PD BAG 279

SEP 14 8 33 AM '78 SEP 12 1978

EXECUTIVE SECRETARIAT

ACTION MEMORANDUM FOR THE ADMINISTRATOR

THRU : ES
AA/PPC, Alexander Shakow

FROM : AA/AFR, Goler T. Butcher

SUBJECT: Operation Haute Vallee - Mali 688-0210

I. Problem: Your approval is required: (a) to approve life-of-project grant funding of eighteen million, three hundred ninety-five thousand dollars ($18,395,000) from the Sahel Development Program appropriation (SH) to the Government of the Republic of Mali (GRM) for the Operation Haute Vallee project (688-0210); (b) to authorize a grant of five hundred thousand dollars ($500,000) in FY 1978 to begin the project; and (c) to approve certain commodity procurement waivers set forth in the attached PAF, Part II.

II. Discussion:

A. Project Description: The purpose of the project is to increase agricultural productivity, production and marketing throughout the Haute Vallee region, an area of 13,800 square kilometers which lies on both sides of the Niger River between Bamako and the Guinea border. Approximately 211,000 people live in the area in over 200 villages and small towns. The project will be an integrated rural development effort with seven components:

(1) Animal traction training and research -- Eight animal traction training and research centers will be established to demonstrate more rational use of work oxen teams and to increase the number of trained teams for service in Haute Vallee. In addition, better farm implements for use in animal traction will be developed at the center. Courses will be available for owners of oxens and their teams, and for blacksmiths in order to develop a local capability to make and maintain implements.

(2) Rehabilitation of the Bancoumana polder -- A rice polder built by the French during the mid-Sixties will be rehabilitated. A program to cultivate improved varieties of rice, expected to increase yields from 700 Kg per hectare to at least three tons per hectare, will be installed, and an effective management system for the facility will be set up. The system will serve 160 rural families (2,000 people).

0003118

(3) Agricultural Credit -- Modifications will be made in the current credit system early in the project to make it more responsive to farmers' needs, by increasing the interest rate on short and medium term loans and making credit available for the purchase of oxen. During project year three, a comprehensive study will be made of the credit system, and a revised system will be installed during project year four.

(4) Road and trail rehabilitation and upgrading -- The biggest constraint to increasing agricultural production and to the overall development of the Haute Vallee is the inadequate road network. 398 kilometers of existing roads and trails will be rehabilitated and upgraded to all-weather standards.

(5) Health -- Assistance will be extended to the Ministry of Health to design and implement a low-cost health program for the treatment of endemic diseases in the area (especially water-related diseases), at an estimated cost of approximately $500,000.

(6) Functional Literacy -- Support will be given to expand the GRM's existing functional literacy program in the Haute Vallee into 100 villages. The results of the program will be evaluated, and, if indicated, the program may be expanded to an additional 100 villages.

(7) Administrative support for Operation Haute Vallee (OHV) To assist OHV to implement the project and to continue it after termination of A.I.D.'s assistance, a socioeconomic base-line survey for future planning will be carried out. The project will also provide training, technical assistance, a new headquarters building, additional field office space, trucks and staff vehicles.

The project is designed to achieve its objectives over a ten-year period. At the end of the initial five-year funding period, it is expected that (a) 1,500 oxen teams will have been trained at the animal traction centers, with each center then capable of training 100 teams per year; (b) a minimum of 1,900 tons of paddy per annum will be harvested by the 160 families farming in the Bancoumana polder; (c) elsewhere in the project area, at least 2,000 farm families will have increased production by 50 percent, thereby graduating from mostly subsistence farming; (d) 30 percent of Haute Vallee's population (61,000 people) will be directly served by the rehabilitated road network, and 90 percent of the population will be indirectly affected by these roads; (e) a minimum of 2,500 people will have received functional literacy training; (f) the Ministry of Health's program will have been established in the project area; and (g) OHV will be a much more effective institution for assisting farmers in the production and marketing of food grains.

This project fully conforms with the GRM's goal of reaching self-sufficiency in food grains and increasing production near urban centers. It is also consistent with A.I.D.'s country strategy for Mali and the Sahel Development Program.

B. Financial Summary:

ITEM	($000) FY 1978	LOP
Technical Assistance	-	3,100
Training	-	690
Commodities	500	2,808
Construction	-	4,042
Health Component	-	500
Other Costs	-	2,916
Contingencies and Inflation	-	4,339
TOTAL --	500	18,395

Of these amounts, an estimated $200,000 will be provided in local currency in FY 1978, and $6,255,000 (34 percent) over the life of the project. The GRM will contribute $6,917,000 to the project. Other donors (FAC, IBRD) support OHV's cash crop operations, but will not participate directly in this project.

C. Sociological, Economic, Technical and Environmental Aspects:

(1) Sociological constraints and incentives have been carefully examined. The majority of people in the Haute Vallee area share a common culture, and traditions are well-established, though changing due to the impact of Western culture and the proximity of Bamako. Every effort has been made to ensure that project components will work through and build upon existing social structures. For example, existing lines of authority and village organizational patterns will be used in organizing Bancoumana polder farmers and in administering the credit component.

(2) The economic analysis conservatively estimates an internal rate of return at slightly over eight percent. The economic analysis helped identify possible constraints to further development of the Haute Vallee which will be carefully followed during project implementation.

The financial analysis shows that the project will be viable for farmers, even assuming that official grain prices are kept artificially low by the GRM. It is expected that farmers will increase the profitability of their operations by selling grain also on the parallel market at higher prices.

3x

The financial analysis revealed that serious consideration should be given during project implementation to ways of increasing OHV's operating revenues to ensure its viability upon termination of A.I.D. assistance. OHV is currently self-sustaining, but its operations will expand significantly as a result of the project. In view of the project's inherent profitability to the country, the development of OHV into a financially viable entity should be feasible.

(3) Technical aspects of the project have been fully examined, and the agronomic, credit, engineering, irrigation and administrative aspects of the project are deemed to be sound.

(4) There are no human rights issues concerning Mali which would preclude authorization of this project.

(5) An IEE was prepared, and a negative environmental determination has been approved by AA/AFR.

D. Major Conditions Precedent and Covenants, Waivers, and Implementing Agencies:

(1) The attached PAF, Part II contains the following significant covenants and conditions precedent for inclusion in the Grant Agreement:

(a) The Credit program -- The GRM will agree to allow OHV (i) to modify the terms of credit to ensure the viability of the credit program and (ii) to purchase agricultural implements for marketing through the credit program from supply sources other than the Government's agricultural supply institution, SCAER, in order to ensure timely availability. The GRM will also agree to undertake a comprehensive study of the credit system in project year three, and to make additional modifications in the credit system, as appropriate, not later than project year four.

(b) Road maintenance -- The GRM will agree to assign responsibility for maintenance of Haute Vallee roads to the Ministry of Public Works and to finance maintenance costs through the national budget, starting as each stretch of road is completed. This arrangement will relieve OHV of the management and financial burden of maintaining the roads rehabilitated under the project.

(c) The Viability of OHV -- The GRM will agree to undertake a study, in cooperation with A.I.D. during the life

of the project, to determine ways of increasing OHV revenues and eventually ensuring its viability after termination of A.I.D. assistance. The studies will include analysis of the effects of official food grain prices on OHV's viability. A recommended program to increase OHV revenues will be implemented during the life of the project.

(d) The Bancoumana polder -- Prior to first disbursement of funds under this component, the GRM will submit (i) documentary evidence of the establishment of a system of dues and fees adequate to ensure the continued funding of polder management and maintenance costs, and (ii) a copy of the model "cahier de charges" to be executed between OHV and the polder farmers which will outline the responsibilities of each party. USAID will have the opportunity to approve the fee system and the model "cahier de charges."

(e) The health component -- Initially, approximately $75,000 will be obligated to finance the design of a low-cost health delivery system for the project area. The remainder of the $500,000 set aside for this component will be obligated after AA/AFR review and approval of the design of the program.

(2) Since Mali is a RLDC, the source and origin of all goods and services, other than ocean shipping and motor vehicles, to be financed under this project shall be Geographic Code 941 countries and Mali, except as specifically authorized by waivers. Based on the justifications included in Annex A7 of the PP, it is recommended that the following procurement waivers be approved:

(a) Raising the unit value limitation for purchase of Code 935 shelf items from $2,500 to $6,000 per unit for spare parts for road construction/maintenance equipment and for survey equipment, to ensure timely availability as the project progresses. A standard supply of spare parts will be purchased in the U.S. with the road equipment, and this authority will be used for additional items needed as the roads are being built.

(b) Purchase of 162 mobylettes ($81,000) manufactured in Code 941 countries.

(c) Local purchase of one 1/2 ton pickup truck (935 source - $10,000) needed immediately to begin road survey work which must be completed during project year one.

(d) Proprietary procurement in the U.S. of $755,000 in road construction and maintenance equipment plus spare parts

5x

($272,000) from the Caterpillar Tractor Company, given the GRM's policy to standardize on Caterpillar equipment and the excellent Caterpillar support facilities in Bamako.

(3) The major GRM implementing agency for this project will be Operation Haute Vallee.

E. Bureau Action and Congressional Apprisement

(1) The Africa Bureau's Executive Committee for Project Review (ECPR) met on August 31 and recommended approval of this project. The Committee recommended inclusion of a covenant dealing with the viability of OHV (see above), and approved the PP's recommendation for developing a low-cost health program in Haute Vallee which the GRM Ministry of Health will be able to fully finance after termination of A.I.D. assistance.

(2) $2,000,000 was identified in the FY 1978 Congressional Presentation to initiate this project (Volume on Africa, page 402).

The USAID/Mali project officer is Quincy Benbow. The responsible officer in AFR/DR is Robert Asselin, Jr.

III. Recommendation: That you sign the attached PAF, Part II and thereby authorize both the proposed project and the requested commodity procurement waiver.

Attachments

1. PAF, Part II
2. IEE
3. PP

Clearances:
DAA/AFR:HNorth
AFR/DR:JWKoehring JWK
AFR/SFWA:JKelly (draft)
AFR/DP:FWTate (Draft)
GC/AFR:STisa (Draft)
AFR/DR/SFWAP:JRMcCabe (draft)
AFR/DR:JNixon (Draft)
AFR/DR/ENGR:ATummarello (draft)
AFR/DR:WJohnson (draft)
SER/COM/ALI:PHagen (draft)
PPC/PDPR:EHogan
AFR/DR/EHR:FMoore (draft)
AFR/DR/H:Stockard (draft)
GC:MBall MB by EAD

AFR/DR/SFWAP:RTAsselin:dmb/baw:09/06/78:Ext:28242

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

COUNTRY : Mali

PROJECT : Operation Haute Vallee

PROJECT No. : 688-0210

Pursuant to Part I, Chapter I, Section 121 of the Foreign Assistance Act of 1961, as amended (the "Act"), I hereby authorize a Grant to the Government of Mali ("Cooperating Country") of not to exceed Five Hundred Thousand United States Dollars ($500,000) to assist in financing certain foreign exchange and local currency costs of goods and services required for the project as described in the following paragraph.

The project shall consist of developing the capability of Operation Haute Vallee ("OHV") to assist the farmers in the Haute Vallee area of the Cooperating Country to increase their production and marketing of food crops by providing (a) rehabilitation/construction of an irrigation system for approximately 640 hectares at the Bancoumana Polder, technical assistance in civil engineering, water management and improved rice production, training for participating farmers and personnel of OHV in the management and maintenance of the irrigation system and in rice production, and land development and production credits for participating farmers; (b) construction and equipping of approximately eight small animal traction training and research centers, technical assistance in the research and development of the use of animal traction for crop production, training and demonstration in the use of animal traction and in the production/repair of farm implements; (c) technical assistance, training and capital for an agricultural credit program for production inputs and animal traction; (d) technical assistance, training, equipment and supplies, and operating costs for extending the Cooperating Country's functional literacy program to approximately 200 villages in Haute Vallee; (e) technical assistance, training, operating costs, goods and other services for the development of a health program; (f) technical assistance, equipment and operating costs for the development of a road construction/maintenance brigade that will improve approximately 203 kilometers of link roads and 195 kilometers of improved access trails; and (g) technical assistance, training, equipment and supplies and the construction of a headquarters, six field offices, and approximately four small warehouses for development of the administrative capability of OHV (hereinafter referred to as the "Project").

I approve the total level of A.I.D. appropriated funding planned for the Project of not to exceed Eighteen Million, Three Hundred Ninety

Five Thousand United States Dollars ($18,395,000), Grant, during the period FY 1978 through FY 1982, including the amount authorized above and additional increments of grant funding during that period subject to the availability of funds and in accordance with A.I.D. allotment procedures; provided that, funds may not be obligated for the health program, other than for the purpose of designing such program, until preliminary planning and cost estimates for such program are reviewed and approved by AA/AFR.

I hereby authorize the initiation of negotiations and execution of the Grant Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority, subject to the following terms together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Goods and Services

Except for ocean shipping and motor vehicles, goods and services financed by A.I.D. shall have their source and origin in countries included in Code 941 of the A.I.D. Geographic Code Book or in the Cooperating Country, except as A.I.D. may otherwise agree in writing. Ocean shipping financed under the Grant shall be procured in the United States or the Cooperating Country; motor vehicles procured under the Grant shall be manufactured in the United States.

b. Conditions Precedent.

1. Prior to the first disbursement of funds under the Grant for the services of the technical assistance contractor, other than short-term personal service contracts, or to the issuance of commitment documents with respect thereto, the Cooperating Country shall furnish to A.I.D., in form and substance satisfactory to A.I.D., a request for proposals for such services and an executed contract for such services with a firm acceptable to A.I.D.

2. Prior to the first disbursement of funds under the Grant for the procurement of road building equipment, or to the issuance of commitment documents with respect thereto, the Cooperating Country shall furnish to A.I.D., in form and substance satisfactory to A.I.D., specifications, invitations for bid for such equipment, except the equipment in paragraph d.5, below, and an executed contract(s) for such equipment with a firm(s) acceptable to A.I.D.

3. Prior to the first disbursement of funds under the Grant for the services of a construction contractor for the OHV administrative office building, or to the issuance of commitment documents with respect thereto, the Cooperating Country shall furnish to A.I.D., in form and substance satisfactory to A.I.D., detailed plans, specifications and bid documents and an executed contract with a firm acceptable to A.I.D., for such services.

4. Prior to the first disbursement of funds for the construction/improvement of the irrigation system at the Bancoumana Polder, the Cooperating Country shall furnish to A.I.D. the following in form and substance satisfactory to A.I.D.:

A. Documentary evidence of the establishment of a system of dues and fees to be charged the farmers participating in the irrigation system in an amount adequate to cover, on a continuing basis, the costs of managing and maintaining the irrigation system.

