their dependance on external funding for the maintenance of nutritional self sufficiency. Finally, and most seriously, the project has damaged the credibility of any future development intervention in the Banamba zone and has thus lowered the level of genuine participation to be expected from small farmers. It should be stressed that this result is not unique to the Livestock Sector Project, but that it dogs almost every development project which is not an unqualified success. Hopefully, the experience of the first two-and-one-half years will enable the Livestock Sector Project to avoid a similar impact in the future.

3. Lessons Learned

The Livestock Sector Project has demonstrated the capacity to construct facilities and to implement development based on GRM agencies in the Bamako area. Extension of development to the countryside has been more uneven -- while the DNE veterinary extension service does the heart of its job, the ECIBEV credit program has been a failure. This difficulty in extending development is unsurprising, as the management and monitoring problems of development projects are enormous and seem to increase exponentially with distance from the capital city.

The problems experienced by the project are exemplified by the ECIBEV component. The specific lesson of ECIBEV is that ad hoc financial structures should not be set up outside the established banking system. The more general lesson, however, concerns the central issue of management. The ECIBEV credit fund was poorly managed and its expected benefits were therefore not extended to the countryside.

By contrast, the Livestock Sector Project has made great strides in improving its own internal financial management, thought the institution of the MDST. The lesson of this success, however, is not necessarily that MDST-style management should now be replicated to other missions (it is

still too expensive), but rather that similarly improved management skills and systems must now be transferred to Malian agencies. As AID's accounting difficulties were resolved by better management, so, too, may at least certain of the problems faced by MRNE be addressed. The institutionalization of better management will allow progress to be made on all project fronts, including for example, resolution of the perennial problem of lack of coordination between the CVL and DNE. Ultimately, improved management at DNE should enable extension of the full benefits of veterinary medicine to the countryside and the generation of a certain amount of project revenue.

D. RECOMMENDATIONS

The following summarizes the recommendations given in the body of the report.

1. For the Current Project

a. Cattle Feeding Credit Program (ECIBEV)

The evaluation team recommends a closure of project activities with respect to the poorly managed, decapitalized ECIBEV credit fund. Detailed recommendations are given in the ECIBEV section relating, for example, to sharing the costs of a final audit and to the improvements that should be instituted in ECIBEV should GRM elect to maintain the program on its own. The essential recommendation, however, is that financial and technical participation in this activity by USAID should be ended and that uncommitted ECIBEV moneys should be reallocated among existing and new activities within the Livestock Sector Project. This reallocation should be conducted as part of a joint planning exercise by USAID and MRNE through the JMC.

b. Project Management/Administrative Support (JMC, MDST and DPMC)

The management activities of the project thus far have been devoted to implementation, and the effort now needs to turn to the transfer of management skills. The existing confusion over the role of the JMC as the ultimate decision-making body of the project must be resolved by giving the minutes of the JMC the legal status of a PIL. It is further recommended that MDST should now take on the enhanced role of independent advisory body and executive secretariat to the JMC, in addition to its responsibilities as project management specialist team and liaison between USAID and MRNE. In the effort to transfer skills, MDST's mandate should be broadened to include all agency activities for a particular management system, rather than being limited to those activities funded by USAID. This would be a logical area for enhanced funding and increased TA personnel in MDST. Furthermore, the introduction of improved systems, such as the MIS, should be developed in accordance with Ministry-wide norms with a view to eventual expansion to other agencies within the MRNE. MDST should be given a special mandate to participate in the management improvement of the DNE as the drive toward privatization of the veterinary service begins. If MDST personnel do not have the time to devote to this

effort, new TA personnel should be hired. Finally, it is recommended that in future solicitations of specialized expertise, the DPMC should be regarded as only one among many possible contracting alternatives.

c. Forage and Livestock Production Research (INRZFH/ILCA)

The evaluation of the INRZFH component of the project shows that the forage and livestock production research effort has generally gone well. The Livestock Sector Project provided timely support, and INRZFH and ILCA have been effective partners. The result is that FSR research of high technical quality has been carried out. However, while research was to have been carried out in the sub-humid zone of Mali, it was in practice tied to the ECIBEV Embouche Paysanne activity in the Banamba/Segou area that, with climatic change, became more arid. There are now compelling reasons to separate the forage and livestock production research unit from its link with the Embouche Paysanne and to expand or shift its activities to the sub-humid zone to the south. Research in the sub-humid zone could contribute to the commercialization of milk and meat production in the Bamako area. It would also appear prudent to have a forage and livestock production technology in place in an area that can expect an increasing influx of cattle as problems of desertification continue in the north and as tsetse and black fly disease vectors are eradicated in the south. Resolution of this issue, and the possibility of increased funding to expand the research area, is a matter that should be addressed by the JMC as a first priority.

Other specific recommendations are given in the appropriate section with respect to research on legumes, introduced and native cultivars, crop rotations and intercropping, exploitation of Tilemsi rock phosphate, basic resource distribution, weeds, household economy, and small ruminants. Specific gaps in staffing, for example the position of sociologist/anthropologist in the research unit, should be immediately filled. Finally, in the interests of communication and coordination among the various groups conducting forage-related research in Mali, the GRM should organize a high-level national agricultural research council with staff and financing to act as a central coordinating body. The evaluation team believes that the costs in management time of this effort would be adequately repaid by the improvements in research coordination.

d. Vaccine Production and Improvement of Management Skills (CVL)

Continuing support is strongly recommended for the CVL as essential to its survival. Whether this support will be required for ten or even twenty years is difficult to predict. The Diagnostic and Research Unit, to be completed soon, is of special concern since it could become a "white elephant" unless serious thought and action are given to its planned use. At present, it is inconceivable that the laboratory and its various operations could become financially self-reliant. A present and future task in laying the groundwork for ultimate sustainability of operations is to capitalize upon the existing resources of the CVL - i.e, vaccine production - to reduce the financial burden created by the diagnostic and research services. Expanded production, support for the separate quality

control section, development of new types of vaccines, and more training are all worthy of project support in this regard. Future self-sustainability of CVL will also require careful planning based on a cost analysis and better organization and coordination of the activities of the CVL and DNE through management improvement. The financial relationship between DNE and CVL could be improved through institution of a line of credit or revolving fund by which CVL would be repaid promptly for vaccines purchased by DNE. One of the basic requirements for both services is continued training, preferably through short-term visits of specialists who would offer seminars oriented to practical topics.

The CVL research effort should be practical in nature and focused on problems related to Malian livestock. Research should emphasize identification of infectious diseases and the development of treatment and control methods. The effort to map and ultimately eradicate tsetse and trypanosomiasis in the sub-humid zone should no longer have priority and, to the extent that this work is done, it should be closely linked with forage and animal production research in that area by the INRZFH.

