

2150 4201

PV-AP6-161

AGENCY FOR INTERNATIONAL DEVELOPMENT  <b>PROJECT PAPER FACESHEET</b>		1. TRANSACTION CODE <input type="checkbox"/> A ADD <input checked="" type="checkbox"/> C CHANGE <input type="checkbox"/> D DELETE	PP  2. DOCUMENT CODE 3
3. COUNTRY ENTITY MALI		4. DOCUMENT REVISION NUMBER <input type="checkbox"/>	
5. PROJECT NUMBER (7 digits) <input type="text" value="688-0215"/>	6. BUREAU/OFFICE A. SYMBOL AFR	7. PROJECT TITLE (Maximum 40 characters) <input type="text" value="First Region Pilot Development"/>	
8. ESTIMATED FY OF PROJECT COMPLETION FY <input type="text" value="8"/> <input type="text" value="2"/>		9. ESTIMATED DATE OF OBLIGATION A. INITIAL FY <input type="text" value="7"/> <input type="text" value="9"/> B. QUARTER <input type="text" value="3"/> C. FINAL FY <input type="text" value="8"/> <input type="text" value="1"/> (Ents. 1, 2, J or 4)	

10. ESTIMATED COSTS (\$000 OR EQUIVALENT \$)						
A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FY	C. L. C.	D. TOTAL	E. FX	F. L. C.	G. TOTAL
AID APPROPRIATED TOTAL	749	418	1,167	2,000	510	2,510
GRANT	749	418	1,167	2,000	510	2,510
LOAN						
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY		68	68		204	204
OTHER DONOR(S)	749	486	1,235			
TOTALS			1,235	2,000	714	2,714

11. PROPOSED BUDGET APPROPRIATED FUNDS (\$000)									
A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY <u>79</u>		H. 2ND FY <u>80</u>		K. 3RD FY <u>81</u>	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) SH	291	230		1,167		1,064		279	
(2)									
(3)									
(4)									
TOTALS									

A. APPROPRIATION	N. 4TH FY		O. 5TH FY		LIFE OF PROJECT		12. IN-DEPTH EVALUATION SCHEDULED  <input type="text" value="0"/> <input type="text" value="1"/> <input type="text" value="8"/> <input type="text" value="2"/>
	D. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN	
(1) SH					2,510		
(2)							
(3)							
(4)							
TOTALS							

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 - NO  
 2 - YES

14. ORIGINATING OFFICE CLEARANCE		15. DATE DOCUMENT RECEIVED IN AID/W OR FOR AID/W DOCUMENTS. DATE OF DISTRIBUTION	
SIGNATURE		<input type="text" value="0"/> <input type="text" value="3"/> <input type="text" value="2"/> <input type="text" value="4"/> <input type="text" value="7"/> <input type="text" value="9"/>	
TITLE			
Acting Mission Director		DATE SIGNED	

AGENCY FOR INTERNATIONAL DEVELOPMENT  
**PROJECT IDENTIFICATION DOCUMENT FACESHEET**  
 TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE  
 C    A = ADD  
                                   C = CHANGE  
                                   D = DELETE

PID  
 2. DOCUMENT CODE  
 1

3. COUNTRY/ENTITY  
 MALI

4. DOCUMENT REVISION NUMBER  
 1

5. PROJECT NUMBER (7 DIGITS)  
 688-0215

6. BUREAU/OFFICE  
 A. SYMBOL    B. CODE  
 AFR          6

7. PROJECT TITLE (MAXIMUM 40 CHARACTERS)  
 First Region Pilot Development

8. PROPOSED NEXT DOCUMENT  
 A.  2 = PRP    B. DATE    MM    YY  
        3 = PP            03    79

10. ESTIMATED COSTS (\$000 OR EQUIVALENT, \$1 = )

FUNDING SOURCE		465.89
A. AID APPROPRIATED		2,510
B. OTHER U.S.	1.	
	2.	
C. HOST COUNTRY		204
D. OTHER DONOR(S)		2,714
TOTAL		

9. ESTIMATED FY OF AUTHORIZATION/OBLIGATION  
 a. INITIAL FY 79    b. FINAL FY 81

11. PROPOSED GUDGET AID APPROPRIATED FUNDS (\$000)

A. APPRO- PRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. FIRST FY		LIFE OF PROJECT	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	H. GRANT	I. LOAN
(1)	SH	291	230	1,167		2,510	
(2)							
(3)							
(4)							
TOTAL				1,167		2,510	

12. SECOND/RY TECHNICAL CODES (maximum six codes of three positions each)  
 540

13. SPECIAL CONCERNS CODES (MAXIMUM SIX CODES OF FOUR POSITIONS EACH)  
 BR

14. SECONDARY PURPOSE CODE  
 222

15. PROJECT GOAL (MAXIMUM 240 CHARACTERS)  
 To raise incomes and improve the quality of life of small farmers in the northern and southern project areas of the First Region.

16. PROJECT PURPOSE (MAXIMUM 480 CHARACTERS)  
 To prepare a comprehensive development strategy for the Region by collecting baseline data and testing pilot development activities in selected villages.

17. PLANNING RESOURCE REQUIREMENTS (staff/funds)  
 REDSO/WA 12 weeks (Design Officer, Ag. Economist, hydro-engineer)  
 PMR (\$9,600) 3 PM (Two agronomists, Coordinator); USAID/Mali 1 PM Staff.

18. ORIGINATING OFFICE CLEARANCE  
 Signature: \_\_\_\_\_  
 Title: Acting Mission Director  
 Date Signed: MM DD YY  
 03 24 79

19. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION  
 MM DD YY

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## ABBREVIATIONS USED IN THIS PROJECT

CAA	.....	Agriculture Apprenticeship Center
DNAFLA	.....	National Directorate of Functional Literacy and Applied Linguistics
ECIBEV	.....	Office for Credit and Investment in Livestock and Meat Sector
FAC	.....	Aid Funds and Cooperation (France)
GENIE RURAL	.....	Rural Engineering Department, Ministry of Rural Development
GRM	.....	Government of the Republic of Mali
ICRISAT	.....	International Crops Research Institute for the Semi-Arid Tropics
IER	.....	Institute of Rural Economy
IOTA	.....	Eye Care Institute in Bamako (part of OCCGE)
MOH	.....	Ministry of Health
MRD	.....	Ministry of Rural Development
MTPW	.....	Ministry of Transport and Public Works
OACV	.....	The Groundnuts and Cereal Crops Operation
OCP	.....	Onchocerciasis Control Program
OMVS	.....	Multistate Senegal River Basin Development Organization
OPAM	.....	Government Marketing Agency for Agricultural Products
OPI-OVSTM	.....	Irrigated Perimeter Operation - Senegal - Terekole - Magui Valley Operation
SAFGRAD	.....	Semi-Arid Food Grain Research and Development Project 
SCAER	.....	Government Agency for Agricultural Credit and Rural Equipment
SEDES	.....	Government Agency for Economic Studies
SERVICE D'ELEVAGE	...	Animal Husbandry Department (part of MRD)
ZAF	.....	Functional Literacy Zone.

## PART I -- SUMMARY AND RECOMMENDATIONS

### A. Grantee and Executing Agencies

The grantee will be the Government of the Republic of Mali, (GRM), represented by the Ministry of Rural Development (MRD). The primary executing agencies will be the Operation Arachide et Cultures Vivrieres, (OACV), a regional integrated rural development organization covering the southern part of the First Administrative Region of the country (the entire Cercle of Kenieba) and Operation Vallee du Senegal - Terekole - Magui (OVSTM), a limited regional agricultural development project covering the northern project area (Cercles of Kayes and Yelimane). Other participating Ministries include: Transport and Public Works (MTPW), Health (MOH), and Education (MOE).

### B. Recommendation

It is recommended that the sum of \$2.545 million life of project costs be authorized during FY 1979 for a grant to the Government of the Republic of Mali for the three-year First Region Pilot Development Project. The pilot project is designed to increase crops and livestock production and improve the income and quality of life of the rural poor of the Region while collecting data and gaining experience for the design of the First Region Integrated Development project.

It is further recommended that: a source origin waiver for Geographic Code 935 be granted to permit the purchase of two 4-wheel drive vehicles, motorcycles (49-175 cc), and construction supplies, the total of which will not exceed the U.S. dollar equivalent of \$237,000. Requests for waivers are detailed in the procurement package found in the Annex.

### C. Summary Description of the Project

The goal of the project is to raise incomes and improve the quality of life of small farmers in the northern and southern project areas of the First Region. The purpose is to prepare a comprehensive development strategy for a long-term, integrated rural development project for the Region by collecting baseline data and testing pilot development activities in selected villages.

Reliable data to justify a long-range program are not available today. Moreover, the Mission believes that data collection alone would provide an insufficient experience base for designing the larger follow-on project. Hence, design of the long-term program will follow an evolutionary approach that combines data gathering with certain pilot activities intended to improve the agricultural production of selected inhabitants of the Region. These activities will be patterned upon those in successful on-going projects elsewhere in Mali, tailored specifically to First Region conditions. Planned, implemented and closely monitored in villages representative of the Region, they will aim at (1) increasing crop and livestock production, (2) providing small farmer support systems (e.g., credit, marketing, feeder roads), (3) improving rural health conditions, (4) promoting functional literacy, (5) introducing low-cost rural technologies and (6) improving basic infrastructure.

The outputs may be summarized as:

1. A firm data base established from agro-socio-economic surveys, engineering feasibility studies, an assessment of human health needs and an alternative technology inventory.

2. A bank of tested, analyzed development interventions suitable for replication elsewhere in the Region. These will be derived from the pilot activities enumerated above.

3. A strengthened Malian capacity to design, implement and evaluate development programs in the First Region as a result of experience gained during this pilot project.

These outputs in the presence of a favorable outcome for the output-purpose assumptions should, under careful USAID and GRM guidance, establish a strong link to the project purpose and lead to its achievement. They should also lay the foundation for implementation of a successful, long-run rural development program in the First Region.

Inputs, which are more fully described in the implementation plan, include technical assistance in agronomy, agricultural economics, sociology, civil engineering, and public health. Project funds will be

provided to (a) collect data; (b) support agricultural and livestock activities; (c) supply small farmer credit; (d) distribute medicine and drugs for sale; (e) purchase commodities and defray printing costs for literacy centers and support the training of literacy teachers; (f) construct small-scale infrastructure projects; and (g) introduce appropriate (village level) technology. Funds will also be used to increase the mobility of extension workers in the field. Training, provided to a large degree by the U.S. technical teams, will include limited U.S. and third-country training as well.

#### D. Summary Findings

The First Region Development pilot project incorporates (i) a novel project design to establish the required data base, and (ii) a sound project development strategy in addressing a complex set of potentials and constraints to the development of Mali's First Region.

A series of surveys and studies, to be conducted and evaluated throughout the life of project, will provide the necessary justification for priority development activities in the First Region Integrated Development project. Keenly aware of the region's problems, the design team has recommended a series of pilot activities in agriculture, livestock, health, literacy, and rural infrastructure to address, in a systematic manner and on a manageable scale, certain issues of immediate concern to the full scale project's beneficiaries. The activities have been drawn largely from AID projects which have proven successful in other regions of Mali and are felt to be applicable for testing in the First Region.

The phased design approach to be employed in identifying and overcoming the Region's constraints and the testing of small farmer technologies successfully introduced elsewhere in Mali are appropriate and feasible for the circumstances of this remote part of the country. The ultimate responsibility for the management of the project will lie with the First Region Pilot Development project committee. This inter-ministerial committee will comprise key representatives of the involved GRM agencies and will help assure cooperation and coordination in the implementation of the pilot project.

The project meets all applicable statutory criteria (Annex 13). A 611 certification is found in Annex 11 of this project paper.

## E. Project Issues

The design team encountered a number of problems as they worked out the approach to the proposed project. Starting from the premise that a project of limited duration and funding should be designed in order to initiate a longer term effort for development of the First Region, the team had to design a project that would offer reasonable expectations of success in a difficult and remote environment over a limited period within a reasonable cost. These factors had to be considered in arriving at each of the proposed activities and can only be briefly summarized here in a simplified manner.

1. Technical and sociological constraints. The First Region environment presents a number of constraints, none of which is unique to the region but all of which together make it one of the most difficult areas of Mali (and perhaps the Sahel) in which to undertake development activities. Foremost among the technical (or tangible) problems is human health. There is virtually no possibility of sustained development in the Kenieba area if onchocerciasis and schistosomiasis cannot be controlled. Although research has not yet produced fully proven methods, the Mission and GRM believe the approach outlined, which will apply technology and delivery methods already undertaken in other projects in Mali and the Sahel, have good chances for success in the First Region. The same can be said for the livestock, agricultural and functional literacy interventions proposed. In addition to the technical challenges are the sociological unknowns. The intended beneficiary groups are believed to be receptive to the introduction of new methods if the methods are adapted to the local situation. This project will apply technologies already available and tested elsewhere in Mali, and it will measure the degree of receptivity and results in the First Region. Mission experience leads us to believe these technologies will be accepted and will result in increased villager production and income. We have no guarantee they will be efficacious until tried in the project area, but close monitoring and objective evaluation of results will help ensure their successful application.

2. Logistical difficulties. The Mission has experienced continuous logistical difficulties in support of its limited crop production projects in the Fifth and Sixth Regions and with rural works and health projects in the First and Fourth Regions. Experience thus far with the rural health advisory team in Yelimane (northern part of First Region) has shown that logistical support is a major factor in getting a project underway in this Region. Communications, transportation and housing present formidable obstacles. Nevertheless the Mission believes it has the experience and organization to support the advisors. A Mission radio communications net is scheduled for installation in late 1979 and vehicle and housing support for technical personnel are proposed in the project. (A direct hire project manager is scheduled to be at post before the project agreement is signed. He will live in the First Region, be in constant touch with the project, and at the same time be in communication with Bamako to facilitate the necessary project support.) The project design has been limited in scope so as to keep

the number of personnel and their support within manageable levels.

3. Project Length and Cost. The three year life of project is the minimum necessary to test the technologies and methods proposed. This allows for no slippage in recruitment and arrival of technical personnel or commodities. The cost is a function of the length of the project and unforeseen delays will result in increased costs. The time schedule is manageable, however, within GRM, USAID and AID/W capabilities. Although design and cost of a follow-on integrated area development program cannot be projected at this time, it is clear that an integrated development program which exploits the potential of the Region and results in benefits for a significant number of its habitants will require a major long term investment from external resources. There is no implied commitment by A.I.D. to make such an investment, either by itself or in concert with other donors, but it should be recognized that there will be no long term developmental return on the \$2.5 million investment proposed in this project unless A.I.D. and other donors are prepared to make the follow-on investments to be indicated by this project.

## PART II. A. - PROJECT BACKGROUND AND DESCRIPTION

### A. Background

Mali has a population of some 6.3 million (December 1976 census), believed to be growing at an annual rate of 2.5%. Agriculture, which accounts for almost half of the country's GNP and nearly all of its foreign exchange earnings, is the source of income for approximately 90% of the population. Except for the Niger River delta and to a lesser extent the Senegal River valley, where irrigation is possible, the development of Mali's agricultural potential is hampered by inadequate and erratic rainfall. Farmer land holdings are small, the level of technology poor and agricultural productivity low. Periodic droughts and the difficulty in receiving and distributing emergency food relief have dramatized the GRM's need to accelerate rural development and achieve food self-sufficiency.

In an effort to increase agricultural production, the GRM has divided the country into eleven rural zones and established a number of financially autonomous management units known as "Operations" or "Actions". "Operations" are now recognized as the vehicle for introduction of integrated rural development. Their success in reaching the small farm family is widely accepted, and AID is working with a number of operations throughout the country.

### B. Mali's First Region

Situated in the extreme western part of the country, the First Region, representing 128,000 square miles, is Mali's second largest. In spite of its relative proximity to the capital, much of the region remains isolated due to its inaccessibility throughout much of the year - heavy rainfall making the already poor road network impassable. In spite of its potential for increased food production, the Region's remoteness relegated it to low development priority until the last several years.

The Region includes the Sahelian zone in the north, the Sudanian zone around Kayes and the high rainfall pre-Guinean zone in the south. Annual rainfall varies from 400-600 mm in the north to almost 1,400 mm in the south. Water resources in the Region include the Senegal River and the Kolimbine and Terekole Rivers which form the network of lakes known as Lake Magui. Management of these water resources is essential to maximize agricultural production and will be an important focus of the project.

### C. Development History

Three projects were included in the GRM's Five Year Plan (1974-1978) for the development of the First Region. Emphasis was logically placed upon the exploitation of the substantial water resources of the lake zones, and the GRM established Senegal-Terekole-Magui Operation in 1975 to assist farmers in realizing this potential. However, personnel and financial resources have been inadequate and the area as a whole has not received the integrated effort necessary to effect an improvement in the quality of life of the area's inhabitants. The First Region's importance in achieving food self-sufficiency is nevertheless clearly recognized by the GRM and other donors.

### D. Other Donor Activities

There is growing interest on the part of international donors to assist the GRM in developing the First Region. This project has been designed to capitalize on this interest and utilize the outputs of various studies and activities now under way. Close coordination with these donors will assure maximum project impact with minimal overlap. Significant other donor support includes the following:

1. World Bank assistance for a second phase of the O.A.C.V. project which will include limited development activities in the Kenieba area.

2. The French (FAC) financial and technical assistance to the O.V.S.T.M. in the study and construction of new irrigated perimeters along the Senegal River (the FAC, with the UNDP, is also financing a study of uranium deposits in Kenieba and an improvement of parts of the Kayes-Kenieba road).

3. The Canadian financed integrated development project Operation Mil-Kaarta in the north-eastern portion of the region. Livestock production, health activities, education, and village water systems are planned in the project, in addition to the millet production activities now on-going. Canadian financial assistance totals almost \$27,000,000.

4. The Federal Republic of Germany contract for a three-year study of the Lake Magui-Terekole-Kolimbine valleys which will include construction plans for three small dams for irrigated perimeters and an assessment of schistosomiasis within the immediate area.

5. The Saudi Arabians' \$15,000,000 agreement for a pastoral/livestock development project part of which will be in the area north of Kayes.

6. The OMVS aerial mapping and road studies in the Kayes and Yelimane Cercles and efforts to arrange financial support for the Manantali dam project.

AID financial and technical assistance already in place or planned in the near future consists of: (i) Support to the CAA (Agricultural Officers' Training Center) at Same, (ii) two irrigated perimeters in the Kayes areas; (iii) a rural health services development project in Yelimane; (iv) feasibility study and interest in joint financing of the Kayes-Niforo road reconstruction; and (v) an OMVS experimental station near Same.

#### E. Project Evolution/Development

In 1976, a PRP was prepared whose purpose was to improve the production, income, and quality of life of the rural poor through an integrated rural development project in the Kenieba area of the First Region. Its principal activities included agricultural production, along with livestock, health, and rural roads components. The subject PRP was reviewed by a Project Committee and disapproved for FY 78 funding due to the lack of an acceptable analytical basis for proceeding to PP design. Recognizing, however, the needs and potential within the First Region, AID/W and USAID/Bamako agreed to a new initiative involving an evolutionary approach - placing technical experts in the field to carry out studies and pilot activities leading to a future integrated rural development project. The new PID was approved.

At the same time, a separate PID dealing with the Lake Magui area was recognized by the Mission and AID/W to be based on insufficient information and hence was only approved on the basis that both the Kenieba and Lake Magui activities would be dealt with by the same evolutionary approach and be combined into one project.

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Project Design Team

Lance H. Jepson	USAID	Project Officer, AGR.
David Delgado	USAID	Project Manager, AGR.
Tom Kellerman	REDSO/WA	Design Officer
Jerry Cashion	USAID	Social Analysis
Tom Park	USAID	Health
Jon Anderson	USAID	Appropriate Technology
Myron Smith	USAID	Livestock
Stan Willis	USAID	Livestock
Randy Casidy	USAID	Program
Boubacar Dacu	USAID	Program
Trid Mukerjee	REDSO/WA	Economics
Lee Hall	USAID	Economics
Bill Gill	REDSO/WA	Procurement
Lyle Weiss	REDSO/WA	Engineering
George Thompson	USAID	Engineering
Gordon Sinclair	Contractor	Agronomy
Assafa Woldeyes	Contractor	Agronomy
Roxana de Sole	Contractor	Administration
Alex Newton	USAID	Economics
Abdoul Diallo	USAID	Functional Literacy
Jerry Johnson	SAFGRAD	Agriculture
Phil Serafini	ICRISAT	Agriculture
Moktar Diakite	USAID	Procurement

PART IIB. DETAILED PROJECT DESCRIPTION

The purpose of the First Region Pilot Development project is to develop a comprehensive integrated development program for the Region through gathering data and developing project experience with pilot production activities. To do so, the project designers have identified two areas which are representative of the Region as a whole in which to focus initial pilot project activities - Sitakili in the north and Yenieba in the south.

Pilot project activities will be initiated at farm centers to be established in these two areas. These centers will serve as headquarters for the technical assistance team and their counterparts, as well as become the focal point for the development or testing of technologies in livestock, agriculture, and appropriate technology. These centers will have classrooms for farmer training programs, animal health facilities to support livestock activities, and research/demonstration fields for crop experimentation. The establishment of these multi-purpose farm centers is a significant and integral part of the overall strategy for the First Region Pilot Development project.

All project activities to be implemented and studies to be conducted in both of the sites are closely time coordinated to provide a sound decision base for incorporation into the larger project. The summary descriptions in this section highlight purposes and activities planned for each of six components: 1) Livestock, 2) Agriculture, 3) Health, 4) Rural Engineering, 5) Appropriate Technology, and 6) Functional Literacy.

Livestock

The livestock component will: (A) introduce sound technologies to improve livestock productivity and to increase selected farmers' income from livestock. Activities planned will (1) Increase the number of trained, well-conditioned work oxen in order to increase labor effectiveness and increase hectareage under cultivation. Farmers will be taught proper care, feeding and training methods at the two farm centers to be established. A corollary activity at the centers will be the introduction of cultivated forage in order to assure an adequate, year-round feed supply for these animals. The introduction of supplemental feeding will preclude weight and strength loss associated with dry season forage, thus maintaining the condition of the animals for work as soon as the rains begin. Early land preparation will reduce some of the risks faced by farmers should the rainy season end early. (2) Increase farmers' income through cattle fattening programs. The successful Emboucne Paysanne program, initiated under the Mali Livestock I project, will be replicated in villages near the two farm centers. ECIBEV, the institution providing credit and technical assistance to the Livestock I project, will likewise implement the program within the project areas covered by OACV and OVSTM. ECIBEV assistance includes (i) training in the selection of suitable feeder cattle, (ii) credit for the purchase of cattle and supplemental feeds and minerals, (iii) technical assistance in management of the feeding program, and (iv) marketing support at the end of the ninety-day period.

(B) Initiate a series of tests in order to develop technological innovations for improved cattle management.

Two tests will include:

- 1) the introduction of Zebu cattle into feeding programs at the farm center in the tse-tse belt to ascertain the performance levels and cost effectiveness of chemotherapy for trypanosomiasis;
- 2) timing the breeding of cows to coincide with the onset of rainy season when lush pasture is available. The study will attempt to determine the effect of this timing on fecundity, calf mortality, etc.

ACR

C) Improve the animal health delivery system in support of the above interventions.

1) In the First Region, it has proven extremely difficult to provide adequate animal health services to cattle owners.

2) To address this problem, the farm centers will include modest facilities to improve the GRM's Service d'Elevage's capacity to extend such care. These facilities will include animal holding (quarantine) areas, and storage space for supplies and vaccines. Limited vehicular support is budgeted in order to increase the mobility of the Service d'Elevage's veterinarian nurses.

The activities planned under the Livestock component will be supervised and directed by the full-time livestock advisor to be assigned to the project. This advisor will have counterparts from ECIREV and the Service d'Elevage.

Agriculture



The Agriculture component includes:

A) On-station and on-farm testing of :

1) varieties of corn and millet which have genetic improvements which seem promising for use in flood recession farming systems.

2) fertilizer requirements for typical soils. Crop rotation plans and the use of organic fertilizers will receive priority attention as a means of providing nutrients found to be lacking in the soil.

3) animal traction devices that are economically justifiable and socially acceptable.

B) Development of new technologies such as a forage crop plan to provide a year-round feed supply for work animals and other technologies needed as a result of agricultural surveys to be conducted.

C) Extension of agricultural technology. As mentioned above, the farm centers will be the central location of trials and demonstrations, but work will also be done on farmers' fields in nearby villages. As packages of new technology are developed, the classroom/meeting hall

Ag. Training  
- 1 -  
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will be the site of farmer training programs.

D) Provision of agricultural credit to finance the inputs recommended by the farm center's research.

A total of fifty thousand dollars will be made available for production credit in the immediate project areas so that farmers can readily adopt the technologies developed at the farm centers.

The farm centers will be the headquarters of one full-time agronomist and his counterparts. In the third year the agronomist will remain in country in order to assist his counterparts with the third crop season, as well as to prepare the agricultural analysis for the First Region Integrated Development Project Paper. The Mission agricultural economist and <sup>limited</sup> TDY assistance will support the work of the agronomist in designing and assisting with the implementation of the agro-economic surveys.

In summary, studies and surveys will be conducted to identify technological gaps. A program of activities will be developed to fill these gaps in order to arrive at an economically sound agricultural strategy which the GRM can use to capitalize on the Region's potential.

Health 

The Health component of the project will concentrate on five broad areas. These consist of:

(1) An assessment of human health conditions. At present, insufficient data exist upon which to develop an unified "plan of attack". Thus, the nature and extent of health problems and their effect upon human productivity will be addressed through surveys to be conducted by Ministry of Health personnel. Training will be given surveyors and coordination with existing work in the health sector (notably the AID-financed work in the Cercle of Yelimane and the German financed health assessment) will provide the quantification needed to justify a more

extensive intervention in the First Region Integrated Development Project. Sample villages have been selected, since the size and difficulty in canvassing the entire Region would make such a study practically impossible.

(2) Treatment trials for onchocerciasis and schistosomiasis.

Treatment programs, rather than the control of the vector, are receiving growing attention. The treatment trials will endeavor to demonstrate that rural health personnel can be trained to diagnose, treat, and monitor a chemotherapy protocol for these two debilitating diseases.

(3) A drug distribution program. Inadequacies in the present system will be addressed. The provision of drugs at cost plus overhead will ensure that the system, once established, can operate without incurring additional costs. Drug control inventories will be strict and patterned after existing controls already adopted under the USAID Rural Health project.

(4) Health improvement activities. The focus of this activity will be the lessening of morbidity through preventive measures. Thus, the MOH personnel assigned to the project will be trained in improving village sanitation methods, low-cost measures for making water safe for drinking, and recognizing and recommending action to remove disease vectors. Training at Bamako's Eye Care Institute (I.G.T.A.) will also be provided to MOH personnel.

Rural Engineering

The engineering component of the pilot project will address (i) improving rural transportation and (ii) water resource development and management. An overall plan, recommending the necessary basic infrastructure, focusing on an improved road/storage network and water resource development, will be prepared for inclusion in the First Region Integrated Development plan.

Activities will:

(1) Carry out studies to determine rural road networks. The studies will include present and projected surplus production areas, location and capacity of storage facilities, and population served. Additionally, feasibility studies will be conducted, and a work plan for roads will be developed specifying estimated time schedule for work on each road segment, design, method of execution, cost estimates, road classifications, and provision for maintenance.

(2) Catalogue water resource development sites. This survey will indicate location, area covered, soil characteristics, production potential, and operational considerations in developing a priority rating based on economic justifications.

(3) Construct and evaluate water resources prototypes. Prototypes to be financed may include small diversionary dams, stock ponds, or bunds.

(4) Construct or renovate facilities at the two farm centers. Office space, training/meeting halls, storage space, and animal holding areas will be constructed under the project. Plans for these buildings have been cost-estimated, and final plans will be reviewed by the USAID or REDSO engineers prior to construction.

An agricultural engineer specialized in rural infrastructure will be assigned to the project for two years. Counterparts from the Ministry of Public Works will assist in the collection of data and construction of the proposed facilities. Peace Corps volunteers will be recruited to assist in the supervision and evaluation of prototypes to be developed.