B. A copy of the cahier de charge in the standard form that will be executed by OHV and the farmers participating in the irrigation system.

C. A copy of an executed agreement between OHV and OTER, the construction Division of Genie Rural, under which OTER agrees to provide adequate numbers of technicians, supporting personnel and equipment to undertake the construction and rehabilitation of the Bancoumana Polder on a timely basis.

c. Covenants

The Grant Agreement shall contain covenants providing in substance as follows:

1. Except as A.I.D. may otherwise agree in writing, the Project shall be implemented by OHV on behalf of the Cooperating Country.

2. OHV may procure agricultural implements and supplies whenever, in the judgment of OHV, Societe de Credit Agricole et d'Equipment Rural ("SCAER"), the agency responsible for agricultural credit and rural equipment, is unable to furnish such materials on a timely basis as needed for the effective implementation of the Project.

3. The Cooperating Country agrees that OHV may apply terms of credit and rates of interest as may be required to ensure the financial viability of the credit fund, including loans for the purchase of work animals, and the achievement of Project objectives.

4. The Cooperating Country agrees that, not later than the third year of the project, a study shall be conducted of the existing agricultural credit and input supply program, including the adequacy of interest rates and credit terms, and that necessary modifications or revisions to the credit and input supply program satisfactory to A.I.D. shall be made, based upon the results of the study, prior to obligation of funds by A.I.D. for the credit program in the fourth year of the Project.

9x

5. The Cooperating Country shall increase the number of extension agents assigned to OHV at the average rate of seven per year for the life of the Project.

6. The Cooperating Country shall use its best efforts to ensure that the maximum number possible of alphabetization centers ("CAFs") participating in the functional literacy component of this Project shall include, as part of their curriculum, classes for women only and that $20,000 from the project credit fund will be used solely by the CAFs for conducting experimental agricultural projects on a credit and group basis.

7. Primes to be paid to eligible persons out of the Grant shall be submitted semi-annually to A.I.D. for review and approval.

8. With respect to the road building components of the Project the Cooperating Country shall agree to the following:

A. A special brigade will be created by Travaux Publics, the Public Works Department of the Cooperating Country ("TP") which will construct, improve and maintain the roads financed under this Grant;

B. TP shall provide to the special brigade a sufficient number of adequately trained technicians and supervisory and support personnel as may be required to construct approximately 203 kilometers of Class B roads and 195 kilometers of trails in the Project area and to maintain such roads and the equipment financed under the Grant;

C. Except as A.I.D. may otherwise agree in writing, road construction and maintenance equipment financed by A.I.D. under the Grant shall be assigned by the Cooperating Country as follows:

(1) road construction equipment, for the life of the project, to OHV which shall make such equipment available to the special brigade for the construction or improvement of roads in the project area;

(2) road maintenance equipment to TP which shall make such equipment available, both during this project and after it is completed, to the special brigade for the purpose of maintaining the roads which are constructed or improved in the Project area under this Grant;

(3) road construction equipment, upon termination of the Project, to TP which shall make such equipment available to the special brigade for the purpose of maintaining and upgrading roads in the Project area.

10 10

D. The construction and improvement of roads in the Project area by the special brigade shall be supervised by TP but shall be under the direction of OHV.

E. TP and the special brigade shall have the responsibility to maintain each road constructed or improved under this Project as soon as construction or improvement of each road is completed, and maintenance costs shall be financed by the Cooperating Country. Within one year after execution of the project agreement, the Cooperating Country shall identify a satisfactory source of funding from its revenues for such costs.

9. Each contract of the Cooperating Country financed under the Grant, other than those between or among agencies of the Cooperating Country, shall be in accordance with A.I.D. Handbook 11 on Country Contracting.

10. The Cooperating Country agrees that a study will be undertaken, jointly by the Cooperating Country, OHV and A.I.D., regarding alternative ways to increase OHV's revenues from both food and cash crops and, prior to the obligation of funds by A.I.D. for year 3 of the project, that the Cooperating Countries, OHV and A.I.D. shall consult regarding the manner in which the recommendations resulting from such study may be implemented.

d. Waivers

Notwithstanding paragraph a. above and based upon the justification set forth in Annex A7 of the Project Paper, I hereby

(1) approve a procurement source waiver to Code 935 for the purchase of one pickup truck;

(2) certify that the exclusion of procurement of such truck from the requested country included in Code 935 would seriously impede attainment of U.S. foreign policy objectives and the objectives of the foreign assistance program;

(3) approve a waiver to permit procurement of 162 mobylettes manufactured in countries included in Code 941; and

(4) find that special circumstances exist to waive, and do hereby waive, the requirements of Section 636(i) of the Act with respect to such truck and mobylettes;

(5) approve an increase in the per unit cost of shelf items from Code 899 countries (which are not also included in Code 941) that may be financed under the Grant from $2,500 to $6,000 for survey equipment and spare parts for road construction and maintenance equipment;

1/x

(6) Approve the procurement from Caterpillar Tractor Company, without competition, of certain items of road construction and maintenance equipment (and spare parts) identified in Annex A7 of the Project Paper based upon the policy of the Cooperating Country to standardize such equipment and the support facilities available in the Cooperating Country.

Deputy Administrator

Date

12 17

INITIAL ENVIRONMENTAL EXAMINATION

Opération Haute Vallee

Outline of IEE

		Page
Cover Sheet		
1.	Foreword	2-3
11	Examination of Nature, Scope and Magnitude of Environmental Impacts	
	A. Description of Project	3-5
	B. Identification and Evaluation of Environmental Impacts.	
	1. Impact Identification + Evaluation Form	5-8
	2. Discussion of Impacts	8-11
111.	Recommendation for Environmental Action: Threshold Decision Followed By Negative Determination.	11

INITIAL ENVIRONMENTAL EXAMINATION

Project Location:	Mali
Project Title:	Opération Haute Vallée
Funding (Fiscal Year + Amount):	FY 1978: $2,000,000
Life of Project:	FY 1978 - 1982
IEE Prepared By:	Quincy Benbow and George T. Eaton in co-ordination with PP design team
Environmental Action Recommended:	Negative Determination

Concurrence:

Ronald D. L

Country Development Officer,
Bamako, Mali

3/3/78
Date

Assistant Administrator's Decision:

Title

Date

Signature

1. Foreword

The PRP for this project, submitted to AA/AFR on December 29, 1976, and subsequently approved, included as Annex H an Initial Environmental Examination that recommended an Environmental Assessment before project authorization. In the course of final design, the project has undergone substantial changes that have a major impact upon its environmental consequences. We are, therefore, submitting this revised IEE with the Project Paper to recommend that a negative environmental determination now be made.

The irrigation component of the Haute Vallée Project is the chief object of environmental concern. The project proposed in the PP does not call for the construction of a new irrigation system but for the rehabilitation of one already existing irrigation polder whose present state of disrepair is itself a serious hazard to the environment. This existing polder harms the ecosystem in the following manner: the water delivery system, since it is not maintained properly, has become infested with weeds and other vegetation, causing a deterioration of canal walls and a decrease in water flow. Small suspended solids and other fine debris from increased sediment have joined in to create stagnation and reduce the flow of water. These conditions are ideal for breeding disease vectors such as mosquitoes, gnats, flies and snails which transmit malaria, onchocerciasis (river blindness), schistosomiasis, and other debilitating tropical diseases that afflict Mali.

In the Haute Vallée Project as finally designed, the irrigation component will rehabilitate the drainage system of the existing polder

to allow the discharge of excess water from the land at a suitable, controlled rate. AID will provide technical guidance for proper use of water in the polder and assist with the necessary arrangements for adequate repair, daily operation and overall management, including training as required in these skills.

In light of these facts, the Project Paper for Opération Haute Vallée states that "a more appropriate title for this project could be Environmental Restoration". The ecosystem in question has already been damaged badly by an ill-managed, poorly maintained facility that, left untouched, will continue to have a serious, detrimental environmental effect. The polder portion of this project seeks to reverse the existing hazard and hence will have a favorable environmental effect. It is for this reason that we now recommend approval of a negative environmental determination along with the Project Paper.

11. Examination of Nature, Scope and Magnitude of Environmental Impacts.

A. Description of Project.

The goal of the project will contribute to improve the income and quality of life of about 8,000 of the rural poor farm families in the region. The project's purpose is to help the Opération Haute Vallée by strengthening its capacity to plan, co-ordinate, implement and evaluate an effective rural development program.

Project implementation is for five years. There will be

twelve long term technical advisors on contract for periods of between two to four years. The project is agriculturally oriented and includes the activities and sub-activities as outlined below. Technical advisory assistance is to be provided for each activity, along with vehicles and equipment support as required.

-- Agricultural Production

Applied research and extension with participation of 400 farmers in a model demonstration program for two crop seasons; special cattle-feeding credit packages for 200 farmers; introduction of improved rice and trials; farm machinery pool; on-going grain handling and storage design and training; limited demonstration structure and equipment; blacksmith training and tools.

-- Administrative Support

Training in administration skills; formation of an economic planning and statistical reports group and system; construction of headquarters office; construction of farm service centers; two way radio communication network; special studies and surveys, e.g., engineering feasibility study of remaining polders, ground water survey, soils reconnaissance survey; pilot project such as charcoal manufacture, fishing, river transport.

-- Bancoumana Irrigation System Rehabilitation

Extension of system from 530-630 hectares, 100-hectare demonstration area; repair and reconstruction of perimeter

dikes and control gates, cleaning and shaping of canals, and cleaning and extension of drainage systems; elimination of wild rice infestation; formation of water user organization.

Agricultural Credit System and Fund

Training, office equipment, fund.

Social Services

Functional Literacy materials for 200 centers; and development of health services training and supply of medications distribution system.

Transportation Infrastructure

Upgrading of 163 km. of link roads and 152 km. of access trails.

B. Identification and Evaluation of Environmental Impacts

1. IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-Areas	Impact Identification and Evaluation
A. Land Use.	
1. Changing the character of the land through:	
a. Increasing the population ----------	N
b. Extracting natural resources ----------	N

c. Land clearing ---------- L

d. Changing soil character ---------- N

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 ---------- M

2. Chemical and biological states ------- M

3. Ecological balance ---------- M

4. Other factors

_____ _____

_____ _____

Use of the following symbols:
N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

C. Atmospheric.

1. Air Additives ---------- L

2. Air pollution ---------- L

3. Noise pollution ---------- L

4. Other factors

_____ _____

_____ _____

D. Natural Resources.

1. Diversion, altered use of water ---------- M
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. Socioeconomic.

1. Changes in economic/employment patterns --- M
2. Changes in population ---------- L
3. Changes in cultural patterns ---------- L
4. Other factors

_____ _____

_____ _____

G. Health.

1. Changing a natural environment ---------- L
2. Eliminating an ecosystem element --------- N
3. Other factors

_____ _____

_____ _____

H. General.

1. International impacts ---------- N
2. Controversial impacts ---------- N
3. Larger program impacts ---------- N
4. Other factors

_____ _____

_____ _____

I. Other possible impacts (not listed above)

_____ _____

_____ _____

_____ _____

_____ _____

2. Discussion of Impacts.

(A) Land Use.

Some land clearing will be necessary for construction of the project's link roads and access trails. Twelve to sixteen meters of width will be cleared, but in most cases the clearing attributable to this project will be minor because the roads and trails will follow existing trails or bush tracks. Therefore, it will usually be a matter of re-clearing overgrown tracks or widening a clearing

rather than starting afresh through virgin bush.

Ditching necessary for road drainage will, for the most part, have little effect on existing drainage patterns. However, where ditches are constructed in the flood plains, they will help eliminate breeding grounds for disease vectors by draining low-lying areas. Culverts will be installed where the tracks cross existing water courses.

(B) Water Quality.

Through rehabilitation of the Bancoumana polder, the project will have a significant favorable impact on water quality. The polder is now in a serious state of disrepair through lack of routine, regular maintenance. Drainage is the most seriously neglected part of the polder system. The drains scarcely work at all because they are choked with vegetation. Some turnout gates are entirely or partly clogged. The canals and laterals need cleaning. The earth embankments of the canals, laterals and dikes have eroded and in some cases nearly disappeared. They need to be reinforced and reshaped. Silt, brush and weeds must be removed from the canals and laterals, and the channels must be reshaped to the proper size to allow water to flow freely and smoothly. All of this work will be done under the project, thus changing the polder from a stagnant source of disease, infection and unwanted vegetation to an ecologically balanced facility functioning as originally intended to permit dramatic increases

in rice production without harmful effects to the environment. Because of the project, that is, there will be a moderate, favorable environmental impact upon the physical state of water in and near the polder, its chemical and biological states, and its ecological balance.

(C) Atmospheric.

Construction work in the polder, on link roads and access trails, and on the Operation's headquarters and its farm service centers will doubtless have a slight, temporary effect on the atmosphere in the form of air additives, air pollution and noise pollution. Traffic on the improved link roads and access trails will also affect the atmosphere, but since the improved roads and trails will also shorten the distances between many points there should be some offsetting benefits. Any given trip, for example, should take less time and therefore consume less fuel. On balance, the impact on the atmosphere should be slight.

(D) Natural Resources.

The project will have a moderate, favorable effect through the diversion and altered use of water in the Bancoumana polder. See the discussion under (B) Water Quality above.

(E) Cultural.

No environmental impact anticipated.

(F) Socio-economic.

The project is expected to have a moderate, favorable effect on economic and employment patterns. A large percentage of the Haute Vallée's farm families will gain access to better agricultural

techniques, less expensive sources of credit and more effective marketing channels, all of which should improve their incomes and opportunities for employment (mostly self-employment). These environmental effects should be good, and they should over the life of the project and beyond constitute significant improvements in the rural quality of life. These same project effects may be expected to have some minor impact on relationships among people and their community as well as on certain social or cultural practices. But no radical interference in established living patterns is planned by the project, so that traditional social structure should not be strongly influenced.

(G) Health.

Only slight changes in the environment are anticipated under this heading. There will be no intentional additions of chemicals to water bodies or clearing of bush other than for link roads and access trails (see (A) Land Use above).

(H) General.

None are anticipated.

III. Recommendation for Environmental Action: Threshold Decision Followed By Negative Determination

Based on the analysis in this IEE, it is recommended that the Assistant Administrator for Africa determines that authorization and implementation of the AID-financed project Opération Haute Vallée is not a major action that will have significant effect on the human environment and that therefore neither an Environmental Assessment nor an Environmental Impact Statement is required for this project.