Finally, great caution is recommended in considering any new construction at the CVL, beyond the completion of work underway. Exceptions are provision of a guaranteed water supply to the facilities at CVL and Sotuba, improving the CVL building's electrical supply, making minor alterations in the internal configuration of the building for efficiency, and improving the track to the experimental farm for ease of access. Provision should also be made for replacement of major equipment as needed.

e. Improvement of Veterinary Services Delivery System (DNE)

MDST, newly freed from its responsibilities for procurement, should now be assigned to aggressively tackle the DNE's administrative problems. Implementation of the MIS, which will allow the DNE to know accurately what is happening in the field and to pass useful information on the CVL, will vastly assist this effort and should be instituted without further delay. Should MDST be unable to devote the time necessary to the DNE, the JMC should consider hiring a long-term technical assistant in management specifically for this purpose. JMC should closely review the priorities of the DNE and define more precisely its main objectives and resource limitations. In particular, studies are needed to determine the possibility of the system becoming self-sufficient. The view of the evaluation team is that this can occur only with careful planning and stepwise development over the long run. The JMC should consider the feasibility of (1) instituting full-cost vaccination in the Bamako District commercial cattle-raising operations, (2) a steady price increase to full cost over a ten year period (or possibly longer) for vaccines given in government-mandated campaigns, (3) full-cost vaccinations for on-demand services, and (4) full-cost vaccinations for cattle crossing Mali's borders. In addition to charging higher fees for its services, the DNE must expand the services it offers through a program of continued training of field agents in diagnostics and treatment. Reactivation of the training and research station at Sotuba, use of the CVL diagnostic unit's

new facilities and expertise, and an expanded program of short-term technical assistance could all be important elements in a training program.

A number of specific infrastructural and equipment improvements are recommended for the DNE, and it is also strongly recommended that procedures be established for defining standard specifications for equipment and supplies needed by field personnel. The field agents should be closely consulted in the matter of equipment by procurement officers.

f. Training

The lack of a unified project training program to fill gaps in available expertise throughout the livestock sector should be addressed by the current MDST effort to integrate the planning of training into a more coherent whole. As part of this effort, the training selection procedure should be carefully reviewed and, in the selection of candidates for training, the competitive process specified in PIL # 2 should be consistently followed. While the value of long-term overseas training at the degree level is not in doubt, the potential of short-term training has not yet been fully exploited by the project. Specifically, every effort should now be turned to giving practical short-term training courses to the DNE field veterinarians.

2. For Future Project Support

a. Credit

If credit funding is envisaged to play a role in a follow-on livestock sector project, the evaluators recommend that all such credit funds should be channeled exclusively through an established and mutually acceptable banking institution in Mali. No ad hoc project credit funds should be set up outside the banking system or operated under criteria other than those of strict and conservative banking practices. Such credit should be authorized to cover a broad range of possible activities in the livestock sector, and the loans should be made on the basis of the technical and financial feasibility of the specific loan proposal and the creditworthiness of the loan recipients. A credit program should not be directed by the lender to a narrowly defined, a priori list of interventions or be based on any predetermined pattern of credit allocations dictated by either the GRM or USAID.

b. Management

The JMC has the potential of becoming an effective management tool. With the proviso that both parties adhere to the principle of joint management and shared decision-making, and that the necessary steps are taken to guarantee that the joint decisions are legally binding, it is recommended that the concept of a joint management committee be continued in any follow-on phase to the present project.

The evaluation team finds that the costs of maintaining an administrative and support team such as the MDST for a single project are excessive. The MDST, however, has proven very effective in permitting rapid implementation of project activities through the use of a specialized management team. Such costs are also not limited to this project, but are similar in other USAID-funded projects. If USAID wishes to delegate administrative responsibilities, then it should explore further the possibility of instituting such a mechanism as MDST on a multi-project or mission-wide basis. This would spread the costs of administration and would free TA time within each project to focus on the specific problems and tasks of the project at hand.

Based on the results achieved to date, USAID should not use a PASA with USDA in any follow-on to the present project.

c. Research

The forage and livestock production research unit has long-term goals and purposes - i.e., to explore development paths for the integration of animal husbandry in the agricultural production systems in the project area. While mixed farming may be less easily developed than originally assumed, because of the excess burden of unpaid labor such development often places on the women and children of the household, the economic advantages of mixed farming nevertheless are great. It is recommended that USAID should continue its technical assistance program with MRNE in this area at least at the present level throughout the life of a follow-on livestock sector project.

The research effort should be expanded to include a focus on small ruminant feeding, and the research should be reoriented from the present semi-arid to the sub-humid zone in order to sharpen emphasis on milk production for Bamako and on animal traction, which is crucial to the sustainability of sedentary agriculture in the sub-humid zone. Research should continue concentrating on the development of low input legume-based forage production, including tree forage legumes. Soil science research should be developed as part of the multi-disciplinary approach. The high priority now assigned to the training of Malian counterparts should be seen as crucial to the institution-building in the INRZFH. This policy should remain in full force throughout the life of a follow-on project.

d. Veterinary Laboratory

Research priorities include continued support of study in such areas as vaccine development, refinement of relevant diagnostic tests, training of personnel, development of methods for the treatment and control of infectious diseases, and the relationships between nutrition and disease in small ruminants. Specific research projects should be generated in close consultation between the CVL research staff, the field veterinarians, and the USAID/COP. All research projects, however, must be justified on the basis of economic significance to livestock and to the objectives of the project.

Arrangements need to be made to alleviate the cash flow problems of the CVL. Funds need to be provided to replace major equipment breakdowns and to make minor building renovations as vaccine production needs change in the future.

Support should be maintained for training programs for field veterinarians and technicians, and for conducting seminars that enhance utilization of the CVL facilities. CVL facilities and expertise should be enlisted to provide practical training for veterinary nurses.

Continued funding should be maintained over a decade at least. The CVL makes a substantial contribution to the Malian economy, and it merits the continued support necessary to put it on a financially sound footing. Such funding, however, should be predicated upon the development of self-sustaining policies of financial management by the GRM -- so that the CVL can ultimately assume the burden of its own recurrent costs -- in anticipation of the time when USAID project support for livestock wanes or is terminated.

e. Veterinary Services Delivery

Efforts to improve the financial viability of the DNE should be directed, first, to lowering the cost of services by increasing their efficiency and capacity, for example by training of field veterinarians in diagnostics that could be done locally at the field stations. Second, as the development of an effective year-round livestock health extension service proceeds, the fees charged to users of the system can be gradually increased to full cost. Improvement in services will require substantial investments in training programs directed at all levels of the veterinary field staff. This training effort could be substantially facilitated by the reactivation of the Sotuba Training Center. An efficient system needs to be generated for the distribution of medications. Finally, technical assistance in management should be provided to the DNE over the life of any future project.

f. Training

Development and maintenance of a coherent and integrated training program is a major priority for a follow-on livestock investment. While long-term training should continue, emphasis should shift to a carefully designed program of short-term practical training courses.