### Appropriate Technology

Appropriate technology study and development has been incorporated into the project to inventory the existing level of technology specifically as it relates to (i) food processing and preparation, (ii) food production, (iii) sanitation, and (iv) village-level water resources. Upon completion of the technology assessment, a literature search will be done in order to identify existing, successful, low-cost technology which might address the needs of the population. The procurement or development of suitable implements will be initiated in order to test, both in villages and at the farm centers, those devices which have the most promise. Short-term technical assistance will be funded under the project, and Peace Corps volunteers (one for each project site) will be recruited to assist in the assessment and pilot testing phase.

### Functional Literacy

Functional literacy programs will be established in order to enhance the receptivity of the villagers to the project activities recommended during the pilot phase of the project, while providing low-cost non-formal education in project area villages. Utilizing the National Direction for Functional Literacy (DNAFLA) personnel, selection of villages, teacher training, and curricula development will be started in both project sites. Inputs into the curricula will be made by the technical assistance team. No outside technical assistance is required or programmed for this activity.

## INVOLVEMENT OF WOMEN

The active participation of women in integrated development schemes is necessary. This project has been designed to allow for maximum involvement of women in each of its activities.

- A. Functional Literacy: Women of all ages have access to functional literacy classes. Past experience in Mali shows that women do take advantage of the possibilities that exist and benefit from such courses. DNAFLA, the executing agency for this component will continue to involve women as they expand their operations in the project zones.
- B. Appropriate Technology: The A.T. activities are centered around food and water technologies. Food preparation and processing and water procurement for family use are for the most part, if not totally, the responsibility of women. Thus, this activity will directly affect some of the most arduous tasks that women encounter and provide them with time and energy to be directed towards activities, economic or social, that they see as priorities.

In addition, women's advice and participation will be actively sought in identifying priority tasks for the A.T. research and development, and their suggestions will be given full consideration.

- C. Health: In as much as women are the hub of family life, they can also have the greatest effect on family health. Training and education programs will include women. In addition, the medical surveys will take a special interest in pregnant and lactating women's diets to determine their nutritional status. Women will have equal access to all preventive and curative interventions.
- D. Rural Engineering, Livestock, Agriculture: All these activities will benefit women. The Design Team's concept of small farmer includes women. Women will have equal access to agricultural credit. Activities will increase families' disposable income. Labor-saving devices will be introduced which will diminish such women-oriented tasks as weeding. Women's needs and activities will be included in the data-collection and survey phase, and a component for interventions will be developed for the future IRD project.

PART III A. SUMMARY OF TECHNICAL ANALYSES

LIVESTOCK

Detailed technical reports on each proposed component of the project are found in the Annexes. This section highlights the principal findings and recommendations of the design team personnel.

1. LIVESTOCK

Mali is and will continue to be a surplus producer of meat. The present West African meat deficit is 600,000 tons and is projected to increase to 740,000 tons by 1985. Sahelian countries have freight advantages and political preference in dealing with the coastal markets. The First Region is an unusually advantageous position to export cattle to the Dakar market.

The First Region, with more than 600,000 head, produces about 13% of the cattle in Mali. While there should be 60,000 - 72,000 head available for market annually, exports to Senegal are only about 5,000 head a year. Even though a 1978 SEDES study indicated that Senegal will in the future depend primarily upon exports from Mali, this advantageous market position of the First Region has not been developed in an organized, efficient manner.

Organization of the marketing system and improvements in herd management could lead to a dramatic increase in Malian export of cattle to Senegal.

POTENTIAL FOR THE REGION

1. The First Region's proximity to Senegal and the under-utilized Bamako-Kayes-Dakar rail line gives it a competitive edge in exports to Senegal.
2. There are large numbers of male cattle of feeder-grade quality available. Finish-feeding programs have been successfully tested in Mali, and these animals are prime specimens for fattening and export.
3. There is an enormous potential for increased cereal production. Surplus grains have already been used for cattle feeding in the area,

and this practice can be expanded.

4. The resources from flood plains of the Lake Magui area can be exploited to increase both livestock and agricultural production.

#### CONSTRAINTS ON PRODUCTION

1. Trypanosomiasis is a threat to animal health in the potentially highly productive southern area of the Region. Chemotherapy tests in Mali are, however, very encouraging.
2. Inadequate nutrition during the dry season, for lactating cows, calves, and the few draft oxen there are, is a critical constraint to increases in both livestock and agricultural productivity.
3. Herd off-take and reproductive rates are lower than what they might be.
4. Present market structures limit the herders' incentive to increase off-take or supplement feed sources.
5. Veterinary extension services are presently inadequate for the herders' needs.

#### RECOMMENDED INTERVENTIONS

The activities proposed have as objectives (i) increasing the supply of milk for family consumption or sale; (ii) increasing the number of draft oxen in the Region; and (iii) fattening and selling feeder-grade cattle.

1. Introduction of finish-feeder activities, patterned upon the AID-financed Embouche Paysanne program, to capitalize on the nearby Senegalese market. Under this activity, farmers are provided with credit and technical assistance for the fattening of cattle over a 90-day period. Modest financial assistance for recurrent costs during the first year or so of the project is included. Credit for the purchase of cattle will be provided by ECIBEV and will carry an interest rate of 12% p.a. It is strongly recommended that ECIBEV introduce an interest and loan service fee to defray recurrent costs.
2. Testing of feeder-grade Zebu cattle for Trypanosomiasis tolerance under chemotherapy.

3. Initiation of a program, in conjunction with the project team agronomist, to provide year-round feed for cattle. The objective of this program will be to explore the potentials of a number of cultivated feeds socially and environmentally appropriate to the climatic zones.
4. Initiation of a cow/calf development study including: (i) techniques to increase fecundity, (ii) lactation levels under different management practices, and (iii) survival rate of calves.
5. Improvements in Animal Health extension activities. Support to the activity would include (i) holding corrals, squeeze chutes, scales, etc. at each of the project's farm centers, (ii) veterinary headquarters and vaccine storage facilities at these centers, and (iii) mobylettes for animal health extension agents.

PART IIIA.

2. AGRICULTURE

The PP team found that in the First Region there is a great deal of arable land under rainfed conditions and large, fertile, flood plains which can be easily brought under improved cultivation. Existing water resources can be economically exploited to increase the irrigable land, and the small farmer population is eager to improve its standard of living through increased agricultural productivity.

Constraints identified by the team included: (i) a poor transportation network, (ii) inability of extension services to reach the small farmers, (iii) a lack of viable technologies to extend, (iv) lack of credit for agricultural production, (v) health problems which limit labor productivity, (vi) pricing disincentives, and (vii) frequent crop losses.

Proposed interventions will take place at two farm centers in areas representative of the Region as a whole. These centers will serve primarily as agricultural research and demonstration areas, but both will be equipped with facilities for livestock production tests and animal health services as well. Animal traction use and the training of oxen will also be conducted at the centers. The introduction of cultivated forage demonstrations will be an integral part of each center's research and extension. Variety trials and extension activities will be conducted both at the centers and in farmers' fields and will be supported by the GRM's Institut d'Economie Rural through the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the Semi-Arid Food Grain Research and Development Organization SAFGRAD).

Constraints

1. Poor Transportation Network
2. Lack of effective Extension service
3. Lack of viable Technology
4. Lack of credit for Agric Production
5. Health problems which limit labor productivity
6. Pricing disincentives
7. Frequent crop losses.

PART III A.

3. HEALTH

The people of the First Region suffer from an enormous disease burden. What little unreliable data there are point to life expectancies under forty years of age, one of the highest mortality rates in the world, and an "under 5" mortality rate that reaches 50%. In this Region, health conditions are primarily responsible for the abandoning of large areas of arable land, decreasing individual productivity and causing a high dependency ratio. Accordingly, an Integrated Rural Development project in the region must address the human health issue in order to succeed.

Existing conditions which prevent the GRM's Ministry of Health from providing health services in the First Region are, (i) lack of baseline data, (ii) lack of sufficient physical infrastructure and personnel, (iii) inadequate health training programs, (iv) limited planning/management expertise, and (v) lack of an adequate medication distribution program. In addition, the specific problem of onchocerciasis is present in areas of the Region.

The health component of this project will address these constraints through a program of (i) in-depth analysis and data gathering, (ii) treatment trials for onchocerciasis and schistosomiasis, (iii) a drug distribution program, (iv) appropriate health improvement activities including health education and training, and (v) limited improvements in the health infrastructure.

Health activities will generate information during the pilot phase of the project which will contribute to the development of a sound health delivery strategy to be incorporated into the First Region Integrated Development Project.

PART III A.

4. RURAL ENGINEERING

The rural engineering component of the project has as its objective the development of an overall Engineering Plan for the First Region while especially concentrating on improvement of (i) the regional transportation/storage network and (ii) water management systems. To evaluate the technical feasibility and to prepare economic justifications for this infrastructure, it is necessary to survey the area and collect data, prepare studies, and test prototypes. The result of these efforts will constitute a prioritized engineering plan for infrastructural support systems for an Integrated Rural Development Project for the Region. To implement these activities, one U.S. engineer will be fielded for 2 years. He will work with GRM counterparts and receive additional support from 2 Peace Corps Volunteers with engineering/construction experience, and will be able to call in short-term expert assistance as specific problems are identified.

Roads and Storage

A transportation analysis of the northern and southern project areas will generate data needed to determine the optimum infrastructure to support the Integrated Rural Development activities proposed during the pilot project. The study of existing (and projected) storage capacities (combined with the agricultural sector projections) will become an integral part of the proposed road/storage network. A linear equation transportation model will be used to determine the transportation system to be included in the First Region Integrated Development project.

Water Resources

The design team engineers recommend that the development of surface water run-off be given priority attention during the pilot project. It is felt that the impact of prototypes introduced to manage surface water (stock ponds, diversion dams, dikes) is both feasible and economical. The development of ground water sources will be investigated in terms of appropriate technology applications.

The development and testing of suitable prototypes is essential during the pilot project stage, not only to assure that the interventions will work, but to (i) gauge the level of community participation, (ii) evaluate the social and environmental impact, and (iii) determine realistic cost figures. Only after well-documented analysis would successful prototypes be replicable for the larger regional project.

### Construction

A total of five houses for the technical assistance team and offices, training rooms, storage areas, and cattle-holding facilities at each farm center will be constructed under the project.

PART III A.

5. APPROPRIATE TECHNOLOGY

Preliminary assessments in some areas of rural Mali seem to indicate that the impact of technological innovation has not been felt for hundreds of years. Methods of food production, (farming implements, etc.) food processing, (drying, smoking, grinding, threshing, etc.) food preparation, (open fires, etc.) and water development and utilization are still often of a low technological level.

The realization that this situation exists contrasts sharply with the knowledge that (1) suitable local raw materials are available, (2) some local expertise in the fabrication of devices is also present, and (3) a tremendous amount of work in appropriate technology has been done both in developed and developing countries, especially over the past twenty years.

This project component will address the low-level technological constraints by a program consisting of three phases. The first phase will be an in-depth study and inventory of the present technology in rural villages, especially as it relates to food and water problems. The second phase will consist of analysis of the phase 1 inventory and research including an appropriate technology literature search. This will provide a knowledge of appropriate prototypes already developed and tested in other countries which seem suitable for Mali and will also give guidelines for a Research and Development program to develop devices for the Malian situation. Finally, in the third phase, devices will be tested as the R and D program progresses.

Working with the "operations", this activity will strengthen GRM commitment and institutional ability to approach the rural population's technological problems and propose appropriate solutions. At the end of three years, successful appropriate technology devices will be alleviating some of the rural villagers' arduous tasks. In addition, a proposal for more comprehensive component for the larger Integrated Rural Development Project will be made.

III. B

FINANCIAL PLAN

The budget summary and back-up tables illustrate the proposed timing and funding levels for the life of the project. While the project was originally estimated to cost only two million dollars, it is impossible to provide the level of technical assistance and the requisite commodity support needed to achieve the project purpose during a three-year implementation period with this level of funding. All project funds for commodities as well as construction costs for the two farm centers and staff housing must be obligated during the first year. The arrival of the technical assistance team has been carefully planned to coincide with particular seasons or in order to conduct necessary pre-activity survey work. The FY 79 obligation of 1.167 million is considered the minimum funding level feasible given the scope of activities planned for the project.

Several positions have been designated as "local hire" (Sociology, animal traction, economics, rural technology, and administration) to be filled by graduate students or ex-Peace Corps Volunteers with needed skills who are residing in Mali. Their immediate availability, language skills, and familiarity with Mali will permit certain activities to begin immediately, as well as reduce the overall cost of the technical assistance required in the project.

## PART III B.

PROJECT BUDGET SUMMARY  
(,000)

	PM	Sub-Totals	OBLIGATIONS			LOP
			FY 79	FY 80	FY 81	
<b>I. <u>TECHNICAL ASSISTANCE</u></b>	<b><u>173</u></b>					
A. Livestock	30	250	100	125	25	
B. Agriculture	41	273	100	173	--	
C. Health	18	150	100	50	--	
D. Rural Engineering	30	250	100	125	25	
E. Appropriate Technology	6	30	15	15	--	
F. Sociology *	12	40	20	20	--	
G. Administrative Support *	36	<u>120</u>	<u>40</u>	<u>40</u>	<u>40</u>	
		<b>1,113</b>	<b>475</b>	<b>548</b>	<b>90</b>	
<b>II. <u>PARTICIPANT TRAINING</u></b>	<b><u>22</u></b>					
A. U.S.	12	25	--	25	--	
B. Third-Country	10	<u>21</u>	--	<u>21</u>	--	
		46		46		
<b>III. <u>COMMODITIES</u></b>		112	112	--	--	
A. 4-wheel drive vehicles (7 at \$16,000 w/spare parts)		112	112	--	--	
B. Motor bikes (5 motorcycles, 14 mobylettes)		14	14	--	--	
C. Other <u>1</u>		<u>308</u>	<u>59</u>	<u>195</u>	<u>54</u>	
		434	185	195	54	
<b>IV. <u>OTHER COSTS</u></b>						
A. Construction (2 farm centers at \$81,000 each) <u>2</u>		162	112	--	--	
Electricity and Plumbing <u>2</u>		41	41	--	--	
B. Operating Expenses, Maintenance		277	99	104	74	
C. Credit Fund		50	--	25	25	
D. Staff housing, plumbing & electricity		205	205	--	--	
E. In-Country training		7	--	7	--	
F. Evaluation		30	--	--	30	
		<b>772</b>	<b>507</b>	<b>136</b>	<b>129</b>	

PROJECT BUDGET SUMMARY - cont.

	Sub-Totals	<u>FY 79</u>	<u>FY 80</u>	<u>FY 81</u>	LOP
V. Sub-Total	2,365	1,167	925	273	
VI. CONTINGENCY/INFLATION (15%)	180	--	139	41	
VII. TOTAL	2,545	1,167	1,064	314	

\* See Budget Table 7  
 1/ See Individual Budget Tables  
 2/ See Budget Table 4

BUDG. TABLE 1  
L I V E S T O C K  
(\$ 000)

	\$	<u>FY 79</u>	<u>FY 80</u>	<u>FY 81</u>
<b>I. <u>TECHNICAL ASSISTANCE</u></b>				
A. Long-term - one Livestock Advisor (24 PM) at \$100,000 =	200,000			
B. Short-term (Range Management, Veterinary Res.) (6 PM) at \$100,000 =	<u>50,000</u>			
	250,000	100	125	25
<b>II. <u>TRAINING</u></b>				
3rd Country training (3 PM) -- \$6,000	= 6,000	--	6	--
<b>III. <u>COMMODITIES</u></b>				
A. Vehicles (one 4-wheel drive) at \$16,000	16,000			
B. Motorbikes (4 at \$1,000 ea.)	4,000			
C. Animal weighing/holding equipment	7,000			
D. Refrigerators (2 at \$1,000 ea.)	2,000			
E. Misc. Lab Equipment	<u>1,000</u>			
	30,000	30	--	--
<b>IV. <u>OTHER COSTS</u></b>				
A. Operating Expenses (office supplies/equipment, labor)	15,000			
B. Vehicle operation, maintenance	20,000			
C. Purchase of test animals	<u>3,000</u>			
	38,000	13	19	6
<b>V. SUB-TOTAL</b>	324,000	143	150	31

BUDG. TABLE 2

A G R I C U L T U R E  
(\$ 000)

		<u>FY 79</u>	<u>FY 80</u>	<u>FY 81</u>
I. <u>TECHNICAL ASSISTANCE</u>				
A. Long-term Agronomist (24 PM) at \$100,000 =	\$200,000			
B. Short-term				
1. Agricultural Economist <u>1/</u> (6 PM) at \$80,000 =	40,000			
2. Animal traction advisor <u>1/</u> (8 PM) at \$50,000 =	<u>33,000</u>			
	273,000	100	173	--
II. <u>TRAINING</u> 3rd Country (7 PM)	14,500	--	14.5	--
III. <u>Commodities</u>				
A. Vehicles w/spare parts (one 4-wheel drive)	16,000			
B. Mobylettes (six at \$500)	3,000			
C. Animal Traction equipment	<u>10,000</u>			
	29,000	19	10	--
IV. <u>OTHER COSTS</u> <u>2/</u>				
A. Vehicle operation/maintenance	18,000			
B. Farm center office supplies <u>3/</u>	8,000			
C. Office equipment	7,500			
D. Operating expenses	27,000			
E. Credit	50,000			
F. Extension/demonstrations (labor, field days)	12,000			
G. Seeds, fertilizers, small farm equipment	6,000			
H. Work oxen for centers	<u>4,000</u>			
	<u>132,500</u>	<u>16.5</u>	<u>55.5</u>	<u>60.5</u>
TOTAL	\$449,000	135.5	253	60.5

1/ May be recruited and contracted locally.

2/ Totals for both centers.

3/ Includes office supplies for "Livestock" as well as "Agriculture".

		FY 79	FY 80	FY 81
<b>I. <u>TECHNICAL ASSISTANCE</u></b>				
ONE HEALTH SPECIALIST (18 PERSON/MONTHS) x 100,000/yr.....	\$150,000	100,000	50,000	---
<b>II. <u>TRAINING</u></b>				
TWO MOH TRAINEES AT I.O.T.A. (6 PERSON/MONTHS).....	7,000	---	7,000	---
<b>III. <u>COMMODITIES</u></b>				
A. VEHICLES (ONE 4-WHEEL DRIVE).....	16,000			
B. MOBYLETTES (5 at \$500 each).....	3,000			
C. MEDICINES AND DRUGS.....	105,000			
D. LAB. EQUIPMENT AND SUPPLIES.....	12,000			
	<u>135,000</u>	31,000	105,000	---
<b>IV. <u>OTHER COSTS</u></b>				
A. OFFICE SUPPLIES AND EQUIPMENT.....	5,000			
B. VEHICLE OPERATION AND MAINTENANCE.....	12,000			
C. IN-COUNTRY TRAVEL.....	8,000			
	<u>25,000</u>	7,000	10,000	8,000
<b>SUB-TOTAL</b>	<u>\$318,000</u>	<u>138,000</u>	<u>172,000</u>	<u>8,000</u>

	FY 79	FY 80	FY 81
<b>I. TECHNICAL ASSISTANCE</b>			
A. CIVIL ENGINEER (WATER RESOURCES) - 24 PERSON/MONTHS AT <u>\$100,000/yr</u> -			\$200,000
B. TDY ASSISTANCE - 6 PERSON/MONTHS AT \$100,000/yr -			50,000
<u>30 PERSON/MONTHS</u>			<u>250,000</u>
	100,000	125,000	25,000
<b>II. TRAINING - U.S. (12 PM).....</b>	---	25,000	---
<b>III. COMMODITIES</b>			
A. VEHICLE (ONE 4-WHEEL DRIVE x \$16,000).....			16,000
B. MATERIALS, LABOR, FOR PROTOTYPES.....			100,000
			<u>116,000</u>
	40,000	45,000	31,000
<b>IV. OTHER COSTS</b>			
A. CONSTRUCTION <sup>1/</sup>			
1. TWO FARM CENTERS AT \$81,000 EACH.....			162,000
2. SEPTIC TANK, WELLS, PUMPS, GENERATOR AND CISTERNES FOR FARM CENTERS.....			41,000
B. VEHICLE OPERATING EXPENSE, MAINTENANCE.....			15,000
C. STUDIES, SURVEYS, ETC.....			20,000
			<u>238,000</u>
	213,000	21,000	4,000
SUB-TOTAL.....	<u>353,000</u>	<u>216,000</u>	<u>60,000</u>
<sup>1/</sup> Includes Contingency/Inflation			

APPROPRIATE TECHNOLOGY

BUDGET TABLE 5

	FY 79	FY 80	FY 81
<b>I. <u>TECHNICAL ASSISTANCE</u> <sup>1/</sup></b>			
6 PERSON/MONTHS.....\$ 30,000	15,000	15,000	---
<b>II. <u>COMMODITIES</u></b>			
A. ONE MOTORCYCLE..... 1,000			
B. TWO MOBYLETTES..... 1,000			
C. IMPLEMENTS, MATERIALS, PROTOTYPES..... 58,000			
<u>60,000</u>	2,000	30,000	28,000
<b>III. <u>OTHER COSTS</u></b>			
A. REFERENCE MATERIAL, REPORTS, EVALUATION..... 5,000			
B. OPERATING EXPENSES..... 5,000			
<u>10,000</u>	2,000	4,000	4,000
SUB-TOTAL.....\$100,000	<u>19,000</u>	<u>49,000</u>	<u>32,000</u>
 <sup>1/</sup> Contract team will recruit and hire locally.			

		FY 79	FY 80	FY 81
I. <u>TECHNICAL ASSISTANCE</u>	---	---	---	---
II. <u>COMMODITIES</u>				
A. VEHICLES (ONE 4-WHEEL DRIVE).....	\$ 16,000			
B. MOBYLETES (4 at \$500 EACH).....	2,900			
C. OFFICE EQUIPMENT/SUPPLIES.....	8,800			
D. LITERACY CENTER EQUIPMENT (GAS LAMPS, BLACKBOARDS).....	4,000			
	<u>30,800</u>	30,800	---	---
III. <u>OTHER COSTS</u>				
A. TRAINING				
1. ZAF LEADERS.....	7,200			
2. VILLAGE TEACHERS.....	9,400			
B. TRAINING MATERIALS, BOOKLETS.....	2,750			
C. VEHICLE OPERATION AND MAINTENANCE.....	8,750			
D. POST-LITERACY MATERIAL DEVELOPMENT.....	56,500			
	<u>84,600</u>	50,000	24,600	10,000
SUB-TOTAL.....	\$115,400	<u>80,800</u>	<u>24,600</u>	<u>10,000</u>

OTHER PROJECT SUPPORT COSTS

BUDGET TABLE 7 )

		FY 79	FY 80	FY 81
<b>I. <u>TECHNICAL ASSISTANCE</u></b>				
A. SOCIOLOGIST (12 PM x 40,000/yr).....	\$ 40,000	20,000	20,000	---
B. PROJECT TEAM ADMINISTRATIVE ASSISTANT..... (36 PM x 40,000/yr)	120,000	40,000	40,000	40,000
	<u>160,000</u>			
<b>II. <u>COMMODITIES</u></b>				
VEHICLES (TWO 4-WHEEL DRIVE VEHICLES <sup>1/</sup> ).....	32,000	32,000	---	---
<b>III. <u>OTHER COSTS</u></b>				
A. CONSTRUCTION OF FIVE HOUSES FOR PROJECT TEAM PERSONNEL AT \$31,000 <sup>2/</sup> .....	155,000			
B. PLUMBING & ELECTRICITY FOR 5 HOUSES.....	50,000	205,000	---	---
C. EVALUATION .....	30,000			30,000
	<u>235,000</u>			
<b>IV. TOTAL</b>	<b>\$427,000</b>	<b>297,000</b>	<b>60,000</b>	<b>70,000</b>

<sup>1/</sup> Includes one vehicle for USAID project manager and one vehicle for Admin. Asst.  
<sup>2/</sup> See Rural Engineering cost estimate (includes contingency & inflation).

GRM Contribution

Personnel

Even though the Technical assistance team may or may not be formally assigned counterpart personnel, it is assumed that, in order to adequately complete their respective assignments, the services of Malian technicians will be required on an equal time basis. In other words, each person/month of ex-patriate assistance will require one person/month of Malian assistance at a comparable proficiency level.

The GRM contribution will consist of salaries of all Malians assigned to the project by the GRM, a health lab, two livestock labs, approximately 20 functional literacy classrooms, and village teachers, (both to be paid by the villages), and land. These costs are estimated below:

<u>Type of Contribution</u>	<u>Total Cost</u>
1. Personnel	\$150,000
- general health (8), health lab (20) livestock (4), livestock lab (10) agriculture (6) and functional literacy (25)	
2. Buildings	
- health lab and equipment	20,000
- 2 livestock labs and equipment	12,000
- functional literacy classrooms	10,000
3. Land (50 hectares)	12,000
<u>Grand Total</u>	<u>\$204,000</u>

PART III C.

Sociological Analysis

Summary of Findings

The chosen sites are representative of both the physical and social environment, and as such, the experience gained during the pilot project phase should be directly applicable to the First Region Development Project. Farmers are aware that improvements in technology (agricultural as well as livestock) can bring about needed improvements in productivity and increase farm income and are eager to participate.

The northern project area is peopled primarily by the Soninke ethnic group with minority populations of Bambara, Khassonke, Kagoro, and sedentary Peul. The southern area is predominantly Malinke but includes Peul, Bambara, Soninke, and Diallonke as well.

The people in the project areas inhabit permanent villages. The average family numbers between 13 and 15 members, not all of which are "actifs". Subsistence and income-producing activities are carried out by the extended family unit, and tasks are normally assigned by sex and age group. The bulk of the agricultural work load is assumed by the male population of ages 15-50. The men are also primarily responsible for providing the meat and fish which go into the diet.

Women provide legumes and vegetables and grow or gather condiments for the diet. In addition to regular household duties (cooking, gathering firewood, pounding of grain, and raising children), some cash crops, notably tobacco and onions, are raised for sale where markets are available. Women in the project area are eager for any assistance that would lighten their workload and improve their income-earning capacity.

Out-migration in the area occurs, and during certain periods of the crop season labor shortages are felt. In this case, all members of the family unit are enlisted, or if the means are available, outside labor is hired.

Health problems, such as blindness and infant mortality, are acute. The villagers are aware that improved health practices exist, but the delivery system is generally inadequate to serve the population's needs. Interventions proposed which would improve health would be warmly welcomed and would enlist the support of the villagers.

Social constraints identified and presented more fully in the annex, have not been judged serious enough to prevent successful implementation of the activities proposed during the pilot project. The input of a rural sociologist is recommended for one year to (i) design and assist in the implementation of data collection activities and (ii) assure that, through constant interaction with the villagers, technologies will be socially acceptable and that the population will become full participants in their own development.

III D

ECONOMIC ANALYSIS

Introduction:

The project is essentially a pilot activity, focusing on rain-fed agriculture based on detailed agro-socioeconomic studies to be carried out in the Region. Based upon studies and pilot activities, an overall integrated development program involving rain-fed agriculture and live-stock production, as well as development of basic, social (education and health), and physical infrastructure will emerge.

Because of the pilot nature of the project, the principal output will be information obtained, experience gained, and establishment of basic technical support infrastructure. It is difficult to place economic values on elements, but future development of the area will depend on these studies and project activities.

The project should be viewed as a measure deemed necessary in order to avoid wasted time and resources on later projects in the Region. It will enable planners to reduce the risk of faulty program design and avoid either aborting or major re-design after the project is launched. This is an important factor, considering that the largest proportion of resources associated with project implementation are expended during the start-up phase.

In O.L.S. sense, this is an extended feasibility study designed to generate primary data by experimentation which will be used in the analysis of ensuing project design.

Many activities have been identified for implementation on an experimental basis. The emphasis on any particular activity will be adjusted as conditions warrant. Thus, it is mere speculation to predict given outcomes and effects.

Current Situation:

Although data are limited, there have been some activities within the Kayes and Kenieba sectors which can be used, in conjunction with data generated in other areas, to describe the economic situation and potential of a development project. Some of the statistics were generated in other areas and, since the First Region is somewhat isolated, price/cost relationships may vary considerably.