INITIAL ENVIRONMENTAL EXAMINATION

Project Country: Mali

Project Title: Haute Vallee

Funding: FY(s) 1976-84 $ 18.4 million

Period of Project: 5 years

IEE Prepared by: David Dibble

Environmental Action Recommended: Negative determination

Concurrence:

Ronald D. Lewin, Mission Director, USAID/Bamako

Assistant Administrator Decision:

APPROVED _____

DISAPPROVED _____

DATE _____

INITIAL ENVIRONMENTAL EXAMINATION

Operation Haute Vallee

Project Overview

This is an ambitious integrated rural development project which will ultimately affect a large number of people living in a rather extensive area. Overall responsibility for the development of the area was given by the GOM fourteen years ago to a legally constituted entity called the Operation Haute Vallee. AID assistance to the Operation is contemplated to occur in a phased manner. In the initial period, this will consist of the rehabilitation of an existing irrigated polder, the improvement of some 315 kilometers of tracks to a minimum all weather usability state, a credit component, a health component, animal traction training, and assistance of an institution building nature to the Operation as such. The design concept is one of evolution. The eventual dimensions the project may assume are not now all known in any sense. It is expected that planning for the future will proceed from and with initial and subsequent interventions. It is intended that various experts will be put in place, among other things, for just this purpose. By interacting with Malian counterparts and farmers and by observations of what the needs are and what succeeds, the future directions and evolution of project activities will emerge over time in a dynamic sense.

The Setting

The project area covers about 13,800 km^2. It lies mostly SSW of Bamako on both sides of the Niger River and extends to the Guinea border on the Southwest. On the west or left bank of the river, upstream from Bamako, it includes the catchment from the border; part of the Baoule catchment south of the Kenyebaoule forest reserve, and the district of Kati north of Bamako. On the east or right bank of the river, the area extends from the border to the Bamako-Bougouni road (which goes to the Ivory Coast). On the south it extends to the limits of the Kangaba and Bamako Districts. The area also stretches north of Bamako to a strip formed by the flood plain of the Niger between Baguineda and Katibougou. Although Bamako falls geographically within the area, the city, its environs, and the State Farm at Baguineda are excluded.

The Niger River flows through the project area from the southwest to the northeast. On the left bank, a plain, bisected by numerous non-perennial streams, slopes gently from the escarpment of the Mandingue Plateau to the river. On the right bank, low hills terminating in a well defined terrace above the flood plain, provide a much more marked

relief. Two major perennial tributaries of the Niger, the Sankarani and the Fie, intersect this plateau.

The Niger flood plain in the area varies around 5 km in width.

The climate in Haute Vallee is characterized by well defined wet and dry seasons. Annual average rainfall is good. It ranges from 1300 mm in the south to about 1000 mm in the north. The rainy season is from mid-April to mid-October. Average annual temperature is hot, about 29 degrees centigrade, ranging from a low of around 17°C in December/January to 39°C in April. Relative humidity ranges from 97% in August/September to 12% in February with an annual average of 51%. Average annual evaporation is about 2050 mm, the maximum being around 300 mm in April.

Soils in the areas are loamy clay, modestly porous and quite fertile. Crop yields can be reasonable even without the use of fertilizers.

Haute Vallee's population totals about 211,000 (excluding Bamako pop. 500,000 +) with 45% on the left bank, 25% on the right bank and 30% in the Kati area north of Bamako. Population density is low, averaging 15/km^2. About 94% of the people are farmers and they live in over 200 rural villages and several small towns.

Social structures range from small nuclear families averaging 9 members (41%), to medium sized groups averaging 15 members (45%), to a few very large extended families with up to 50 members (14%)

There is about 5000 km^2 of land in the area suitable for agriculture. Presently 2000 km^2 are cultivated, but only about 1/3 is cropped in a season, the remainder lying fallow. Approximately 36 km^2 is irrigated.

Land for agriculture is not in short supply, but there is no individual land ownership. Land use is allocated to families by traditional authorities. Medium and smaller farm families have about 12 hectares of which about 1/3 is cultivated at any one time. Food crops generally are rice, millet, sorghum and maize and constitute about 75% of production; cash crops consisting of mainly peanuts, but also some cotton and tobacco, account for about 22%; vegetable production is 2-3%.

Between 1946 and 1962 a number of flood plains covering about 3600 ha. were developed for single crop irrigated rice production. These polders were formed by building dikes permitting controlled flooding and providing protection against Niger floods.

Generally speaking, the irrigation and controlled flooding schemes have not been as successful as might have been expected. This is because of

2716

inadequacies in design and construction, fields not level and too large, poor water distribution and unsatisfactory drainage provisions. Additionally, there has been a lack of maintenance and an infestation of yield-reducing wild rice which the small farmer does not have the means to eliminate. The result is that only two polders are presently used for intensive irrigated cultivation-Krina (200 ha.) which produces floating rice and Bancoumana (650 ha.) producing paddy. Not all of Bancoumana is cultivated.

Draft animals are rather extensively used, it being estimated that 20% of farm families take advantage of this kind of energy in doing their work. Total equipment is estimated at 2,500 pairs of draft oxen, 2000 plows, 200 multicultivators, 400 harrows, and 800 wheel carts.

Livestock production is rather widely practiced. There are at present an estimated 74,000 cattle, 24,000 sheep and goats, and 300,000 poultry. The cattle are mainly of the N'Dama breed which is well adapted to the environment and is tolerant to trypanosomiasis. Animal diseases are a major constraint to livestock. They include rinderpest, CBPP, blackleg, pasteurellosis, trypanosomiasis, helminthiasis, and coccidosis. Mortality is about 35% for calves, 10 % for young animals and 30% for adults. Most livestock production is consumed where grown. About 10% is marketed in Bamako.

Human health problems are severe in Haute Vallee, as well as everywhere else along the Niger. Onchocerciasis is possibly the worst of these as it is widespread and leads to blindness. Malaria and schistosomiasis are also endemic and widespread. Trypanosomiasis is present. Guinea worm, intestinal amoeba, and other diseases related to drinking water and lack of sanitation cause serious morbidity.

The existing main all-weather road network has a total of about 230 kms. The most important road is a 120 km section which goes SW from Bamako to Guinea and passes through the towns of Sibi, Narena, and Kouremale. An 89 km section along the edge of the flood plain on the left bank of the Niger connects Bamako to Kongaba. These two left bank N-S roads are linked by a 21 km road between Sibi and Bancoumona. On the right bank of the river, the eastern boundary of the area is marked by the main road leading south from Bamako to Bougouni and on to the Ivory Coast.

The above described network is linked to a number of tracks which provide dry season vehicular access to most of the project area. These tracks are maintained by the rural villagers. They are generally impassable for vehicles in the wet season due to lack of surfacing, poor drainage and difficult stream crossings.

Project Description as Concerns the Environment

Bancoumana Polder Rehabilitation

The Bancoumana irrigated polder was developed along with seven other polders in Haute Vallee in the mid-1960's. It incorporates an area of approximately 640 hectares of land, of which about 540 ha could be irrigated by the present system. Its source of water is a non-perennial tributary of the Niger called the Koba. The east side of the polder lies at the edge of the Niger flood plain. The polder is protected from the flood waters of the Niger by a perimeter dike. Water supply to the polder is by gravity feed. The amount of water allowed onto the polder and to the paddy fields is controlled by a system of main canals, control gates, lateral canals, and bunds. Water moving through the system is in part absorbed into the soil and in part circulated to the Niger via drainage canals. The system is characterized by the continued presence of water on the growing crop for much of the growing season.

The polder was from the beginning never properly constructed. Adequate leveling and terracing was not accomplished. In addition, there has been no routine or regular maintenance for a number of years, possibly since construction. The only attention of this kind observed is that of a local nature carried out by some farmers to improve water flows in their own immediate laterals. The most seriously neglected part of the system is the drainage which has now become almost non-functional due to vegetative growth choking the drainage ways. The canals and laterals generally need cleaning and removal of weeds. Some turnout gates are clogged and need attention. The headworks dam on the Koba River needs some masonry work, as does the main canal intake gate and also some of the checks. The earth embankments of the canals, laterals and dikes have been eroded in varying degrees and in some places scarcely exist any longer. A great need exists to remove silt, brush, weed growth, and reshape the channels of the earth canals and laterals to the required size to allow water to flow freely and smoothly.

The rehabilitation of the polder is a major component of the initial years of the Haute Vallee project. In addition, its cultivatable area will be extended by one hundred hectares, and the level of the perimeter dike raised uniformly to 20 cm above the highest estimated 100 year Niger flood level. Deep plowing will be executed to eliminate the in-depth infestation of yeild-reducing wild rice. The project further provides for the installation of an effective operations and maintenance program wherein water user organizations will be formed and lead farmers trained in the management and maintenance of the system. Expatriate expertise will be used to advise OHV and the farmers in efficient methods of water management

and improved irrigated rice cultivation.

Use of the polder land is allocated to families on the basis of one hectare per working family member. There are presently 160 farm families cultivating about 540 hectares, for an average of about 3 1/3 ha. per family. Use rights to the polder land are based upon a written agreement between the farmer and the OHV in which the farmer agrees to certain conditions in order to have the land. One of these, up to now, has been an annual payment of 50 kilos of rice per ha. Others include obligations in respect of the maintenance of the polder.

Environmental Considerations on Bancoumana Polder

Environmental health, salinization of agricultural land resulting from irrigation and adverse effects on water quality, either ground or surface, resulting from the use of chemical fertilizers and pesticides, are the three possibilities for environmental impacts that are identified for scrutiny in connection with the rehabilitation of the Bancoumana Polder.

The first thing to note in this analysis is that the project is concerned with an irrigation scheme that has been in existence and in operation for some 14 years. As such, there have been, and there would continue to be in the absence of the project, opportunities for increasing the incidence of such water vector borne diseases as malaria and schistosomiasis. Equally soil salinization and adverse water quality impacts could occur without the project.

A continuation of the operation of the polder in its present condition of disrepair and lack of management, though, could also easily result in increasingly significant adverse impacts of the kind noted, particularly environmental health impacts. Presently the canals and drainage ditches are over grown with weeds, there has been a considerable amount of siltation and water flows are reduced to almost stagnation levels. These conditions provide an ideal habitat for the growth of the malaria mosquito and the schistosomiasis vector, the Bulinus snail. Both of these diseases are endemic and severe in the polder area.

Rehabilitation and efficient management of the polder, as is contemplated by the project, should greatly diminish the attractiveness of the polder waters as a habitat for these vectors. A major focus for the project will be the cleaning of weeds and debris from the canals and the maintenance of this improved condition. If the canals are kept free of weeds and the water allowed to move at a normal pace through them, it is unlikely that any significant populations of either mosquito larvae or snails will occur.

In addition to the foregoing, the project also includes a component of health education and sanitation which can be expected to have some beneficial impacts on the incidence of schistosomiasis. If the farmers and other people in the area could be lead to understand the linkage between using the polder ditches as latrines and the spread of the disease, they might lessen this practice.

In summary, in respect of environmental health and the occurrence of schistosomiasis and malaria, the polder rehabilitation will not result in any degradation of the conditions already present, and can expect to provide some modest benefits.

Concerning possible land salinization impacts, the polder, again, has been in operation for 14 years, and there has been no significant build-up of salt in the soil. Land fertility is good and soil and water samples tests for salt content indicate that salinization has not been and should not be a problem in the future. As a further protection in this respect, better water and irrigated land management techniques to be provided by the project, such as better drainage and ample water for leaching, should diminish even further this consideration.

Concerning chemical fertilizers, especially the nitrogen they contain, these may, either through leaching to ground water or dissolving and draining off into the Niger, affect the nitrogen/and or nutrient levels in the receiving waters. Phosphorous and potassium tend generally, to fix themselves to the soil constituents and stay put. But such fixation can occur also in respect of nitrogen if the material is plowed into the ground prior to flooding and seeding. On the other hand, side dressing of fertilizer after the plant has begun to grow will result in a considerable leaching or movement of nitrogen into both the drain water circulated to the Niger and into ground water. Deleterious effects on the quality of both of these waters can be a possible consequence that should be avoided.

The present balance of nutrients in the Niger and its capacity to absorb additional quantities, is not very well known. There are, though, many agricultural activities and projects planned for the river system. The use of fertilizer on these projects will undoubtedly grow and it is entirely possible if the issue is inadequately considered, that there will be a point sometime in the future where the ecological balance of the river may be seriously upset. Results, among others, can be significant increases in the growth of weeds (such as the water hyacinth which has become such a problem in East Africa) consequent decreases in photosynthesis and in the supply of oxygen in the water and a diminution in fish and other similar life populations in the river system.

31

Significant amounts of nitrogen in the form of nitrites in ground water supplies used for drinking can also have a debilitating effect on infants and small children. The condition that can result is called methaemoglovinaemia.

As mentioned earlier, though, appropriate cultivation and fertilizer use practices can reduce the dangers of water quality degradation to low and not significant levels. The project intends to attach a great deal of importance to the matter and consequently, fertilizer use should not constitute a significant environmental problem.

Pesticides will probably be used in the project. Persistent chemical pesticides can have seriously deleterious effects on the ecology of the project area as well as on the ground water and the entire drainage basin of the Niger. AID's present pesticide regulations provide that prior to the funding and/or use of pesticides in a project in which AID is participating, a separate IEE constituting a risk-benefit analysis, will be completed and a separate formal environmental Threshold Decision be taken prior to proceeding to using pesticides. Aspects to be considered in the risk-benefit analysis include, inter alia, the EPA status of the pesticide and whether it is to be for a same or similar use as the EPA approved label, and the extent to which the country has considered and is pursuing policies of integrated or alternative practices for managing pests.

Road and Track Improvements

The vehicular movement of people and things into and out of most of the Haute Vallee is greatly limited or essentially non existent during the wet flood season from around mid-June to the end of October. There are, however, all-weather trunk roads serving the area - one going SW from Bamako to the Guinea border serving the left bank of the valley area and the other going south of Bamako on the right bank of the river towards the Ivory Coast. This latter road marks the east boundary of the project area. There is also a major road south out of Bamako to Kangaba and beyond which is along side the left bank flood plain of the Niger. There are points along this road that become impassable during the wet season. Connecting to these main roads are a system of dry weather tracks that provide dry weather vehicular access to the entire project area.