3. Summary and Conclusions

These recommendations essentially support the twenty-year strategy of the Project Paper. They include a suggestion for closure of one project activity, and no suggestions for major new ventures are advanced. Rather, the evaluation team finds that the veterinary research and extension services, forage production research, and management development activities of the project are sound and viable investments that are worthy of continued support in the present and follow-on projects. While the INRZFH should be directed to conduct research to anticipate a heavier

burden of cattle foraging in the sub-humid zone, other recommendations focus on the difficult and long-term tasks of training and management improvements in the CVL and DNE. These continuing efforts at institution-building are necessary in order to bring the project investments to full maturity as self-sustaining components of the Malian livestock sector.

APPENDIX A

BENEFICIARIES ANALYSIS METHODOLOGY

Throughout this evaluation, directed interviews with specific individuals based on the schedule of questions which follows this section provided basic information. A total of 38 informants were interviewed in 34 sessions that covered different aspects of beneficiary analysis. Since the interviews were always directed toward specific information - e.g., the effect of water shortages on the feeding out of ECIBEV cattle - the informants are classified according to the project components they discussed. Thus, a separate discussion of the informants for the DNE component, the training analysis, and ECIBEV appears further on in this section.

Interviews were conducted in the presence of government representatives, and such interviews were also balanced with one-to-one discussions with particular farmers. Translation -- where necessary as for instance from Soninke to French -- was provided by the GRN liaison with the evaluation team, but most interviews were conducted directly in Banana by the team member in charge of beneficiary analysis.

Farmers of the Khasonke, Maraka (Soninke), Banana, and FulBe ethnic groups contributed valuable information, as did several FulBe cattle owners and professional herders. Unfortunately, the strongly Islamic tenor of the principal project zone (Bananba) made it inappropriate to specifically seek out womens' views on the ECIBEV cattle-feeding program. However, male informants expressed distress concerning the restriction of access to credit to men. Further research -- if such were deemed necessary -- might well concentrate on direct interviews with women.

It should be noted that most informants were reluctanct to answer the most important questions relating to credit and its uses, vaccine costs, and ownership of cattle. These issues are extremely sensitive at the village level and demand long-term work rather than a quick evaluation.

In the case of ECIBEV informants, farmers from a broad economic spectrum were interviewed. Two farmers reported that they did not own any cattle -- a presumed index of 'poverty' -- and three farmers owned ten cattle or more. Furthermore, the two herders interviewed either owned or managed more than 50 head of cattle. Additional approximations of the socio-economic status of the ECIBEV informants is provided by the summary of their social positions and small ruminant holdings in Appendix Table A.1. The table lists the 21 Bananba zone informants who were interviewed in 19 interview sessions. The column showing years of ECIBEV participation enables the reader to contrast ECIBEV with non-ECIBEV farmers in terms of livestock holdings.

In addition to the informants listed in Table A.1, two extremely wealthy ORS farmers were interviewed at Dioro, near Markala in the region of Segou, thus bringing the total number of ECIBEV informants up to 23.

Unfortunately, it was not possible to obtain a clear idea of these ECIBEV participants' cattle and small ruminant holdings. These farmers appeared to speak candidly and were happy to provide detailed information, only so long as it did not concern their personal finances. Due to the lack of precise socio-economic data these informants have not been included in the table. However, it is worth noting that one farmer was the president of the local cooperative and the other the adjunct treasurer. Without providing personal details, both farmers and ORS representatives confirmed that a rice harvest of over 1,000,000 FCFA was not an unusual occurrence in Dioro. The interviewees both arrived on new mobylettes and spoke proudly of their cooperative's ability to repay the 1,460,000 FCFA it had borrowed from the BNDA last year. Clearly, these were the wealthiest farmers in the entire ECIBEV sample, and one has to keep this in mind when reviewing the ECIBEV section dealing with ORS.

Before closing the discussion of the methodology used in obtaining the ECIBEV field data, one should note that the schedule of questions was never administered question by question. Rather, the schedule served as a base and guide for the interviews. For example, the first question, "Why did you refuse or reject involvement in the ECIBEV cattle fattening program?" was never asked at the beginning of an interview. In fact, it was the usual procedure to start with the second page of questions and work backwards. Moreover, the questions changed as the evaluation progressed. In at least one village, informants underlined the importance of water shortages as a constraint on the cattle fattening program, and a complete series of questions emerged during the interview which cannot be found on the questionnaire. The list of questions should not be considered as anything more than an intellectual scaffold which rearranged itself in response to the field situation and the differing expertises of different informants.

The informant base for the DNE beneficiary analysis presented similar although more acute problems than those encountered in the ECIBEV work. In general, farmers are not willing to say how much they paid their local veterinary agent for either vaccinations or other animal treatments. This is a personal contract negotiated between the farmer and the animal health agent; the farmer usually fears that he will place this relationship in jeopardy if he reveals the details of financial transactions to an outsider. Due to the delicacy of the questions relating to vaccine prices, numbers of cattle deaths, and the cost of animal health treatments, it was possible to carry out only six interviews that focused exclusively on DNE issues.

A concerted effort was made to counterbalance this small number of interviews by selecting farmers and herders who could not possibly know of each other and who originated in completely different areas of the First and Second Regions. Information gathered at the village level was then tested against information gathered from trained veterinary agents in Bamako as a further check of accuracy. In general, farmers in outlying bush areas listed animal health costs which agreed with those cited by Bamako veterinarians. This suggests that, despite the small sample size, the range of costs listed in the beneficiary analysis is on target. The

following informants provided DNE beneficiary information (place listings indicate the informant's normal domicile, not the location of the interview):

- A veterinary engineer with two years bush experience and considerable working time in Bamako;

- A moderately wealthy cattle owner and his professional FulBe herder -- residents of a village in the First Region;

- A moderately well-off farmer from the Banamba zone;

- The Chief Veterinarian of Nara;

- A very wealthy cattle owner interviewed in the presence of the Director General of the DNE in Kayes and his agents. This informant refused to discuss the issue of animal health costs; and

- A well off farmer and trader in small ruminants from Kita.