The average farm size in Kayes is 3 hectares and is worked by 12-15 family members. In Kenieba, the farm averages 2 hectares worked by 10-12 people. Crop and yield statistics are depicted in Table 1. Cereals are the major crops. Most farmers will have some cattle, with 5 head per farm unit being the national average.

Land preparation for planting and harvesting are two peak periods for labor demand in the production cycle. These activities are accomplished by hand using only the crudest of instruments. Fields are prepared for planting with a short-handled hoe, and seeds are broadcast in a random fashion, rendering adequate weeding nearly impossible. A small knife is used for harvesting, which requires cutting each plant individually. An activity that consumes many hours of labor daily, on a year-round basis, is the preparation of grain for cooking. A mortar and pestle is used for milling of grains and requires 3-4 hours for each day's meal. A special effort will be made in this project to address the productivity problem through designing and experimentation with appropriate technological labor-saving devices.

The state office OPAM is supposed to regulate the flow of cereal commodities and maintain pre-determined prices to producers and consumers. The intended policy is toward generating market stability of staple commodities with respect to season and location. A universal price is established for each crop but is often lower than cost of production.<sup>(1)</sup> This has inevitably led to the creation of a non-controlled parallel market for surplus farm cereals. Prices on this market are estimated to vary from 20-150% above the controlled price. Estimates of quantity moving through this mechanism vary from 40-70% of total cereals marketed.

The important distinction to make is not to mark potential performance against OPAM prices. Since farmers are required to market at least a portion of total production through OPAM, any analysis that accurately reflects income changes due to farmers' choices regarding improved technology must base value estimates on some mixture of the two markets.

The Bamako-Dakar railroad traverses this Region with daily stops in Kayes, connecting it with two lucrative markets for supplies and finished products. The cost of shipping grain to Dakar is about \$30/ton and slightly higher to Bamako. Transport overland is generally not as reliable and costs more than by rail.

#### Area Potential

Farmers using improved technology (seeds, fertilizers, fungicides) as espoused by OACV in Kenieba (Table 2) increased yields of peanuts, millet/sorghum, and corn by 21%, 9%, and 24% respectively. Yet, of all the sub-regions within the First Region, Kayes and Kenieba have the lowest percentage of farmers using the extension practices of OACV. No data are available on the associated increase in costs of the Kenieba participants in the OACV program.

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(1) La Politique Cerealiere au Mali; H. de Meel, 1978, Pg. 34.

A rough estimate of the number of farms in the Kenieba sector can be obtained as follows. The area population, according to the First Region Governor's Office, was 83,892 as of December, 1978, of which 96% were engaged in agriculture and livestock. In line with national average, probably more than half (say 60%) are farm workers. If it is assumed that there are 11 persons/farm, the estimate would be a total of 4,365 farms, as shown in Table 2. Production increases as a result of adoption of improved technology as extended by OACV would be 400 tons peanuts, 253 tons millet/sorghum, and 119 tons corn.

A similar estimate can be calculated for millet/sorghum production in Kayes, because present yields under traditional methods are the same as in Kenieba. The total hectarage of millet/sorghum is 140,000. Average yield increases comparable to those received by OACV Kenieba participants would create an additional 8,120 tons.

The First Region is sometimes a surplus producer of grain, but the Kayes area is deficient in supply of cereals. In 1978, this area received 10,000 tons of various grains (excluding rice) from OPAM and other sources.

The Kenieba sector has a cattle population of 28,500 head, and Kayes has 155,000. The animal off-take for slaughter is estimated at 10-12%, or approximately 20,000 head.

ECIBEV's Embouche Paysanne program is designed to assist farmers finish-feed higher quality animals on the farm. ECIBEV supplies otherwise unattainable inputs on credit and provides medicines and technical advice. Using a basic diet of farm-grown forage, molasses, and cotton seed, participants in this program have averaged \$34/head profit on a net weight gain of 63 kilograms after three years experience with the improved technology. At \$0.75/kg, (average price received for fed cattle) the added value of the 63 kg is \$48.

ECIBEV estimates that an average of 50% herd off-take is of acceptable quality. However, if there were a significant increase in demand for draft animals in the area, the percentage of available feeders would be much less. Even if the supply were only 25% of off-take, there would be 5,000 head of acceptable quality and finish-feeding could increase farmers' income by \$170,000 with an associated added market value of \$240,000 annually.

The preceding estimate of production and revenue potential increases within the Region under consideration is merely hypothetical, using non-related data that were available. Thus, these estimates must not be construed as conclusive. One of the main purposes of this project is the creation of reliable base-line data which could lend credence to a quantifiable analysis of the area production potential.

Approach:

Of the basic resource categories employed in agricultural production (land, labor, management, capital, and technology), the most immediate constraint limiting output expansion is due to the low capital/labor ratio which leads to low productivity and remuneration of labor. This has resulted in heavy seasonal migration and net out-migration of labor seeking more lucrative markets. Initial attempts must be directed toward introducing the idea of increasing capital investment as a means of enhancing the productivity and, by implication, remuneration of labor.

Current practices create peak demand at certain periods of the crop cycle, mainly for land preparation prior to planting, and severely restricts size of exploitation. The use of draft animals and associated implements would not only allow considerable expansion of hectareage cultivated but would raise the overall marginal productivity of labor such that other aspects of crop culture can be improved with a resulting increase in yields per hectare. This is particularly true for weed control, which is currently done on a rather haphazard basis as time permits.

A team of oxen costs \$400 and a multiple cultivator \$220. Hypothetically, oxen costs could be amortized over 7 years and cultivator costs over 5. Thus, a farmer's net income must increase by at least \$101 per year to be able to afford the purchase without experiencing a decline in disposable income for other purposes. Animal traction represents a considerable investment for a farm family whose per capita income is about \$50/year. Yet, farmers may be willing to partially offset the cost by accepting a lower disposable income in order to enjoy the labor-saving advantage provided by mechanization. When offered the opportunity to purchase on credit, they have shown keen interest in accepting the obligation throughout other areas of the country, indicating that animal traction is a desired change.

Even with a credit program, the farmers must be able to make the down-payment. The opportunity to derive sufficient profit from cereals alone to finance capital investment is very low under current price policy. In fact, the use of draft animals is highly correlated to cash crop production. Mechanization of agriculture is fundamental to any substantial program to increase agricultural output but is rarely employed for cereal crops. It is envisioned that the finish-feeding program will complement the purchase of animal traction and equipment. A farmer will be encouraged to use funds generated through the feeding program to either purchase outright or make down-payment on animals and equipment.

Under existing price conditions in Mali, integration of crop and livestock production offers the greatest opportunity to increase mechanization of both these farming enterprises. They are technologically complementary in the use of resources and can be undertaken simultaneously

without serious labor competition. Thus, the combined financial returns are higher than the sum of the two returns when engaged in separately. This combination can provide the farmer with a diversity of liquidity sources and permits product transformation which offers an alternative when he is faced with unfavorable market conditions for a single commodity.

Due to possible unavailability of adequate or timely feed supplies and associated higher transport costs to the First Region, the intended emphasis will be to have participants supply their own feeds. The farmer can produce the legume forage he needs by growing various peas, using manioc leaves or peanut hay, etc. He can supply all necessary energy feeds by growing feed-grade sorghum cereals or cultivated forages which can be selected to suit the particular locale and farmer's labor schedule.

Shown below are costs and returns of participants in the Embouche Paysanne program (1976/77) and a comparison of returns if all feeds used were grown by the producer.

	<u>ACTUAL</u>	<u>PROPOSED</u>
Purchase Price (1 feeder)	<u>112.31</u>	<u>112.31</u>
Other Costs	<u>38.76</u>	<u>19.79</u>
Total Loan	<u>151.07</u>	<u>132.10</u>
Sale Price	198.83	198.83
Gross Profit	47.76	66.13
Value Forage (home grown)	10.31	31.96
Return to Labor & Management	37.45	34.77

Under the current program, the gross profit is \$47.76 per head. This figure would increase to \$66.13 using the proposed change. It is assumed the farmer can produce feeds for the proposed program with minimal cash outlay. If the farmer could supply one feeder and purchase another through the credit program, his net cash revenue would be \$244.57, less the cash outlay to produce feeds. This would be sufficient for making a down-payment on a pair of oxen and associated equipment. If the farmer could not supply any feeders, a similar income could be obtained by feeding four animals during one season.

Growing feed for four animals might be beyond the capacity of a farmer who has no mechanized means of production. An alternative would be to introduce a credit package with more liberal terms. In fact, such a program is currently being proposed in another USAID-assisted project in Mali (Operation Mils-Mopti). A small credit component is included in this project to test farmer receptiveness to a variety of schemes.

Farmers will be encouraged to expand production both in terms of yields and hectareage. However, given the quasi-controlled market situation for goods that otherwise might be lucrative, the capital generating activity for economically justifying mechanization will be restricted to finish-feeding cattle until more is known about other markets.

The success of the finish-feed cattle program is based on the assumption of a market sufficiently strong to return an attractive profit to the entrepreneur. There is no doubt that the end market, in this case Dakar, offers a good price. Transport to Dakar from Kayes by rail is reliable and costs are reasonable. To move the finished product from the farm-gate to Kayes may pose a problem, not so much in exorbitant costs as in reliability due to poor road maintenance. The project includes a component to establish criteria for comparison of the net value of goods shipped versus the cost of improved road facilities.

The following activities will not generate benefits which are easily measured in monetary terms but are considered necessary to enhance the probability of success and facilitate the implementation of other activities.

Included is the design and implementation of a health component for people, which will include a disease control/prevention program and health improvement activities. The health intervention will increase the availability of labor days for agricultural production, as well as labor productivity per time unit. It will also improve people's attitude toward accepting other project components.

The functional literacy component will increase the farmer's receptiveness and ability to assimilate technology and management changes which improve operating efficiency and result in greater outputs, lower production costs, or a combination of the two. In other areas, it has been more than justified in terms of reduced time requirement, and hence cost, of providing social services.

There will also be a cadre of civil servants trained in managing organizations which deliver those services to people not provided by the free market but considered essential for the removal of certain constraints limiting production.

Also included is a component on appropriate technology which, for the most part, will undertake tests of labor-saving devices and their effect on the marginal productivity of labor.

TABLE 1 - FARM SIZE AND AVERAGE YIELDS IN KAYES AND KENTIERA

KAYES:

<u>Crop</u>	<u>Size</u>	<u>Average Yield (Traditional)</u> (Kg/Ha)
Millet/sorghum	1.55 Ha	600-650
Corn	1.00 Ha	800
Peanuts	0.25 Ha	650-700
Rice	0.05 Ha	not available
Cotton	0.10 Ha	not available

KENTIERA:

<u>Crop</u>	<u>Size</u>	<u>Average Yield (Traditional)</u> (Kg/Ha)
Millet/Sorghum	1.00 Ha	600-650
Corn	0.20 Ha	550
Peanuts	0.60 Ha	600-700
Rice	0.20 Ha	900

Source: O.V.S.T.M. - Kayes

**TABLE 2 - ESTIMATES OF LAND AREA UNDER CULTIVATION:  
PROD/YIELD OVER THE ENTIRE ZONES SUPERVISED BY  
OACV IN THE CIRCLE OF KENIEBA (1978-79 Campaign)**

SUB/SECTOR (1)

	KENIEBA	KASSAMA	DOMBIA	DIALAFARA	TOTAL
<u>Land Areas (Ha)</u>					
Peanuts	2,500	1,400	1,350	300	5,530
Millet/Sorghum	2,900	1,900	2,500	3,000	10,300
Corn	860	400	400	500	2,160
<u>Production (Tons)</u>					
Peanuts	2,095	1,210	1,100	267	4,672
Millet/Sorghum	1,690	1,425	1,875	2,250	7,240
Corn	470	360	280	300	1,410
<u>Yields (Kg/Ha)</u>					
Peanuts	838	864	815	890	852
Millet/Sorghum	583	750	750	750	708
Corn	546	900	700	600	686

Source: O.A.C.V. - KENIEBA

- I. Since 1975, the Kenieba Cercle is included in the O.A.C.V. area of operations. It is divided into 6 sub-sectors. Falea and Faraba, not shown, are included in the other areas.

**OACV** The Groundnuts and Cereals operation  
**OVSTM** Irrigated perimeter operation -  
 Senegal  
 TereKole  
 Magui vally  
 operation

PART IV. IMPLEMENTATION PLAN

A. Administrative Arrangement

The pilot project will be implemented by O.A.C.V. and O.V.S.T.M. in their respective areas, with assistance from representatives of the National Direction of Functional Literacy, (Ministry of Education) the Service d'Hygiene of the Ministry of Health, the Service d'Elevage, and ECIBEV of the MDR. Infrastructure activities will receive assistance from the Ministry of Transportation and Public Works through their regional offices. An inter-ministerial committee (Comite d'Etude et du Plan) will coordinate the involved agencies, resolve inter-agency issues, and review the progress of the pilot project during formal evaluations. This steering committee has representatives of each of the respective implementing organizations plus the Ministry of Planning and the Ministry of Finance. The Committee chairman is from the Ministry of Rural Development.

USAID will have a full-time project manager assigned to the First Region to coordinate project implementation. A technical assistance contract team, to be fielded in January, 1980, will be assigned to the region and will have counterparts from the respective ministries, i.e., an MOH technician for the public health advisor, etc. The two "operations", O.A.C.V. in the south and O.V.S.T.M. in the north are responsible for integrated development efforts within their respective zones. The technical assistance team will work at the farm centers (or in some cases in nearby villages) as members of multi-disciplinary teams headed by the director of each "operation".

By December of 1981 the contract advisors in health, rural engineering, agriculture, livestock, and appropriate technology, with their GRM counterparts, will submit technical analyses and recommendations for inclusion into the First Region Integrated Development PP. These reports will be evaluated and the detailed PP will be prepared for submission to Washington in March of 1982.

B. Implementation Plan

- |  |             |
|--|-------------|
| 1. Arrival of USAID Project Manager  | March, 1979 |
| 2. Project authorization   | April, 1979 |
| 3. PPT developed by USAID Project Manager and GRM project Directors  | April, 1979 |
| 4. Project Agreement signed  | May, 1979   |
| 5. Request for proposals completed, issued   | May, 1979   |
| 6. Design and pre-testing sociological survey begins   | July, 1979  |
| 7. GRM assigns coordinator and assistant coordinator for Functional Literacy program                               | July, 1979  |
| 8. Functional Literacy: Villagers contacted, commitment assessed, villagers start construction of literacy centers | Aug., 1979  |

9. Commodity procurement begins Aug., 1979
10. Farming Center and housing A & E and Construction Management contract signed Aug., 1979
11. Initial literacy materials produced Sept., 1979
12. Farm Center and housing layout/site plans finished and approved Sept., 1979
13. Selected villages start literacy classes Sept., 1979
14. Technical Assistance contract negotiated and signed Oct., 1979
15. Ministry of Health names project personnel Oct., 1979
16. Farm Center and housing draft plans, specifications, and bid documents finished, observations made by MRD/USAID Oct., 1979
17. Farm Center and housing final bid package complete, IFB advertised Nov., 1979
18. Initial Technical Assistance Team members arrive Dec., 1979
19. Farm Center and housing bids in, contract signed Dec., 1979
20. Rural Engineering studies begin Jan., 1980
21. Health assessments begin, medical surveys designed, drug distribution and treatment trials set up, training begins Jan., 1980
22. Farm Center construction begins Jan., 1980
23. Appropriate Technology inventory begins Jan., 1980
24. Initial post-literacy materials developed Jan., 1980
25. Construction of engineering prototypes begins March, 1980
26. Agricultural studies begin - first year activities planned March, 1980
27. Farm Center and housing construction ends May, 1980
28. All team members in country May, 1980
29. Experimental plots and animal traction program begins May, 1980
30. Report on Appropriate Technology inventory submitted and literature search begins Jan., 1981
31. Evaluation by Committee of all activities (Mid-term) Feb., 1981
32. Appropriate Technology R & D continues and field-testing of devices begins April, 1981
33. Technical Assistance and GRM personnel supply inputs into second-year Functional Literacy program and post-literacy materials July, 1981
34. Recommendations for components of future Integrated Rural Development Project made Dec., 1981
35. Evaluation by Committee of all project activities Jan., 1982
36. First Region Integrated Development PP submitted to AID/W Mar., 1982

**MISSING PAGE**

**NO.** 48

I. General Introduction/Background Information on Livestock Sector Within Mali and First Region.

A. Mali

Mali is and will continue to be a sizeable and growing surplus producer of meat. Exports are projected to double during the interval from the present to 1990.<sup>(1)</sup> Presently, West African demand for meat exports in excess of Sahelian supply is estimated at over 600,000 metric tons of meat.<sup>(2)</sup> It is projected that this same West African deficit will increase to about 740,000 tons by 1985. Mali is now exporting some 15,000 tons of meat to this market annually. The Sahelian countries, compared to their South American and European competitors, have freight advantages and are also accorded political preference by their meat deficit neighboring countries. Furthermore, West African consumers have a taste preference for Sahelian beef.

New criteria for access to the export market have evolved over the past decade. These have been identified principally as beef quality and regularity of supply and price. Much of the livestock production side of the development project for the First Region aims at meeting these criteria, particularly that of quality. Price competition appears attainable, but this will be quantified by the project studies. Regularity of supply is addressed in the Mali Livestock Sector II Project, but the principle of this intervention is also included for study in this project.

Only through exploiting the export market and meeting its criteria for access will Malian, and particularly First Region, livestock and crop producers be able to enjoy a substantial improvement in financial return on their investment in animals. Failure to meet this challenge could result in price depression and disincentives for further increased production in view of the fact that Mali is a surplus producer of meat.

Thus, in summary, there is an immense demand for meat in West Africa, but the criteria for access to this market have changed and will continue to change. To meet this demand, Mali must modernize its marketing system and concentrate on increasing the efficiency of its livestock production which currently is quite inefficient in contrast to that of its competitors.

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(1) Production, Consumption, Exportation de Viande Bovine et Ovine-Caprine au Mali et Projections 1974-1990. Bamako: OMBEVI, Economie Document No. 96, Ministere de la Production, November, 1976.

(2) Approvisionnement en Viandes de l'Afrique de l'Ouest. Paris: SEDES for O.M.V.S., 1974.

B. First Region

Region I produces about 13% of the cattle in Mali, and the cattle population is now slightly in excess of 600,000 head. At a take-off rate of 10-12%, there should be 60,000-72,000 head available for market each year. Estimates of annual exports to Senegal are about 5,000 head, according to OMBEVI. Slaughter at controlled markets in the First Region were about 6,300 head in 1976, and recently obtained information indicates that uncontrolled slaughter as much as doubles that amount, a likely total of about 12,000 head consumed in the Region. Consumption and export estimates then total about 17,000 head. The remainder of the cattle, perhaps 45,000-55,000, are trekked to larger markets such as Kati, where they are sold to both butchers from the Bamako market and to exporters.

The First Region is located in an unusually advantageous position for exports of cattle to the Dakar market, but this advantage has not been exploited on an organized basis. Precise and up-to-date figures are difficult to obtain, but in 1976 Senegal had a production of about 55,000 tons of meat and a consumption of about 93,000 tons, leaving a deficit of about 38,000 tons, according to C.E.A.O. statistics. Of that amount, about 56% is estimated as beef. Thus, the beef deficit was about 21,000 tons, equivalent to about 160,000 head, or twice the present production of Region I. Animals trekked in on foot made up some of the deficit. Mauritania exported about 18,000 tons of beef that year, but much of its exports transit Mali to the southern coastal nations.

In regard to the future, the SEDES report<sup>(3)</sup> predicted that after 1975, the deficit in beef in Senegal could not be completely fulfilled either by local production or by imports from Western Mauritania unless the livestock development projects in Senegal and at Kaedi in Mauritania progressed faster than was expected. SEDES projected that, in the long-term, it appeared that the supply of beef for Senegal will essentially depend upon exports from Mali.

In summary, the Senegalese demand for beef is greater than the entire current off-take from Mali's First Region herds. The organization of an orderly marketing system and the efficient management of First Region herds could result in a dramatic increase of Malian cattle exports to Senegal.

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(3) SEDES, *ibid.*

## II. The Livestock Scene in the First Region

The livestock production pattern in the First Region is stratified according to the tsetse fly zone (generally divided at the 800 mm Isohyet). The Zebu, trypano-sensitive, breed is raised to the north of the zone and the Ndama, trypano-tolerant, breed is found to the south.

The northern part of the region has an annual rainfall ranging from 400 mm to 800 mm. The range area vegetation in this Sudano-Sahelian zone consists of occasional trees and shrubs and a mixture of annual and perennial grasses. However, the native grasses are generally sparse and the annuals predominate. Further north, trees are fewer, shrubs more numerous, and the grass is increasingly sparse. This native range has a very low cattle-carrying capacity, even where sufficient water is reasonably available. There are, nonetheless, exceptions to this situation. In some places, underground water sources provide a supply for vegetative growth well into the dry season, and this vegetation is of high quality. Indeed, some of these areas remain green almost until the onset of the next rainy season. This results in an overstocking in these areas to such an extent that grass re-growth is severely restricted, because the critical amount of leaf surface needed for photosynthesis is constantly being grubbed to the surface. One unusual water resource of the northern, low-rainfall, part of the First Region is the network of flood plains which intermittently (i.e., during the rainy season and lasting long into the dry season) become what is referred to as Lake Magui. These flood plains are formed along the north-south axis of the Kolimbine River and, to a lesser extent, along one of its tributaries, the Terekole. To date, this great water resource has been little exploited.

Government figures for the First Region indicate that about one third of its cattle population is located in the circles of Kayes and Yelimane, both of which are north of the tsetse zone. Most of these cattle are owned by permanently-resident families who also grow cereal crops. All animals not required for milk go with the transhumant herds to the north in the rainy season, tended by young Fulani, and return to the south during the dry season. During the rains, the transhumant herds benefit from the grasses on the rain-fed plains, such natural salt licks as exist, and the absence of most vector-borne diseases, and thus normally show a better weight increase than those cattle which remain in the villages. However, dry season pasturage is seldom, if ever, adequate, and weight loss during this period is marked, varying from 10-25%. Moreover, the herds graze on mature annual and perennial grasses of low nutritive value, and the resultant nutritional deficiency limits growth and reproduction rates to not more than 50% of their potential. Storage of feed for diet supplements during the dry season is virtually non-existent, although by-product feeds such as peanut hay are sometimes fed to the cattle. Yet, a practice particular to the Lake Magui area is exceptional and worth noting. Some farmers there grow a soft "dura" type sorghum to provide supplemental feed to their cattle.

The southern area of the First Region, particularly Kenieba circle, has an annual rainfall of 1,000-1,400 mm. Its vegetation consists of more intensive forest cover, less shrubbery, and a denser grass cover of a higher quality than is found in the north. The duration of the rainy season is two to four months longer than in the north, and rainfall is thus much better distributed. Pastures, therefore, have a greater and longer carrying capacity per hectare, and the opportunity for growing forage crops, which are the real foundation of efficient livestock production, is greatly enhanced. Hence, the possibility for a profitable return to the producer for each day of productive effort is greater in this area. Further, the opportunity for diversification and for farming systems that can optimize distribution of the labor effort throughout the production season is vastly greater.

In Kenieba, the Ndama breed is raised, but the cattle population is quite low. The low density has been attributed to a lack of market demand for beef and draft oxen in the circle. (In some southern and eastern areas in Mali where farmers have adopted animal traction for crop production, there is a much higher Ndama population density and greater demand for both beef and draft animals.) The herds are not transhumant. They are left to graze freely during the dry season. During the rainy season they are corralled but let out daily to be taken to water sites and pasturage by a herder. While the traditional Sahelian cattleman scorns the Ndama breed, no reliable research has yet shown it to be less efficient a producer of meat per hectare of pasturage than the Zebu, although it is generally felt that the Ndama produces less milk than the Zebu. However, as local peoples have known for centuries, there is presently no alternative to the Ndama in tse-tse zones for traction and for meat and milk products.

### III. Potential for First Region Livestock Development

- A. There is a vast and increasing demand for beef in Senegal which is not being exploited on an organized basis. Imports of beef in Senegal are more than double the estimated current marketable surplus in Region I, yet Bamako-Dakar freight trains consistently dead-head to Dakar.
- B. The First Region proximity (border area) to Senegal lends it a financially competitive edge over other producers, particularly since the Dakar-Bamako rail line bisects the Region and provides a low-cost means of cattle transport.
- C. There are large numbers of male cattle of feeder-grade quality which are grazing the Sahel range and which have a very low annual value gain. These are prime specimens for profitable finish-feeding and export.
- D. There is an enormous potential for increased cereal production. Surplus can be used for cattle finish-feeding and also to establish security stocks for human consumption, providing a hedge against drought.

- E. The Lake Magui flood plains are a fine, natural resource which, with proper management, can be exploited to contribute to both increased livestock and agricultural production.

#### IV. Constraints on Production

- A. Trypanosomiasis is a threat to animal health in the southern parts of the First Region. Chemotherapy is just now being tested in Mali, and initial results indicate promise, since all animals under heavy fly challenge which were treated with Trypanomidium have been protected from the disease.
- B. Inadequate nutrition during the critical dry season, for lactating cows, young calves, and the few draft oxen there are, is an additional constraint on both livestock and agricultural production. The causes are many and varied. The low quality of the dry season range is a reality throughout the Malian Sahel, but grass fires exacerbate this by destroying up to an estimated 40% of the range dry matter (i.e., what is not grazed upon when the transhumant herds are further north). Draft oxen are in a poor state just when they must be utilized for plowing. A lack of understanding of the principles of animal nutrition is evident. Owners often milk their lactating cows to the extent that the calf is deprived of an adequate supply of milk necessary to sustain its growth. Few farmers supplement the feed of their cattle during the dry season. Herders retain unproductive steers, which graze on rangeland that could sustain younger cattle, for too long a period, and such aged cattle become more vulnerable to vector-borne disease. It is known that the range can sustain cow-calf herds, and it is therefore essential that what potential there is, however limited, be managed to conserve its optimum vegetative productive capacity.
- C. Herd off-take and reproductive rates are considerably lower than their potential, for some of the same reasons as were mentioned above.
- D. Lack of technical means and knowledge has precluded the effective exploitation of the Lake Magui flood plains.
- E. The lack of market opportunities limits the cattleman's incentive to increase his off-take rate, supplement his cattles' feed, and reduce the number of steers in his herd.
- F. Lack of an adequate and effective veterinary extension service is an additional factor which prevents Malian cattlemen from maximizing the potential of their herds.

## V. Interventions

Providing more milk for family consumption or sale, increasing the number of draft oxen, and fattening and selling feeder-grade steers, are some of the justifications for the livestock interventions outlined below. The increased supply of draft animals can bring benefits of particular socio-economic importance to the rural farmer, for the O.A.C.V. has shown farmers who are good managers that they can triple the number of hectares they work and double their yields per hectare as well. Moreover, the back-breaking hand-labor effort required is considerably ameliorated, and the family increases its income.

A livestock specialist will be recruited for the project team. With his Malian counterpart, he will assist in implementing the following:

1. Initiate a finish-feeder program to increase the cattelman's income, and to reliably and competitively supply the Senegal market with the quality and quantity of animals not available from other suppliers.

The finish-feeder activity is an integral part of the overall livestock sector development project currently under design, but not planned for introduction in the First Region until later years. No additional funds from the design project for the First Region are required for the major part of this program. Some modest financial support will be required for holding lots (parks) for feeder-grade cattle to hold the cattle purchased until there are enough of them to trek to the two centers proposed for this project. These lots are made of low-cost local materials.

This program already exists in other parts of Mali under the Embouche Paysanne Activity of the project Mali Livestock I, but does not operate in the First Region at present. Under this activity, sedentary crop farmers are provided (a) credit for the procurement of feeder-grade cattle, (b) assistance and guidance in procuring the appropriate type of cattle for feeding, (c) credit for and access to supplementary feeds if the farmer does not have these available, (d) health service for the animals, (e) technical guidance in the management of the animals during the usual 90-day feeding period, and (f) assistance in marketing. Credit is furnished for 100% of all costs. Interest is 12% per annum. Profits per head range on the average from 10,000 to 15,000 MF net (\$25-\$35). This is significant, as the per capita cash income in rural Mali is only 7,250 MF/annum. As a participant in the program gains experience, he is authorized to increase the number of head he feeds accordingly. The limit allowed is governed by the quantity of forage available.