The project proposes to improve some 398 kms of this system to provide vehicular access to the area throughout the year. Some 200 km. of these improvements will constitute upgrading with laterite surfacing to a class C level. The remainder planned for improvement will consist of reshaping

and elevating to provide for better drainage and culverts to be installed at waterway crossings. None of the roads will be new. They will all follow existing alignments. The choice of the roads selected for improvement was based on existing use patterns. Borrow pits, per se, will not be needed in respect of the improvements to the tracks since these will be subjected only to scraping and shaping. To the extent borrow pits are necessary for the laterite surfaced roads, the project provides that such pits will be leveled and filled so as not to become sites for standing water which might serve for mosquito breeding.

Environmentally viewed, the road improvement activities are not expected to result in any significant impacts. To the extent impacts occur these should be modestly favorable. For instance, grading, shaping, leveling and the placing of culverts in waterways should appreciably decrease erosion. So far as people movement is concerned, none of the project area is in any sense remote. Access in and out in the dry season is not difficult. The effect of improving tracks will be merely to extend this accessibility throughout the year. Economically and socially, extended access to the area will make it possible for goods and services, including health related services, to remain available throughout the year. The improvements will primarily, of course, make marketing of farm products much easier. The overall impact of the project is expected to make the area a more attractive place to live and earn a livelihood, and the road improvements, as a part of this scheme, can be expected to contribute to a lessening of tendencies of young people, particularly, to leave for the city. The impact of the road upgrading, therefore, should be moderately beneficial.

Other Project Components

In addition to the polder rehabilitation and road improvements, other project components to be put in place gradually include improved credit and access to agricultural inputs, animal traction training, institutional strengthening of OHV, improved extension services, blacksmith training for the manufacture and maintenance of animal traction equipment, on farm research, resource and agricultural land use and practices survey, a functional literacy program, and a health services activity. Generally speaking, all of these activities will build on existing programs. None of them are really new. Also, there is no reason to perceive that any of them will have any significant impacts on the environment beyond those discussed earlier for the polder rehabilitation. About the only physical thing they may result is the building of some modest structures which will be environmentally sound.

The health component, though, merits some further discussion. The disease problems in the Haute Vallee are important. There is extensive prevalence of debilitating illnesses such as malaria, onchocerciasis, schistosomiasis, gastro-enteritis, parastic worms, etc. Attention to trying to do something to improve these conditions is considered essential. There are possibilities, for instance, if the project is successful, that it will attract new people to the area, or at least slow the movement of people out of it. This means that people may, as a consequence of the project, be exposed to diseases to which they might not otherwise have been. This is particularly important in respect of onchocerciasis which can result in blindness.

The objective of the health activity is to reduce the disease burden in the valley by making basic prevention and curative health services available. The project will, with relatively modest inputs, and building on existing programs, provide training to health and extension personnel and attempt to improve the distribution system for medication.

The consequences of the health component can be expected to result in moderate gains in the struggle against the disease problems in the area.

Recommendation:

From the foregoing discussion it is reasonable to conclude that OHV will not result in any significant impacts on the environment. No serious if any adverse impacts are perceived and some modest environmental benefits will hopefully occur. Additionally, this is a pilot demonstration undertaking. It will present opportunities for sensitizing people in the OHV and farmers to actions that can preserve and maybe improve the environment. The degradation into which the Bancoumana Polder has been allowed to lapse, is a case in point. A Negative Determination under AID Regulation 16 is, therefore; recommended for the project.

M A L I

OPERATION HAUTE VALLEE

PROJECT PAPER
FINAL OFFICIAL VERSION
AUGUST 1978

Project No. 688-0210

25

35

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

TRANSACTION CODE: A (A = ADD, C = CHANGE, D = DELETE)

PP

2. DOCUMENT CODE: 3

3. COUNTRY/ENTITY: Mali

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 688-0210

6. BUREAU/OFFICE: A. SYMBOL: AFR; B. CODE: 06

7. PROJECT TITLE (Maximum 40 characters): Operation Haute Vallee

8. ESTIMATED FY OF PROJECT COMPLETION: FY 83

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 78; B. QUARTER 4 (Enter 1, 2, 3, or 4); C. FINAL FY 82

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 -)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL						
(GRANT)	(2,278)	(1,650)	(3,928)	(12,140)	(6,255)	(18,395)
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY					6,917	6,917
OTHER DONOR(S)						
TOTALS	2,278	1,650	3,928	12,140	13,172	25,312

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 78 F. GRANT	E. 1ST FY 78 G. LOAN	H. 2ND FY 79 I. GRANT	H. 2ND FY 79 J. LOAN	K. 3RD FY 80 L. GRANT	K. 3RD FY 80 M. LOAN
(1) SH	243	070		3,928		3,518		4,807	
(2)									
(3)									
(4)									
TOTALS				3,928		3,518		4,807	

A. APPROPRIATION	N. 4TH FY 81 O. GRANT	N. 4TH FY 81 P. LOAN	Q. 5TH FY 82 R. GRANT	Q. 5TH FY 82 S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1)	3,542		2,600		18,395	
(2)						
(3)						
(4)						
TOTALS	3,542		2,600		18,395	

12. IN-DEPTH EVALUATION SCHEDULED: MM 08 YY 80

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.

2 (1 = NO, 2 = YES)

14. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE

DATE SIGNED: MM 06 DD 19 YY 78

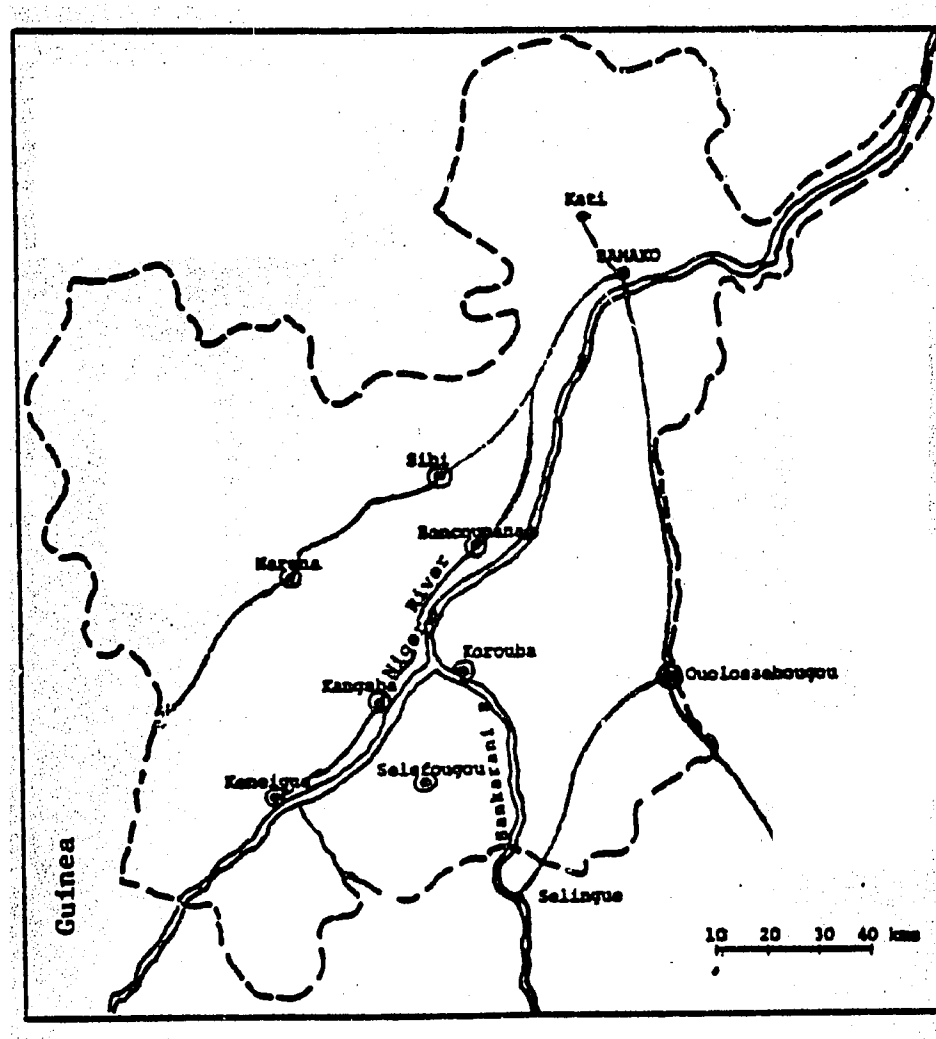
15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM 06 DD 20 YY 78

AID 1330-4 (3-76)

ABBREVIATIONS

CAF	Centre d'alphabetisation Fonctionelle (Center of Functional Alphabetization)
CMDT	Compagnie Malien pour le Developpement de Fibres Textiles (Malian Company for Development of Textile Fibres)
DNAFLA	Direction Nationale d'Alphebetisation et Linguistics appliques (National Center for Functional Literacy and Applied Linguistics)
GENIE RURAL	Rural Engineering Department—OTER is construction division
IER	Institut d'Economie Rurale (Rural Economy Institute of Ministry of Production)
OACV	Opération Arachide et Cultures Vivrières (Authority for Development of Peanuts)
OHV	Operation Haute Vallée (Authority for Rural Development in the Haute Vallée)
OPAM	Office des Produits Agricoles du Mali (Government Marketing Agency for Agricultural Products)
RED	Rural Engineering Department (Ministry of Production)
SCAER	Societe de Credit Agricole et d'Equipment Rurale (Government Agency for agricultural Credit and Rural Equipment)
SER	Secteur d'Expansion Rurale (Rural Development Sector)
SAFGRAD	Semi Arid Food Grain Research and Development Project
TRAVAUX PUBLICS	Public Works Department - Ministry of Transport and Public Works
WARDA	West African Rice Development Association
ZER	Zone d'Expansion Rurale (Rural Development Zone)

OPERATION HAUTE VALLEE PROJECT AREA



Project Boundary
Roads
Proposed sites for Animal Traction Centers

TABLE OF CONTENTS

		PAGE
I.	Background Information	
	A. Project Goal and Purpose	1
	B. The Haute Vallee Area	1
	C. Outstanding Features of the Haute Vallee Critical to Understanding Project Design	3
II.	Detailed Description of Project	
	A. Project Approach	4
	B. Project Components	5
	1. Animal Traction Training and Research	5
	2. Rehabilitation of the Bancoumana Polder	7
	3. Agriculture Credit	8
	4. Road Improvement	10
	5. Health	14
	6. Functional Literacy	15
	7. Administrative Support for Operation Haute Vallee	17
	C. End-of-Project Status	23
III.	Project Analyses	
	A. Economic/Financial Analysis	24
	B. Technical Analysis	27
	C. Sociological Analysis	30
	D. Administrative Analysis	32
IV.	Implementation and Evaluation	33
V.	Project Budget Table	36

ANNEXES

PAGE

A. PROJECT EXHIBITS

A-1 Mission Director's Certification 1

A-2 IR Approval Cable 4

A-3 Project Check List 5

A-4 Draft Project Descriptions/Position Descriptions TA/Team 14

A-5 Logical Framework 29

A-6 Pert Chart 36

A-7 Procurement Plan 42

A-8 Project Inputs and Outputs 53

A-9 Tables 62

B. PROJECT TECHNICAL DETAILS

B-1 Irrigation/Bancoumana 65

B-2 Link Roads and Access Trails 87

B-3 Agricultural Credit 124

B-4 Economic/Financial Analysis 137

B-5 Agriculture Animal Traction 169

B-6 Operation Haute Vallee 199

C. PROJECT - BACKGROUND

C-1 Role of Women 220

C-2 Report on the Haute Vallee 223

C-3 Social Analysis - Ethnographic 244

C-4 Initial Environmental Examination. 245

C-5 Field Data and Evaluation of Disease Vectors in Haute Vallee 255

D. SPECIAL CONDITIONS FOR GRANT AGREEMENT 271

E. BUDGET TABLES 277

OPERATION HAUTE VALLEE

SUMMARY FOR FIVE YEAR FUNDING ($'000)

TABLE 1

	Animal Traction - Research		Administrative Support/OHV		Irrigation/ Bancoumana		Agricultural Credit		Functional Literacy and Health		Link Roads/ Access Trails		TOTALS		
	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	GRAND
Technical Assistance	668	-0-	1,251	-0-	380	-0-	367	-0-	-0-	-0-	434	-0-	3100	0	3100
Commodities	352	35	530	-0-	307	-0-	58	-0-	106	5	1455	-0-	2808	40	2848
Training	171	-0-	165	-0-	199	-0-	118	5	37	9	-0-	-0-	690	14	704
Construction	64	-0-	224	175	566	40	100	-0-	-0-	2,000	3,088	-0-	4,042	2215	6,257
Credit Capital/Research Fund	125	10	-0-	-0-	-0-	-0-	1,310	-0-	-0-	-0-	-0-	-0-	1435	10	1445
Studies/Evaluations	-0-	-0-	175	-0-	75	-0-	43	-0-	-0-	-0-	50	-0-	343	0	343
Maintenance/Salaries/Primes	332	599	357	989	124	328	325	325	-0-	211	-0-	236	1138	2688	3826
Contingencies (15%)	256	127	406	175	248	51	348	80	21	334	754	35	2033	802	2835
Compounded Inflation at 8%	277	158	349	246	244	83	557	131	8	453	871	77	2306	1148	3454
TOTALS	2245	929	3457	1585	2143	502	3226	541	672*	3012	6652	348	18395	6917	25312*

*includes $500,000 for health component, not broken down into cost categories.

I. Background Information

A.1. Project Goal: To increase the income and improve the quality of life of the rural poor in the Haute Vallee region (est. population 211,000).

A.2. Project Purpose: To increase agricultural productivity, production and marketing throughout the Haute Vallee region.

B. The Haute Vallee Region:

Haute Vallee project area covers about 13,800 km2 and lies on both sides of the Niger River between Bamako and the Guinea border. Although the capital city of Bamako falls within the area, the city and its environs, as well as the State Farm at Baguineda, are excluded from the project area. On the left bank of the Niger River, a plain, dissected during the rainy season by numerous streams, slopes gently to the river. On the right bank, there is a well-defined terrace above the flood plain. Two major tributaries, the Sankarani and the Fie, intersect this plateau, forming a peninsula. The Niger flood plain varies around 5 km in width. No detailed hydrogeological survey of the area has been carried out, but, it does not appear likely that high-yielding acquifers exist in the area. About 35 percent of the area's soils are suitable for agriculture and include 10 percent hyrodomophic soils and 25 percent alluvial soils containing rapidly decomposed organic material, including varied alluviums (20 percent) sandy flood plain soils (2 percent), and ferruginous tropical hydromorphs (3 percent).