It is hoped that future field work will clarify the issue of animal health treatment costs so as to provide an accurate basis for a decision regarding the privatization of veterinary services.

The training analysis presented an entirely different set of problems than either the ECIBEV or DNE components. Most students who have received scholarships to study abroad have a vested interest in the training they have received once they return to Mali, and ex-trainees are perhaps not always the most objective source of information regarding their training program. Nevertheless, informal interviews were carried out with several training participants. Formal interviews were used to obtain information from a high-ranking Bamako GRM representative who had studied abroad but had not been involved in the Livestock Sector Project Training Program, and from a retired employee of the MRNE who had observed training programs and their results since independence. Trainees funded by the Livestock Sector Project were observed at work in the field and in Bamako and were compared with those educated by other governments. Finally, formal interviews were arranged with Malafyn Keita, the project assistant in the Human Resources Development Office at AID, and with Ms. Sherri Suggs, the AID Human Resources Development Officer. Further information was provided by Richard Pronovost at MDST. Due to the fact that Philip Anderson had only just finished a report on long-term training it was not considered necessary to repeat his survey work. The reader should note that a preliminary draft of the training section had already been written prior to reading the Anderson report. It is significant that both the evaluation team and Anderson had reached the same conclusions independently.

To summarize, each beneficiary analysis -- ECIBEV, DNE, and training -- required a different research approach and presented different problems. Overall, the most significant factor affecting the validity of informants' responses was the widespread awareness that all questions were

being asked for the purpose of a mid-term evaluation and the belief (rightly or wrongly) that further funding might be affected by the interviewee's response. It should be emphasized that a mid-term evaluation, by definition, is not an objective situation in which research can occur, since all informants have vested interests at stake. This usually results in a universally positive description of the project in question no matter what the immediate problems may be. It is hoped that the research strategies detailed in the preceding description of the team's beneficiary analysis methodology have enabled the evaluation team to make an accurate assessment of the realities which are determining the progress of the Livestock Sector Project.

SCHEDULE OF QUESTIONS USED IN ECIBEV INTERVIEWS

1. Why did you refuse (or reject) involvement in the ECIBEV program?
   (This question was only asked after it was ascertained that a village or farmer had considered the ECIBEV program and had decided not to participate in it)

2. Does he regret his decision or is he satisfied with it and if so why?

3. What does he know or think about the situation of the farmers who have participated in ECIBEV --
   Does it work?
   If it (ECIBEV Embouche program) works, why and with whom?

4. Does the farmer see ECIBEV as a new technical advance or was he already familiar with the feeding out procedure before the existence of ECIBEV in the Banamba area?
   If he was familiar with this procedure prior to the activities of ECIBEV, where did he learn about it? How long ago?

5. Over the informant's entire lifetime what, in his opinion, is the factor which has contributed the most to agricultural prosperity?
   Get him to list whatever he names in order of importance.

6. Why has the number one factor in question 5 been so important?

7. Given the fact that most heads of extended families receive substantial sums of money from young men working in Bamako or Abidjan, ask the informant what his priorities of investment would be if he were to receive, for instance, 100,000 CFA.
   If he mentions several forms of investment ask him to list them in order of priority.

8. Given that the informant has provided the list requested in question 7, why would he choose to invest in the above items?

9. Does he rely on the cash sent home by family members working outside the Banamba region for ongoing expenses or does he consider that this money arrives rarely enough that he should invest it in a long term project?

10. Has his investment strategy changed since the recent drought?

11. If his strategy has changed, what is the new rationale behind his current investment strategy?

12. Which would he prefer to invest in, cattle, sheep, or goats? Why?

Schedule of Questions used in ECIBEV Interviews (cont.)

13. Since the drought, has he noticed any change in which animal species are surviving the best in the Bananba region?
    Offer the alternatives of cattle, sheep, and goats -- the three animals which are the major proportion of livestock in the area.

14. After two good years of rain, will he invest in animals different than he invested in immediately after the drought?

15. If the farmer does invest in cattle how do his wives and daughters benefit from this investment?

16. Has the informant heard of anyone in the Bananba area who used his Embouche profits for bridewealth?

17. Has the informant ever wished to sell a cow or calf belonging to one of his daughters (as part of her bridewealth), but she refused?
    If so, why?
    Did he sell the animal anyway?
    Has the informant's daughter ever sold one of her cows without consulting him?
    Has the informant's daughter ever sold one of her cows against his will?

18. Has any woman in the informant's family ever used the proceeds of selling milk to buy cattle for herself?
    If not, why not?

19. How many cattle did the informant own before the drought?
    How many cattle does he possess now?
    Why has there been a change (if there has been a change)?

20. Have the young men (and possibly the young women) who left the area because of the drought returned?
    If not, does the informant believe that they will eventually return?
    What has been the effect of this out-migration on the amount of land he has been able to cultivate in the last few years?

21. What are the reasons for not investing in cattle?

22. What are the names of the most serious cattle diseases in the Bananba area?

23. Have any of these diseases affected his decision to invest or not to invest in cattle?

24. Has he had cattle which have died (either ECIBEV cattle or others)?

25. What was the reason for these deaths?

Schedule of Questions used in ECIBEV Interviews (cont.)

26. When the informant was a child did cattle die of the same diseases as are common now or were they different?
    (This question requires that one establish the approximate age of the informant)
    If cattle deaths have decreased since the informant's childhood, what does he attribute this decrease to?

27. What is the one thing that the informant thinks would help him the most in raising healthier cattle?

28. Does the informant (or his neighbors if they are the participants in the Embouche Paysanne program) keep the ECIBEV animals tied up?
    If not, why not?

29. Is there any difference between the meat of animals which have been fattened using the Embouche procedure and the meat of a standard animal?
    Does this difference affect the sale of the embouche animal or its price?

30. Has the informant observed any differences between animals which were kept stationary during the feeding out process and those that were allowed to roam?
    What were these differences?

31. What are the worst diseases (in the informant's opinion) for sheep and goats?

32. If these diseases (cited in question 31) could be cured or prevented would the informant or members of this family be more or less inclined to invest in small ruminants?

33. If and when the informant sells a small ruminant (sheep or goat) who does the money belong to?
    If the head of the family takes the money what does he use it for?