Serviced by the two proposed farm centers, participants in the program will feed out their cattle on the excess cereals and forage, the provision of which forms part of the agronomic program to be conducted by the agricultural expert on the team.

Since ECIBEV, the Malian agency which administers the highly successful Embouche Paysanne program in other parts of Mali, has the requisite experience, it is recommended that this agency handle the credit and technical support for the finish-feeder activity. Some assistance for recurrent costs will be required to support the ECIBEV operation during the first years of the project, since the volume of the program at the outset will not self-generate sufficient funds to cover developmental expenses.

After initial start-up costs, it is essential that this activity be self-financing if it is to be continued. A financial assessment by the producer is often more favorable if it is associated with benefits such as credit, market access, and increased income. It is recommended that during the first three years of this design project ECIBEV assume the responsibility to build into its interest and service fee schedule an appropriate charge for recurrent costs.

2. During the first summer of the project, at least 10 feeder-grade Zebu cattle should be purchased and tested on farms at each of the two centers for tolerance to trypanosomiasis under chemotherapy. Any losses incurred will be borne by the project. Credit for purchases of feed will be provided by ECIBEV. If the Zebu cattle can endure the fly challenge in the Kenieba center during the rainy season, then it can be expected that they will endure the less challenging conditions during the dry season. The farmers in the Kenieba area then will have the option of feeding either Zebu or N'Dama cattle. If the Zebras cannot endure the conditions in that area, finish-feeding will have to be restricted to the N'Dama. It is expected that the Zebras will endure the rainy season in the Lake Magui area, since they are presently able to endure more challenging conditions at Bamako when provided a chemical suppressant to trypanosomiasis (Trypanmidium).
  
3. In conjunction with the agronomist and his counterpart, a program to provide year-round feed for cattle will be initiated. With the help of the sociologist, agronomist, agricultural economist, and engineers, it is proposed that an integrated research program be undertaken to explore the potentials of a number of cultivated feeds socially and environmentally appropriate to the climatic zones.

4. A cow/calf development activity will be studied. This consists of the development of techniques to increase the fecundity of cows, their level of lactation, and the survival rate of calves. The benefits of such a program can only be measured in the long-term. The justification to include this activity in this design stage of the project is to measure producer receptivity to the concept, and to initially identify productive techniques, the potential productivity of a breeding herd under various conditions at the two centers, the potential applicability of these techniques to other areas in the Region, and the problems involved in the implementation of the program. Such information is essential in consideration of the design for such an activity on a long-term basis.

The technology involved includes the timing of breeding to have delivery coincide with the onset of the rainy season and to permit cows to have calves weaned at the onset of the dry season. Fertility is substantially enhanced if a cow is bred at the stage when she is on lush pasture and in a stage of increasing vigor when bred. Breeding normally should follow three months after calving. This pattern is ideal for a pure cow/calf production program. Since milk is desired on a year-round basis, this breeding schedule must be modified according to the requirements that exist for the producer. Nonetheless, the potential to increase the vigor of the brood cows and their milk production, the birth weights of calves, and their survival and weaning weight is tremendous.

Another necessity will be to assure that the young calf has adequate nutrition during its early months of growth, a handicap of ten resulting from the family's priority for milk over that of the calf. This competition has been reduced even amongst the rather intractable Masai and other ethnic groups in Kenya by increasing the availability of cereals for human consumption. Alternatively, cereals can be incorporated into calf supplements. The livestock advisor will be responsible for collaborating with other project personnel in developing proposals for this problem, discussing them with producers to develop a program that they would like to test, and conducting controlled tests to determine their efficacy. This herd improvement activity should be tested by at least 5 heard owners at each center.

5. An upgrading of the Animal Health Extension capability is recommended as fundamental for the support of livestock functions proposed and for the successful continuation of activities once the project has ended. This will require proper storage and delivery facilities for vaccines and

other health assistance. A means of transport is essential to extension services (4-wheel drive trucks and trail bikes). Recurrent costs must be assessed and built into the health service fees charged to the producers. Accepting an appropriate health program will be requisite to producer participation in the credit activity for livestock procurement.

To upgrade animal health extension services in conjunction with other project activities, it is proposed that each of the farm centers have a holding corral for up to 50 head of cattle, a lane leading to a metal squeeze for handling, a scale, and a loading chute. A veterinary office and vaccine storage unit will be included at each center headquarters. Since most villages will be within 15 to 20 kilometers of the center, any herds needing treatment can be brought to the center. New feeder-cattle will be quarantined in this area and provided medical treatment before distribution (vaccination, etc.).

6. A draft animal development activity will be initiated. The major operational aspect of this activity will be borne by the agronomic experts, since draft animal utilization will be demonstrated by them. The animal health and supplemental feeding activities will fall to the livestock experts. Credit for the procurement of the draft animals will be administered, not by ECIBEV, but by the project.
7. It is felt that no long-term development of livestock production in this Region can be undertaken without a strategic design encompassing water--its procurement, utilization, conservation, and storage. The following items might also be considered by the engineer during the project:
  - a) surface reservoirs for the farm center villages,
  - b) water pumps for each storage facility where gravity flow systems are not feasible.
  - c) storage facilities (surface reservoirs or other) in or near the Lake Magui flood plains.
  - d) excavated reservoirs in the riverine ravines west of Segala and near Kenieba.
  - e) village wells where deemed necessary by villagers and engineer.
  - f) upgrading (e.g., capping) of existing wells as engineer deems necessary and villagers concur.
8. The livestock specialist will participate in studies and analyses including, but not limited to, such topics as the following:
  - a) land use patterns and yields for both range and cultivated areas.

- b) water resource facilities.
- c) herd composition, rate of reproduction, death loss, quantity marketed (composition, timing, location of market, prices), herd management systems (sedentary--transhumant).
- d) livestock marketing patterns and future market potentials.
- e) existing animal health extension services, areas covered, resources.
- f) proposed land use management systems, comparative advantage under various pricing regimes for inputs and outputs, time phasing, resources required, and costs for implementation.
- g) proposed water development programs, potential benefits, time phasing, resources required, and costs for implementation.
- h) livestock production programs for the various production systems, comparative benefits under various comparative price regimes for inputs and outputs, time phases, resources required, and costs.

## VI. Conclusion

It is believed that the constraints identified can be overcome or ameliorated with the assistance of the project team. Further, the interventions proposed are indeed capable of (i) helping farmers to increase cattle and crop production; (ii) lessening the burden of hand labor; (iii) increasing disposable income; and (iv) contributing to a better standard of living for the target population.

Finally, it is especially recommended that the project team study or consider ways of combining agricultural credit (for oxen, plows, fertilizer, etc.) with the finish-feeder activity. The profit realized from the latter could be used to pay off the debt incurred from agricultural purchases, thereby shortening the period of the loan and decreasing the overall interest paid. It is believed that the economic incentive provided by the combination of activities will induce many farmers to participate in the entire program.

## AGRICULTURAL ANALYSIS

ANNEX 2

### I. INTRODUCTION

The people of the First Region practice subsistence farming and raise cattle, but their remoteness from markets makes the sale of any surplus production difficult and costly. For similar reasons, the extension of appropriate crop and livestock production technology has been limited. Pricing policies adopted by the GRM serve the urban consumer at the expense of the rural farmer and may discourage him from expending any additional labor effort beyond what will ensure a food supply for his family, since a marketable crop surplus brings in little cash at official prices.

A substantial rural exodus of young men has resulted from the lack of income-producing opportunities at home. The back-breaking hand labor required for crop production, which generates little cash, must indeed seem less attractive to rural youth than a paying job elsewhere.

In spite of the poverty and remoteness of the First Region, there exists an unexploited potential for increased agricultural and livestock production. Much arable land goes uncultivated each year, and, with appropriate technical assistance and marketing outlets, cattle production could provide the rural farmer with a higher income. Although the annual amount of rainfall varies greatly in different parts of the Region, the Senegal River and its tributaries make irrigation and flood recession cropping possible. The objective, then, of this project will be to increase the potential of such land and water resources and extend such technology necessary for their exploitation. By consulting with farmers and conducting specific agricultural and livestock production trials with their assistance, the project team will seek to design an appropriate package which might later be incorporated into a larger project and disseminated to a majority of farmers in the First Region.

### II. DESCRIPTION OF EXISTING CONDITIONS

The project will begin in two of the five administrative circles that make up the First Region. In these two circles it is estimated that only 2% of the farmable land is currently being utilized. Rainfall in the northern part of the Region is barely adequate and of short duration, which makes rain-fed agriculture a high-risk undertaking for many farmers. In the southern part of the region, annual rainfall is some of the highest in Mali and is spread over six months or more.

Soils in these circles are among the oldest, most weathered soils in the entire world and are extremely fine-textured, with a high bulk density, a low water-holding capacity, a low infiltration rate, and a low Cation Exchange Capacity. Additionally, ecological relations tend to make them poor in organic matter.

The Senegal River system forms large alluvial plains along its Faleme branch in the circle of Kenieba. Precise figures for unutilized hectareage comprising the Faleme flood plains are unavailable, yet, as a whole, these plains are little exploited. GRM agricultural agents estimate potential rice production hectareage in the circle of Kenieba to total 2,437 hectares, of which only 1,220 are currently being exploited. In Kayes and the adjacent circle of Yelimane, the Kolimbine-Terekole-Krigou branches of the Senegal system form an important complex of small, intermittent lakes and flood plains in the rainy season, collectively known as Lake Magui. The potential hectareage of this area is estimated to be 35,000-50,000 hectares, yet it is vastly underutilized for crop production because of the limited capacity of the resident population. The soils of both the Faleme plains and the Lake Magui complex, unlike the leached, lateritic soils of most of the First Region, are therefore exceptionally fertile. The Lake Magui soils are enriched by the regolith of rock and minerals that form its perimeter. The weathering of the regolith, i.e., the chemical reaction of water with organic, carbonic, nitric, and sulfuric acids, results in the formation of very rich elements, which some 400-500 mm of annual rainfall washes down onto the plains. Contributing to their fertility of the flood plains in the Lake Magui Valley is the relatively high amount of organic matter found on the plains. It accumulates as a result of the alternate pattern of flood and recession and the Cation Exchange Capacity (C.E.C.) of the soil - its ability to hold in an exchangeable form such nutritively important elements as N, K, P, and Ca - is very high. The manure left by cattle which graze the plains as the water recedes also contributes to this fertility.

In the case of the Faleme Valley plains, the southern mountains of the Tamboura escarpment parallel the river, and a higher annual rainfall, (1,000-1,400 mm) washes important minerals into the flood plains. Heavy rain, however, contributes to a major constraint on the full exploitation of the plains, in that it provides breeding sites for the black fly, the transmitter of onchocerciasis. Moreover, the heavier forest cover in Kenieba provides a habitat to a high game population, chiefly the phacochere, which farmers pointedly cite as the most destructive threat to their crops.

Farmers in the area produce subsistence crops of millet, sorghum, and corn. Although some rice is currently being grown, its amount is insignificant in comparison to what might be cultivated. Lack of an efficacious means of water control, health hazards, plus the fact that

rice is considered a luxury food, limit its cultivation. A small amount of peanuts for sauces and earth peas as a dietary supplement are grown by the women. During the rainy season, women also tend a small vegetable garden containing some onions, tomatoes, bitter tomatoes, squash, and peppers. If water is sufficiently available in the dry season, women grow an onion crop which is sold where markets are available. In the circle of Kenieba, many women grow an off-season tobacco crop, which is sold to merchants from Kenieba town.

In Kayes, the average cultivation consists of a plot about three hectares in size worked by a family of 12-15 and counting 3-4 male farmers among its members. Hectarage is broken down by major crops as follows:(1)

<u>CROP</u>	<u>SIZE</u>	<u>AVERAGE YIELD (TRADITIONAL) Kg/ha</u>
millet/sorghum	1.55 ha	600-650
corn	1.00 ha	800
peanuts	.25 ha	650-700
rice	.05 ha	not available
cotton	.10 ha	not available

Thus, some eighty-five percent of production is devoted to millet, sorghum, and corn. In Kenieba, the average plot consists of two hectares divided as follows:(2)

<u>CROP</u>	<u>SIZE</u>	<u>AVERAGE YIELD (TRADITIONAL) Kg/ha</u>
millet/sorghum	1.00 ha	600-650
peanuts	.06 ha	650-700
corn	.02 ha	550
rice	.02 ha	900

Average family size in Kenieba is somewhat smaller, numbering 10-12 people, among whom there are two male adult farmers.

Most farmers, both men and women, cultivate their fields by hand, using short-handled hoes of various sizes. New fields or fields which have lain fallow for some years are cleared with machetes and by fire. As the first rains approach, farming activity intensifies. The new fields must be cleared, then, when the rains have softened the earth, breaking and turning of the soil in both new and old fields must be done in a short time, for farmers realize that planting late means their harvest will be decreased. It is at field preparation time that a family labor shortage can be acute. Fields near the village which are farmed every year are usually fertilized with animal manure. Outlying fields cultivated intermittently are not fertilized. The crops are planted by hand in ridges or mounds built up when the field is prepared. All subsequent

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(1) Source: O.V.S.T.M., Kayes

(2) Source: O.A.C.V., Kenieba

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While the O.A.C.V. originally devoted its energies only to the peanut cash crop, it is now assisting the farmers with their grain crops via the extension of knowledge, technology, credit, and marketing. In its overall zone of operation, (covering some 160,000 square kilometers and 1,300,000 inhabitants) it has helped farmers to substantially increase farm yields. For example, in crop year '78-'79, estimated peanut yields per hectare for farmers adopting O.A.C.V. technology increased from 670-840 kilograms, and estimated yields for all cereals increased from 520 to 670 kilograms.<sup>(1)</sup>

The Senegal River - Terekole River - Lake Magui Operation (O.V.S.T.M.) is currently planned as a successor to the Irrigated Perimeters Office (O.P.I.). The latter was created in 1975 after studies performed by a French firm established the potential for the development of irrigation on the Senegal River between Diamou, east of Kayes, and the Mali-Senegal border. The French studies also suggested the river valley locations best suited for such development. To date, the activities of O.P.I. have been limited to the Senegal River Valley. Thirteen irrigated perimeters, comprised of 189 hectares and 372 participating farmers, are now in operation, including the 25-hectare perimeter at Moussala financed by USAID. It is foreseen that the O.P.I., finances permitting, will become fully operational and expand its activities, which now consist of growing fruits and vegetables marketed in the regional capital. New activities include:

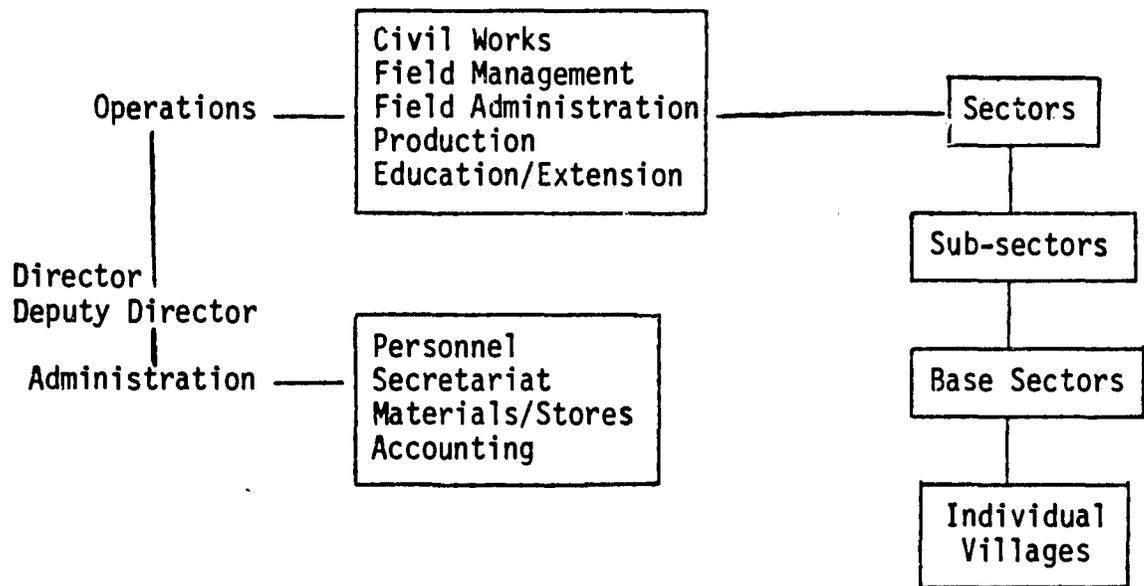
- Training of agricultural extension agents in water management and intensive cultivation in order to capitalize on the irrigation potential of the Bafing branch of the Senegal River as a result of the Manantali dam.
- Double cropping via irrigation.
- Diversifying of resident population's diet.
- Training of farmers in efficient and appropriate agricultural technology, financial management, and marketing.
- Increasing cereal production to overcome the northern area's chronic grain deficit.

While some facets of the infrastructure have been created, the O.V.S.T.M., because of a lack of financing, thus far exists mostly on paper.

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(1) Compte Rendu de la Campagne de Production. Bamako: O.A.C.V., November, 1978.

Below is an organizational diagram of both O.A.C.V. and O.V.S.T.M., which are similar in structure:



In addition to O.P.I.-O.V.S.T.M. and O.A.C.V., the multi-national Senegal River Development Organization (O.M.V.S.) also works in Mali's First Region. Apart from its studies which concern the proposed Manantali dam site, the O.M.V.S. sponsors a full-time research station at Same, 15 kilometers west of Kayes city on the Senegal River, which concentrates its efforts on seed variety testing and seed multiplication under conditions of controlled irrigation. The Same station also trains agricultural agents but does no extension work.

The government theoretically provides a number of marketing channels to the farmer. These consist of local cooperatives, the production operations (O.A.C.V., O.P.I.), and the Malian Agricultural Products Office (O.P.A.M.). Local cooperatives participate, to a limited extent, in the marketing system and not at all where production operations are present. The operations buy on behalf of and are financed by O.P.A.M. via marketing season bills of credit provided by the Malian Development Bank (B.D.M.)(1).

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(1) Marketing, Price Policy and Storage of Food Grains in the Sahel, a Survey. Volume II: Country Studies. Ann Arbor:C.R.E.D., University of Michigan, Aug., 1977.

Thus, all crops are supposed to be marketed through official channels at official prices. In reality, perhaps only 40% passes through O.P.A.M., an existing, somewhat tolerated, parallel market absorbing the other 60% of marketed crops. There are two reasons for the existence of the parallel market. First, O.P.A.M. and the production operations have neither the financial nor the operational capability to handle the entire market. Second, parallel market prices are usually higher than official government prices, and farmers prefer to sell in the parallel market.

In summary, First Region conditions are such that, for reasons outlined above, a vast agricultural potential which could benefit the rural population and the nation as a whole, remains unrealized.

### III. SUMMARY OF POTENTIALS

- a) Vast, uncultivated, numbers of hectares.
- b) Fertile flood plains of Lake Magui and the Faleme branch of the Senegal River.
- c) Abundant rainfall in the south, usually adequate rainfall in the north.
- d) Valuable water resources which might be used to irrigate crop lands.
- e) An industrious population, eager to improve its standard of living and access to improved agricultural practices.

### IV. SUMMARY OF CONSTRAINTS

- a) Few existing all-weather roads and transportation facilities.
- b) Lack of access to improved techniques for increasing farm production and income.
- c) Lack of credit facilities.
- d) An infrastructure incapable of extending appropriate knowledge, technical packages, and other basic services to the rural population.
- e) Poor health, which reduces productivity.
- f) Food pricing disincentives.
- g) Crop destruction by wildlife, insects, etc.

## V. DESCRIPTION OF PROPOSED AGRICULTURAL ACTIVITIES

The objective of the interventions proposed is to increase agricultural production in the project areas by removing those constraints that can be presently overcome, while conducting studies to seek solutions by which the more difficult constraints can be addressed. The purpose of the agricultural activities is to enhance the standard of living of the rural farm family by increasing its disposable income and diminishing its manual labor requirement.

The project will be evolutionary, incorporating continuous redesign as necessary to reflect the producers' concerns. The technology and services to be employed will likewise remain flexible.

Agricultural activities will be centered around two sites representative of the Kayes and Kenieba areas which are reasonably accessible, both for the general population and the project team. Two such sites have already been identified. These sites will provide the range of conditions characteristic of the First Region as a whole. The project team, directing agricultural activities, will include an agronomist permanently assigned to the region to supervise activities at these sites. An agricultural economist, to be fielded on a short-term basis will support activities of both the agronomist and the livestock advisor. Two Peace Corps volunteers to work at the farm centers in animal traction are recommended. Farm centers, having both agricultural and livestock facilities, will be built at these sites. Facilities will include an animal traction school, cattle corral, offices and storage buildings, and crop demonstration plots. Existing facilities at Segala (proposed as a site) can be utilized, although some additional construction will be necessary.

Varietal testing will be conducted at these farming centers as well as on farmers' fields. There is a great deal of research work to be done on corn and millet best adapted to the Lake Magui recession agricultural potential. Although considerable research has been done on irrigated rice in the Senegal basin, much work remains on upland cropping.

Fertilizer requirements will be the subject of other testing at both farm centers. Because the rich regolith on the perimeters of the Lake Magui complex and the abundant organic matter nourish the area's soil, the C.E.C. is very likely quite good and the nutrient needs of the soils not apparent. This is equally true of the Faleme flood plains, and the rain-fed plains off the Tamboura escarpment in Kenieba. Fertilizer trials should thus be conducted to establish what nutrients might be lacking, rather than doing laboratory analysis of the soils.

The use of organic matter for fertilizing and the inclusion of rotating grain crops with legumes will be demonstrated at the farming centers. The use of legumes (peanuts and earth peas are already grown in the area) as main, inter, and follow crops to provide nitrogen, coupled with the use of domestically-produced natural phosphates (telesi) which are high in calcium, can do much to achieve essential soil fertility levels without acidifying the soils.

The animal traction school will demonstrate and teach the techniques and labor-saving efficiency of using oxen or donkey-drawn implements such as plows, seeders, multi-culteurs, and carts. Animal training techniques will also be taught. Demonstrations can be done both on farm centers and selected plots of participating individuals or groups of farmers. Straight-line seed planting and spacing will concomitantly be demonstrated so that farmers can understand how animal traction can be utilized for timely, labor-saving, and yield-increasing weeding.

An agricultural credit program will be financed and established under the auspices of O.A.C.V. and O.P.I.-O.V.S.T.M. so that farmers will have access to credit for the purchase of tools, fertilizers, insecticides, animals, etc. (See the description of the credit program attached to this annex).

A forage crop plan will be explained and implemented with farmers who have the means or wish to cultivate using animal traction (and who also wish to participate in the farmer feeder activity) whereby a small portion of cultivated hectareage is destined to be harvested and used specifically as livestock feed. It is envisioned that this may be a particular sorghum which some farmers already grow to feed animals.

It should be made clear that women are included in the project's definition of "farmer" since they raise their own cash crops (e.g., onions, peanuts, tobacco) and participate to some extent in all farming activities.

**AGRICULTURAL APPLIED RESEARCH AND PRODUCTION TECHNOLOGY PROCESS/SYSTEM**

Phase I	Phase II (First Growing Crop Season)	Phase III (First Dry Season)	Phase IV (2nd Growing Crop Season)	Phase V (2nd Dry Season)
		Ongoing Throughout Project (Based on Establishment Farm Records, etc.)		
<p>Collect Agro-socio-economic information to determine characteristics, practices, problems/constraints of small farmers with current use of technology.</p> <p>Statistical Analysis (10% sampling) - North - 100 farm families - South - 100 farm families</p> <p>Define population to be reached/final selection of villages stratified by socio-economic level (6 villages to be chosen in North and South) with groups and individual farmer families (2 each)</p>	<p>Design Best Initial Estimated Technical Package (Based on analysis of survey info., previous research, etc.)</p> <p>(1) Transfer or extend package directly to farmer groups with animal traction, credit, etc. (no controls)</p> <p>(2) Testing package on individual farmer and group fields under supervision with SAFGRAD.</p> <p>(3) Formal trials/experimentation on research plots at Farm Centers with ICRISAT.</p>	<p>Evaluate/analyze results between seasons, reformulate where required, and carry out same procedure again. (i.e., extension, directly to farmers, testing on farmers' fields, and experimentation under controlled conditions)</p>	<p>Based on evaluation, carry out same procedure again. (i.e., extension directly to farmers, testing on farmers' fields, and experimentation under controlled conditions.</p>	<p>Evaluate/Analyze results and reformulate as required for Planned Output of Best Technical Package and Integration in Ag. Dev. Plan (and promotion, as well as production).</p>
Spring/Fall 1979 (FY 79)	Spring/Summer 1980 (FY 80)	Dec. 1980 (FY 81)	Spring/Summer 1981 (FY 81)	Dec. 1981 (FY 82)

## APPENDIX TO ANNEX 2 : Agricultural Analysis

### Agricultural Credit

First Region farmers presently obtain agricultural inputs and implements on a cash or credit basis only from the Irrigated Perimeter Operation (OPI) or the Terekolé -- Magui -- Senegal Operation (OVSTM). Consumer credit is often available from local merchants but is rarely extended for agricultural purposes. The OPI and OVSTM obtain supplies and equipment from SCAER (Société de Credit Agricole et Equipement Rurale) which has a monopoly on the sale of agricultural inputs.

Until 1976, SCAER prices were heavily subsidized but have recently been rising at a rate of between 7.5% to 11% annually. Producer prices for grain have risen recently and are now maintaining increases roughly equivalent to increases in the costs of inputs and farm implements.

SCAER, which absorbs the risk of lending and operates at a small credit margin, has been increasingly interested in adjusting credit policies in dealing with specific "Opérations."

### Recommended Project Intervention

It is recommended that \$50,000 be provided for small farmer credit needs, with \$25,000 provided to each of the two project areas. The funds will be deposited in the Development Bank of Mali in special accounts for use by OVSTM and OPI in six selected villages. Interest rates on these loans should reflect the real cost of capital and consider initially high loan delivery costs. A suggested interest rate of 12% is considered to be minimal and 15% probably an accurate rate in view of the fact that insurance for cattle may be included in the loan. Two types of credit should be implemented, i.e., short-term credit of up to one year for the purchase (or supply in kind) of seeds, fertilizers, small farm implements, etc. and medium-term credit to cover larger agricultural implements such as plows, carts, etc. Farm plans and budgets for both kinds of credit will be developed by the extension agent with each farmer. This budget will specify the quantity and timing of the application of all recommended inputs as well as specific repayment responsibilities. It is suggested that medium-term credit be provided on a group basis in the beginning of the project. A comparison of repayment rates of individual borrowers versus group loans (jointly and severally liable) should be conducted and evaluated as a basis for recommending a credit system for the second phase of the project.

## Suggested Procedures and Forms for Determination of Credit Requirements

### Loan Forms

With the assistance of the project's technical advisors, the farmer will fill out a FARM LOAN PAPER detailing present farm and farm family size, crops grown and corresponding hectarage, and total family income. This paper will be filed at the respective Opération's regional office and will serve as a valuable data base for future analysis. To insure as best as possible the accuracy of the information, the village council will sign the Farm Loan Paper.

The loan application form will be filled out each season or as new credit needs arise. The application form will be sent to the respective Opération's regional office for approval after signature by the extension agent and the village council. So the system will continue, initially, to rely on the village council's determination of whether someone has the capacity to take out a loan. Loans exceeding \$300 may be sent to the Director of the Opération for approval if the repayment ability of the applicant is questioned. All loans to applicants related to the extension agent or approving Opération's Regional Officer within the third degree of consanguinity or any loans to other "Opérations" employees must be approved by the Director.

### Credit Projections

Prior to acceptance of loan applications, the respective head of each Opération's Regional Office will determine the season credit demand by type of loan. Based upon this determination, "credit lines" will be opened to extension agents who will act as credit officers. This will enable the Directors of each respective Opération or his appointed officer in charge of the funds to establish lending ceilings to each sector, sub-sector, or village according to demand. Sectors, sub-sectors, or villages whose total loan applications exceed their "credit lines" must submit a justification to the approving Opération's Regional Officer for authorization of an adjusted credit line.