The Selingue Dam, on the Sankarini River which feeds into the Niger, borders the project area and is scheduled for completion in 1980. It will have a road across the top, with year-round all-weather access to Bamako, via the Bamako-Ivory Coast highway. Water from the dam will be available for irrigation downstream along the Sankarani river via pumping. Almost 30,000 ha of land could be put under irrigated cultivation once the Selingue Dam irrigation outlet work is completed. The electric power there will serve primarily Bamako.

The Haute Vallee has a Sudanese climate characterized by a well-defined wet season (approximately mid-June to mid-October, with some rains occurring in April-May). Annual rainfall is roughly equivalent to that in North Carolina and varies from 1,300 mm in the south to about 1,000 mm in the north. Average temperature at Bamako is 84°F, varying from a monthly maximum of 102°F in April to a minimum of 62°F in December.

The population of the project area totals about 211,000, of whom about 25 percent in the Niger right bank districts—45 percent in the left bank districts, and 30 percent in the Kati district. (This figure does not take into account the city of Bamako, whose population is estimated at more than 400,000). Population density is low, averaging 12 persons/km2. About 94 percent of the total population is engaged in agriculture, and the people live in over 200 rural villages and several small towns. The 1977 "Socio-economic study of the Haute Vallee" by IER shows that there are about 16,000 farm families in the

project area and large families, averaging a total membership of 35 including 19 workers, comprise 14 percent of the total population. Medium size families (average 15 family members with 7 workers) comprise 45 percent of the total population. The smaller families (average 9 members with 5 workers) are 41 percent of the total population. The population is roughly 60 percent Malinke and 40 percent Bambara.

The worse disease problem in the Haute Vallee is onchoceriasis followed closely by malaria and, to a lesser extent, shistosomiasis.

Of a total land area estimated at 13,800 km2, about 5,000 km2 would be suitable for agriculture. At present, only 2,000 km2 are cultivated, of which about 700 km2 are cropped (approximately 40 km2 irrigated), and 1400 km2 are fallow. Land is not in short supply. The IER study indicates the following concerning the average farm family in the Haute Vallee:

- average about 12 ha each, with about 5 ha being cultivated;
- cereals (paddy, millet, sorghum, maize) take up 75 percent of the cultivated hectarage;
- cash crops (mainly peanuts, and now some cotton and tobacco) cover approximately 22 percent;
- while no specific hectarage was indicated for vegetable production, they would appear to comprise 2-3 percent of total cultivation.

Only two polders are presently cultivated--Krina (200 ha) and Bancoumana (640 ha, of which about 540 ha is cultivated). The BDPA has concluded that there are about an additional 1,000 hectares which could be developed for irrigated rice cultivation in the area.

Millet, sorghum, corn and rice, grown on about 75 percent of the total 78,000 ha cultivated in Haute Vallee. Peanuts are gown on 15 percent of the available land. The main non-food cash crops are cotton (3,000 ha) and tobacco (300 ha). Annex A-9 tables 1 and 2 contain information on Agricultural Productivity in Haute Vallee.

The Mali Agricultural Sector Assessment shows that while the Haute Vallee farmers have significant numbers of cattle, only 25 percent of their income comes from livestock, the remainder coming from agriculture.

In Mali, specialized state companies have, in theory, a monopoly on marketing almost all agriculture products. For food grains, cotton and peanuts, the agencies are OPAM, CMDT and OACV, respectively. These agencies, in turn, contract with the operations. In the Haute Vallee, OHV has authority to purchase peanuts, cotton and tobacco, for which it receives a marketing fee, which largely supports all of OHV's activities. The Federation of Cooperatives is responsible for purchasing the major cereal crops for OPAM. In actual practice, agriculture produce is marketed through the open (parallel) market with prices determined by supply and demand. In years of poorer harvests, such as 1977, farmers are much more reluctant to sell at the official price because the open market prices are mugh higher, while in years of good yields, such as 1976, market prices may be no more than 25 percent higher. In general, OHV farmers' grain sales to the GRM are a small percentage of their total grain sales, so that the average price received by them even in a normal year is significantly higher than the official price.

The Haute Vallee is a classic case where poor transportation infrastructure is the major limiting factor to increased agricultural production. The present road network consists of about 230 km of roads on the western side of the Niger River. Segments of this road sometimes become impassable during the rainy season. On the east side of the river, the Bamako-Ivory Coast road borders the project area, and a new road connecting Selingue Dam to this road passes through some of the project area. These roads are linked by well over a thousand kilometers of bush trails which are opened up after the rainy season by the villagers and which provide additional dry season access to most of the area. These trails are closed during the rainy season due to poor surfacing and difficult stream crossings. Improved roads are at the top of the farmers' list of priorities since they become locked-in during the rainy season.

Additional information on the Haute Vallee area can be found in Annex C-2.

C. Outstanding features of the existing situation in the project area critical to understanding project design.

The Haute Vallee area has excellent agricultural potential for many reasons.

- Annual rainfall equivalent to that of North Carolina.
- Proximity to country's largest market, Bamako.
- Excellent existing potential in irrigated rice because of the Niger and Sankarani rivers.
- Exceptionally good future potential in irrigated rice when Selingue Dam is completed in 1980, allowing an additional 30,000 hectares downstream to be irrigated from dam discharges.
- A regional and financially viable Operation (OHV) which most experts conclude has a sound organisational structure which needs no major changes -- just assistance.
- An on-going functional literacy program to which support could be given so that it can become a better instrument for introducing improved cultural practices and technology to farmers.
- The existence of one common dialect throughout the region and the absence of major conflicts between ethnic groups.
- A very strong village structure which is already being used effectively in OHV's on-going farm implement supply systems.
- The widespread use, and cultural acceptance, throughout the project area of animal traction.
- The exceptionally good receptivity of villagers, GRM officials and OHV staff/field agents to a project to increase agriculture productivity, production and marketing -- if the roads are improved.

There are also a number of reasons why this great potential has not yet been realized:

- The roads and trails in the area are in terrible condition. Farmers everywhere say that getting their food crops to a major route leading to Bamako is so problematic as to make producing more than their needs not worth the effort;
- OHV lacks the facilities and funds to extend its activities over existing levels and its staff requires more training and technical assistance in order to expand its operations;
- The GRM's credit system, which OHV administers in the Haute Vallee, allows farmers only 3 years to repay; farmers say that they are afraid to take out loans for fear of not being able to repay in time.
- Farmers everywhere say they dearly want work oxen, but a team costs $325, up to $390. And those farmers who have been able to buy the oxen do not always use them effectively.
- The vast majority of farmers are illiterate and DNAFLA lacks funds both for extending its alphabetization efforts beyond the 17 centers presently in the area, and for revising its educational materials to make them better communicate improved agricultural and disease prevention practices.
- OHV has lacked the expertise and funds to extend its agricultural research program in the area.
- Finally, as in most areas along the rivers in Mali, diseases, especially onchocerciasis and to a lesser extent malaria and shistosomiasis, are very debilitating.

II. Detailed Description of Project.

A. Project Approach

The scope of the project has been dictated by existing conditions in the Haute Vallee and the GRM's capacity to administer an integrated rural development project there.

The Project will concentrate on seven specific areas:

(1) animal traction - to increase productivity;
(2) improved irrigation-to increase rice production;
(3) credit - to expand access to basic agricultural technology;
(4) road rehabilitation and upgrading - a prerequisite for ensuring that increased agricultural production will be translated into increased income for Haute Vallee farmers;
(5) disease control-to improve labor efficiency and the general welfare;
(6) functional literacy-to facilitate access to agricultural information and for the general welfare.
(7) support for OHV in crop research and administration.

Given the ambitious objectives of the project and the interrelated requirements for their attainment, the project has been conceived of in terms of a ten-year effort, although initial funding will be for five years. The fact that the project is designed to achieve its objectives over a period of ten years must be borne in mind in order to understand why certain project activities will be only reaching major proportions in the fifth year.

The basic thinking behind the project's approach can be summarized as follows:

1. Rather than try to superimpose dramatically new and different approaches in the area, the project proposes to build upon and improve existing practices that heretofore have demonstrated success and potential for improvement in Mali, e.g., use of an autonomous implementing agency (Operation Haute Vallee), irrigated rice production, use of animal traction, and an ongoing functional literacy program.

2. The project will conform with and build upon existing village social structures and the already operating extension services.

3. Because of the complexity of the proposed project and the burdens it will impose upon OHV and USAID/Mali, the effective phasing of project activities is of utmost importance.

4. Flexibility must be maintained because of the nature of the project, and in order to take full advantage of the project's built-in research component.

5. Every effort has been made to tailor the level of assistance in various areas to the capacities of the farmers and OHV and to avoid grandiose schemes.

6. While all project components will contribute significantly to achievement of the project's overall objectives, only two are critical--roads and credit.

7. The project has been designed to respond to the expressed desires of the Haute Vallee farmers for better roads, improved credit, access to animal traction, disease control, etc.

B. Project Components

1. Animal Traction--Training and Research

Research in the Haute Vallee at GRM's animal research station at Samanko has revealed that cereal crop yield increases of up to 50 percent can be obtained with animal traction through deep plowing, good weed control,

and timely planting—even without chemical fertilizers. Furthermore, the effects of fertilizer in increasing yields are considerably greater with deep plowing. Deep plowing is possible only with animal traction (or higher technology). Animal traction also increases the productivity of farmers' labor by enabling them to expand the area they cultivate.

Oxen are currently used by many farmers in the Haute Vallee, although the efficiency with which they are used could be greatly improved. For example, animal traction is used for plowing but not for weed control; row-planting is not practiced; animals are not always properly fed, trained or used in a timely fashion. To address these problems and promote the expansion of animal traction in Haute Vallee, it is proposed that eight animal traction training and research centers be set up, two per year beginning in project year two. These centers, which have proven to be successful in other West African countries will be designed to: (1) increase the number of trained oxen teams, (2) demonstrate a more rational use of work oxen to farmers through different cultivation techniques and redesigned implements, and (3) develop more appropriate and less expensive implements for work oxen and train local blacksmith to make them.

Experience in other areas of West Africa has shown that certain conditions are necessary to the success of an animal traction program. These include: (1) cultural acceptance and, preferably an already existing use of work animals, (2) sufficient supply of work oxen, (3) favorable soil conditions, (4) good market potential for increased production, and (5) no excess labor supply. All of these conditions are present in the Haute Vallee. These centers should be kept simple and inexpensive to operate. No elaborate equipment or offices are needed. The basic requirements are a corral for the oxen, a storeroom for grain and implements, and a covered area for a blacksmith. Experience elsewhere has also shown that it will take awhile for farmers to accept the concept of the training center. However, the only way to obtain credit to purchase oxen will be to go through the training program. Elsewhere in West Africa, this has been enough stimulus to induce farmers to pay for training. Demonstration of the proper and more effective use of oxen will make their worth more clear, and demand for credit should begin to rise.

Individual training of farmers and their oxen will last 2 weeks. During each center's first year of operation, 40 teams are to be trained, and their eventual capacity will be 100. The operation of the centers is fully described in Annex B5.

Animal traction experts in Mali strongly recommend that two centers be built in the beginning—one in the upland area and one in the flood zone—to enable project technicians to get experience in both climatic zones. The training-research centers will be attached to OHV offices at the following locations:

PY 2 Bancoumana and Siby
PY 3 Kangaba and Narena
PY 4 Keniegoue, Ouelessebougou and Selegougou
PY 5 Kourouba

All except the last two are existing ZER headquarters and the centers of OHV's greatest activity. The Kourouba and Selefougou sites were selected for their central location.

An animal traction expert and an agronomist will be provided to work on this component of the project. The agronomist will work closely with OHV's head of "vulgarization" who is OHV's chief technical/agronomical advisor. The animal traction expert will work with the head of OHV's "Action Betail" who presently is involved mainly in animal feeding and care programs as well as animal fattening and vaccination. A total of 16 PCV's will assist in both the training and research phases of the project. Their job will be to work with the ZER heads and S.B. heads, and teaching them how to operate the centers and how to train the oxen.

At each center, about 2 hectares will be set aside for research involving both cultural practices and animal traction. The program will include research into such things as better yokes, seeders and plows, as well as crop rotation and planting. As results from this research become clear, starting in PY 3, the program will expand into the extension program and include on-farm/village demonstrations. In addition, OHV's blacksmith expert will receive 6-month training in a third country and then will continue the training of local blacksmiths. OHV's blacksmith specialist and the projects' animal traction expert will collaborate in developing more appropriate implements.

The research/demonstration phase is a critical element of the project because it is the only component which will eventually enable the credit program to expand beyond its initial focus mostly on animal traction.

2. Irrigation Improvement and Rehabilitation at Bancoumana

The Bancoumana polder irrigation system, located in the flood zone of the Niger River about 60 km from Bamako, was initially developed, along with six other polders, in the mid-1960's. It is farmed by 160 farm families and supports 2,000 people. The polder was poorly designed, and water levels are unequal in its existing 540 hectares. As a result, good water management has been next to impossible and yields are poor (only 0.8 tons/hectare). Average yields of 3 tons per hectare should be obtainable after land leveling, with complete water control, use of Asian irrigated rice varieties, and weed control.

Plans call for extension of the system an additional 100 hectares, increasing its full potential to 640 hectares. The activities necessary for rehabilitation and extension of the polder system are:

—repair and reconstruction of the perimeter dike to the necessary crest level of 20 cm. above the estimated 100 year flood level;

—repair and reconditioning of all control gates;

—cleaning and shaping of canals; and

—cleaning and extension of the drainage system.

During the first project year, one hundred hectares will be leveled and rehabilitated and will serve as a demonstration area on which U.S. technical assistance, on-the-job technical training and farmer training will be concentrated. Water-user organizations will be formed and farmer leaders trained in management and maintenance of the system. Expatriate technical assistance will be provided to supply necessary expertise in civil engineering, water management and improved rice cultivation. In addition there will be other short-term consultants on call.

The low water-use efficiency in the Bancoumana polder area, estimated at 10 percent, points to the need for training programs for OHV technicians and intensive education and extension information for participating farmers. The project provides for third country training for OHV personnel and intensive on-polder training for them and the polder farmers.

Use of the village structure is important to the long-term effectiveness of the irrigation system. Participating farmers must feel a certain village pressure to cooperate in their use of their system. A "Cahier de Charges" will be developed, similar to those in use elsewhere in Mali, which will explicitly outline the duties of both the polder farmers and OHV.