34. Does the informant know of any women who have made a substantial amount of money from raising and selling either goats or sheep?
    (Try to get an estimate of the figure in question)

35. What have these women done with their profits?

TABLE A. 1
LIST OF ECIBEV INTERVIEWEES

FARMER	# ECIBEV CATTLE 1985-1986	# OWN CATTLE	# SMALL RUMINANTS	YRS OF ECIBEV PARTICIPATION	SOCIAL STATUS WHEN KNOWN
Farmers 1 through 10 were interviewed with the assistance of the GRM liaison.					
#1	3	7	no information	10	wealthy farmer
#2	3	none	no information	2	relatively poor farmer
#3	10	4 plough oxen and additional unknown number of cattle	no information	7	wealthy farmer
#4	5	2 animals (one cow + 1 calf)	at least 2 sheep	4	moderately well-off farmer
#5	4 (2 were pregnant cows)	at least 10	at least 10	2	extremely wealthy farmer - wealth derives from sons' import/export business in Bamako
#6	4	7 cows & 2 calves (all personal livestock bought with ECIBEV profits)	8 goats, 3 kids, 5 sheep (2 pregnant)	9	moderately wealthy farmer - only farmer whose social status had dramatically changed due to ECIBEV participation
#7	3	2 plough oxen	unknown	8	village notable interviewed in the presence of the entire village council
#8	4	none	unknown	2	poor farmer
#9	4	none	unknown	2	poor farmer
#10	2	none	unknown	3	poor farmer

TABLE A. 1, continued

FARMER	# ECIBEV CATTLE 1985-1986	# OWN CATTLE	# SMALL RUMINANTS	YRS OF ECIBEV PARTICIPATION	SOCIAL STATUS WHEN KNOWN
Farmers 11 through 21 were interviewed on a one-to-one basis; all came from the Banamba area and were familiar with the ECIBEV program although they had not participated in it.					
#11	0	none	6 sheep, 10 goats	0	village councillor, 56 years old; poor farmer
#12	0	2 plough oxen	30 (sheep + goats)	0	village notable, 65 years old; farmer
#13	0	none	10 (sheep + goats)	0	village notable, 45 years old; farmer
#14	0	5	26 (sheep + goats)	0	village notable, ancien combattant, 63 years old; farmer
#15	0	no animals owned individually - see following informant (father) for family's animals		0	village councillor, 33 years old; traditional healer, son of village 'chief,' maître d'alphabétisation
#16	0	12	17 (sheep + goats)	0	village chief, 70 years old
#17	0	16	56 (sheep + goats)	0	village councillor, 39 years old; paysan pilot, former OACV agent
#18	0	80	60 (sheep + goats)	0	Fulani cattle owner, 56 years old; can read and write Arabic

TABLE A. 1, continued

FARMER	# ECIBEV CATTLE 1985-1986	# OWN CATTLE	# SMALL RUMINANTS	YRS OF ECIBEV PARTICIPATION	SOCIAL STATUS WHEN KNOWN
#19	0	80 (cares for, does not own these)	0	0	professional FulBe herder, 36 years old
#20	0	8	12 (sheep + goats)	0	farmer, 45 years old; seasonal laborer in Bamako
#21	0	4	30 (sheep + goats)	0	very successful farmer, 56 years old; paysan pilot

APPENDIX B.

A COMPARISON OF THE PROJECTED AND ACTUAL PROJECT IMPLEMENTATION SCHEDULES

1. Project Management (MDST) Component

Activity Number	Activity Description	Month Projected	Actual Month
1	Project Paper approved	June 1982	August 1982
2	Grant Agreement signed	June 1982	August 1982
3	Order tools and equipment for maintenance facility	July 1982	January 1984
4	Contractor/PASA teams are selected and contracts/PASAs are negotiated	August 1982	April 1983
5	Advance team members arrive in Mali, including the management specialist and contract administrator	December 1982	August 1983 November 1983
6	Rest of contractor/PASA team arrives in Mali and principal Malian staff positions are filled	January 1983	February 1984
7	Begin setting up the vehicle/equipment maintenance facility	February 1983	November 1983
8	Joint review of the overall livestock program design PP workshop	April 1983	Not Executed
9	Prepare first annual and more detailed six month work plans	June 1983	February 1984
10	Work plans and buugets are approved	July 1983	March 1984
11	Completion of second six month work plan	December 1983	September 1984

12	Tools and equipment arrive and equipment maintenance center is operational	December 1983	July 1984
13	Work plans approved	January 1984	October 1984
14	Start activity specific intensive reviews (ASIR) of first year progress	April 1984	Never Executed
15	ASIRs are completed and provide the basis for third six month work plans and budgets	June 1984	Never Executed
16	ASIRs synthesized for sector program review	July 1984	Never Executed
17	First year progress review and third six month work plans and budgets approved	July 1984	May 1985
18	Project Agreement amendment signed	October 1984	--
19	Fourth six month work plans and budgets are completed	December 1984	December 1985
20	Begin preparations for major project review	January 1985	January 1985
21	Work plans and budgets are approved	January 1985	December 1985
22	Major program evaluation (MPE) begins	May 1985	August 1986
23	Major program evaluation completed	July 1985	o/a Feb. 1987
24	Results of MPE are reviewed and program for the final two years of the project are approved in detail for the fifth six month work plans and budgets	July 1985	

2. Cattle Feeding Credit Program (ECIBEV) Component

Activity Number	Activity Description	Month Projected	Actual Month
1	Detailed job descriptions for technical assistance personnel are prepared	July 1982	July 1982
2	Recruitment begins	July 1982	July 1982
3	Selection of two initial candidates for M.A. program and begin language training	September 1982	October 1983
4	Begin receiving farmer applications for credit for 1982-1983 cattle feeding cycle	October 1982	October 1982
5	Screen credit applicants from OHV/CMDT/ORS	November 1982	December 1982
6	Begin procuring animals for participants requesting this service	November 1982	December 1982
7	Provide credit for the selected candidates	December 1982	December 1982
8	Contractor/PASA team selected	December 1982	January 1984
9	Cattle feeding and support program begins	January 1983	January 1983
10	ECIBEV advisors arrive	January 1983	February 1984
11	Begin detailed review of component program including a needs assessment of participants and preparation of work plans and budgets	February 1983	February 1984

12	Hold first meeting on research program	February 1983	Not Executed
13	Complete preparation of specifications for order of ECIBEV commodities	April 1983	February 1984
14	Begin selling fed animals and buy from those farmers requesting this service	April 1983	April 1983
15	Begin developing an improved accounting system and procedures within ECIBEV	April 1983	October 1982
16	Joint review of the livestock sector program design	April 1983	Not Executed
17	Work plans and budgets are reviewed and approved	June 1983	March 1984
18	Language training program ends and first students leave for the United States	June 1983	August 1984
19	All animals are sold and loans are repaid	June 1983	September 1983
20	Select candidates for Masters program and start language training	September 1983	September 1984
21	Begin screening applicants for the credit program in CMDT/OHV/ORS	September 1983	October 1984
22	ECIBEV commodities begin arriving	October 1983	July 1984
23	Begin animal procurement for participants requesting this service	November 1983	December 1984
24	Internal program review is completed and provides basis for preparation of the second six month work plan and research program	December 1983	March 1984