A suggested format for determining credit needs is as follows:

SUGGESTED FARM LOAN PAPER

(Sector/Sub-Sector)

Office \_\_\_\_\_

Village \_\_\_\_\_

Date \_\_\_\_\_

Name \_\_\_\_\_

I.D. No. \_\_\_\_\_

Number of Immediate Family Members \_\_\_\_\_

Size of Farm \_\_\_\_\_

Number of Work Animals \_\_\_\_\_

Number of Cattle \_\_\_\_\_

	<u>Crops Grown</u>	<u>Number of Hectares</u>	<u>Estimated Yield</u>
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____

OTHER INCOME SOURCES (Specify)

1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____

Signature of Applicant \_\_\_\_\_

Attestation of Village Council \_\_\_\_\_

Opération Extension Agent Signature \_\_\_\_\_

SECTOR/SUB-SECTOR APPLICATION FOR CREDIT LINE

1. Number of farmers in area of intervention \_\_\_\_\_
2. Number of extension agents who are credit supervisors in area of intervention \_\_\_\_\_
3. Estimated value of individual loans for:
  - a. Work animals \_\_\_\_\_ MF
  - b. Plows, other \_\_\_\_\_ MF
  - c. Fertilizers \_\_\_\_\_ MF
  - d. Animals for fatteing \_\_\_\_\_ MF
  - e. Labor costs \_\_\_\_\_ MF
  - f. Village water systems \_\_\_\_\_ MF
  - g. Other \_\_\_\_\_ MF
4. Estimated value of group/associations loans \_\_\_\_\_ MF
5. Total estimated credit needed \_\_\_\_\_ MF
6. Total loan applications approved last year \_\_\_\_\_ MF
7. Credit Line application last year \_\_\_\_\_ MF
8. Line 5 as percent of Line 7 \_\_\_\_\_ %
9. Percent repayment of short-term credit last year \_\_\_\_\_ %
10. Repayment rate of credit \_\_\_\_\_ %

## HEALTH ANALYSIS

### A. Introduction/Background

The health analysis will provide a general introduction/background of the health sector within Mali; it will describe the nature/extent of existing conditions within Cercles of Kenieba, Kayes, and Yelimane, commenting specifically on existing and potential constraints, and will recommend an intervention to improve the health of the rural population. An implementation plan and a health component budget are also included.

Most of Mali's people have little access to basic health services. The health problems of Mali are typical of those of other Sahelian West African countries. Communicable and parasitic diseases account for life expectancies under 40 and one of the highest mortality rates in the world. (25/1000). Most adults suffer from at least two of these disease types. Complications arising from malnutrition, malaria, and measles account for an estimated mortality rate of 50% for children under five years of age. Lack of safe drinking water coupled with present methods for waste disposal have made the village environment a source of disease vectors.

The GRM has a policy of providing human health care to rural areas, but there has not been much progress because of existing constraints. These are limited financial resources, lack of adequate physical infrastructure and personnel, inadequate health training programs, and limited planning/management expertise. As a result of these constraints, it is estimated that only 10% of the rural population has access to health services.

Characteristic of the existing health system is a focus on expensive facilities and curative services for a minority of population living in larger populated centers. Although disease prevalence varies according to different ecological conditions within the First Region, the constraints and characteristics of the health system are similar. For those living in the Kenieba area, there is the added burden of onchocerciasis. Based on available evidence and observations of team members, it is felt that this disease is primarily responsible for the abandoning of fertile agricultural land, reducing the capacity to work (with its resultant decrease in productivity) of those who remain in the areas, and eventually causing high dependency ratio (as blind people increasingly become burdens on their communities).

In conversations with villagers, health problems are invariably mentioned as priority concerns. Sickness and death are a daily reality. The vicious cycle of disease, poverty, and low productivity is understood by villagers (even if causes of diseases are not). Integrated Rural Development programs must include health components in order to succeed,

## B. Preliminary Assessment - The Problem

### B.1 Kenieba

#### B.1 (i) Health Infrastructure/Facilities/Personnel

The health center located in Kenieba consists of a maternity ward, an out-patient clinic, and a several-bed hospital ward. It is managed by a Medecin-Chef who is currently taking a two-year course in tropical medicine in Belgium. The staff includes two senior nurses, one mid-wife, eight nurses, one health aid, one auxiliary nurse, three orderlies, three laborers, and one driver.

The health center is not equipped to do surgery or adequate laboratory analysis, for which it depends on the regional hospital in Kayes (250 km. and 5 hours distance by road in the dry season). The health center is capable of doing simple diagnosis and treatment of the commonly occurring diseases. Its drugs are sent from Bamako once a year from the Pharmacie d'Approvisionnement (MOH) which provides the drugs free. This supply usually lasts about six months. The shortage is made up by Catholic Missionaries, who receive their drugs from abroad. There is a Pharmacie Populaire in Kenieba whose supply of drugs for sale is more or less adequate during the year.

The health center has two mobylettes and two land rovers, which are in disrepair and have been for some time. There is a garage with a mechanic, but he lacks tools and has no spare parts. The Cercle is in radio-telegraph communication with Kayes and Bamako. There is an airport, and emergency medical evacuation can be done by plane (usually by the Protestant Missionary plane).

There are 6 state dispensaries in the Cercle; at Sitalkili (30 km. from Kenieba), at Dalafara (85 km.), at Dombia (85 km.), at Dioulafoundouba (97 km.), at Faraba (85 km), and at Falea (85 km.). With the exception of those located on the Kayes/Kenieba road, most of these dispensaries are cut off from the health center at Kenieba during the rainy season.

These dispensaries, which cover 200 villages, are poorly equipped: a typical dispensary has a few syringes, some first-aid dressings, and a drug supply which lasts 3 to 4 months a year. This means that for 8 to 9 months a year, the dispensary can be considered out of business.

The health staff at these dispensaries, usually consisting of a health aide and an auxiliary nurse, are competent to do only minimal diagnosis and treatment of a few diseases. There are no health education or related out-reach programs. The health personnel are rarely supervised, and need re-training to upgrade their skills.

In addition to the 6 state dispensaries, there are 4 missionary dispensaries in the Cercle of Kenieba. Two are run by Catholics (at

Kassama, 35 km. from Kenieba, and at Guene-Gore, 50 km.) and two are run by Protestants (at Guindissou, 45 km. and at Kenieba itself). Each dispensary is well-equipped and well-run by a trained staff of an expatriate plus a Malian. While a typical state dispensary has from 100-150 consultations per month, a missionary dispensary has from 1,000-15,000 consultations per month, which is one indicator of the limited impact of the GRM health system in the Cercle.

The health center staff at Kenieba cited scarce financial resources and lack of adequate physical infrastructure as main constraints. They are as follows:

- lack of vehicles (cars and mobylettes) and spare parts, and chronic gasoline shortages.
- poor roads, which become worse/impassable during the rainy season.
- chronic lack of drugs.
- inadequate laboratory facilities.

These constraints, taken together, limit the coverage of the health system to an estimated 10-15% of the 100,000 people living in the Cercle of Kenieba.

#### B.1 (ii) Disease Problems

As is true for practically all of Mali, there is practically no base-line data available in Kenieba on disease prevalence for the population as a whole. At the health center, and at the dispensaries, service data is collected and is willingly shared by the health staff. This data is biased, by definition, as it is reflective only of the estimated 10% or so of the population which has access to modern health care (approximately 10,000 people). In addition, given the absence of adequate laboratory facilities and the limited diagnostic competence of the health personnel, the accuracy of the collected data is questionable.

However, a reasonable assessment of the major diseases found in the area can be made. Many of the GRM's health personnel have been living in the Cercle of Kenieba for 5 years or longer, and have a good sense of what diseases the population suffers from. Numerous contacts with the villagers revealed that they were able to identify their health problems, even if they were often unsure what caused them.

An analysis of available data, field visits, discussions with the health personnel, and direct contact with villagers yielded a consensus of sorts. The three most commonly occurring diseases in

the Cercle are onchocerciasis, schistosomiasis, and malaria. These diseases are grouped together because they have the greatest impact on productivity. In a second category are such health-related concerns as: diarrhea/dysentery, upper respiratory infections, hepatitis/jaundice, trachoma/conjunctivitis, venereal disease, intestinal worms, leprosy, trypanosomiasis, hernias, and equally important, the scarcity of safe water.

B.1 (ii)a. Onchocerciasis

This disease is by far the biggest health constraint to development in the Cercle. It was cited as the most important health problem in every health post and village visited. Based on clinical diagnoses, estimates of its prevalence by Cercle health personnel varied from 60-90%. In 1976, a Cercle-wide survey was conducted by health center staff of the number of blind people. The results were that the total reported blind cases amounted to 1,032 out of a population of 100,000. One can assume, given the limited MOH survey capacity, that the true number is higher. According to information published in Onchocerciasis Control Program (OCP) reports, the prevalence of disease reaches hyperendemic levels all along the tributaries of the Senegal River (the Faleme and the Baoule), which pass through the Cercle and constitute "severe foci" of black fly breeding sites.

An OCOGE team conducted, in the fall of 1978, a vector ophthalmological survey in the Cercles of Kenieba, Kayes, and Yelimane. Preliminary and unofficial results confirm the severity of the onchocerciasis in the Kenieba Cercle, but the report itself has not yet been published.

The Onchocerciasis Control Program has tentatively decided to conduct a two-year feasibility study of extending the limits of its current control campaign in the Senegal River Basin area (covering the countries of Guinea, Mali, and Senegal). It is expected that this study will lead to an operational vector control program. A series of meetings are planned for the rest of the year in which scope of work and funding sources are being discussed. Providing that terms of reference can be agreed upon by all member countries and donors and that the necessary financial support can be found, such a study could take place in 1980 at the earliest.

B.1 (ii)b. Schistosomiasis (Haematolium and Mansoni)

People use the rivers and marshes of Kenieba as the primary water sources for their drinking, bathing, washing, and toilet needs. Potential exposure to schistosomiasis (and to other water-borne diseases as well) is therefore full and complete. Based on clinical diagnosis, health personnel estimate that over 50% of the children

have schisto. It can be assumed that if the children have it and if all age groups are exposed, then the adults have it at proportionate rates. However, it's particularly difficult to arrive at even an estimate of schisto prevalence for all the age groups because adults are reluctant to admit having urinary and bowel problems (which means that venereal diseases are probably under-reported as well). Information on the prevalence of schisto M is therefore unknown.

#### B.1 (ii)c. Malaria

No one escapes this disease. Recurrent bouts of fever and chills are part of everyone's existence. Complications resulting from malaria, weaning, diarrhea, and upper-respiratory infections are the major infant killers. Those who survive tolerate malaria, but it is nonetheless a major health constraint to productivity.

#### B.1 (ii)d. Other Diseases

The second grouping of diseases, taken together, act as a major constraint to productivity, particularly gastro-enteritis, intestinal worms, upper respiratory infections, conjunctivitis, and trachoma. The estimated prevalence of each one varies by location and season. During the course of medical surveys and treatment trials, these commonly occurring diseases will be diagnosed and treated.

### B.2 Kayes

#### B.2 (i) Health Infrastructure/Facilities/Personnel

There is a large hospital complex in the city Kayes which serves as the back-up and referral center for all the health facilities in the Region. It comprises a maternity ward, a pediatric ward, a surgical center, a laboratory, and an eye-ear-nose-and-throat clinic. The complex is relatively well-staffed and equipped, although there are often shortages of basic drugs and medical supplies. Also in Kayes, serving the 48,000 living in the urban area, are the out-patient facilities of a health center and an MCH center.

The general health services picture of the Kayes Cercle is similar to that described in Kenieba. A village representative of these conditions is Segala, which is located east of Kayes on the road to Nioro just outside the Cercle of Yelimane. It is the administrative center of one of the main arrondissements and one of the 6 villages tentatively selected for pilot agriculturally related development activities during the first phase of the project. The population of these villages is approximately 12,000 people. There is a dispensary in Segala, which is within approximately 10 km. from four of the other five villages, and about 15 km. from the remaining village.

The dispensary is poorly equipped and supplied. There are chronic shortages of medication, usually lasting 8 to 9 months in any given year. Consequently, the credibility of the dispensary is low, and a relatively small minority of the population makes use of its services. As in the case in the Cercle of Kenieba, the health staff is competent to do only minimal diagnosis and treatment. With adequate medical supplies, however, and with regular supervision and re-training, the quality and quantity of health care could be significantly improved.

The Segala health staff are in a position to take advantage of the activities taking place under the AID-financed Rural Health Development Services project in the Yelimane Cercle, and they will be included in this project's training program as appropriate.

### B.2 (ii) Disease Problems

Much of what was written on disease problems in the Kenieba section applies to the area north of Kayes: no base-line data, limited and biased service data, and 90% of the population not being reached by the health care system. Field visits and discussions with medical authorities identified malaria, diarrhea/dysentery, upper-respiratory infections, and trachoma/conjunctivitis as the major diseases in the area. Intestinal worms, TB, skin diseases and sores, measles, and schistosomiasis are other important health problems. Onchocerciasis is not a health problem because of the absence of suitable black fly breeding sites. Schistosomiasis tends to be both limited and seasonal. Snail breeding sites are found in marshes and small ponds that accumulate water during the rainy season. As these water sources dry up during the long dry season, snail populations are not able to reach large sizes.

### B.3 Yelimane

In the Cercle of Yelimane, there is a health center and 4 dispensaries at the arrondissement level. AID is currently implementing a 4-year Rural Health Development Services project (688-0208) to design, implement, and evaluate a demonstration, low-cost village-based rural health services system in selected areas of Mali which could eventually be adopted by the GRM as the foundation for national rural health services delivery system. The Cercle of Yelimane has been chosen as an initial project site. There are training programs underway to improve technical skills and to train trainers and supervisors of health workers at village/arrondissement/cercle levels. Project activities also include diagnosis of health problems and resources within the community, the implementation of disease, health education and simple diagnostic/curative health services in demonstration areas, and the provision of medicine and equipment for the system to function effectively.

Taking into consideration the on-going work in Yelimane, this project does not plan any health interventions in this area. However, activities will be coordinated in such a way as to assure that data gathered and experience gained will be fed into this project and used for the design of a future health component for the First Region.

### C. Interventions - The Solution

The preliminary assessment of the First Region's health situation clearly indicates the broad lines of a health component. This component can be divided into five main interventions. These consist of (1) an in-depth analysis of the health situation and on-going health projects in the First Region and similar areas, (2) a program of treatment trials especially for onchocerciasis and schistosomiasis H and M, (3) a drug distribution program that is self-financing, adequate in coverage, and makes drugs available on a timely basis, (4) appropriate health improvement activities including training, education, and disease control/prevention, and (5) a limited improvement of health infrastructure including the supply of vehicles, lab equipment, and operating expenses.

#### C.1 Analysis and Data Collection

A constraint to effective health programs is the lack of baseline data. Medical surveys to gather data on the nature and extent of health problems in the selected zones will respond to this constraint. MOH personnel will be trained not only in the gathering of such data, but also in techniques of quantification and record-keeping to ensure that data collection is an on-going procedure.

This aspect will collaborate with on-going projects to avoid duplication of effort. No assessment will be done in the Yelimane Cercle because of activities being implemented under the Mali Rural Health project. The Federal Republic of Germany is also doing assessment work, and their findings will be incorporated into the data base for this project.

The area of intervention is obviously too great to be completely covered by the limited means available to the GRM and the project. Sample villages have, therefore, been selected. These villages respond to the criteria of (a) having a dispensary, (b) being within 5-10 kilometers of a planned pilot agricultural intervention, and (c) being representative of the different ecological and health conditions that exist in the First Region. In the north, Segale, and in the south, Sitakili, have been selected for surveys.

Medical surveys will be conducted in these areas to determine disease prevalence. Urine, stool, and blood analyses will be done by MOH personnel assisted by project staff, to determine primarily the prevalence of onchocerciasis, schisto H and M, and malaria.

During the course of these surveys, information on the prevalence of other diseases, such as diarrhea/dysentery, upper respiratory infections, trachoma/conjunctivitis, intestinal virus, TB, measles, and skin diseases, will also be generated. Medication for the treatment of these diseases will be presented at the time of the medical surveys. In addition, the surveys will look into food consumption patterns in order to assess the nutritional status of children under five and pregnant and lactating women.

## C.2 Treatment Trials

Based on the results of the medical surveys, treatment trials for onchocerciasis and schisto H and M will be conducted in the selected sites. The purpose of the treatment trials is to demonstrate that rural health personnel can be trained to diagnose, treat, and monitor a chemotherapeutic protocol for onchocerciasis and schistosomiasis H and M.

Treatment programs for onchocerciasis, opposed to vector control, are becoming increasingly worthy of consideration. OCP experience shows that vector reinvasion poses a threat to disease control efforts. In addition, the filaria which causes onchocerciasis may live for up to 15 years in the human host, and accordingly, blindness may continue to occur many years after a hypothetically successful vector eradication or control program. The known treatment drugs are powerful and may cause side effects and thus, appropriate doses must be prescribed and monitored. The MOH has authorized a chemotherapeutic protocol for treating onchocerciasis with Diethylcarbamazine. Reduced doses of this drug reportedly cause negligible side effects while effectively killing the micro-filaria. (See Appendix A for additional information.) For the treatment of macrofilaria, a protocol of reduced doses of Suramin will also be conducted.

In addition to onchocerciasis treatment trials, attention will be given to schistosomiasis H and M. Treatments for these diseases are better known, but careful monitoring of the use of medications will be made. Information from the results of these treatment trials will be used to determine whether they can be safely used on a wider scale during Phase II of the project.

## C.3 Drug Distribution Program

The weaknesses of the present drug situation are obvious. Only the Pharmacie Populaire has drugs throughout the year—for a price. The free dispensing of drugs acts as a drain on the MOH budget which cannot be supported. Thus, a program of selling drugs will be instituted. Funds obtained from drug sales will be returned to a revolving fund for the financing of additional supplies.

Two factors are necessary for this system to work. First, the rural poor must have enough money and enough confidence in the health system to be willing to buy the drugs. Experience indicates that the rural poor in Mali have the capacity to pay for medications. Second, strict controls must exist, including monitoring and accounting procedures, to insure that drugs are indeed being sold for the appropriate prices. Such controls have been developed under the Mali Rural Health project and will be instituted under this project.

The drugs to be sold and amounts are listed in the project budget.

#### C.4 Appropriate Health Improvement Activities

Much can be done to alleviate the debilitating effects of diseases through preventive measures. The main thrust of this aspect of the health intervention will be on training and education. MOH personnel will be trained at the village, arrondissement, and cercle level, not only in medical surveys and treatment surveys, but also in preventive measures such as sanitation, safe drinking water, and awareness of disease vectors. There are already training programs of health workers, trainers, and supervisors, and this project will allow for this work to occur in the project zones and be adopted to the unique situation of the First Region.

In addition, selected MOH personnel will be trained at the Bamako Eye Care Institute (IOTA). IOTA is a regional center for eye care in the Sahel and is well known and respected. MOH project personnel will be trained for 3 months on eye care which, as the preliminary assessment shows, is extremely important for the Kenieba area of the First Region.

#### C.5 Infrastructure

The last aspect of the health intervention will be the support of health infrastructure. The state of Malian infrastructure is well documented. For this component to be successful, vehicles will have to be financed to allow MOH project personnel to have the required mobility for the surveys, data collection, treatment, monitoring drug distribution, etc. In addition, lab equipment must be financed to allow for basic analytic work to be done. A list of these commodities is found in this section's budget.

### D. Implementation Plan

#### Months

- 1-2 Collect and analyze information available on health problems in Kayes region.
- 1-2 Collect and analyze most recent information on the diagnosis and treatment of onchocerciasis from OCOGE (IOTA)\*, WHO (OCP), and from the MOH.

\*) Such as the report from December, 1978 survey team mentioned above.

- 1-2 In collaboration with project and GRM staff, select target groups (in the northern part of the Region, Segala has been identified, where there is a dispensary which serves approximately 12,000 people. In the southern part of the Region, Sitakili has been recommended, a village of approximately 800, with a dispensary).
- 1 MOH selects health personnel to be counterparted to the project.
- 1-2 Consult with IOTA and MOH staff on sending 2-3 Malian health personnel to three-month training course at IOTA in eye care.
- 1-2 Order commodities (drugs, lab equipment, LR, molyettes).
- 1-6 Health personnel begin IOTA training program.
- 2-6 Make site visits to Kayes Region and elsewhere as needed; consult with missionaries working in Kenieba area; prepare for medical surveys; arrange logistics.
- 3-8 Assist in organizing and setting up drug distribution system.
- 6-LOP Assist in training local health staff in conducting medical surveys in Kenieba.
- 7-LOP Assist in conducting medical surveys in Kenieba (skin snip and urine concentrate tests). During the surveys, the commonly occurring diseases of the target population, except for oncho and schisto, will be diagnosed and treated to the maximum extent possible.
- 7-LOP Collect and analyze survey data with MOH staff.
- 8-LOP Assist in planning and organizing treatment trials in Kenieba.
- 8-LOP Assist in conducting and monitoring treatment trials for oncho and schisto in Kenieba.
- 8-LOP Assist in the treatment and recording of secondary effects.
- 10-LOP Repeat medical survey to evaluate treatment trials.
- 11-LOP Adjust/modify and repeat treatment trials as needed.
- 12-LOP Repeat the steps above for the northern area of Kayes.
- 22-LOP Analyze relevant data from all surveys and trials with GRM officials.
- 22-LOP Assist in the preparation of a health program for the First Region project.

E. Commodities Budget for Health Program

AID (in U.S. dollars)

I. Commodities

A. Medicine

1. DEC (Diethylcarbamazine - Microfilaricide) (\$5/per person/8-wk. treatment for 5,000 people)	\$31,000
2. Suramin (Macrofilaricide drug) (\$5/per person/8-wk. treatment for 5,000 people)	31,000
3. Astiban/Ambilhar (\$5/per person/4-wk. treatment for 7,500 people)	37,500
4. Penicillin V (15,000 tabs)	1,500
5. Chloroquin (50,000 tabs)	2,900
6. Aspirin (40,000 tabs)	200
7. Vermox (10,000 tabs)	400

8. Sulfisoxazole (25,000 tabs)	250
9. Ophthalmic drops	500
10. Anti-allergic drugs	1,000

B. Medical/Laboratory Equipment

Forceps, skin punches, related lab equipment	1,000
Microscopes (3)	3,000
Slides, stains, misc. lab supplies	1,000
Manual centrifuges (2)	650
Diagnostic kits with accessories (2 at \$200 each)	400
Slit lamp with accessories (tonometer, triple mirror contact lens, single mirror contact lens (1)	5,000

TOTAL.....117,000

GRM

Appropriate health personnel at Regional, Cercle, Arrondissement levels (10 people)	20,000
Recurrent costs for health system (use of medical facilities including drugs, equipment, and supplies)	15,000

TOTAL,.....35,000

APPENDIX A

Malian Ministry of Health

Chemotherapy Protocol

for Onchocerciasis Microfilaria (a) (1.10.75)

I. Curative Treatment (with DEC) as follows:

1/4 tab per person per day for 6 days  
1/2 tab per person per day for 6 days  
1 tab per person per day for 6 days

This will be followed by 15 days rest under medical surveillance after which the second treatment begins as follows:

1/2 tab per person per day for 6 days  
1 tab per person per day for 6 days  
2 tabs (a.m. and p.m.) per person per day for 6 days  
1 tab per person per week for 4 weeks

II. Preventive Treatment (DEC)

1/2 tab per person per week (for those over 10 years old)

III. Remarks

The curative treatment includes excision of nodules, as well as the use of cortisones, antihistamines, and other anti-allergic drugs as required.

The Ministry of Health has been using this protocol since 1975. There is some data available from a FED-funded livestock project located at Madina in the region of Sikasso. According to its reports, over 400 people have received curative treatment with DEC, following the chemotherapy protocol for onchocerciasis, and have experienced "positive" results. Furthermore, they claim that side effects have been limited to headaches and itching skin. However, since data has not been collected on the prevalence or severity of side effects, it is difficult to assess the efficacy of their oncho treatment.

(a) There is no MOH protocol for macrofilaria treatment.

### Background

The design team confirms the great potential for development within the First Region, given the necessary infrastructure. The team identified two areas which must be given special attention for such potential to be realized: improvement of the transportation/storage network and of the water management system.

To realistically identify specific problems and to evaluate the technical feasibility and economic justification of infrastructure solutions based on proposed agricultural, livestock, and other related interventions, it will be necessary to field an engineering team for a sufficient period of time to canvas the areas, search existing information sources, gain field experience, and test possible prototypes. The result of this effort will be an overall regional engineering plan focusing, as priorities, on improvement and/or additions to the rural roads and grain storage network and the development of water resources management sites.

To this end, the following manpower will be necessary: one U.S. agricultural engineer specialized in rural infrastructure with experience in both water resources and rural roads; two Malian engineering counterparts, one from Genie Rural/one from Travaux Publique; and short-term expertise in rural road, storage, water storage, soils, etc. as needed to aid the engineers in their respective studies.

### Roads and Storage Study

A transportation analysis of the Region will generate data to determine the optimum infrastructure required in support of the pilot activities proposed (primarily agriculture and livestock). The road network will be determined by a linear equation transportation model since sophisticated, electronic computers would not be necessary and would be difficult to transfer to the Malian counterparts. Storage ability is an integral part of an overall transportation plan, and the study will include an inventory of current grain storage facilities and projected storage capacities.

Field observations and a study of available maps and documents provide the following information on some existing road segments.

The existing system of route infrastructure<sup>(1)</sup> in the First Region consists of National Roads (NR), Regional Roads (RR), and Local Roads (LR). The First Region has 602 km of National Roads, 1,633 km of Regional Roads, and 171 km of Local Roads. In addition to these "classified" roads, there are 172 km of non-classified improved tracks and 38 km of agricultural roads in the Region. Information is available showing the point-to-point location and the distance for each segment of the classified roads and non-classified improved tracks in the First Region.

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(1) Direction Regionale des Travaux Publics et de L'Urbanisme, Kayes as of 1976.

Kayes and Yelimane Cercles:

The existing road network within the Kayes and Yelimane Cercles that will influence the project areas are:

1. Kayes-Nioro (NR 1, 251 km) road, east of Kayes, follows the Kolimbine River to Segala and will prove to be a great stimulus to development activities being considered at Niamiga, Diataya, Segala Central, Segala Ba, Marena, and Koniakari, which are all located downstream of the Lake Magui chain of lakes. Access to the National Road 1 (the Kayes-Nioro Road, if constructed as planned) will insure market accessibility for all types of crops when they are ready for market.
2. Kayes-Sero-Yelimane (RR 3, 136 km) traverses most of the fertile flood plains of the upper Kolimbine and Terekole Rivers; however, this route (trail) is not improved and passable only long after the wet season ends. There are neither culverts nor paved fords at water crossings, and the roadway, for the most part, is below the surrounding terrain, creating numerous mud holes with the least amount of rain.

Area East of Kolimbine River:

To provide all-weather accessibility to these fertile flood plains east of the Kolimbine River, roads would have to be constructed to connect with the Kayes-Nioro road. There are two alternative routes to be particularly considered in this flood plain area, and they are:

- (a) Construction of a route from Yelimane via Kionkoulane, Tambakara, Diabougou, Sero, Nogossire, Saboussire, and connecting with the Kayes-Nioro road at Segala. This route will require the rebuilding of the 70 km between Yelimane and Sero and construction of the 40 km between Sero and Segala.
- (b) Construction of a route from Sero via Diabougou, Tambakara, Dionkoulane to Yelimane, and then improving the RR 5 between Dialaka and Yelimane by repairing stream crossings and regrading portions of the road. This route would require rebuilding the 70 km between Yelimane and Sero (the same as for alternative "a" above). However, the rebuilding and repair of stream crossings and reconstruction of many portions of RR 5 between Dialaka and Yelimane, which is about 68 km long, would be required. In addition to the construction cost, the transportation distance and cost will be greater for all the villages served in the Kolimbine River flood plain.

A choice between these alternatives can be made only after reliable baseline data for crop production is available. The economic relationship between construction cost, transportation cost of inputs and surplus output, projected volume of output, and location will be analyzed to determine economic justification for route selection.

Area West of Kolimbine River:

The necessity of all-weather access to the flood plain area on the west bank of the Kolimbine is not justified by the population in this area. There is only one village (Kontela—opposite of Sero on the eastern bank of the Mer de Magui) in the western flood plain, and during the dry season it can be reached by RR 3.