Effective management of the activity, special training of the extension agents, and an intensive farmer education program are critical to the success of the project. All persons involved will be well acquainted with the recommended technology, timing, and importance of the program. The project area will be constantly monitored for rice pests and diseases. Farmers will have very close supervision and technical assistance available at all times for initial land preparation through the harvest period. Selected interval deep-plowing will be done to control or eliminate wild rice before and after the cultivation period. All leveling work not done by oxen-pulled scrapers will be done on a contractual basis with Genie Rural, using its own equipment.

3. Agricultural Credit

In Mali, the purchase of farm inputs (fertilizers, chemicals and small farm equipment) is the monopoly of SCAER, which acts primarily as a supply agency for the different Government Operations. SCAER's function in the project area are performed by OHV, which receive a 5 percent commission for each input. The unit prices for different items are fixed by the Government each year and are in general lower (20 to 30 percent) than SCAER's calculated cost prices. This subsidy is partially (if not completely) offset by the taxes levied on every ton of seed cotton and peanuts marketed. Fertilizers, seeds and chemicals are sold on short-term credit (less than one year) and no interest is charged. Small farm equipment is sold for cash or on maximum 3-year credit at about 3 percent interest, but a one-third down payment is required. Loans for motor pumps are made on a maximum 5-year basis. There are no loans for purchasing work animals. The system operates simply since no money passes hand. The only other sources of credit in the Haute Vallee are local traders and relatives.

The present credit system is considered to be inadequate because: (a) SCAER does not always supply OHV with agricultural implements in a timely fashion; (b) maturities are not considered by the farmers to be long enough to acquire more expensive equipment; (c) no credit is available for the purchase of work oxen; and (d) SCAER's low interest rate of 3.1 percent does not provide for a self-sustaining credit program.

The project proposes to build upon the existing credit system, modifying its most deficient aspects during the first three years. The reason for using the existing credit system as a building block rather than proposing a brand new credit program from the beginning is two fold: First, the demand for credit in the Haute Vallee cannot be expected to rise greatly for several years; so no elaborate credit system is justified. Second, it will not be possible to design a credit system to meet the needs of the area until U.S. technicians have been there for some period of time. Before the project's third crop season, a U.S. credit design specialist, with the assistance of the long-term credit specialist, will make a detailed 5-month study of the credit program with GRM officials, and make recommendations for a new credit system. This timing makes sense in terms of the training program since OHV credit technicians will return to Mali at that time.

The principal changes which will be made right away in the current credit program are as follows:

a) allow for longer repayment schedules (5 years) for specific farm implements.

b) permit loans for the purchase of work oxen.

c) introduce an insurance program for the oxen purchased on credit which will insure traction animals at 100 percent of their value against death from any cause except slaughter and will be paid for by a premium of 2½ percent on all oxen loans. (Ten thousand dollars will be deposited in the insurance account at the outset from the grant, separately accountable).

d) make loans available for necessary land-leveling at the Bancoumana polder.

e) increase the current interest rate for all commodities purchased on credit as follows in order to ensure viable credit program from the outset:

COMMODITY	I-RATE	DOWN PAYMENT	REPAYMENT SCHEDULE
Work Oxen	12 percent incl.	25 percent	5 years
Implements	6 percent	0	5 years
Fertilizer	6 percent	0	1 year
Seeds, supplies	6 percent	0	1 year

In addition, the GRM will be requested to give OHV the right to purchase implements directly from suppliers—including from local blacksmiths—thereby encouraging the development of the incipient small scale agricultural implement industry in Haute Valley and enabling OHV to overcome some of SCAER's delivery shortcomings. Loans will continue to be made available to villagers or associations, making responsibility collective. Villages will not receive receive loans the following year until all outstanding installments have been paid as provided in loan agreement. This condition is currently being applied in Gao where the repayment rate has remained at 100 percent.

No change will be made in the processing of loans, because the present system works satisfactorily.

To help keep work oxen healthly, veterinary treatment will be given, includi vaccinations, shots for sleeping sickness and internal parasites, and spraying for ticks. The total cost will be no more than 1,000 MF ($2.17) per animal, to be charged to the farmer. In addition, veterinary supplies will be sold at all OHV outlets and 3 OHV agents working in OHV's animal division will be given training in diagnosing and treating anaimals.

4. Road Improvement

Road improvement is the sine-qua-non for development of the Haute Vallee. Without improved roads, farmers will continue to be disinclined to produce much more than they need for subsistence, and none of the other project components would be worth undertaking. Annex B-2 gives detailed information on existing and planned roads, design standards, selection criteria and maintenance.

The project will improve 398 km of existing roads and trails in the Haute Vallee so as to be passable year round and enable extra food production resulting from the project to be marketed. The roads and trails will, in addition, act to stimulate agriculture production itself and facilitate the provision of technical assistance and social services to rural farmers. 203 km will be improved to Class B all-weather standards, including laterite surfacing; the remainder will be graded, but made all-weather by installation of drainage structures.

The criteria used for road selection were:

(1) population served;
(2) market production;
(3) existing road structure;
(4) geographical considerations (stream avoidance and river flooding);
(5) location of animal traction/credit centers.

The link roads and access trails proposed for construction are listed in the table below.

	Length (kms)	Type	Cost - $[1/]
1. Area West of Niger			
Sandanba-Kenyero	30	AT	69,000
Kenyero-Nyenkema	12	AT	27,600
Keniegoue-Kafoulate	11	AT	25,300
Kofoulate-Kouremale	20	AT	46,000
Niger R. - Kangaba	2	LR	26,000
Kangaba-Kenyeba	27	LR	351,000
Keneyeba-Nougani	11	LR	143,000
Nyame-Digidala	4	AT	92,000
Gwansolo-Digidala	3	AT	6,900
Digidala-Samako	11	AT	69,000
Bankoumana-Somono	5	LR	273,000
Bankoumana-Sibi	21	LR	273,000
Kangaba-Banankoro	40	LR	520,000
Medina-Karan	25	AT	57,500
Karan-Narena	18	AT	41,000
		Sub-Total --	1,676,000
2. Peninsula Area			
Sanankoro-Selefougou	17	AT	39,100
Maninkoura-Figuiratomo	15	AT	34,500
Figuriratomo-Selefougou	22	LR	286,000
Selefougou-Selinkenyi	17	LR	221,000
Kotouba-Fanzan	15	AT	34,000
Fanzan-Selefougou	14	AT	32,200
		Sub-Total --	647,300
3. Area East of Niger and Sankarani			
Makono-Dankosa	3	LR	35,000
Dankosa-Kourouba	20	LR	260,000
Kourouba-Faraba	21	LR	273,000
Faraba-Sankama	14	LR	182,000
		Sub-Total --	750,000
		GRAND TOTAL	3,073,500
		or	$3,074,000

1/ Construction costs include labor and machine operation only. They do not include costs for equipment acquisition or spare parts.

In selecting which roads to improve, it was decided that all roads should provide easy access to both the animal traction/credit centers and the region's two major highways -- the Bamako-Guinea border road and the Bamako-Ivory Coast border road. No new roads or trails are proposed -- all trails and roads follow existing marketing patterns. In addition, topographical considerations were given their due weight.

The 398 km of proposed access trails and roads will directly serve an estimated 61,000 persons, or about 30 percent of the total rural population of the project area. An estimated 90 percent of the Hautee Vallee population will be affected by the proposed roads.

The link roads will be laterite topped for the entire length of road constructed. Clearing width will be 15 meters minimum and the necessary cuts and fills shall be made so that the maximum grade will normally be no greater than 15%. The road shall be surfaced with no less than 0.3 meters above the natural ground. The roadway shall have shoulders on each side and ditches to intercept sheet flow and divert to culverts installed for cross drainage. If agricultural marketing in the Haute Vallee area is doubled from the present 17,000 ton level (project 10 year goal), the expected life of this class of road would be less than 15 years.

"Access trails" in this project are no more than improved tracks. A dozer will be utilized to clear the trails to a minimum width of 10 meters and make the necessary cuts and fills to provide them with grades normally no steeper than 20 percent. The trails will also be graded to provide roadway surface drainage and side ditches to intercept sheet flow and divert to culverts installed for cross drainage.

The principle criteria for determining the sequence of road construction was the location and sequence of project activities. This suggested that the first roads and trails to be constructed should be those around Bancoumana, and then proceeding southward and, eventually, across into the peninsula and the east side of the river. Consideration was also given to those roads in poorest condition with significant traffic. The following construction sequence is therefore recommended:

	ROAD	TRACK
PY 2		
Kangaba-Banankoro	40	
Medina-Narena		43
	40	43
PY 3		
Sibi-Bancoumana-Sonono	26	
Nyame-Digidala-Gwonsolo-Samako		18
Nougani-Keneyeba + 13 km	24	
Sandamba-Nyekema		42
	50	60
PY 4		
Keneyeba-Niger R.-Figuiratomo-Senlinkenyi-(Selingue Dam)	55	
Kenieqoue-Kouremali		31
Sanakoro-Selefougou		17
	55	48
PY 5		
Faguiratomo-Maninkoura		15
Koutouba-Fanzan-Selefougou		29
Sankana-Makono	58	
	58	44

Overall responsibility for the road and trail construction and maintenance will be delegated to Travaux Puolics (TP) of the Ministry of Transport and Public Works. Travaux Publics has had years of experience in constructing and maintaining roads in Mali. Short-term engineering consultants will be provided. Travaux Publics will undertake the final engineering design, and set up a construction and maintenance brigade for this project. The brigade will work under the direction of OHV but be supervised by TP on a day-by-day basis. Travaux Publics has expressed its complete accord with this. This arrangement will relieve OHV of much of the management burden of this component of the project.

A list of the construction and maintenance equipment to be purchased under the project is given in Annex B-2. The

construction equipment will be assigned by the GRM to OHV which will contract with TP and make the equipment available to construct the roads and trails. The construction will be done by a brigade set up by the Division des Travaux Neuf de la Direction Nationale de l'Infrastructure des Transport with the assistance of a U.S. civil engineering advisor attached to TP and a construction manager. The Direction will also have responsibility for maintaining the project equipment since it has the machinery, personnel and experience to do so. This is the same arrangement which has been made in the Operation Mil Mopti project. Two OHV maintenance facilities will be set up in the Haute Vallee to house the construction and maintenance equipment and ensure its timely repair and maintenance.

Travaux Publics will be responsible for maintenance of the roads repaired under the project, with maintenance equipment assigned by the GRM directly to TP. Road construction equipment will also be turned over to TP following completion of the Haute Vallee roads, and it will also be used for road maintenance. A covenant requiring GRM agreement to assign maintenance responsibilities to TP and support maintenance costs through the national budget will be included in the Grant Agreement.

Villages are in the habit of clearing access trails after each rainy season, and their assistance in trail maintenance will continue to be engaged.

5. Health Program

The health infrastructure within the Operation Haute Vallee (OHV) zone includes two regional hospitals (Bamako), one cercle health center (Kangaba), and about 20 functioning dispensaries and pharmaceutical depots. These health units are staffed by Ministry of Health personnel. Other health personnel include several agents of the national communicable disease program. Drugs are supplied on an irregular basis (for two or three months out of a year) by the Pharmacie d'Approvisionment which is part of the Ministry of Health (MOH), with offices only in Bamako. These drugs are transported out to the Haute Vallee and disbursed for free. During the remainder of the year, medicine is supplied by the Pharmacie Populaire, a parastatal organization, which sells drugs. There are only five such pharmacies in the project area.

Thus, there is a nascent health infrastructure within the OHV zone, but it has little impact on the health of those living in the area, and it is estimated that 90 percent of these people have no access to modern health care.

A significant portion of project activities will be along the Niger River, where water-related diseases are endemic. Four diseases have a major impact on health status in the OHV zone: malaria, onchocerciasis, schistosomiasis and gastroenteritis. It is estimated that these water-related diseases account for a loss of 30-45 work days per person per year. In addition, the presence of measles, upper-respiratory infections, intestinal parasites, tuberculosis, trypanosomiasis, memingitis, malnutrition and venereal disease sap the strength of the labor force and result in very high infant and maternal mortality rates.

The Ministry's health plan for the OHV zone has the following objectives:

1. To assure an adequate and regular supply of medications for the diseases mentioned above;

2. To strengthen the diagnostic and treatment skills of the existing health personnel; and

3. To train existing health personnel to train and supervise village health workers for health promotion at the village level.

It is proposed that $500,000 be reserved for the health component of this project. An initial portion of these funds will be used to send a project design team to Mali to make an assessment of health conditions in the Haute Vallee area and submit recommendations for a limited health intervention. USAID already is carrying out a rural health project with the Ministry of Health (MOH), and it is proposed that the funds reserved under this project also be channelled through the MOH. Funds for actual implementation of the health component of the project will not be spent until the subproject recommended by the team of health experts is approved by AID/W.

Lack of sufficient wells is a common complaint among villagers everywhere in the Haute Vallee. Funding is a major constraint to increasing well production in the area. This should be fully examined by the health design team.

6. Functional Literacy

The literacy rate in Mali is only about 10 percent, and less than that in rural areas such as the Haute Vallee.

There is an on-going functional literacy program in the Haute Vallee conducted by the National Office of Functional Literacy and Applied Linguistics (DNAFLA), Ministry of Education, whose village level courses are training villagers in the basics of math and reading. The logic behind giving assistance to this program is that with basic literacy, the spread effect and utilization of new technologies and research results among farmers will be enhanced.

Illiteracy acts as a constraint to the project's purpose of increasing food crop productivity in two principle ways. First, illiteracy limits farmers' ability to communicate with OHV field agents. Without simple reading skills, farmers cannot take advantage of agricultural extention materials. Second, illiteracy means for any Haute Vallee farmers limited participation in non-village-centered activities. The increased marketing intended as a result

56

of this project will require some knowledge of weights and measures as well as counting. Likewise, participation in OHV credit services and research/demonstration activities tends to require some basic literacy skills. In short, no matter what amount of support is given to OHV, it will continue to face an uphill battle as long as so many farmers remain illiterate.

Functional literacy programs were introduced in Mali in 1968 with assistance from UNESCO, France and Germany. Organizational responsibility rests with DNAFLA. DNAFLA is comprised of two units: (a) a management unit which undertakes preliminary surveys, prepares programs, implements the literacy campaign and undertakes evaluations, and (b) an audio-vidual aid production unit which prepares and distributes posters, brochures and other educational material and develops radio broadcasts to supplement teaching efforts at the literacy centers. There are now 17 functional literacy centers (CAF's) located in the larger villages of the Haute Vallee, such as Bancoumana, Sibi, Kangaba, Banankoro, Ouelessebougou, Samako and Narena. The post literacy phase will soon begin in these villages, where classes become more advanced.