25	Second six month work plan and budget approved	December 1983	March 1984
26	Select candidates for credit program, begin granting credit, and begin support services	December 1983	December 1983
27	Cattle feeding program begins	January 1984	January 1984
28	Cattle feeding program ends and selling of fed animals begins. ECIBEV buys animals from those farmers requesting this service	May 1984	May 1984
29	Annual intensive review of the component program	May 1984	Not Executed
30	Third six month work plan is approved	May 1984	October 1984
31	Language training ends and students depart for the United States	June 1984	September 1985
32	All fed animals are sold and loans are repaid	June 1984	September 1985
33	Select candidates for the Masters program and start language training	September 1984	Not Executed
34	All ECIBEV commodities are in Mali and cleared through customs	October 1984	October 1984
35	Begin screening applicants for the credit program	September 1984	October 1984
36	Begin animal procurement for participants requesting this service	November 1984	December 1984
37	All credit candidates are selected and credit delivery begins	November 1984	December 1984

38	Internal program review is completed and provides the basis for preparation of the fourth six month work plan	December 1984	October 1984
39	Cattle feeding program begins	January 1985	January 1985
40	Begin preparations for the major project review	January 1985	June 1986
41	Cattle feeding program ends, selling begins, and ECIBEV buys from farmers requesting this service	May 1985	May 1985
42	Major project review ends	July 1985	September 1986
43	Results of the project review analyzed and ECIBEV program for the final eighteen months of the project is approved. A detailed fifth six month work plan is approved	July 1985	Not Executed
44	All animals are sold and loans are repaid	July 1985	September 1985
45	Begin candidate selection for the credit program	September 1985	October 1985
46	Begin procurement of animals for farmers requesting this service	November 1985	December 1985
47	Cattle feeding cycle begins	January 1986	January 1986
48	Sixth six month work plan is approved	January 1986	January 1986
49	Selling of fed animals begins and ECIBEV buys cattle from farmers requesting this service	May 1986	May 1986
50	Annual intensive review of implementation performance is conducted	May 1986	Not Executed

51	Seventh six month work plan is approved	June 1986	Not Executed
52	All animals are sold and loans are repaid	July 1986	September 1986
53	Begin candidate selection for the credit program	September 1986	Not Executed
54	Begin procurement of animals for farmers requesting this service	November 1986	
55	Cattle feeding cycle begins	January 1987	
56	Eighth six month work plan is approved	January 1987	
57	Final intensive program review begins with use of external consultants	April 1987	
58	Final intensive review is completed	June 1987	
59	Final work plan is reviewed and approved	July 1987	

3. Forage Production Research (INRZFH) Component

Activity Number	Activity Description	Month Projected	Actual Month
1	PASA/Contractor selected	July 1982	June 1983
2	Technical assistance team members arrive:		
	a. Animal Scientist	November 1982	
	b. Agricultural Economist	November 1982	July 1984
	c. Forage Agronomist/ Farming Systems Specialists	November 1982	February 1984
3	Review of existing research is conducted	January 1983	November 1983 March 1984
4	First work plan and budget are submitted	February 1983	March 1984
5	First work plan and budget are approved	February 1983	March 1984
6	Farmers are selected to participate in the research program from among ECIBEV program participants	March 1983	May 1984
7	Selection of type of research to be started at Sotuba	March 1983	June 1984
8	Field trials started at at ECIBEV and Sotuba levels	June 1983	July 1984
9	Field trials evaluated	October 1983	Nov-Dec 1984
10	Cattle feeding program begins	November 1983	November 1984
11	Cattle feeding program is evaluated at the end of the feeding season	February 1984	July-Sept 1984

2nd Year

12	Second work plan and budget is submitted	February 1984	2nd JMC Meeting
13	Second work plan and budget is approved	February 1984	2nd JMC Meeting
14	Farmers selected to participate in second round of research trials	March 1984	November 1984
15	Selection is made of crops to be planted	March 1984	May 1984
16	Research trials established at Sotuba and on farmers' fields	June 1984	May-June 1985
17	Crop trials harvested and results evaluated	November 1984	Nov-Dec 1985
18	Cattle feeding program begins	November 1984	November 1985
19	Identification is made of crops and programs working well after two seasons	December 1984	January 1986

3rd Year

20	Evaluation of the research program	January 1985	Aug-Sept 1986
21	Return of non-viable research to Sotuba for further trials	January 1985	N/A
22	Third work plan and budget is submitted	February 1985	September 1985
23	Third work plan and budget is approved	February 1985	September 1985
24	Farmers are selected to participate in the third season research program	March 1985	November 1984

25	Research program begins and crops are planted	June 1985	July 1986
26	Crops are harvested and field results are evaluated	November 1985	Nov-Dec 1986
27	Cattle feeding program begins	November 1985	Not Executed
28	Cattle feeding program ends	February 1986	Not Executed
29	Research program and trial results are evaluated	February 1986	Aug-Sept 1986
30	Fourth work plan and budget is submitted	February 1986	October 1986
31	Fourth work plan and budget is approved	March 1986	November 1986
32	New farmers are selected to participate in the research program	April 1986	Not Executed
33	Research program begins and crops are planted	June 1986	Not Executed
34	Crops are harvested and trial results are evaluated	October 1986	Not Executed
35	Cattle feeding program begins	November 1986	Cancelled
36	Cattle feeding program ends and results are evaluated	February 1987	
37	Research program and trial results are evaluated	February 1987	
38	Fifth work plan and budget is submitted	March 1987	
39	Fifth work plan and budget is approved	March 1987	
40	New farmers are selected to participate in the research program	April 1987	

41	Research program begins and crops are planted	June 1987
42	Crops harvested and trial results are evaluated	October 1987
43	Cattle feeding program begins	November 1987
44	Cattle feeding program ends and results are evaluated	February 1988
45	Final evaluation of the research program and trial results	March 1988
46	Follow-on research phase begins	March 1988

4. Vaccine Production and Improvement of Diagnostic Skills (CVL)

Activity Number	Activity Description	Month Projected	Actual Month
1	Prepare detailed job descriptions for CVL technical assistance personnel	June 1982	October 1982
2	Receive preliminary drawings and specifications for the new laboratory and animal facility	June 1982	November 1983
3	Notify USDA of technical assistance needs and scheduling for arrival to start recruitment	July 1982	August 1983
4	Prepare specifications and bids for the final design of the CVL facilities	August 1982	February 1984
5	Prepare specifications and bids for renovation of the CVL Farm Facility and solicit bids locally	September 1982	March 1984
6	Order one passenger vehicle for the CVL	September 1982	January 1984
7	Determine the annual requirements for diagnostic reagents, equipment, and research equipment and place commodity orders	September 1982	February 1984
8	Let the design contract for the laboratory and animal holding facility	October 1982	April 1984
9	USDA recruitment of the laboratory diagnostician and parasitologist	October 1982	October 1983