Terekole Valley:

The Terekole Valley is served by a track that passes through Niougomera, Sara Madina and ties into the Kayes-Nioro road NR 1, at Birou, about 47 km west of Nioro. All-weather access to this fertile valley would be by either one of the alternative routes justified to serve the eastern flood plain of the Kolimbine River.

Kenieba Cercle:

The existing transportation infrastructure within the Kenieba Cercle that will influence the project area are as follows:

Bafoulabe-Kenieba-Frontier (NR2, 184 km) road bisects the Kenieba Cercle. The road starts at Satadougou-Tintiba in Mali and traverses the Kenieba Cercle in a northeasterly direction and passes through Kenieba. About 90 km from the Senegal border at the village of Djibrouia the road divides, its northern part (RR 1, 187 km) going to Kayes and NR 2 going to Bafoulabe, which is about 100 km from this junction. From here, shipments to the seaport in Senegal would go to the railroad at Kayes, while shipments for Bamako and other southeastern destinations would go to the railroad at Bafoulabe. These two roads, NR 2 (Bafoulabe-Kenieba-Frontier) and RR 1 (Kayes-Sadiola-Djibrouia) are the key to development of the Kenieba Cercle because all other routes would require major structures over the following rivers: Balinn, Bafing, Bale, and Bakoye, to reach the railroad. This would reduce 200 km of rail freight shipments from Bamako and add 200 km of rail freight shipments to Kayes and the seaport in Senegal.

Kenieba-Kouronkoto-Kokofata-Kito (RR 9, 180 km) is an east-west route. This route terminates at the reservoir behind the planned Manantali Dam. The portion of RR 9 west of the Manantali reservoir in the 1,200 to 1,300 mm rain belt is not an all-weather road and crosses many intermittent streams and two rivers (Ouloukali and Dassabala) which flow year-round.

Non-Classified Roads:

Within the Kenieba Cercle there are two major non-classified routes serving the area south of NR 2 and RR 9. One begins at Sata-dougou-Tintiba, traverses some 70 km and passes through Falea before

reaching the Guinea border. The second part branches off RR 9 east of Dabia and passes south through Faraba and Fari-Ndantare before reaching the Guinea border, which is about 110 km from where it left RR 9. Both these routes traverse areas of low population and high rainfall.

### Water Resource Management Study

Of the water sources available in the First Region, it is recommended that the development of surface water run-off be given priority. Development of ground water will require power and a higher level of technology. Hydroelectric power, when developed (Manantali Dam) and distributed, will change the economics of ground water resources development. Appropriate power systems such as wind, solar, or animal-driven power should be explored in the overall plan nonetheless.

In the Yelimane Cercle (Sahelian zone) the following relevant data are provided:

Rainfall is between 300 and 650 mm/yr.  
Deviations are 30-45% from mean.  
Generally, there are 26-46 days of rain annually which are in the months of June, July, August, and September.  
Evapotranspiration ranges from 1,700-1,900 mm/yr.  
Winds are often strong, averaging 5-16 km/hr.

These climatic conditions and the topography of the hilly terrain and the wide, flat, flood plain make possible the development of fertile valleys, (the Terekole and Gari river basins) dependent on flood water.

The GRM and the Federal Republic of Germany will study the hydrology, climatology, topography, agronomy, and socio-economic conditions in the Terekole-Kolimbine and Lake Magui region, located in the Cercles of Kayes and Yelimane, leading to the construction of three small dams with associated irrigation scheme. The work is scheduled to be completed in 3 years. Care will be taken to fully coordinate efforts to avoid duplication.

In the northern area of the Region, the project will capitalize on the cataloging of development sites and the data generated by the Federal Republic of Germany study.

In the southern area of the First Region, (Kenieba Cercle) the climatic zone is classified as Sudan<sup>(2)</sup> - Woodland<sup>(3)</sup> with the following relevant data:

Rainfall is between 650-1,400 mm/yr.  
Deviations are 20-30% from mean.  
Generally there are 50-80 days of rainfall annually.  
Evapotranspiration ranges from 1,600-1,800 mm/yr.  
Winds are low, averaging 3-8 km/hr.

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(2) IBID

(3) IBID

These climatic conditions and topography ranging from hilly to mountainous with few wide, flat, flood plains, offer less development possibilities than other Cercles. However, there are numerous small watersheds along the escarpment that form the divide between the Faleme and the Bafing river basins. Most of these watersheds have formed a delta that can be made more productive through the introduction of appropriate technology and/or construction of water management structure, i.e., farm stock ponds, diversion dams for field and orchard flooding, and diking for retention of water for rice cultivation.

Although the study will investigate many other sites, field observations and a study of available maps, etc. revealed the following information:

Yelimane and Eastern Part of Kayes Cercles:

In the extreme northern part of these two cercles there are two possible types of interventions, both requiring construction for the control of water. The first is a diversion dam located on mainstreams or tributaries to control the height of flood waters and the duration of flooding. The second possibility is irrigation from water pumped from land to be reclaimed via drainage. The location of these drainage/irrigation systems could be located along the perimeter of Lake Magui, etc. on the Kolimbine River.

The most promising locations visited for diversion dams to control flood height and duration are:

1. Terekole River Basin upstream of Niougomera. The river valley floods each year, the soil is heavy and retains sufficient moisture to support a corn crop after the flood waters have receded. The building of diversion dam and/or dams either on the main-stream or on the tributaries would insure that flooding will occur each year even during periods of below-average rainfall.
2. Gouroule stream above the crossing of the Yelimane-Kayes road via Lake Magui. Similar to the Terekole valley, the soil is quite heavy, but the topography is different--the stream is not in the foothills but in the ancient flood plain of the Kolimbine River. A structure at this location may require extensive diking to close off the many side channels that exist. At each of the side channel locations an outlet would be required to drain these channels when flooding is no longer required. Pump irrigation system may prove feasible here because the soil along the perimeter of the Lake Magui system is quite heavy and slow-draining and will not require large pumps to keep developed polders suitable for cultivation. The pumped drainage water could be efficiently utilized for irrigation of suitable riparian land above normal lake level. The inputs required are topographic mapping (scale 1:2,000 and contours at 0.5 m) for layout of drains, dikes, and irrigation laterals, and soil sampling and testing to determine drainage system design and pumping requirements is needed.

### Kenieba Cercle:

A possible form of intervention in the Kenieba Cercle would require construction of diversion dams and/or dikes to retain flood water for rice cultivation and/or soil moisture build-up for corn, millet, and sorghum after recession of control flooding.

One of the more promising sites is the Moussala Plain at the junction of the Faleme and the Selingouma. This plain of about 900 hectares is subject to seasonal flooding and, recently, rice cultivation has commenced on about 13 hectares. A system of bunds and drainage ditches would be necessary to expand rice and/or other cereal production on this plain. The inputs needed for the design of this system would require topographic mapping (1:2,000 with contours at 0.5 m) for layout drains and determination of the area that can be cultivated.

Another site similar to the Plain of Moussala is located at Faraba and is estimated to have 300 hectares available for development. Identical inputs would be required for development of this plain.

### Prototypes

The objective of this component of the project is to arrive at an overall engineering plan for an integrated rural development project in the First Region, recommending feasible and justifiable interventions to improve all sectors of the area. In order to gain field experience and investigate the technical feasibility (and community impact) of proposed infrastructure solutions, the engineering team, in coordination with other members of the Project Team, will construct prototypes. The prototypes are not only essential to insure that proposed interventions will work, but also to judge the level of community participation, the social impact, the environmental impact, and the true costs of building.

Many of these "models" will be built to provide sufficient data from road, storage, and water management structures (e.g., laterite tracks, culverts, village granaries, diversion dams, reservoirs) while also providing technical support to pilot activities to be carried out in this project. A small budget of \$125,000 is recommended specifically for this vital aspect of the study. Liberally estimating an average cost for each construction at \$7,500, sixteen or more prototypes can be constructed under the project (at least eight within each of the project areas).

### Facility Construction

Housing, offices, and farm centers will be necessary to support the project staff. The buildings must be built well in advance of the staff's

arrival in-country to assure that valuable time is not wasted due to a lack of housing or work areas.

#### Housing:

Of the project team, three will be permanently stationed in project areas where inadequate housing exists, while the rest will be visiting the areas frequently. Therefore, five houses will be needed, three for the permanent staff and two for visitors. Four of these houses will be located in the south and one in the north. Adequate staff housing is available for renting in Kayes.

The houses will be modest but comfortable, with electricity and indoor plumbing. Their design will be adapted to the climate and provide a living and dining room, three bedrooms, one and a half bathrooms, a kitchen, and adequate storage space for a total floor space of 140 square meters.

The houses will be constructed of reinforced "banco", (adobe-dried earth) both economical and durable. Important criteria to be followed by the designer will be specified.

#### Farm Centers:

Two farm centers will be built, and each is composed of two buildings built of reinforced banco. The first will contain a reception area of 25 m<sup>2</sup>, three offices for project staff of 15 m<sup>2</sup> each and two large meeting/training rooms of 50 m<sup>2</sup> each. The second building will contain a covered cattle vaccination area of 25 m<sup>2</sup>, two safe, fully enclosed storage areas of 25 m<sup>2</sup> each, and a large open storage area of 75 m<sup>2</sup> for farm implements. In addition, 2,000 lm of fencing will be necessary for a corral area.

#### Implementation Plan

The first implementation action will be the procurement of technical services. Two types of procurement are proposed; (1) U.S. procurement of technical services from a consulting firm; and (2) Local procurement of architecture and engineering (A & E) services for the advance construction of support facilities and training centers. Required counterparts and Peace Corps Volunteer(s) must also be recruited.

The U.S. technical services will be under one contract based upon an RFP to be prepared by the USAID Project Manager. The contracting procedures for the local procurement are described below:

Local Contracting Procedures Design & Construction: The Design Division of Genie Rural (MRD), the building authority for all rural construction, is fully capable of doing A & E work for rural facili-

ties. However, at this time their staff is overloaded with work (much of it for AID on other projects) and, therefore, the A & E work will be done by private local A & E firms. This private firm will provide construction management, supervision, and inspection of the work with assistance by Genie Rural and the USAID engineer.

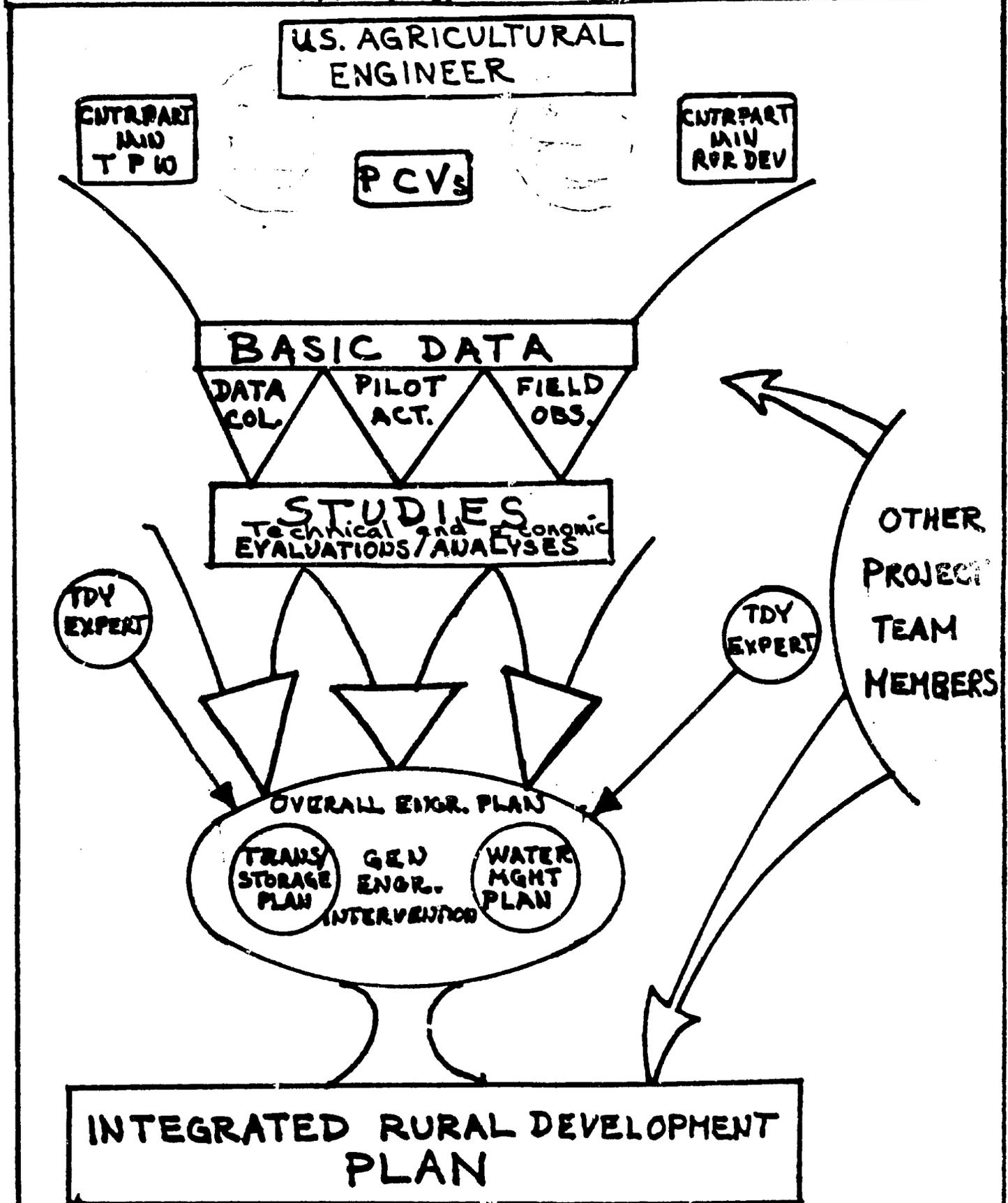
The schedule for this work depends, to some extent, upon the rainy season (June-September). However, the Grant Agreement should be signed by June, and negotiations with an A & E firm should be complete by that time so that a contract can be signed immediately. Therefore, an approximate schedule of the building design and construction is as follows:

<u>Implementation Action</u>	<u>Date (Month/Year)</u>
1. Grant Agreement signed	6/79
2. A & E and Construction Management contract signed	7/79
3. Site work/furniture and equipment ordered	7/79
4. Layout/site plans/finished and approved	8/79
5. Draft plans, specs. and bid documents finished and observations made by MRD/USAID	9/79
6. Final bid package complete IFB advertised	10/79
7. IFB to contractors	10/79
8. Closing date bids in contract signed	11/79
9. Construction begins	12/79
10. Construction complete	4/80
11. Furnishing of buildings complete	5/80
12. U.S. project team moves in	5/80

This schedule is tight, especially considering the approvals required at various stages, but the USAID Engineer will be responsible for obtaining them in a timely fashion. The waiver for construction materials and services (see procurement plan) is considered vital to the timeliness of implementation.

The engineering activities of the project are shown in the bar diagram in Appendix B.

# ENGINEERING INTERVENTION



GRAPHICAL CONCEPTION  
PLANNING APPROACH

APPENDIX B

ENGINEERING COMPONENT — IMPLEMENTATION ACTIVITIES

Activity	Mon 2/80	5/30	8/80	11/80	2/81	5/81	8/81	11/81	2/82
1. Data collection									
2. Devel. proto criteria									
3. Design prototypes	—								
4. Assist other proj. members		—					.....		
5. Devel. Road and Storage Planning criteria				—					
6. Construction prototypes									
7. Cost estimating									
8. Eval. proto & other project interventions, modify as appropriate							—		
9. Eval. trans/storage needs from I.R.D. recommendations									
10. Analysis all									
11. Prepare Water Resource PLAN							.....		
12. Prepare TRANS/STORAGE PLAN							.....		
13. Prepare overall infrastructure plan									
14. Assist I.R.D. PLAN									

APPENDIX C

Construction Cost Breakdown

Factors 10%+15%+10%+9% = 44%

M.F. C.F. D.F. I.F.

I. 5 - Houses 140 m<sup>2</sup> banco

$$140 \text{ m}^2 \times \$150/\text{m}^2 = 21,000 \times 5 = \$105,000$$

$$\text{Sub-total } \$105,000 \times 1.44 = \underline{\$151,200}$$

II. 2 - Farm Centers

Storage and Demonstration Building (concrete block)  
 $150 \text{ m}^2 \times \$175/\text{m}^2 = \$26,250$

Administration Building (training/meeting rooms, offices, etc.) - Banco  
 $170 \text{ m}^2 \times \$125/\text{m}^2 = \$21,250$

Sanitary (concrete block)  
 $10 \text{ m}^2 \times \$400/\text{m}^2 = \$4,000$

Corral  
 $2000 \text{ m} / \$2.50/\text{m} = \$5,000$

$$\text{Sub-total } 56,500 \times 2 = 113,000 \times 1.44 = \underline{\$162,720}$$

III. V R D

Septic tank and dry well, LS =  $\$10,000 \times 1.44 = \$14,400$

Generators for houses,  $5 \times \$8,000 \times 1.20 \text{ trans} = \$48,000$

Well and pump = \$ 14,000

And Cisterns:

Pump = 1,000

Well = 5,000

Cistern = 1,000

X 2 = \$ 14,000

Sub- total = \$ 91,000

TOTAL rounded to \$ 405,000

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Tab A to APPENDIX C

BUILDING CONSTRUCTION COST ANALYSIS

Construction Cost Estimating in Mali is more of an art than a science. In the last year, completed construction costs estimates have varied from \$200/m<sup>2</sup> to \$400/m<sup>2</sup> for the identical construction. The reasons for these variations are numerous. Bids are not based on costs of materials and labor alone, but upon a contingency or "risk" factor which exists in construction in Mali.

The location of the work, uncertain availability of construction materials, and price fluctuations greatly influence bids. A contractor may bid very low on a job.

Equipment repair and seasonal labor present uncontrollable factors increasing the cost of construction. Construction costs are difficult, if not impossible, to accurately estimate. Project unit cost estimates, however, have been based upon best-guess, current costs.

1. Simple Concrete Block Construction:

The cost per square meter of houses built of reinforced concrete frame and roof, concrete block masonry, and without certain finishing elements (electricity, wiring, water, and plumbing connections, screens, door locks) done by a small local contractor with little overhead (tacheron), is \$175. Similar type construction (slightly more modest) of offices and housing, but completely finished and done by force account cost \$225-285/square meter about 9 months ago in Sevare (Fifth Region). Thus, a reasonable budgetary estimate is believed to be:

Stable half walls (no elect.)	\$175/m <sup>2</sup>
Warehouse/Garage	\$250/m <sup>2</sup>
Simple Concrete Block Offices	\$275/m <sup>2</sup>
Simple Concrete Block House with Plumbing	\$300/m <sup>2</sup>
Sanitary facilities	\$400/m <sup>2</sup>

II. Improved Adobe Block (Banco) Construction:

The cost of improved adobe construction depends to a great extent upon how much, and in what manner, it is improved. The cost per square meter of a relatively simple building (house, classroom, office) of adobe construction including concrete slab floors and cement reinforced plaster plus reinforced concrete lintals, metal windows and doors, and corrugated roofs, varied from about \$74 (office, classrooms) to \$125 (houses) on recent bids for construction near Bamako. One recent price obtained for identical construction at an isolated location was

about \$130/m<sup>2</sup>. It is therefore believed that reasonable budgetary figures are as follows:

Open buildings (classrooms, meeting halls, warehouses) \$100/m<sup>2</sup>  
Offices \$125/m<sup>2</sup>  
Housing with plumbing \$150/m<sup>2</sup>

Factors: To the above budgetary figures are added the following factors based upon the USAID Engineer's best judgement.

Inflation 1%/month un compounded  
Market Factor 10%  
Contingency Factor 15%

Total Global Factor: 25% plus 1.5%/month inflation

Though seemingly high, the limited success which USAID has had up to date in estimating reasonable costs which are adequate make this large global factor seem accurate. It is hoped that, as the construction industry becomes more stable in Mali, this factor can be reduced significantly.

## APPROPRIATE TECHNOLOGY

### A. Initial Assessment

The level of technology available to the rural poor in Mali is very low. The First Region is no exception. In terms of food production, farm implements are of the simplest sort, and even animal traction has yet to make an impact. Food processing such as grinding, threshing, drying, smoking, etc. utilizes very basic devices. The grinding of grain with a mortar and pestle takes a large portion of womens' time and is arduous. Food drying, usually done in the open air, leaves the product open to pest attack. The preparing of foods, usually done over an open fire, is inefficient, leading to excessive use of scarce and costly fuel wood. It is also unhealthy, as women often inhale smoke, and children run the risks of being scalded.

Another area where technology is of low level centers around water. The procurement of water is almost always done by hand, whether from streams or "mares", sometimes distant from the point of utilization, or from wells with a line and bucket. Often irrigation is done by hand. Methods of preserving water, especially during the dry seasons, are of a basic nature or completely lacking. In addition, simple techniques for making drinking water safer are sometimes unknown, often unused.

This situation is unfortunate considering the tremendous amount of work done in the past twenty years in the area of intermediate technology. Much of this work has been done in developing countries with great success, and much literature exists even in the records of patent offices of developed countries. In addition, there exists in Mali suitable local materials and technical expertise for the fabrication of some intermediate technology devices which would have a great effect on the lives of the rural population.

### B. Appropriate Technology Program

A program to address this situation will include three phases. The first phase will be a more detailed assessment of the level of technology used in and available to rural villages. This phase is similar to a tool inventory. The basic technologies which surround the exploitation of food and water will be studied and enumerated. This will be the first time such a comprehensive study and following R and D program have been done in Mali.

Under the guidance of technical assistance personnel, extension agents from the two concerned "operations" will work with two Peace Corps Volunteers to make a technology assessment. The T.A. personnel will have experience not only in intermediate technology devices but with survey work and statistics.

The first phase will end with a report on the project area situation. This in-depth assessment will clearly give the broad guidelines for a program of research and development.

The second phase will be research, including an extensive literature search, concentrating on work done and tested in developing countries, on those items of major importance in the first phase report. This will provide two main thrusts for the continuing work. First, some prototypes should be ready for immediate testing in the villages of Mali. Second, directions for additional R and D programs will be outlined.

The third phase is the small-scale testing of intermediate technology devices at the village level and a continued R and D program under the direction of the respective "operations". This phase will require continued monitoring and evaluation to assess (1) the sociological implications of the introduction of even such simple, low-level technology, (2) the productivity of the devices in order to ascertain that the devices do indeed alleviate some of the tasks without creating others, and (3) device durability.

End of program status will also include an array of functioning intermediate technology devices at the Farming Centers. This will not only provide visitors, "operation" personnel, and researchers easy access to important devices but will allow local rural poor to be exposed to different ideas, broadening their horizons and allowing them to choose types of devices that will directly affect their lives.

This three-year program will be similar to a laboratory experiment. The product will be a viable appropriate technology package to be included in the future PP and to be implemented on a wide-scale in the First Region Integrated Rural Development Project. No wide-spread "vulgarisation" or extension will take place under the present program, but a series of recommendations on successful "vulgarisation" techniques will be made.

The separation of the appropriate technology component from the other technical aspects of this project is essential. While technical project personnel in other areas will have the responsibility to feed information and requests into the A.T. component, without such a component much would "fall between the cracks". This component allows necessary work to be done on devices usually deemed out of the "operations" or technical activities mandate and too insignificant for their work. Also, as seen by the A.T. concentration on food and water, the role of women in development is recognized and exploited.

### C. Appropriate Technology Budget

1. Technical Assistance - 6 person/months.....\$30,000
2. Commodities
  - a) Vehicles - 1 motorcycle, 2 mobbyettes..... 2,000
  - b) Materials, prototypes..... 58,000

3. Reports, Evaluation, Reference Materials.....	5,000
4. Operating Expenses.....	5,000
	<u>100,000</u>

### FUNCTIONAL LITERACY

The cost of delivering traditional education to rural areas often places a large burden on developing nations' budgets. Functional literacy has been shown to be a cost-effective way of reaching all segments of the rural population, young and old, male and female, with the basic education necessary to help them improve their daily lives. In addition to stressing traditional technical education, the GRM places high priority on the extension of functional literacy to its rural populations.

Established in 1968 through financial assistance from FAC, FED, and UNESCO, the GRM's Direction Nationale d'Alphabetisation Fonctionnelle et de la Linguistique Appliquée (DNAFLA) is the executing agency for non-formal education programs throughout the country. Evaluations conducted of the first literacy program (in the OACV zone near Bamako) have measured the value of literacy in increasing the farmers' receptivity to extension materials and brochures and adoption of improved production methods and in improving villager income through the amelioration of math and home-making skills. Literacy programs are in place or planned in each of 20 development operations. AID assistance to non-formal education includes an AIP project for a literacy program within the Fifth Region and a larger literacy program for the Haute Vallée Int. Development Program.

The determination of the village to organize literacy councils, build centers, and select teachers for training is felt the essential component of the community development process. Admission into literacy classes is based largely on a person's motivation and interest.

The literacy curricula has been under constant evolution and now includes health and nutrition information, appropriate technology themes, and development of handcrafts in literacy and post-literacy material, in addition to the traditional livestock or agricultural extension messages. Additionally, the development of post-literacy material prior to the implementation of literacy training is an integral part of the literacy program. The development of this material will assure that the students will have graduated texts to read upon completion of their training.

DNAFLA works through the development operation in organizing the literacy programs and assigns a coordinator and an assistant coordinator to supervise implementation. The project area is divided into functional literacy zones (Zone d'Alphabetisation Fonctionnelle - ZAF) which are supervised in turn by ZAF chiefs.

In cooperation with agricultural, livestock, and health extension agents, the ZAF chief canvasses the villages, explains the program and the villagers' responsibilities, and organizes the teacher training programs. Villagers contribute the literacy center building itself, select two

villagers as teachers, and organize a literacy council to monitor the activities at the center. Donor assistance is limited to the provision of blackboards, pressurized gas lamps, vehicles and mobylettes, and reproduction equipment for the Regional headquarters. Literacy materials are prepared and printed at the National and Regional level in cooperation with the participating technical agencies operating in the area.

Currently, approximately 30 such centers are functioning within the Cercle of Kenieba teaching courses to over 900 villagers. In Kayes, although appropriate materials exist, the project will supply DNAFLA with the means to actively engage in functional literacy activities.

The objective of this component of the project will be to:

- 1) increase DNAFLA's capacity to extend functional literacy within the pilot project area.
- 2) extend literacy within rural communities in such a way that the impact of the work of extension agents is enhanced in improving the welfare and productivity of these communities.
- 3) integrate health information and community action training into literacy and post-literacy material for these villagers.
- 4) to enable these rural communities to open and manage their own village pharmacies.
- 5) increase villagers' awareness of simple intermediate technologies that could improve their daily lives.

Local language material for the First Region has already been developed in Bambara and Soninke, and no outside technical assistance is required for the implementation of the Functional Literacy component of the project.