The (CAF), the basic unit of the program, is established in a village upon the request of villagers. The village is responsible for providing the classrooms and desks. The village council or specially appointed literacy committee chooses one or two literate volunteers (animateurs/animatrices) to conduct the classes. These animateurs are trained at the regional level by DNAFLA and then return to their village with the necessary instructional materials to begin actual classwork.

DNAFLA has a division especially for women, as a result of which some literacy classes are for women only, and focus on health and other matters in which the participants are interested. Most classes, however, are mixed. The literacy committee meets every 2 weeks to ensure regular attendances; in addition, the committee arbitrates in disputes between the instructors and students.

DNAFLA's long-term plans are to set-up 200 centers by 1982-83. DNAFLA's largest problem at the moment is lack of finances. For this reason, DNAFLA has made official connections with the "Operations." The most successful program unquestionably has been that of DNAFLA with OACV (Mali's peanut program). In 1976, a relationship was initiated with OHV. Under this arrangement, OHV is the coordinating agency. A person from DNAFLA's staff has been transferred to OHV to direct the functional literacy program in the Haute Vallee. The literacy classes in Haute Vallee have been highly successful (1976-77 Mali Functional Literacy Evaluation Report), and the PP team has determined that with the recommended inputs, it should continue to be a successful part of the OHV program.

A controlled experiment will be undertaken as the project is expanded. There are six essential elements which will be included in the expanded program:

1. Training for teachers.
2. Re-designed reading material dealing with agriculture, health, etc.
3. Essential commodities --- lanterns, blackborads, pens, pencils, etc.
4. Annual evaluations
5. Materials in Bambara-Malinke.
6. Linking the program strongly with OHV.

Under the recommended program, funds will be provided for commodities and technical assistance for DNAFLA to develop agriculture and health-related materials in Bambara -Malinke, and for training. The program will be expanded to include up to 100 new CAF's of the 200 DNAFLA plans, on a trail basis. The functional literacy program in these 100 villages will be evaluated in terms of its effectiveness in increasing the literacy skills of those in the program vis-a-vis a control group in the remaining villages where DNAFLA programs will not yet have been carried out. Before the program is expanded beyond the initial 100 villages, the evaluation will be examined to determine if the results obtained in the villages participating in the program would justify expenditure of additional funds. If the program is found successful, it should help contribute to efforts to increase farmer productivity in the area.

The average number of students per CAF will be 25, with the number of training years varying between 1 and 3 for a student to become alphabetized. The typical center will be graduating an average of 8.3 students the first year, 11 students the second and 12.5 students thereafter. On this basis, the table below shows the number of villagers to be alphabetized by the end of five years will be over 3000.

	1978	PY 1	PY 2	PY 3	PY 4	PY 5
(1) CAF's operating	17	20	35	60	80	100
(2) Students enrolled	423	500	875	1,500	2,000	2,500
TOTAL GRADUATES (PY 1-5)		238	371	624	880	972

7. Administrative Support for OHV

The success of the project is dependent to a great extent on (a) the effectiveness of OHV's technical staff and (b) its capacity to handle the anticipated increase in its supply and marketing activities, on which its financial viability hinges. Accordingly, the project will assist OHV through the following activities:

(a) Training and Technical Assistance;

(b) Construction of additional field office space, a new headquarters building, and warehouses;

(c) Additional trucks and staff vehicles;

(d) $15,000 in equipment for the OHV vehicle garage;

(e) A socio-economic base line survey of the Haute Vallee to provide a solid foundation for project planning and evaluation.

(a) Training/Technical Assistance

The principal deficiency in the OHV organization is management expertise. OHV Managers have been trained in agricultural science, but they have had no management training. The training program outlined below provides training for 23 employees in the U.S. and 12 in West Africa.

	NUMBER
2-year MA level training:	5
1 in management	
2 in agronomy	
1 in credit management	
1 in engineering	
1-year academic training:	6
1 in management	
2 Ag. Extension	
1 statistician	
2 in finance	
6-month training:	12
3 mechanics	
5 credit specialists	
1 water management engineer	
3 rice production	
3-month training	13
8 in crops/management	
1 in marketing management	
3 in animal traction	
1 in functional literacy	

A detailed training plan is given in Annex B6. The program will remain flexible to respond to changing needs.

The following technical assistance will be provided:

a. Long-Term

1 Administrative advisor (team leader) 48 PM

69

1 Financial Management advisor	30 PM
1 Agricultural Supply/Credit Management Advisor (under credit section)	
2 PCV mechanics (2 years each)	48 PM
b. Short-Term	
1 Agricultural economist	4 PM
Agricultural Statistics advisors, on call	24 PM
1 Personnel Admin. advisor	2 PM
1 Short-term consultants on call, including 6 month mechanic	21 PM

An analysis of each of OHV's divisions and a description of the duties of each of the above advisors can be found in Annexes A4 and B6.

(b) Office and Wareshouse Construction

The following table outlines building construction plans:

	Animal Traction Storerooms 1/	Additional Warehouse Space 2/	Office Space OLD	Office Space NEW	Number of Structures	Year Constr-uction
Bancoumana	40	125	10	80 3/	2	PY 1
Kangaba	40	125	25	-	1 or 2 4/	PY 3
Ouelessebougou	40	125	15 5/	25	1 or 2 4/	PY 3
Siby	40	-	20	-	1	PY 2
Narena	40	-	10	20	1	PY 3
Keniegoue	40	-	15	20	1	PY 4
Selefougou	40	25	-	20	1	PY 4
Kourouba	40	25	-	20	1	PY 4
Karan	-	125	15 5/	-	1	PY 3
TOTAL —	320	550		185		

TOTAL CONSTRUCTION - 1055 Square Meters.

1/ Financed under budget of the proposed animal traction training-research centers.
2/ Financed under implement supply/credit section.
3/ Includes dormitory space
4/ Determination depends on precise location of animal traction centers.
5/ Rented

At a cost of $200/sq. meter, the cost of 1055 sq. meters of space comes to $211,000 of which $31,000 represents additional office space. An additional $15,000 is allocated to refurnish two OHV guesthouses at Kangaba and Siby to make them suitable for extended visits. This will provide office space for visiting expatriate personnel.

OHV currently rents two buildings for headquarters staff which have a total floor spare of 229 sq. meters and cost $7,176/year. The buildings currently contain 30 OHV staff members. The condition of the buildings is not bad, but the problem is that there is hardly enough room for the existing staff, much less any U.S. technicians. OHV's projections for the next 5 years show an increase in moniteurs/encadreurs and staff of about 10% year. At that rate, it can be estimated that the present 30-man headquarters staff will expand to 70 persons by 1988. To adequately accommodate OHV's growing staff and expatriate advisors, 700 square meters of office space is needed. The courtyard in back of OHV's current office's is very small, and no more than 50 sq. meters could be added on. Because OHV does not own the buildings, expanding the existing structures is impossible, and construction of a new headquarters staff building is recommended. OHV already has land and a proposed design for the building.

It is estimated that a basic office building can be constructed for about $275/sq. meter.

	MF	$
Foundation	3,187,800	6,930
Superstructure	9,032,099	19,635
Exterior closure	11,600,049	25,217
Partitions	10,537,449	22,908
Plumbing	8,943,549	19,442
Electrical	7,969,499	17,325
Miscellaneous	37,279,930	81,043
	88,550,000	192,500

The most frequently heard complaint at OHV after lack of trucks is lack of warehouses for storing fertilizers, insecticides and implements. The 7 warehouses owned by OHV have a total space of only about 920 square meters. To help accomodate OHV's warehousing requirements, the Federation of Cooperatives and villages lend OHV warehouse space free of charge. None of this warehouse space is used for storing agricultural produce because it is not needed -- the produce is easily kept in sacks in fenced-in surroundings during the dry season until picked up by truck.

61 58

Available OHV Warehouse Spare (sq. m)

ZER	OHV owned	Loaned Free
Kangaba 1/	-	250
Karan	-	50
Bancoumana	230	125
Narena 1/	60	-
Kati	-	-
Ouelessebougou	120	-
Siby 1/	450	-
Keniegoue 1/	60	-
Dankassa	-	30
Figuera-tomo	-	25
Faraba	-	50
Djoliba	-	50
Sandama	-	50
	920	580

If OHV is to greatly expand its implement-fertilizer supply operations, the problem of warehouses must be addressed. OHV says that additional warehouse space is needed everywhere but gives priority to Karan, Kati (outside the project area), Ouelessebougou, and Kangaba - in that order. It is recommended that 125 square meters additional warehouse space be built in FY 3 and 4 in Karan, Ouelessebougou, Kangaba, and Bancoumana. These four buildings will be quite modest in size, but will be of great assistance to OHV, increasing its space at the ZER level by roughly 25 percent. Twenty -five square meters additional space is recommended for Selefongou and Kourouba. If this additional 550 square meters of warehouse space is not provided, the project purpose of significantly increasing OHV's implement-fertilizer supply program will face a severe constraint.

(c) Trucks and other Vehicles

OHV's single greatest complaint is lack of large vehicles for carrying agricultural supplies to the Haute Vallee (and returning with agricultural produce). At present, OHV has only 4 operating 5- ton trucks (1972 Peugeots) only 3 of which normally operate at any one time. This 15-ton capacity is grossly inadequate --- and expensive.

1. Warehouse space is insufficient and in these villages, OHV has tobacco drying houses, part of which are used to store fertilizers/implements.

During the December-March campaign, OHV must rent numerous trucks. Numerous scheduling, supply and security problems are encountered when OHV has to rely so heavily on renting trucks.

It is recommended that 5 ten-ton trucks be purchased for OHV. OHV has 12 mechanics and 2 electricians to maintain these vehicles. PCV mechanics and training will help increase the quality of the work of the OHV garage.

At present, very few of OHV's 86 agriculture extension workers have mobylettes. Mobylettes are without a doubt "appropriate technology" for Mali --- they are very easy to repair, and private repair men probably number about 100 in the Haute Vallee alone. These bikes last easily 5 years. It is strongly recommended that all extension workers have mobylettes. Accordingly, 122 mobylettes are included in the project. It is also recommended that 5 four-wheel drive vehicles be purchased for OHV sector heads.

(d) Garage Equipment

The training/technical support for the garage has already been mentioned. The equipment with which mechanics work must be improved, and $15,000 is allocated for this.

Existing Equipment	Equipment Most Needed
2 battery chargers	Assortment of tools
1 small electric air pump in bad repair	Electric welder
1 small electric welder	Vice
4 large size scales	Forge
assortment of tools	Anvil-block
assortment of spare parts	Pressurized grease pump
	Hydrolic lift
	Electric air pump
	Engine hoisting gear
	Assortment of wiring
	Electric power controller
	Electric grinder
	Tire disk

(e) Socio Economic Base Line Survey

To provide the basis for both project evaluation and maintaining, a socio-economic base line survey needs to be made and up-dated constantly during the life of the project. The INTERIM REPORT recommended that a socio-economic study of the project area be undertaken. This was carried out by IER. The IER report is hardly sufficient to serve as a foundation for a 10-year project of sizeable scope. Consequently, it is recommended that a thorough socioeconomic study be done of the

the Haute Vallée by I.E.R. with the assistance of top professionals in the field. Twelve man-months of statistical services are budgeted for this activity plus $50,000 for I.E.R. The U.S. technical advisors will only assist and advise, and the actual survey will be contracted with I.E.R. Having I.E.R. undertake this study rather than the OHV is advantageous in that it will serve the OHV project area while at the same time give Mali a much greater statistical gathering capacity which can be tapped by all Malian agricultural operations.

C. End of Project Status

Input - output tables for each project component are given in annex A-8.

At the end of the project's fifth year, if is expected that many farmers in the Haute Vallee area will have adopted improved technology and that agricultural production will have significantly increased. Further, OHV will be a much more effective agricultural institution in terms of serving as a catalyst for increased food crop productivity and will no longer need the extensive technical assistance and training provided in the project.

More specifically, 1,500 oxen teams will have been trained at the animal traction centers. The animal traction centers will be charging farmers the full cost of their services, and thus will be completely viable, with each school training about 100 teams a year.

The 160 families (2,000 persons) farming inside the Bamcoumana polder will be harvesting an annual average of 3 tons paddy/ha, or 1,920 tons paddy in all, and marketing over 1,800 tons of this.

A new credit system will be operating in a viable manner. At least 2,000 farm families who were mostly subsistence farmers at the start of the project (25,000 persons), in addition to the polder farmers, will have increased productivity and production by 50% and will be earning cash incomes, and marketing most of their increased produce.

398 km of roads and trails will have been rehabilitated and upgraded, and a maintenance operation will be functioning, thus ensuring transportation infrastructure in Haute Vallee for the first time.

The people along the Niger River will be much more aware of how to avoid river-related diseases, and will know how to detect and treat the disease. A Minimum of 2500 people will have been trained in functional literacy and will be profitting from the agriculture and health information learned in class. There will be at least 100 functional literacy centers in operation, of which 25 will have classes for women only, and most will be offering post-literacy course.

III. Project Analysis

A. Economic/Financial Analysis

The economic/financial was undertaken at three levels: a macro-economic analysis examining the project's impact upon and value to the country of Mali as a whole; a macro-financial analysis examining the project's impact on key institutions involved and assuring their financial viability; and a micro-financial analysis looking at the project's impact on the farm unit (target group).

The macro analysis had two goals: firstly the socioeconomic need for and desirability of activities aimed at increasing food crop production in the Haute Vallee; secondly, to identify major constraints to further development in the areas and to determine whether or not the project would adequately address these constraints.

The economic analysis defines the need for such a production program in terms of the "need to raise the income and quality of life of the rural poor in Haute Vallee" -- the project goal -- while subsequently reducing Mali's dependence on grain imports in years of poor harvests and strengthening its foreign exchange position through possible grain exports in better years, as manifested in the economic analysis' use of c.i.f. and f o.b. values for cereals. All countries surrounding Mali are net importers of cereals.

A detailed list of basic assumptions regarding yield expectations, benefits, and externally and locally financed costs was provided in the economic analysis. Given these simplifying assumptions, the analysis conservatively estimated a social internal rate of return of slightly over 8%.

The analysis points to three major factors which account for the relative modesty of the IRR: 1) Terminal year for the analysis was year 15, although benefits after that period exceeded costs by $900,000 discounted at 15%; 2) values of assets (with the exception of value of oxen which was easily quantifiable) were not added in as benefits in final year of analysis; 3) projected yield increases due to improvements on unrested land was from 750 kg to 850 kg/ha (100 kg/ha 13%) whereas similar projects by other donors in the area estimated an increase from 750 to 900 (150 or 20%).