10	USDA PASA technical assistance specialists arrive in Mali for two month TDY while final clearances are obtained	November 1982	Not Executed
11	Determine annual requirements for laboratory experimental animals and place the order	November 1982	March 1984
12	Order spare parts for the laboratory	November 1982	June 1984
13	Identify Masters candidates and technicians for United States training and start language training	November 1982	January 1984
14	End of TDYs and beginning of long term assignments for diagnostician and parasitologist	February 1983	February 1984 March 1984
15	Joint review of the overall livestock program design workshop	February 1983	February 1984
16	Prepare first annual and more detailed six month work plans	February 1983	February 1984
17	Recruit replacement microbiologist	March 1983	November 1983
18	Microbiologist arrives on two month TDY	March 1983	Not Executed
19	Send Masters candidates to United States universities and technicians to USDA laboratories	March 1983	June 1984
20	Solicit bids for CVL construction	April 1983	August 1984
21	Microbiologist finishes TDY and starts long-term assignment	June 1983	February 1984

22	Let construction contract for new laboratory	July 1983	December 1984
23	Original microbiologist finishes assignment	July 1983	July 1983
24	Submit second detailed six month work plans	August 1983	Not Executed
25	Order two field vehicles for CVL	September 1983	April 1984
26	Order major equipment for new laboratory and animal facilities	October 1983	April 1984
27	Determine the annual needs for experimental animals and place orders	November 1983	June 1984
28	Order spare parts for the laboratory	November 1983	November 1984
29	Determine candidates for Masters degrees and technicians for short-term training and start language training	November 1983	November 1984
30	Prepare second annual and more detailed six month work plans	February 1984	2nd JMC - annual work plans/budgets approved, 6 month budgets not programmed for accomplishment: October 1984
31	Finish construction on CVL farm facilities	February 1984	October 1985
32	Send Masters degree candidates to United States universities and technicians to USDA laboratories	March 1984	November 1984
33	Prepare fourth detailed six month work plans	August 1984	Not Executed
34	Determine annual requirements for diagnostic reagents and research equipment	September 1984	March 1985

35	Determine annual needs for experimental animals and place orders	November 1984	March 1985
36	Determine Masters degree candidates and technicians for short-term training and start language training	November 1984	March 1985
37	Start preparations for the major program evaluation	November 1984	February 1985
38	Prepare third annual and more detailed six month work plans	February 1985	3rd JMC - annual work plans and and budgets approved, 6 month work plans not programmed for accomplishment: May 1985
39	Send Masters degree candidates to United States universities and technicians to USDA laboratories	March 1985	March 1986
40	Major program evaluation begins	March 1985	July 1985
41	Major program evaluation is completed	May 1985	October 1985
42	Laboratory facilities are completed at CVL	July 1985	Not Yet Completed
43	Microbiologist finishes long-term assignment	July 1985	March 1987
44	Prepare sixth detailed six month work plans	August 1985	Not Executed
45	Determine annual requirements for diagnostic reagents and research equipment and place orders	September 1985	April 1986
46	Determine annual needs for experimental animals and place orders	November 1985	January 1986

47	Determine Masters degree candidates and technicians for short-term training, start language training	November 1985	January 1986
48	Microbiologist tour ends	February 1986	March 1987
49	Prepare fourth annual and more detailed six month work plans	February 1986	At 4th JMC - 6 month work plans not executed: December 1985
50	Send Masters degree candidates to United States universities and technicians to USDA laboratories	March 1986	Ongoing
51	Prepare eighth six month work plan	August 1986	Not Executed
52	Determine annual requirements for diagnostic reagents and research equipment and place orders	September 1986	Not Yet Executed
53	Determine annual needs for experimental animals and place orders	November 1986	Not Yet Executed
54	Determine Masters degree candidates and technicians for short-term training, start language training	November 1986	Not Yet Executed
55	Prepare fifth annual and more detailed six month work plans	February 1987	Annual work plans to be approved at JMC c/a March 1987
56	Send Masters degree candidates to United States universities and technicians to USDA laboratories	March 1987	Ongoing
57	Parasitologist and diagnostician finish their long-term assignments	July 1987	June 1986

5. Improvement of Veterinary Services Delivery System (DNE) Component

Activity Number	Activity Description	Month Projected	Actual Month
1	Prepare detailed job description for Animal Health Planning Specialist and forward to USDA	June 1982	Not Executed
2	Animal Health Planning Specialist arrives in Mali and assembles an overview of animal health situation	November 1982	Not Executed
3	Begin detailed survey of facilities, equipment, transport, and staff in the First and Second Regions and recommend which region to start in and how	January 1983	May 1984
4	Joint review of the overall livestock sector program	April 1983	Not Executed
5	Completion of six month work plan and detailed plan for improving the delivery system including objectives, timing, commodities, training, construction and technical assistance, if any.	July 1983	February 1984
6	Six month work plan and budget and plan for improving the delivery system are approved	July 1983	October 1984
7	Improvement Plan for the selected region is put into effect and commodities are ordered	July 1983	February 1984
8	Select Masters degree candidates and begin language training	September 1983	April 1984

9	Prepare second six month work plan	December 1983	September 1984
10	Second six month work plan is approved	January 1984	October 1984
11	Begin development of a training package for animal health programs	February 1984	Not Executed
12	Annual intensive review of the animal health programs	May 1984	Not Executed
13	Prepare third six month work plan	June 1984	September 1984
14	Third six month work plan is approved	June 1984	October 1984
15	Language training ends and students depart for the United States	June 1984	May 1985
16	Commodities are received	August 1984	March 1985
17	Select two candidates for Masters degree program and begin language training	September 1984	January 1985
18	Prepare fourth six month work plan and budget and develop an improvement plan for animal health delivery in the remaining region	December 1984	Not Executed
19	Fourth six month work plan and budget and improvement plan for the region are approved	January 1985	May 1985
20	Implementation of the second regional improvement plan is begun	January 1985	Not Executed
21	Begin to prepare for the major program evaluation	January 1985	May 1986