DESCRIPTION OF ELEMENTS TO BE FINANCED

(in U.S. dollars)

The following items are to be purchased under this project for support of the Functional Literacy project:

Office Equipment and Supplies - Local Procurement

- |  |       |
|--|-------|
| a) 2 Gestetner 420 mimeograph machines<br>(electric and manual)..... | 5,500 |
| b) 450 reams of paper.....   | 2,750 |
| c) 40 boxes of stencils.....   | 350   |
| d) 3 portable cassette tape recorders.....                           | 200   |

SUB-TOTAL.....8,800

Provisions for Functional Literacy Centers

a) 1,200 notebooks.....	675
b) Plywood and paint for 60 blackboards.....	650
c) Pencils, pens, and chalk.....	175
d) 60 pressurized gas lamps.....	2,000
e) 60 transistor radios (for radio broadcasts in support of literacy training).....	500
	<u>SUB-TOTAL.....4,000</u>

Training Cost, Teaching Materials, and Other Miscellaneous Support

a) Training ZAF leaders (transportation cost to Bamako, per diem, pens, paper, etc. x 3).....	7,200
b) Training village animateurs (transportation costs to regional centers, "primes", pens, paper, etc. x 3).....	9,400
c) Training materials, booklets, and other expenses.....	2,750
	<u>SUB-TOTAL.....19,350</u>

Vehicles

The vehicle, mobylettes, and spare parts will be delivered to OACV/OVSTM by USAID for support of functional literacy activities. OACV will be responsible for maintenance of this vehicle.

a) 1 four-wheel drive vehicle.....	16,000
b) 4 mobylettes.....	2,000
c) Vehicle operation and maintenance.....	8,750
	<u>SUB-TOTAL.....26,750</u>

Post-Literacy Material Development Support

a) Operating expenses per year (two years).....	11,000
b) Transportation costs and per diem for ZAF, DNAFLA, and village animateurs (for yearly seminars).....	8,000
c) Services of translators, editors, and graphic artists.....	11,500
d) Printing services.....	16,000
e) Evaluation costs (yearly x 2 years).....	15,000
f) Primes.....	6,000
	<u>SUB-TOTAL.....56,500</u>

TOTAL.....115,400

## SOCIAL SOUNDNESS ANALYSIS

### A. Introduction

USAID has responded to the Malian government's request for developmental assistance for the First Region by proposing an integrated development project for two selected locations, one in the Cercle of Kayes and the other in the Cercle of Kenieba. The two locations are representative of the Region as a whole in which the rural population practices a mixed complex of agricultural and livestock production. Technology not yet adopted by the target population can diminish the labor burden on both men and women and also allow them to augment the hectareage of their cultivated lands, thereby increasing their harvests and disposable incomes. A major constraint on increased production is a lack of knowledge of or access to appropriate technology. It is this constraint the project seeks to address by demonstrating better methods of crop cultivation and an efficient utilization of animal-powered implements and by organizing and financing a small scale credit program. Additional constraints posed by health problems, particularly in the wetter, riverine areas of the southern part of the Region, and by widespread illiteracy, are to be addressed by the health and functional literacy components of the project.

The preliminary sociological field investigation has indicated that farmers in both areas are well aware of the benefits that modern, appropriate technology and farming practices can bring them in the way of better methods of land cultivation, management, and exploitation of labor-saving tools such as plows and seeders. Farmers fully recognize that such technology and methods can substantially augment their harvest and therefore allow them to accumulate security grain stocks, as well as put more cash in their pockets. They understand that better livestock management practices can make their herds healthier, diminish the calf death rate, and increase the overall numbers of their cattle. They know that oxen and plows ease their hand-labor burden. Moreover, people are well aware of the severity of their health problems, especially onchocerciasis, and are accustomed to travelling long distances to any of the Region's poorly supplied dispensaries.

The main problem the project will confront is that of determining and recommending agricultural and livestock practices which will not only be technologically desirable and feasible, but which will also be both socially and economically acceptable to the target population.

### B. The Sociocultural Scene

The two sites selected for the initial phase of the project have much good land that hand cultivation cannot fully exploit. Both locations are well-watered. The northern site in the arrondissement of Segala, Circle of Kayes, is peopled primarily by the Soninke ethnic group and has minority populations of Peul, Bambara, Khassonke, and Kagoro. The southern

location, the central arrondissement of the Circle of Kenieba, is populated mostly by Malinke and by small minorities of Peul, Diallonke, Bambara, and Soninke.

The Soninke, Malinke, Bambara, Diallonke, and Kagoro all have similar customs and traditions, forming part of the extensive Mande culture complex in West Africa. Their languages also form part of what is considered the Mande language group. The Malinke, Bambara, Kagoro, and Khassonke dialects are mutually intelligible to the attuned ear. Soninke has a Mande structure, but its vocabulary is sufficiently different to render it incomprehensible to the uninstructed. Diallonke is a more distant Mande dialect related to the Susu and Yalunka (the anglicized version) of the Sierra Leone - Guinea border areas to the south of the Futa Jalon highlands. The Diallonke were formerly residents of the Futa Jalon but were displaced by the invading Toronke Peul in the 16th and 17th centuries. A minority of these peoples are now settled on both sides of the Guinea-Mali border in the Circle of Kenieba along the Faleme River boundary areas.

The Peul peoples in the two project locations are sedentary dwellers and have adopted sociocultural traditions similar to the Peul of the Ouassoulou and Fouladougou areas of Mali. This is especially true in the Circle of Kenieba, where the Peul have lived for so long among the Malinke that they have become "Mande-ized", so-to-speak, and often no longer even speak the Peul language. This is, however, less true in the arrondissement of Segala where the relatively recent, mid-eighteenth century intrusion of Al Hadj Umar Tall and his Toucouleur followers has made the Peul-Toucouleur the dominant ethnic group in some villages, notably Koniakari and Diataya. Other than by language, the major ethnic distinction between the Peul and Mande groups can be made on the basis of their differing economic emphases: the Peul tend to be cattlemen, and the Mande are farmers. Yet the emphasis should not be misconstrued, for the Mande also raise cattle, and the Peul have adopted agriculture. The point to be made is that the Peul of the project sites are not the transhumant Peul of, for example, the Macina.

All the peoples of the project area inhabit permanent villages and dwell in either cylindrical or rectangular adobe homes roofed with thatch or mud but sometimes metal. Within the villages the extended families are grouped, if the village is of mixed ethnicity, by ethnic quarters. The average family numbers 13-15 people among its members, yet may on occasion consist of 100 people or more. In the arrondissement of Segala, village settlements are dispersed along the banks of the Kolimbine-Korigou branches of the Senegal River. In Kenieba, onchocerciasis and warfare have sent the majority of the population into the hills, and there are very few villages settled on the plains or on the Faleme or Bafing Rivers.

Habitation is patrilocal and descent and inheritance is patrilineal. The head of household is the oldest male, and if he should die his next oldest brother succeeds him. The population of the First Region has for centuries been exposed to Islam, and marriages are polygamous, depending

on family or individual means.

Subsistence and income-producing activities are carried out by the extended family unit, and tasks are normally assigned by sex and age group. Generally, men between ages 15-50 are responsible for providing the grains that constitute the family diet. They do the work necessary to clear, hoe or plow, maintain the field, and harvest the crop. Elders are considered to have already put in their years of toil and, unless there is a particularly acute shortage of labor, do not participate in these tasks. Uncircumsized youngsters, i.e. 13-14 years of age and under, are the bird and animal chasers. Young boys, if necessary, may also help out in the fields by leading the plow oxen.

Men are also responsible for providing the meat and fish which go into the family diet. Depending on herd size, the transhumance can make difficult labor demands on young herders. Sedentary livestock-raising cannot, however, be considered labor-intensive because the most laborious cattle-related task is that of periodically constructing a new corral. This task is performed by the young men in the southern, non-transhumant, areas of the First Region where the cattle are penned during the farming season to keep them from destroying the crops. In the northern area, however, the cattle are transhumant, moving north into Mauritania during the rainy farming season and south in the Lake Magui area once the rains have ceased and water and pasturage has been exhausted. In the latter system, family members or hired Peul herders tend the cattle.

Women are usually responsible for providing the legumes and vegetables, condiments or spices for the family diet. This means they tend to the peanut and vegetable cultivation during the rainy season and, depending on the availability of water, may grow a dry season vegetable crop also. The dry season garden tends to contain marketable produce which is transportable, e.g., onions. In mountain villages of Kenieba, women grow an extensive dry season tobacco crop which is marketed to merchants from Kenieba town. The proceeds from these marketed crops remain at the disposition of the women and to what extent the family will benefit from her gain is the woman's decision.

Apart from being responsible for her own peanut and garden crops, the women also assist the men in planting the grain crops and in transporting the harvest to the granaries. They must winnow and pound or grind the grains. They gather and cut firewood. They gather and process wild foods such as shea nuts and locust beans. They draw and haul water to fill the household jars. They attend to the cleanliness of the family compound and clothing. And they give birth to and raise children. All of this constitutes a demanding work schedule, for which reason co-wives are often welcome additions to the family compound for the work load may then be shared.

Elder women are exempt from these tasks, except that of looking after their co-wives or daughter's children. They may also tend their own garden plots and sell the produce for their own benefit. Young girls, as

soon as they are able, at perhaps age 9-10, assist their mothers and aunts in all endeavors. The much-enjoyed respite from the demands of work comes on market days, Islamic or national holidays, and family celebrations.

All agricultural work is done using hoes and machetes, except among families with the financial means to have oxen or donkey-drawn plows.

Land for cultivation is allocated to village families by the local chief acting in consultation with his counselors and the descendants of the original village settlers. There is no private land ownership as we know it, but the right to perpetual use, passed from father to brother or son, is usually assigned. This right depends on (1) when and to which families land was originally assigned; (2) the need of the individual family for arable land, and its ability to exploit it; and (3) the availability of land. Three "tiers" of land surrounding the villages are farmed. The first area is that which surrounds the village. This is cultivated every year and fertilized with compost and animal manure. The second area is farther outlying. It is also assigned to individual families, farmed for a period of a few years using no fertilizer, and is then left fallow for as many years as is possible depending on its extensiveness. If land disputes arise, they usually concern questions of boundaries between family sections in this second land area. The third location farmed lies some distance from the village. People wishing to cultivate these far-distant areas consult with the chief of the local hunters, who are considered "masters of the bush", for land assignments. Sometimes, because good land near the village is scarce, farmers will establish hamlets many kilometers away from their villages. Because of the distance between hamlet and village, the farmer will pass the entire farming season with his family in the hamlet, returning to the home village only after the harvest is in. In many instances, such farming hamlets are augmented by additional families and grow into permanent satellites, inhabited year-round, of the main village.

There are three social classes among all ethnic groups. The "nobles" are the most socially privileged, and the village chief is normally a member of the noble class, which means that he exercises important control over the distribution of land. But if the nobles are not part of the same ethnic group or social class as the descendants of the first village settlers, the latter will also be consulted on questions of land distribution or tenure.

A second social class is that of the endogamous castes. This class consists of the blacksmiths, weavers, leatherworkers, woodworkers, griots or bards, and other such craft or speech specialists. It is noteworthy that distinctions in class between the "nobles" and "castes" are made via occupational speciality and marriage preferences (i.e., endogamy) rather than by levels in the society. The "nobles" and "castes" might, therefore, be considered to be separate but equal, for representatives of the caste groups are normally important participants and counselors in all village-level decision-making.

This is not as true for the third class, the descendants of slaves. They are generally less esteemed, have less say in village matters, and are sometimes found in patron-client relationships with noble families. Presently, this class distinction is diminishing in importance, particularly at the sites chosen for the project. Indeed, most people realize that such a status usually resulted from war and conquest, which inflicted slavery on the vanquished only until they were able to reassert themselves. Thus, it is often the case that villagers of this class have become important people, because of their education or wealth, and also play a respected role in the village decision-making process.

Because of the extensive out-migration of Soninke young men from the Segala area who go abroad to work, usually in France, for indefinite lengths of time, there is sometimes a keenly felt family labor shortage as the rains approach and the farming season begins. This migration is not based solely on a search for economic opportunity, for there is an old tradition among the Soninke and other ethnic groups as well, which dictates that young Soninke men must go off on a voyage of indefinite duration to live and work in another country. It is said that a Soninke does not become a man until he has made his voyage. A man's sons normally take turns going off on their travels, the oldest leaving first. When he returns, the next oldest may go. While the tradition can create a labor shortage, the home village and the nation as a whole benefit from it in several ways. First, money sent back by sons overseas represents badly needed foreign exchange for Mali. Second, the capital is expended on improved housing, agricultural technology (i.e., plows, seeders, fertilizers), cattle, consumer goods, educational costs for other family members, and hiring seasonal laborers who take the place of absent sons. Third, the voyagers are exposed to many facets of the modern world. They learn French, sometimes becoming literate, and may increase their skills by taking night courses in France. They return to Mali with these skills and the exposure to modernization they have gained abroad. Moreover, the laborers hired benefit from a daily wage that is as high as 1,500 MF, one of the highest in Mali. The laborers are mostly young Khassonke and Malinke men from the Circles of Kita and Bafoulabe, which means that what they earn is redirected into their home villages. The wealth thus diffuses and benefits other areas. Other, less tangible, effects, no doubt result from the foreign travels: improved health and sanitation practices, an awareness of the value of education, increased political awareness.

In the Kenieba area, out-migration from home villages is most often only seasonal. Because of the relative abundance of gold in the Circle of Kenieba, young men do not have to go far from home in search of off-season economic opportunity. They migrate to the gold-mining areas during the dry season, but return home to assist with the farming activities as the rains approach.

Village authority is vested in the local chief, the oldest male descendants of the original settlers, and the heads of the extended families. The chief is often the oldest male descended from original settlers. Occupational specialists--griots, blacksmiths, and others--also have desig-

nated representatives from among their ranks who participate in the village decisions. Families who are still remembered to be descendants of slaves have their interests represented by the patriarch of the extended family with which they have a patron-client relationship--this being the case if they have not yet become economically or otherwise powerful enough to be able to assert themselves in village affairs. While women and youth are not direct participants in village-wide decision-making, they can make their desires known to individual elders for consideration.

Other village organizations, such as the women's association and the young men's association, may be represented in village decisions. The women's organization is headed by a female elder and may include such sub-units as blacksmiths' wives or griots' wives. The young men's association numbers the various age-sets (those who were circumcised together) among its ranks, up to an age of perhaps 40. This group may be headed by the oldest member of the oldest age-set, but often the leader of the association is elected. The young men's group often acts as a cooperative work force which will help individual farmers or families work their fields. For such assistance, the group receives a payment, in cash or kind, which goes into a general fund. The moneys or commodities can be utilized as the association sees fit, yet most often it serves to sponsor a big end-of-harvest celebration.

### C. Constraints

#### 1. Circle of Kenieba

a) The major part of the population of the circle is located in the arrondissements of Kassama, Dombia, and the eastern part of Kenieba Central, all of which are mountain areas, part of the Tamboura escarpment. This means that there is probably insufficient land available in or near the mountain villages for the project to attempt to increase agricultural production by expanding hectarage under cultivation. Moreover, if a long-range project intent is to entice mountaineers to descend to farm the plains, it will be attempting to reverse a century-old settlement pattern.

b) Attempting to increase rice production along the Faleme River, which has been part of the development plan for Kenieba circle in years past, will also seek to reverse ancient settlement patterns. There are very, very few villages located on the Faleme, or on the Bakoye or Bafing, and we therefore conclude that people are very aware of the health threat posed by these river valleys. Furthermore, rain-fed rice is a major crop in some areas of Guinea along the rivers that form its boundary with Mali, including the three mentioned above plus the Sankarani. In some of these border areas, Malian farmers who formerly grew rice have stopped cultivating it for three main reasons. First, the lack of consumer goods

in Guinea has led Guinean farmers to market some of their rice in Mali at a low price and thus obtain Malian francs with which to buy goods available in Mali. Second, the differences in currency values has meant that Malians have been able to purchase Guinean sylis for 50-60% of official value. The Guinean currency might then be spent on buying cattle and rice in Guinea at very favorable prices and turning over the purchases in Mali or the Ivory Coast for a good profit. (Recently, however, the change in Sekou Toure's policies has apparently led the syli to rise to nearly par with the Malian franc.) Third, the low official Malian price for rice, along with the above, has shown the border-area Malian farmer that there is little or no benefit to be derived from growing rice commercially. These factors would seem to apply to the circle of Kenieba and particularly to the southernmost arrondissements of Faraca and Falea.

c) The relative abundance of gold in Kenieba may mean that many farmers believe the financial benefits to be derived from increased production for commercialization are not sufficient enough to justify a substantially increased labor effort.

d) The many phacochere (wild pigs) in Kenieba, especially on the plains, and the threat of crop destruction that they pose is another factor weighed by farmers contemplating increased production efforts.

## 2. Circle of Kayes

a) Lack of good drinking water during the period of intense activity at the beginning of the rainy season when rising water floods the wells sunk in the river beds constitutes a production constraint due to ill health resulting from water-borne sicknesses or dehydration.

b) A substantial increase of cattle in the Lake Magui area may lead to conflict between Peul and Soninke over patterns of access to and use of dry season pasturage.

## D. Constraints Vis-a-Vis Project Interventions

The constraints mentioned have not been judged serious enough to prevent individual project activities from being successful. Indeed, the general constraints will be the focus of the health, engineering, functional literacy, and agronomic and livestock activities. These activities will only be implemented after close consultation with farmers who have understood what benefits they can expect to derive and have themselves decided to participate in the project activities. However, some remarks concerning the specific constraints are necessary.

1. The plains villages of Batama and Moralia have tentatively been identified as locations to which farmers from the mountain villages of Kassama and Guindisson descend to cultivate in the rainy season. The sociologist and his counterparts should investigate these villages and determine what factors have affected farmers' decisions to descend from the mountains. Further, the sociologist should try to specify whether onchocerciasis and phacochere are indeed major obstacles to the exploitation of the plains, or whether the lack of technology, e.g., plows and oxen, prevents the plains from being farmed. It may be simply the combination of requirements of hand-labor and the phaco threat which keeps farmers in the mountains during the rainy season.

2. Some rice is already being cultivated in Kenieba, but very little is commercialized. Since the Faleme River Valley is so heavily infested with the black fly, the project team should concentrate its rice production efforts on areas away from the Faleme River until the efficacy of the oncho chemotherapy activity is proven. The sociologist and agricultural economist should investigate the border trade in cattle and grains between Kenieba and Guinea to determine the effect that Guinean prices and currency exchange rates have on production in Kenieba.

3. The sociologist and economist should seek to learn if and in what way the proceeds derived from gold sales are invested. Such proceeds may not amount to enough to allow for purchase of plows, or they may be invested in cattle or accumulated for payment of bride prices. The attitude of the local people and their perceptions of benefits that can accrue from various alternatives such as cattle or crop production, gold mining, or trade must be specified.

4. The preliminary field investigation indicated that there is occasional conflict over rights to pasturage among certain villages in the circles of Kayes and Yelimane. While this did not appear to be the case in the immediate project area, the sociologist should direct his inquiry to such possible conflict.

#### E. Recommendations

(1) A rural sociologist/anthropologist should be stationed either at Kenieba or Segala but divide his time equally between the two areas. He should be provided a separate 4-wheel drive vehicle for his activities. A team of four Malian counterparts should be assigned to assist with such surveys as will be conducted. Mobylettes should be supplied to each counterpart. Ideally, they can serve as the heads of the teams of surveyors/enumerators that will conduct the combined agro-socioeconomic research required to provide the data base for the integrated project foreseen for the future.

(2) The role of the sociologist is seen as two-fold. First, working in close consultation with other members of the project team and Malian counterparts, he will design and implement field surveys to

thoroughly investigate the traditional systems of agricultural and livestock production and exploitation, the roles that both men and women play in the systems, the socio-cultural and economic considerations which determine the systems, and the roles that village structures—local council, women's organizations, young men's organizations—play which may be integrated into the project activities. Through such investigation, he will seek to discover quantitative and qualitative factors which affect peoples' decisions when faced with alternative choices. Second, he must sensitize project's technical experts to these factors so that their recommendations will be particularly appropriate to the needs of the target population. Thus, through constant consultation and idea exchange with the project team members, the rural population will be full participants in their own development program, rather than have it imposed upon them by others.

(3) Before arriving in Mali, the sociologist/anthropologist should examine the available literature in the U.S. on the ethnic groups the project will deal with, their traditional systems of production, and relevant survey design literature.

(4) Copies of all the results of agro-socioeconomic surveys should be deposited with I.E.R. so as to be permanently available to interested Malian specialists.

INITIAL ENVIRONMENTAL EXAMINATION

Project Location: First Region of Mali

Project Title: First Region Pilot Development Project

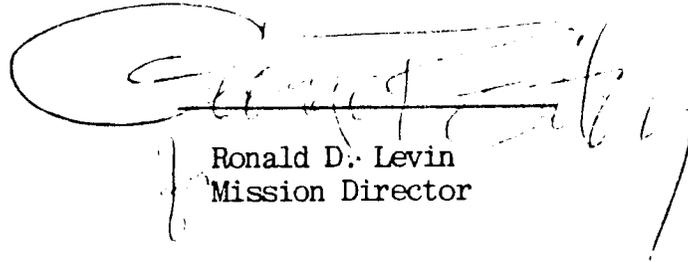
Funding: \$2,510,000

Life of Project: Three years

IEE prepared by: Tom Park, George Thompson, Gerald Cashion Date: 3/23/79

Environmental Action Recommended: Negative Determination page 117

Concurrence



Ronald D. Levin  
Mission Director

Date: 3/24/79

Threshold Decision:

This project will not cause any significant impacts on the environment. No serious adverse impacts are perceived, and some modest environmental benefits will hopefully occur. Additionally, this is a pilot demonstration undertaken which will present opportunities for sensitizing farmers to actions that can preserve and maybe improve the environment. Consequently, a negative determination is recommended, together with a monitoring of the physical and social environment through the life of the project for early identification and correction of any possible negative effects.

Approval:

Approved: \_\_\_\_\_

Date:

Disapproved: \_\_\_\_\_

Date:

## ENVIRONMENT

### Background

Mali has a population of some 6.3 million (December 1976 census), believed to be growing at an annual rate of 2.5%. Agriculture, which accounts for almost half of the country's GNP and nearly all of its foreign exchange earnings, is the source of income for approximately 90% of the population. Except for the Niger River delta and to a lesser extent the Senegal River valley, where irrigation is possible, the development of Mali's agricultural potential is hampered by inadequate and erratic rainfall. Farmer land holdings are small, the level of technology poor and agricultural productivity low. Periodic droughts and the difficulty in receiving and distributing emergency food relief have dramatized the GRM's need to accelerate rural development and achieve food self-sufficiency.

### Mali's First Region

Situated in the extreme western part of the country, the First Region, representing 128,000 square miles, is Mali's second largest. In spite of its relative proximity to the capital, much of the region remains isolated due to its inaccessibility throughout much of the year.

The Region includes the Sahelian zone in the north, the Sudanian zone around Kayes and the high rainfall pre-Guinean zone in the south. Annual rainfall varies from 400-600 mm in the north to almost 1,400 mm in the south. Water resources in the Region include the Senegal River and the Kolimbine and Terekole Rivers which form the network of lakes known as Lake Magui. Management of these water resources is essential to maximize agricultural production and will be an important focus of the project.

The northern project area is peopled primarily by the Soninke ethnic group with minority populations of Bambara, Khassonke, Kagoro, and sedentary Peul. The southern area is predominantly Malinke but includes Peul, Bambara, Soninke, and Diallonke as well.

The people in the project areas inhabit permanent villages. The average family numbers between 13 and 15 members, not all of whom are "actifs." Subsistence and income-producing activities are carried out by the extended family unit, and tasks are normally assigned by sex and age group.

The First Region Development pilot project incorporates (a) a novel project design to establish the required data base, and (b) a sound project development strategy in addressing a complex set of potentials and constraints to the development of Mali's First Region.

A series of surveys and studies will be conducted and evaluated throughout the life of the project which will provide the necessary justification for priority development activities in the follow-on First Region Integrated Development project. Keenly aware of the region's problems, the design team has recommended a series of pilot activities in agriculture, livestock, health, literacy, and rural infrastructure to address, in a systematic manner and on a manageable scale, certain issues of immediate concern to the full-scale project's beneficiaries. The activities have been drawn largely from AID projects which have proven successful in other regions of Mali and are felt to be applicable for testing in the First Region. This design approach to be used to identify and overcome the Region's constraints as well as the testing of small farmer technologies successfully introduced elsewhere in Mali, is both appropriate and feasible for the circumstances of this remote part of the country.

### PROJECT OVERVIEW

The project is a first step toward the design of a comprehensive development plan for Mali's First Region. The project team will assist small farmers and livestock producers by demonstrating appropriate technology intended to ease hand-labor requirements, <sup>reduce disease</sup> improve cattle health, herd off-take and reproduction rates, increase crop yields and the producers' disposable income. Participation will be voluntary, and the project team will consult the farmers at all times to consider their needs and perceptions as well as to benefit from their experience. At the same time, the team will conduct a number of surveys to compile data to use as a base for the design of a larger, more comprehensive development plan for the region. The design concept is thus evolutionary, and the possible dimensions of the future project are not yet precisely known. Planning for the future, integrated development project will incorporate the results of the activities planned and the data-gathering activities initiated under the pilot phase of the project.

### Project Activities and Environmental Concerns

#### 1. Agriculture

The project team will attempt to increase crop yields and cultivated hectareage by teaching farmers the use of animal traction, the importance of proper plant spacing and timely weeding, the benefits and techniques of organic fertilization, and crop rotation. At the same time the team agronomist and his counterparts will test seed varieties under both local and controlled conditions. The economics of chemical fertilization will be tested under controlled conditions and only where any possible run-off into streams and ponds can be minimized. In their study of the potential benefits to be derived from water control, the engineering specialist will describe the possible environmental effects their water management proposals may have and recommend ways by which such effects can be minimized.

## 2. Livestock

The project team does not intend to increase the cattle population, but instead will seek to maximize the potential of existing herds through animal health extension services, improved feeding practices, and general herd management. A major part of the livestock program is the farmer feeder activity which is modeled after the highly successful "Embouche Paysanne" program now operating in other areas of Mali. Some construction of stock ponds in existing natural depressions may be recommended by the engineering experts who will also study such ponds' environmental effects.

## 3. Functional Literacy

This project activity will be similar to the GRM's efforts in other areas of the country. DNAFLA has the technical ability and experience to conduct the village functional literacy activities, but lacks the financial wherewithal to expand its program to cover the entire First Region. Project support of this activity will thus be strictly financial and no change in the natural environment will result. It is assumed that the socio-economic status of the villagers participating in the functional literacy activity, particularly women, will be improved from learning rudimentary reading and math skills.

## 4. Agricultural Credit

Credit programs have been successful in other development projects in Mali. During its preliminary field investigation, the project design team observed that many farmers were aware of production credit programs but have limited access to them. The project team will consult with farmers to initiate an agricultural credit program. It is envisioned that the socio-economic status of farmers, both men and women, will be improved as a result of the ability to purchase such agricultural technology -- plows, small farm implements, hand-powered threshers and grinders and this technology will reduce the fatiguing hand labor currently required.

## 5. Health

Medical surveys and treatment trials will be conducted in selected sites in order to determine the effectiveness and safety of a chemotherapeutic protocol for onchocerciasis. During the course of the surveys, drugs will be provided to treat other commonly-occurring diseases. Information generated from these activities will be used as a basis for planning the health component of the First Region Integrated Development Project. It is expected that the health status of the population will be improved, and that no detrimental change to the environment will result from these health activities.

SUMMARY AND RECOMMENDATIONS

The project will be an evolutionary one, involving continuous redesign and constant consultation with the participants. Much of the project activity will be focused on studies and surveys to provide data for the design of the future comprehensive development plan. Such studies will also consider possible significant effects of proposed project activities on both the physical and social environment and include continuous monitoring of such effects by project experts - the sociologist for the social scene, the engineers for the natural environment, the medical experts for health, and so on. Since all activities have been tested in other Malian development projects with no significant environmental effects occurring, none are anticipated in the First Region.

From the foregoing discussion, it is reasonable to conclude that this project will not cause any significant impacts on the environment. No serious adverse impacts are perceived and some modest environmental benefits will hopefully occur. Additionally, this is a pilot project which will present opportunities for sensitizing farmers to actions that can preserve and maybe improve the environment. Consequently, a negative determination is recommended, together with a monitoring of the physical and social environment through the life of the project for early identification and correction of any possible negative effects.