22	Major program evaluation begins	May 1985	August 1986
23	Language training ends and degree candidate leave for the United States	June 1985	December 1985
24	Major program evaluation ends	July 1985	October 1986
25	Results of the evaluation are reviewed; DNE work plan for the final two years of the project is approved; and fifth six month work plan is prepared and approved	July 1985	Not Executed
26	Sixth six month work plan is prepared	December 1985	January 1986
27	Sixth six month work plan is approved	January 1986	January 1986
28	Annual intensive program review is conducted, results are assessed, seventh six month work plan is prepared and approved	July 1986	Not Executed
29	Prepare eighth six month work plan and budget	December 1986	
30	Eighth six month work plan and budget is approved	January 1987	
31	Final intensive program review is conducted, possibly with outside consultants	April 1987	
32	Final intensive program review ends	June 1987	
33	Final work plan is prepared, reviewed and approved	July 1987	

APPENDIX C

LIST OF PERSONS CONTACTED

Ministry of Natural Resources and Livestock

Mr. Tiena Coulibaly, Technical Adviser
Mr. Yaya Fomba, Chief Administrative Officer of the Cabinet
His Excellency Dr. El Hadj Oumar Tall, Minister
Dr. Gagny Tiabo, Technical Adviser
Dr. Ferdnand Traore, Director of the Cabinet

ECIBEV

Mr. Phillip Anderson, Technical Assistant/Accountant
Mr. Cheik Abba Ciase, Division Chief for Credit
Mr. Nouhoum Ciase, Division Chief for Marketing
Dr. Abdramane Coulibaly, Deputy Director
Mr. Sambou Coulibaly, Chief Accountant
Mr. Yaranga Diarra, Field Agent, Boron
Mr. Kelefa Doumbia, Research Coordinator
Mr. Dembele, Field Agent, Bananba
Mr. Dicko, Field Agent, Nioro
Dr. Ousmane Guindo, Director General
Mr. Sidy Mohamed Kantago, Field Agent, Sirakorola

CVL

Mr. Zakaria Bocoum, Animal Section
Dr. Moussa Coulibaly, Veterinary Inspector, Epidemiology Sect
Dr. Oumar Diall, Veterinary Inspector, Protozoology Section
Dr. Alpha Diallo, Technical Assistant/Microbiologist
Mr. Souleymane Diallo, Virology Section
Dr. Aligui Djiteye, Biologist, Entomology Section
Mr. Chieck Fane, Head Cashier/Project Accounting Officer
Dr. Thomas Galvin, Technical Assistant/Parasitologist
Mr. Hamidou Kanoute, Maintenance Section
Dr. Baboucar Kouyate, Parasitology Section
Mrs. Traore Aminata Niara, Food Bacteriology Section
Mrs. Kone Oumou, Vaccine Quality Control Section
Dr. Boubacar Seck, Deputy Director and Division Chief for Diagnostics and Research
Dr. Simbe, Division Chief for Vaccine Production
Mr. Sambala Sissoko, Chief Accountant
Mr. Aboulaye Sow, Project Contract Botanist
Dr. Mody Toure, Director General

DNE

Mr. Djiriba Coulibaly, Chief of Veterinary Post, Koula
Dr. Habib Coulibaly, Head of Projects and Programs Division

Mr. Mahamadou Coulibaly, Section Chief, Bamako
Dr. Ali Amadou Diall, Regional Veterinary Director, Region II
Mr. Diall, Accountant
Dr. Amadou Diallo, Chief of Veterinary Sector, Koulikoro
Dr. Hawa Dolo, Projects and Programs Division
Dr. O. Kone, Regional Veterniary Director, Region I
Dr. Ouattara, Veterniary Sector Chief, Nara
Dr. Amadou Samba Sidibe, Sector Project Coordinator
Dr. Bassa Toure, Beterinary Sector Chief, Nioro
Mr. Mahamadoun Alassane Toure, Animal Production Division
Dr. Karamoko Wague, Head of the Animal Health Division

INRFZH

Dr. Birama Diakate, Director General
Mr. S. Dicko, Chief of Livestock Research Division
Mr. Cheick Oumar Diop, Head of Animal Science Research
Mr. Racine Ly, Agronomist/Director of Research Unit
Mr. Mamadou Ouattara, Deputy Director General

OMBEVI

Dr. Almouzar Maiga, Director General
Mr. Modibo Sangare, Deputy Director General
Mr. Brehima Sangare, Division Chief/Training

OHV

Mr. Mamadou Sall, Livestock Section Chief

ORS

Mr. Moctar Diallo, Director General
Mr. Doumbia, Chief of Livestock Service
Mr. Toure, Deputy Director General

BNDA

Mr. Dianka, Chief of the Young Graduate Livestock Program

PRODESO

Dr. Al Hassan Toure, Director General

ILCA

Mr. Paul Bartholomew, Agronomist
Mr. Adama Tall, Adinistrative Director

AID/Washington

Ms. Ann Burgett
Ms. Claudia Cantell
Mr. Robert Shoemaker

USAID/Bamako

Mr. Eugene Chiavaroli, Mission Director
Dr. James Elliot, Program Economist
Mr. Zach Hahn, Project Design and Evaluation Officer
Mr. Michael Ireland, Management Officer
Mr. James Jackson, Agricultural Development Officer
Mr. George Jenkins, Mission Controller
Mr. Malafyn Keita, Assistant Training Officer
Mr. Richard Newberg, OHV Project Manager
Ms. Rebecca Niec, Livestock Project Manager
Dr. S.K. Reddy, Agronomist
Ms. Celeste Robertson, Assistant Program Officer
Mr. Moussa Sinaga, Agricultural Development Officer
Dr. Roger Simmons, Program Officer
Dr. Emmy Simmons, Agricultural Economist
Ms. Sherry Suggs, Training Officer
Dr. Wilbur Thomas, Deputy Mission Director

MDST

Mr. Baboukarba
Dr. Richard Cook, Director of Operations designate
Dr. Pierre Chaloux, Former Director of Operations
Mr. William Chevalier, Technical Assistant/Maintenance Specialist
Mr. Erebweren Djibo, Assistant Director of Finance
Mr. Richard Provonost, Director of Finance
Mr. A. Toure,

DPMC

Ms. Pierrette Countryman
Mr. David Levine

Other Persons Contacted

Dr. Ousmane Ba, Director General, SAPROSA, Bamako
Mr. Joan E. Clemenceau, Assistant Representative, UNDP, Mali
Mr. Michael Furst, Resident Representative, World Bank/Mali
Mr. Mama Garda Tapo, World Bank/Mali
Mr. Roger Goudiard, Caisse Centrale de Coopération Economique, Bamako
Mr. Christian J. Lapointe, First Secretary and Consul, Canadian Embassy, Bamako

APPENDIX D

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