IMPACT IDENTIFICATION AND EVALUATION FORM

<u>Impact Areas and Subareas</u>	<u>Impact Identification and Evaluation:</u>
A. Land Use	
1. Changing the character of the land through:	
a) increasing the population	N
b) extracting natural resources	N
c) land clearing	N - L
d) changing soil character	M (positive)
2. Altering natural defenses	N
3. Foreclosing important uses	N
4. Jeopardizing man or his works	N
5. Other factors	

B. Water Quality

- 1. Physical state of water N
- 2. Chemical and biological states N - L
- 3. Ecological balance N
- 4. Other factors

C. Atmospheric

- 1. Air additives N
- 2. Air pollution N
- 3. Noise pollution N
- 4. Other

D. Natural Resources

- 1. Diversion, altered use of water L - N
- 2. Irreversible, inefficient commitments N
- 3. Other factors

E. Cultural

- 1. Altering physical symbols N
- 2. Dilution of cultural traditions N
- 3. Other factors

F. Socio-Economic

- 1. Changes in economic/employment patterns L - M (positive)
- 2. Changes in population N - L (positive)
- 3. Changes in cultural patterns N - L

G. Health

- 1. Changing a natural environment N
- 2. Eliminating an eco-system element N (positive)
- 3. Other factors

H. General

- 1. International impacts N
- 2. Controversial impacts N
- 3. Larger program impacts N - M (positive)
- 4. Other factors

A N N E X 9

P R O C U R E M E N T P L A N

1. Responsible Agency

All procurement of project goods and services will be the responsibility of the Government of the Republic of Mali (GRM), with specific authority centered in the Ministry of Rural Development which will control and coordinate procurement actions. If the host Government declines to accept responsibility for procurement implementation, it must do so in writing to the Director, USAID/Mali; the Director, USAID/Mali can then be authorized by the host Government to act on its behalf in procurement matters which will range from commodity procurement through contracts for technical assistance and building construction. The complexities of inputs to the project-educational, medical, agricultural, rural development, livestock development -- require that close association and coordination between USAID/Mali and GRM project personnel be everywhere exercised, so that service and commodity requirements can be met and project implementation proceed as scheduled.

Procurement of U.S. source commodities will be undertaken by an American procurement agency selected by the GRM and approved by USAID/Mali. The Afro-American Purchasing Center (AAPC) or a similar purchasing agency will be contracted to act as procurement agent upon the agent's stipulated availability and acceptance of its fee.

If the host government so authorizes, USAID/Mali or any other U.S. Government agency is eligible and qualified and can act as procurement agent.

2. Required services and equipment lists

Projected requirements for dollar amounts of goods and services are listed in tables 1 through 6. These requirements represent the general needs of the project over its three (3) year life span. More exact details and specifications will be furnished in Project Implementation orders/Commodities and Technical Services (PIO/C's and PIO/T's) or other procurement documents that will be issued to enact procurement.

3. Source of Procurement

The source and origin of commodities and services being procured for this project will be code 941 countries (selected free world) and Mali except for motor vehicles (including motorcycles), ocean shipping, fertilizers and pharmaceuticals and, as authorized under waivers or exempted shelf items purchased under sanctioned local currency procurement.

#### 4. Shelf Items Procurement

As specified in Sections II B3 and II B4 of HB 15 and Sections 18 A2, 18 A3, and 18 A4 of HB 1, Supplement B, items to be purchased as shelf items procurement shall be those imported into Mali and kept in stock in the form in which imported for sale to the general public.

Imported shelf items having their origin in code 941 countries can be purchased without restriction, except for the limitation on the total amount available for local procurement,

Shelf items having their origin in the Geographic code 899 countries are eligible for financing if the unit cost doesn't exceed the equivalent of \$2,500 and the total of such financing does not exceed 10% of the total local costs financed by AID or \$10,000, whichever is higher.

Commodities mined, produced, or assembled in Mali are eligible for financing without restriction, except for the limitation on the total amount available for local procurement. However, the statutory restrictions on certain commodities are also applicable to locally produced commodities; e.g., pharmaceuticals, fertilizers, motor vehicles (including motorcycles), etc. Imported shelf items produced in or imported from countries not included in Geographic code 899 are not eligible for AID financing.

Procurement of shelf items shall conform to good commercial practices, shall be at reasonable prices, and shall be consistent with local laws and practices. A supplier furnishing shelf items for the project must provide a statement attesting to the source and origin of the commodity sold,

#### 5. Waivers

Waivers of AID source and origin requirements to authorize procurement from other than approved project sources are requested as follows:

- a) Geographic Code 935 procurement for two four-wheel drive utility vehicles for use in the project areas of Kayes, Kenieba, and Yelimane in the First Region, 250 km. west of the capital city, Bamako. In order for the project to be implemented as scheduled, it is imperative that 2 vehicles be made available immediately for the liaison work of the USAID project manager and for the initiation of agro-socio-economic surveys. Presently, no American auto maker has established adequate after-sales parts and maintenance support for U.S. vehicles in Bamako or elsewhere in Mali. Although there are plans for up-grading a local dealership to supply parts and maintenance services for U.S.-made vehicles,

this will not be available in time for the start-up of the pre-implementation activities planned in the project. If such a capacity were presently available, two vehicles would be purchased and no time would be lost. On the understanding, however, that after-sales service will be available in the future, the remaining five 4-wheel drive vehicles will be procured from the United States.

For the reasons stated above, the waiver to permit Geographic Code 935 procurement of two (2) utility vehicles, 4x4, in order that critical project implementation time not be lost, is considered justified. It is found that special circumstances therefore exist to waive the requirements of section 636 (i) of the Foreign Assistance Act. Estimated total waiver cost is \$32,000.

- b) Geographic Code 935 procurement of nineteen (19) motorcycles (49-175cc) for the use by personnel engaged in data gathering and instructional activities in the project. Motorcycles and repair parts from U.S. and other code 941 countries are not available in Mali, and Malians are not trained in the basics of their maintenance. However, motorcycles are common units of personal transport in Mali, especially in the project area. Maintenance is easy and spare parts readily available area-wide.

The motorcycles are classified as vehicles, therefore it is found that here, too, special circumstances exist to waive the requirements of Section 636 (i) of the Act. Estimated waiver dollar value is \$15,700.

- c) A waiver is requested to permit procurement of construction materials from Code 935 source/origin countries. The timely construction of five houses and two rural training/demonstration centers and the construction during the project of small prototype structures for pilot interventions are vital to the success of the project. The houses and centers are located in isolated villages in Kenieba and Segala in the First Region of Mali. They will be constructed by one or two local entrepreneurs under the supervision of a Malian firm. The host country as a source of construction material is very limited. There is one cement factory that produces only 10% of the country's demands. There is no steel production in the country. Other construction materials (e.g., plumbing fixtures, tiles, roofing, ceiling materials, etc.) are available from Malian sources, but origin varies - some from 941 countries, but most from 899 countries. Requiring 941 source/origin on these materials would make the construction by almost all Malian firms impossible. It would increase costs considerably and delay completion indefinitely.

It is therefore recommended that the interests of the U.S. are best served by permitting the procurement by local entrepreneurs of construction materials from all free world countries (Code 935) and that project authorization contain a waiver to that effect. Total cost of construction is estimated at 312,000; 60% or \$187,200 is estimated to be commodities.

6. Local Cost Financing

Authorization for local currency is required to cover in-country purchase of vehicles, motorcycles, and construction services and materials. Appropriate waiver requests are included in paragraph 5 above. In addition, local currency authorization will be required to cover purchase of shelf items, project operating expenses (vehicle operation and maintenance), in-country training and travel, etc. Requirements of anticipated local currency expenditures are as follows:

--2 four-wheel drive vehicles	\$16,000
--19 motorcycles	15,700
--construction services/materials	312,000
--vehicle operation/maintenance	75,750
--local training and travel expenses	31,600
--work oxen, test animals, credit, etc.	58,000
TOTAL.....	<u>509,950</u>

7. Payment

Limited U.S. procurement is anticipated. However, it is expected that all such procurement will be undertaken by the Afro-American Purchasing Center (AAPC) in New York. Payment for services rendered by AAPC will be made by Direct Letter of Commitment which will be issued by SERIFM, AID/W.

For local procurement payment, documentation will be presented to USAID/Bamako Controller; Mission payment policies will be followed.

8. Delivery

All project commodities imported into Mali will be shipped on the basis of CIF, Bamako. Suppliers will provide all-risk marine insurance in the amount of 120% of the CIF cost of the commodities and similar insurance for inland freight. AID's marking requirement for overseas shipments will be enforced by AAPC.

9. Receipt and Utilization

The GRM is responsible for the proper reception and clearances of incoming project commodities, with the assistance of the AID/Mali staff.

Inspections of incoming shipments must be made, and receiving documents shall be annotated with comments on evident damages/losses.

Reports of damages/losses must be made promptly; if incoming cargo has been procured in the United States, AAPC must be notified by telegram of the extent of the damages/losses so that AAPC can file a "notice to file a claim" against the ocean carrier or freight forwarder(s) involved. Once AAPC has filed its notice, the carrier must await the filing and adjudication of the claim; this permits the GRM and personnel to acquire more information and particulars about this claim. In most cases where damages or losses are noted, a picture of the broken box or damaged crate or crushed vehicle roof is the best possible evidence that can be presented. Receiving documents properly annotated, are valuable; if damages or losses are not noted on the documents, however, there would be little or no possibility of having a claim settled.

The GRM is required to put into project use all commodities procured for the project within one (1) year of receipt; USAID/Bamako will inspect the GRM utilization reports as a matter of course.

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Project Title and Number: FIRST REGION PILOT DEVELOPMENT PROJECT - 688-0215

Life of Project:  
From FY 79 to FY 81  
Total U.S. Funding: \$2,545,000  
Date Prepared: March 1979  
Page 1

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
GOAL:			
The goal of this project is to raise incomes and improve the quality of life of small farmers in the northern and southern project areas of the First Region.	<ol style="list-style-type: none"> <li>1. Measurable evidence of annual increases in marketed crops and livestock, and corresponding increases in disposable income.</li> <li>2. Evidence of reduced incidence of disease in the First Region.</li> <li>3. Evidence of increased functional literacy in project areas.</li> <li>4. Evidence of increased usage of labor-saving devices.</li> </ol>	<ol style="list-style-type: none"> <li>1. Analysis of crop and livestock production/marketing statistics.</li> <li>2. Comparison of project financed socio-economic studies in sample villages.</li> <li>3. Analyses of Ministry of Health records/statistics.</li> <li>4. Review of functional literacy evaluation reports.</li> </ol>	<ol style="list-style-type: none"> <li>1. Surplus crop and livestock production will be marketed after local consumption needs are met.</li> <li>2. GRM pricing/marketing policies will not serve as a disincentive to increased production within the project areas.</li> <li>3. GRM commitment to the development of the region remains a high priority.</li> <li>4. Small farmers willing to make necessary changes to improve the quality of life.</li> </ol>

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Life of Project:  
From FY 79 to FY 81  
Total U.S. Funding: \$2,545,000  
Date Prepared: March, 1979  
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Project Title & Number: FIRST REGION PILOT DEVELOPMENT - 688-0215

NARRATIVE SUMMARY Project Purpose:	OBJECTIVELY VERIFIABLE INDICATORS (End of Project Status)	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS Assumptions for achieving Purpose
<p>Prepare a comprehensive regional development strategy for a long term integrated rural development project, which will grow out of baseline data collected/analysed and the experience gained from pilot development activities</p>	<p>A sound, multi-year development plan is prepared jointly by AID and the GRM which proposes and justifies interventions in crops and livestock production, human health, infrastructure, non-formal education and village level technologies.</p>	<ol style="list-style-type: none"> <li>1. Analyses of technical reports and studies prepared by the project team personnel.</li> <li>2. Acceptance/approval by AID and/or multi-donors of a larger, integrated regional development project.</li> </ol>	<ol style="list-style-type: none"> <li>1. Technical assistance personnel will have enough time and resources to collect data and develop and extend improved crop/livestock production techniques.</li> <li>2. Data gathered and pilot activities implemented provide sound basis for planning long run project.</li> </ol>

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Project Title and Number: FIRST REGION PILOT DEVELOPMENT - 688-0215

Life of Project:  
From FY 79 to FY 81  
Total U.S. Funding: \$2,545,000  
Date Prepared: March 1979  
Page 3

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
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Outputs:

Magnitude of Outputs:

- |  |  |  |   |
|--|--|--|---|
| <p>1. <u>A firm data base established as result of agro-socio-economic surveys, engineering feasibility studies, an assessment of human health needs, and an alternative technology inventory.</u></p>   | <p>1. A minimum of one survey, study or assessment and an evaluation of the data for each pilot project component (livestock, agriculture, health, rural engineering, and appropriate technology).</p> | <p>1. End-of-tour reports from project personnel, project evaluations and reports.</p> | <p>Assumptions for achieving outputs:</p> <p>1. Sampling techniques used in surveys prove valid.</p>  |
| <p>2. <u>A bank of tested, analyzed development interventions suitable for replication elsewhere in the region including:</u></p> <ul style="list-style-type: none"> <li>a) technology packages for crop and livestock production;</li> <li>b) health delivery systems;</li> <li>c) integrated curricula for functional literacy programs;</li> <li>d) village-level appropriate technology; and</li> <li>e) rural infrastructure prototypes.</li> </ul> | <p>2. Conclusive results that pilot project interventions can improve small farmer productivity and/or quality of life.</p>  | <p>2. Personal observations.</p>   | <p>2. Technology packages developed for various cereal crops and livestock are more productive than existing systems, are acceptable to farmers, and can be expanded without difficulty.</p>                      |
| <p>3. <u>A strengthened Malian capacity to design, implement, and evaluate development programs in the First Region through training and job experience gained during this pilot project.</u></p>  | <p>3. Approximately 15 trained GRM personnel participate in the preparation of the regional development plan.</p>  |  | <p>3. OPI/OVSTM and OACV receive farmer support and participation in all related project activities.</p> <p>4. Agronomic, livestock, climatic, and other environmental conditions remain normal or favorable.</p> |

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

Life of Project:  
From FY 79 to FY 81  
Total U.S. Funding: \$2,545,000  
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Project Title and Number: FIRST REGION PILOT DEVELOPMENT - 688-0215

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<u>Inputs:</u>	<u>Implementation Target (Type and Quantity)</u>		<u>Assumptions for Providing Inputs:</u>
<u>AID-Financed Inputs:</u>	1. 173 Person-Months of technical Assistance in livestock, agronomy, public health, civil engineering, appropriate technology, and sociology.	AID and GRM records, supplier invoices, implementation documents, (PIO/T, PIO/C, PIO/P, etc.), CPI network, and construction contract.	1. Qualified U.S. technical personnel can develop technologies and plan data collection activities effectively.
2. Participant Training - In-country - Third-country - U.S. (short-term)	2. 10 Person-Months of Third Country training, 12 Person-Months of U.S. training.		2. Proposed commodities (equipment and materials) are essential to support personnel and project activities.
3. Commodities (equipment, materials, vehicles, etc.)	3. 7 Four-wheel drive vehicles 19 Motorbikes \$308,000 of miscellaneous materials and supplies.		
4. Construction (prototype infrastructure and physical facilities in support of U.S. technicians and project).	4. 5 Staff houses and 2 farm centers.		
5. Other Costs (various operating expenses, such as vehicle maintenance and fuel; travel U.S./ Malian staff, Ag Credit Fund; contracted studies/ evaluations, etc.)			
<u>GRM-Financed Inputs:</u>			
- Salaries of counterpart/other project personnel			

PROJECT DESIGN SUMMARY  
LOGICAL FRAMEWORK

( Cont. Sheet)

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Project Title and Number: FIRST REGION PILOT DEVELOPMENT - 688-0215

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NARRATIVE SUMMARY

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GRM-Financed Inputs

- ECIBEV Credit Fund for Embouche Paysanne (finish-feeder beef cattle) program
- Other Costs.

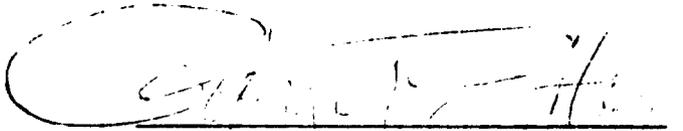
ANNEX 11

FIRST REGION PILOT DEVELOPMENT PROJECT

CERTIFICATION PURSUANT TO SEC 611 (a)  
OF THE FOREIGN ASSISTANCE ACT OF 1961,  
AS AMENDED

The project analyses demonstrate planning and design incorporated into all components of the First Region Pilot Development Project. The financial plan resulted from these analyses. Furthermore, the USAID engineer has reviewed and approved the planning and financial analyses for all engineering components in this project and recommends 611(a) certification.

Therefore, I, Ronald D. Levin, Mission Director of the Agency for International Development in Mali, based upon the project analyses and the recommendation of the USAID engineer, do certify that in my judgement adequate planning necessary to carry out project assistance and a reasonably firm estimate of all costs to the U.S. Government have been completed and, therefore, Section 611(a) of the Foreign Assistance Act has been satisfied.

  
Ronald D. Levin  
Mission Director

Date: 3/24/79

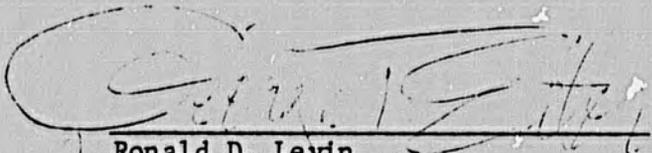
FIRST REGION PILOT DEVELOPMENT PROJECT

CERTIFICATION PURSUANT TO SEC 611 (e)  
OF THE FOREIGN ASSISTANCE ACT OF 1961,  
AS AMENDED

The purpose of the First Region Pilot Development Project is to prepare a comprehensive development strategy for a long term, integrated rural development project for the First Region by collecting baseline data and testing pilot development activities in selected villages. In this way, the specific needs of the First Region will be determined, and the information gained will serve as the foundation for project activities to be included in a larger follow-on project.

It appears that adequate financial and human resources will exist in the project to maintain facilities and implement planned activities. The maintenance and utilization by the people of Mali in previous projects financed and assisted by AID has been satisfactory.

I, Ronald D. Levin, Mission Director of the Agency for International Development in Mali, do certify that in my judgement, based upon experience with donor assistance programs in Mali and the level of technology being introduced in this project, Mali will have the financial and human resource capability to effectively maintain and utilize the inputs provided in the First Region Pilot Development Project.

  
Ronald D. Levin  
Mission Director

Date: 3/24/79

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## ANNEX 13

5C(2) - PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a sub-category for criteria applicable only to loans); and Security Supporting Assistance funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? IDENTIFY. HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT.1. App. Unnumbered; FAA Sec. 653(b); Sec. 671

(a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project;  
(b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that figure

1. Advice of program change will be submitted.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

2. Yes

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

3. NA

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per *the Principles and Standards for Planning Water and Related Land Resources* dated October 25, 1973?

4. Pilot activities proposed for project include limited water resource management based upon studies to be conducted by civil engineer assigned to the project. Prior to implementation of these activities, internal economic return will be developed.

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

5. Yes. See ANNEX

6. FAA Sec. 209, 619. Is project susceptible of execution as part of regional or multi-lateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. If assistance is for newly independent country, is it furnished through multi-lateral organizations or plans to the maximum extent appropriate?

6. The project purpose is to demonstrate by experimentation that grain production and livestock methods can increase farmers' productivity through technical packages suited to his style of living. The accomplishment of this purpose will increase the likelihood of multi-lateral participation at a later date.

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5C(2)-3  
Omitted 1/

7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.
  8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).
  9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.
  10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?
  11. ISA 14. *Are any FAA funds for FY 78 being used in this Project to construct, operate, maintain, or supply fuel for, any nuclear powerplant under an agreement for cooperation between the United States and any other country?*
7. The project will encourage private initiative and improve technical efficiency of agriculture.
  8. The project will be a series of experiments and trials to determine the most appropriate long-term project, which in turn could result in the importation of American machinery into Mali.
  9. The GRM is contributing local support costs as permitted by its National budget. No U.S. owned foreign currency is available for support of this project.
  10. No U.S. foreign currency is available for support of this project.
  11. No

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#### B. FUNDING CRITERIA FOR PROJECT

##### 1. Development Assistance Project Criteria

a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions?

b. FAA Sec. 103 thru 106.  
(page 5C(2)-3)

- 1a. This project is involving the rural poor in their own development. It provides them a low-cost credit source for purchase of agricultural inputs to increase farm production and teaches them to use effectively animal traction to increase work output with less human input. The project will be in two areas of one of the least developed regions in Mali.

NA for Sahel countries. Programs funded under Sahel Development Program

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B1

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: [include only applicable paragraph -- e.g., a, b, etc. -- which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.]

NA for Sahel countries funded under Sahel Development Program

- (1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;
- (2) [104] for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;
- (3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;
- (4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:
  - (a) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;
  - (b) to help alleviate energy problem;
  - (c) research into, and evaluation of, economic development processes and techniques;
  - (d) reconstruction after natural or manmade disaster;
  - (e) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;
  - (f) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

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B1b

- [ (5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries. NA (part of B.1.b.)

c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

c. NA

d. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

d. NA

e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.

e. The project is in direct support of meeting the country's food needs. The health component of this project will undertake a program to test chemotherapeutic treatments on people who are suffering from onchocerciasis in the southern sector of the First Region, where this illness is the area's biggest constraint to development activities. The integration of women in development and the strengthening of their participation in the local economy is included in this project.

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

f. The project will utilize to the fullest extent possible the capacities of the people of this country.

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1/ (5C(2)-6 omitted)

g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1)-(3) and -(8). Does the activity give reasonable promise of contributing to the development: of economic resources, or to the increase of productive capacities and self-sustaining economic growth; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?

g. Yes

h. FAA Sec. 201(b)(6); Sec. 211(a)(5), (6). Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U.S. balance-of-payments position.

h. NA

Development Assistance Project Criteria (Loans only)

a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.

NA for Mali.  
1/ Note: also NA for Mali are B.3. Security Supporting Assistance, and B.4. Alliance for Progress on page 5C(2)-6

b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.

c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds \$100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?

d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?

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The aim of the First Region Pilot Development Project is to collect data and establish an analytical basis for the justification of an integrated development project for the First Region. To do so, two areas, microcosms of the region, have been selected by the design team to do the initial pilot project activities. Activities which are to be implemented and studies which are to be done in both areas will be well coordinated to yield the necessary decision base for incorporation into the larger project. The detailed description in this section summarizes the planned activities for the six project components: (1) Livestock, (2) Agriculture, (3) Health, (4) Rural Engineering, (5) Appropriate Technology, and (6) Functional Literacy.

Livestock

The purposes of the Livestock activity are: (A) to introduce sound technology to enhance livestock productivity and to increase income from livestock. The planned activities will aim: (1) to increase the number of trained and well conditioned work oxen in order to improve labor effectiveness and increase cultivated hectarage. Farmers will learn proper animal care, feeding, and training techniques at the two project farm stations. Another activity at the stations will be the introduction of cultivated forages which is necessary in order to have a year-round feed supply for the oxen. The farmers will be introduced as well to the concept of supplemental feeding which will allow the animals to work as soon as the rainy season arrives. Finally, early land preparation will be stres-

sed, because it will eliminate a certain amount of risk that the farmer faces if the rains end prematurely. (2) to increase the farmers' income through cattle fattening programs. The highly successful Embouche Paysanne activity of the Mali Livestock I project will be replicated in both project sites. This will be implemented by ECIBEV in OACV and OVSTM areas of responsibility. Its assistance will include (i) training in the selection of good feeder cattle, (ii) handling of the credit for buying cattle supplemental feeds and minerals, (iii) providing management for the feeding program, and (iv) giving marketing support at the end of the 90-day period. (B) to initiate a series of tests in order to develop technological innovations for improved cattle management. Two studies will be conducted to determine the performance levels and cost effectiveness of chemotherapy for trypanosomiasis with Zebu cattle and to determine whether the timing of the breeding of cows to coincide with the onset of the rainy season will effect fecundity, calf mortality, etc. (C) to improve the animal health delivery system in support of the above interventions. Animal health coverage has been meager in the region. The farm stations will include some facilities to improve present coverage. The station will have quarantine facilities, storage space for supplies, and vaccines. Some vehicular support is budgeted to increase the mobility of the veterinary nurses. The activities planned under the Livestock component will be supervised and directed by the full-time livestock advisor to be assigned to the project. This advisor will have counterparts from ECIBEV and the Service d'Elevage.

## Agriculture

The purposes of this component are:

A) on-station and on-farm testing of:

1. corn and millet varieties which have genetic improvements that show potential for recessionary farming systems.
2. fertilizer requirements for typical soils. Priority will be given to crop rotation and use of organic fertilizers.
3. economically justifiable and socially acceptable animal traction devices.

B) development of new technology:

1. a forage crop plan to provide a year-round feed supply for work animals/ and other technologies needed as a result of agricultural surveys to be done.

C) extension of agricultural technology. The farm stations will be the place of trials and demonstrations, however, other work will be conducted on farmers' fields in near-by villages. Courses will be held at the centers in: (1) care, feeding, and management of draft animals, (2) the value of crop rotation, and (3) fertilizer timing and application.

D) provision of agricultural credit to finance the inputs recommended by the farm center's research.

The headquarters of the full-time agronomist and his counterparts will be at the farm stations. Besides designing and helping with the implementation of agro-economic surveys, the agricultural economist will

assist the work of the agronomist.

In summary, studies and surveys will be done to locate technological gaps. Activities will be designed to bridge the gaps in order to arrive at an economically sound agricultural strategy that the GRM can use to enhance the region's potential.

### Health

The health component will focus on five major areas:

- (1) an assessment of human health conditions. Incomplete data exists now upon which to make a common plan of action. Surveys on the nature and extent of health problems and their effect upon human productivity will be done by the Ministry of Health. Surveyors will need to be trained and coordination between the AID project in Yelimane Cercle and the German-financed health assessment will provide the base-line data needed to justify greater involvement in the First Region Integrated Development Project. A study for the whole region is practically impossible, so sample villages have been selected for the data base.
- (2) treatment trials for onchocerciasis and schistosomiasis. Treatment programs, rather than the control of the vector, is receiving growing attention. These trials will show that rural health personnel can be trained to diagnose, treat, and monitor a chemotherapy protocol for these two diseases.
- (3) a drug distribution program. Inadequacies of the present system will be addressed. The provision of drugs at cost plus

overhead help the system, once on-going, to operate without taking on extra costs. Accounting methods will be strict and designed according to controls already in effect.

- (4) health improvement activities. The aim of this activity is to reduce morbidity through preventive means. Therefore, the MOH personnel with this project will be trained in increasing village sanitation methods, low-cost measures for making water safe for drinking, and recognizing and recommending ways to remove disease vectors. Training at the Eye Care Institute in Bamako will also be provided to MOH personnel.
- (5) improving health infrastructure. Project funds will be earmarked to improve the mobility of personnel doing survey work or monitoring treatment trials, laboratory equipment, and essential operating expenses will also be financed.

### Rural Engineering

This component will have an overall plan, recommending the necessary basic infrastructure, concentrating on an improved road/storage network and water resource development. Activities will be:

- (1) carry out studies to determine rural road networks. The studies will look at present and projected surplus production areas, location and capacity of storage facilities, and population served. Feasibility studies will be done, and a work plan for roads will be prepared detailing estimated time schedule for

- work on each road segment, design, method of execution, cost estimates, road classifications, and provision for maintenance.
- (2) catalog water resource development sites. The survey will show location, area covered, soil characteristics, production potential, and operational considerations in developing a priority rating based on economic justifications.
  - (3) construction and evaluation of prototypes. Prototypes to be financed will include any small rural infrastructure which is wanted by the people and/or will give important indications as to social, technical, or economic feasibility of possible future project activities.
  - (4) construction of facilities at the two farm stations. Office space, training/meeting areas, storage space, and animal holding areas will be built under this project. Plans for these buildings have been cost-estimated and final plans will be reviewed by the USAID or REDSO engineers before construction.
  - (5) developing an overall engineering plan. The synthesis of the above studies and activities and of analyses of other engineering and construction inputs required for the First Region Integrated Development Plan will result in an overall engineering plan.

A general agricultural engineer will work with this project for two years. Ministry counterparts will help in the collection and analysis of data and construction of the proposed facilities. A Peace Corps volunteer will assist in the supervision and evaluation of the prototypes to be developed.

### Appropriate Technology

Appropriate technology has been incorporated into the project to inventory the present level of technology as it relates to (i) food processing and preparation, (ii) food production, (iii) sanitation, and (iv) village-level water resources. When technology assessment is finished, a literature search will be done to identify existing, successful, low-cost technology which could address the needs of the local people. The procurement or development of suitable implements will be initiated to test, in the villages and at the station, those devices with the most promise. Short-term technical assistance will be funded under the project, and Peace Corps Volunteers (one at each project site) will be recruited to help in the assessment and pilot testing phase.

### Functional Literacy

Functional literacy programs will be set up to improve the villagers' receptivity to the project activities recommended during the pilot phase of the project, at the same time delivering low-cost non-formal education in project area villages. Personnel from National Direction for Functional Literacy (DNAFLA) will be used to choose village sites, to train teachers, and develop curricula for both sites. No outside technical assistance is required or programmed for this activity.