Although circumstances did not permit sensitivity analyses of the major assumptions, a discussion of impacts of several variations on these assumptions was undertaken to identify those most critical to project success; and it was felt the assumptions upon which the economic analysis was based were conservative (See Annex B4). In addition, it was felt that unquantified and unquantifiable benefits would make the project more desirable than the calculations would have it appear. Time did not

1562

permit an alternate analysis using optimistic assumptions to see how its IRR would compare to the 8% obtained, but the 8% return was considered to be the minimum that the project will achieve. A complete list of the unquantified variables is provided in the analysis.

Because of the difficulty in quantifying both benefits and costs and the lack of studies on increased productivity due to anticipated inputs, calculations in the analysis do not include the health or functional literacy components. This does not mean they are not considered essential to the project. On the contrary, the considerable increase in demand for labor and timeliness of agricultural activities assume good health of labor and its ability to retain information provided by extension services.

Several concerns raised in previous project reviews were also considered:

1) Financial Viability at Farm Level: An original concern regarded use of fertilizer and its financial viability for sorghum, millets, etc. A financial analysis and cash flow analysis for the farmer are provided. Fertilizer is not to be financed by AID for this project, and it was not taken into consideration as an input in either cost or yield projections. The financial analysis demonstrated project viability at the farm level.

2) GRM Price Policy: The official pricing policy does not affect the calculation of the value of benefits in the economic analysi since world prices were employed. Official prices to affect both farm viability (1 above) and crop choices. The fear that the project in itself will lead to promoting non-food crops, etc., is not justified, but it must be pointed out that future GRM pricing policies will affect production decisions by farmers regarding all crops. Food grain prices will continue to be a top priority issue for discussion between the GRM and the donor community.

3) Assumption of Constant Relative Prices: As in most analyses of this sort, the project analyses assumed constant relative prices between agricultural products and inputs, industrial and oxen. If relative prices do not remain constant, the viability of the project, particularly at the farm level, could be adversely affected (if input prices rise relative to output prices); however, the reverse could also occur, especially if, as the project is successful in increasing production, the GRM feels less constrained to keep official grain prices artificially low.

The macro analysis identified several possible constraints to further development in the Haute Vallee which will be closely monitored during project implementation.

1) Due to increased demand for labor caused by improved agricultural methods, there could be a seasonal bottleneck of labor (for weeding, harvesting). On the other hand, a successful project will help stem out migration from the area.

2) Oxen supply in Haute Vallee may be a problem in later years, given increased demand caused by dramatic increases in animal traction. On the other hand, Haute Vallee is an area through which transhumance is practiced, and supply can be expected to respond to demand.

An examination of the credit fund and the OHV was undertaken to determine the basic financial viability of these two key institutions and thereby ensure their continued support for the project.

Given AID's input into the credit fund, the credit pool will continue to meet demands on the fund made by new farmers. A 10% interest rate (not counting 2% for health insurance) for animals and 6% on implements, may still not be enough to cover decapitalization and overhead in a country with almost 10 percent inflation. The project makes provision for technical assistance by credit specialists, who will design a revised program. The examination was made to determine the sufficiency of AID's allocation for credit. It was determined to be adequate.

Using the lowest assumption that only 50 percent of the increased production will be marketed and only 40 percent of that amount will be handled by OHV at 20 MF per kilo, a comparison of increased revenues and increased costs incurred by OHV was undertaken. The examination showed that OHV--even if it were to impose the suggested tax of $41 per hectare on the polder--will not be receiving sufficient revenues after termination of AID assistance to cover the increased operating costs of the project. The analysis emphasized that cost projections beyond year 5 were particularly speculative however, this does not necessarily imply that the projections are exceedingly high.

This issue bears further examination, even though modest assumptions were made in the analysis about OHV involvement in the market. OHV might be tempted to encourage farmers to produce non-food crops over which it has a near monopoly in marketing. As this project is economically beneficial to the country, revenue should be tappable, even though subsidies may be the means employed. Alternative ways of raising revenue must be examined as the project proceeds. A covenant will be included in the Grant Agreement calling for a joint study of alternative ways of increasing OHV revenue as the project proceeds, and recommendations will be adopted by project year three. This strategy has already been successfully applied in other AID-supported Operatio in Mali.

The micro-financial analysis is based upon projected farm budgets for those groups of farmers considered to be target groups of the project: farmers who cultivate 1.5 hectares on the Bancoumana rice polder in addition to an average of ten hectares of other farm land elsewhere, and, those farmers who do not have access to the Bancoumana polder. A comparison was made between the cash-flows to the farmer resulting from project inputs as opposed to traditional methods.

The cash-flow analysis was directed only toward changes in income related to inputs and outputs specifically within the projects sphere. Thus, while the non-polder farmer may appear in a "cash" sense to be worse off during the first five years of operation using project inputs, there may in fact, be income flows which will improve their position. Furthermore, it is important to note that extending the projected farm budget over eight-

teen years, and liquidating farmer assets, the initial investment in project inputs will yield an internal rate of return of almost 17%. Since farmers' assets increase significally during the early years of the project, they are in fact economially better off.

On the other hand, for those farmers who cultivate 1-5 hectares within the polder area, the project inputs will result in an immediate improvement of income. In fact, over eighteen years, their income will increase annual income by 80,675 MF ($183), or by 40%.

The financial analysis indicates the great increase in net worth accruing to the farmers, especially during the early years when the non-polder farmers would receive less cash income. This may serve as an incentive for them to purchase project inputs. Further, given the fact that the interest rate on the loans is exceeded by the inflation rate, farmer income is understates since it is presented assuming constant prices. Lastly, this analysis illustrates the central importance of increasing prices paid to farmers for food grains marketed through official channels. The FAO has just submitted a report to the GRM on its grain policies which will be used as a basis for concerted donor community discussions with the Government with a view toward increasing official market prices.

B. Technical Analysis

The technical analysis is broken down into the following categories: agronomic, credit, engineering, animal traction, health, functional literacy, irrigation, and roads.

1. Agronomic

a. The long-range and short-range potential of the proposed agriculture program in the Haute Vallee is as follows:

1) Short-range: The program will improve the technical capability of all farmers in the OHV Program. The availability of good land, coupled with a highly organized Operation with proper support, will hasten success.

2) Long-range: Traditional agricultural practices will be modified,and yields of 700 kgs. of rice and 500 kgs. or sorghum, millet and corn per hectare should be increased to 3 tons for rice and one ton for other grains.

b. Existing projects in similar areas have shown optimum rice yields of 5 tons per hectare are obtainable.

c. Technical packages proposed for extension have been in use by other projects for a number of years and have proven successful.

d. The research component of this project is designed to continue to refine technical packages and develop new ones. It will be essential to consider a long-term research program in the Second Phase of the project.

2. Agricultural Credit

Analysis will be undertaken to create an improved credit system that can be used as an example nationwide. The system of credit that will be proposed from current and future studies will present various options for rural credit. Meanwhile, the current credit system in Haute Vallee will be improved to respond in greater measure to farmers' requirements. The approach proposed to improving the credit system to make it both service the needs of the farmers for improving farm production and to eventually make the system a viable one reflects considered judgment on what should, and what can, be done.

3. Engineering

The primary purposes of the engineering analysis is to review preliminary plans for all construction and maintenance and to judge the capabilities of the local implementing agencies. All plans have been reviewed by Mission engineers and found to be satisfactory. AID/W engineers in collaboration with Mission and REDSO engineers have agreed to a mix of equipment that will adequately accomplish the objectives of this project.

4. Animal Traction

A crucial part of the project's effort to increase agricultural productivity will be the establishment of animal traction and research centers to train work oxen to plow and weed and to help farmers effectively use them. The purpose is to make animal traction more effective and economically viable. U.S. technical assistance will include an animal traction expert, crop specialist and PCV's. Research in Haute Vallee at the GRM's animal traction research station at Samanko (near Bancoumana) reveals that cereal crop productivity and production increase significantly with deep plowing and good weed control, even without chemical fertilizers—if the animals are used timely and fed properly.

5. Health

A major part of the project's activities will be carried out near the Niger River, where water-related diseases are hyper-endemic. It is important to point out that hard data on disease mortality and morbidity simply does not exist in the OHV zone. But even though the exact dimensions of health problems are unknown, site visits and discussion with health personnel at the national and local levels reveal a consensus that the following diseases have the major impact on health status in the OHV zone: malaria, onchocerciasis, schistosomiasis and gastroenteritis. It is estimated that these water-related diseases account for a loss of 30-45 work days per person per year. In addition, the presence of measles, upper-respiratory infections, intestinal parasites, tuberculosis, trypansomiasis, meningitis, malnutrition and veneral disease sap the strength of the labor force and result in very high infant and maternal mortality rates.

Our analysis is that it is absolutely necessary for a group of qualified health officials to study health conditions in Haute Vallee and recommend a course of action to improve the health of those living there. These recommendations will take into consideration USAID's existing programs in Mali and GRM capabilities and plans.

6. Functional Literacy

Refinement of the present functional literacy system in the Haute Vallee should be continued on an experimental basis to determine the effectiveness of the services in helping to increase farmer productivity and welfare. Based on the findings of an evaluation of an initial program, a decision will be made whether to continue to expand the DNAFLA program.

7. Irrigation

The rehabilitation of the 640 hectare irrigation rice polder at Bancoumana and the formation of a water-users association to take over some of the maintenance and operations is feasible from both a technical and sociological point of view.

A complete list of assumptions which provided these results was included in the financial analysis.

A review of Mali's five year plan indicates that even though highly ambitious targets are established for new irrigation development, the most consistently mentioned problem pertains to operation and maintenance For this reason, an anthropological/socioligical team with two years experience in Mali was asked to explore ways to ensure farmer cooperation in water control. Their recommendations have been incorporated into the technical analysis of this project.

8. Roads

The feasibility of a program to rehabilitate and upgrade 398 km. of existing roads and trails in the project area has been shown. The approach of creating a bridgage under the direction of Travaux Public has been chosen since TP has many years of experience in the construction and maintenance of roads in Mali.

C. Sociological Analysis

The total population in the Haute Vallee is estimated at about 211,000. Of the four ethnic groups which occupy the Haute Vallee, OHV works primarily among the Malinke-Bambara people. Within the valley, the Malinke dominate (60%), though the Bambara (2 6%) comprise a substantial populous. Both share a common culture, and since the vast majority of people in the Haute Vallee speak or understand the same Bambara dialect, communication is not a problem. Of the other ethnic groups, OHV works least among the Somonos (13%) because they are fishermen and live in their own villages on the Niger River. And, while the Malinke-Bambara people tend to have retained their traditional religion, the Samono are Moslems. The Peulh, a Fulani people, (1%) tend livestock and live together among the Malinke and Bambara villagers.

The inhabitants of the Haute Vallee are also differentiated by three classes: noble families; craftsmen and groits; and descendants of slaves. While many of the political and social prerogatives for the noble families have been lost today, they still have privaleged powers in relationship to land tenure and dealing with other segments of the population. For example, lands in irrigation projects are typically assigned to families on the basis of their genealogical affiliation. The more populous lowercaste, nonetheless benefit in the form of increased employment opportunities.

The farmers of the Haute Vallee are primarily horticulturalists, utilizing hand tools and, when they can afford it, animal traction. There is more use of oxen and plow for cultivation in the softer soils of the river valley than in the hills. Tractors are now seen frequently along the river.

While the extended family is responsible for the basic farming of their land they sometimes call on "tons" during peak labor requirement periods in the fields Tons are age-group organizations, arranged by sex. The tons cut across family and caste lines. Activities of the ton include: brush fire control; maintenance of public places; policing of markets; repair of public buildings; guarding mango trees, and; construction of village schools. They also provide basic aid to families lacking sufficient manpower. Ton labor is not as easy as it once was. Farmers are part of a village structure which is very well organized and which can exert great pressure on individuals to cooperate. Its pressure on individuals for group cooperation can be difficult for a farmer or "ton" to resist.

Local government rests on a sacrosanct relationship between the land of a community and the lineage which first settled it. The village chief, who invariably belongs to the founding family, controls the land, at least in theory, and it is parceled out in collective usufruct among the various extended families whose head in turn controls his portion. Land users have solid rights to the use of the land, but cannot sell it. Once the land is assigned, however, the heads of the extended families can reassign it to their descendants.

Theoretically all men can claim land if it is not in use, but the father usually makes the claim for the land, and this follows hierarchical lines. For the payment of a token sum or poportion of the produce, strangers are able to use land that is not assigned.

The society and culture of the people of the Haute Vallee area are changing. The impact of Bamako and western culture appears to be a cause of this change. While the OHV organization is seeking to improve conditions, the traditional culture still forms the matrix within which it must operate if is to be successful. It is therefore obligatory that in the course of introducing innovations that the village and family potential for development not be stiffled or discarded. Indeed, they provide an existing structure through which OHV can operate. It is especially important for the OHV to be continuously aware of the impact of its innovations on the core of community life and its institutions. So this is why an anthropologist is needed for the project during several short-term periods of the project.

a. Bancoumana Polder

The Plan Parcellaire (plan for division of land) was drawn up in 1971 by Genie Rural. It gives a map of the numbered plots occupied by the 160 families whose names and quarters of residence in Bancoumana and number of hectares per plot are recorded. The plan is still in effect. The fields were originally assigned by the village council to these farm families on the basis of their family connections and their ability to farm the plot. A contract book (cahier de charge) was signed by the head of the farm family in which he agreed to certain conditions including 50 kg/paddy/ha in order to retain the right to use the land. They know that they should not be removed without just cause, so the basic land tenure concepts are present in this project area. Other lands, such as those used for millet, sorghum, peanuts and vegetables, are also farmed by these families.

High yields in the polder will require good water management; this will be impossible without farmer cooperation. There already exists an organization to assist in that cooperation -- the "Commission de Vulgarisation" which regulated water in the polder, and collected fees to assist in maintenance when the polder was working. The village also has a village council composed of 13 elected heads of extended families in Bancoumana. Therefore, the polder farmers are represented on the village council. Its pressure on individuals for group cooperation can be difficult for a farmer or "ton" to resist. The Commission de Vulgarization has years of experience organizing farmers and will be used to assist in the formation and operation of the water user associations.

Since all classes and ethnic groups of the area are represented in, and will benefit by, the polder on a basis not unlike that of the Haute Vallee in general, the benefits from the project will not benefit one class over another or upset the existing social structure.

b. Credit

OHV already has an existing credit system which operates well, but is inadequate. Farmers everywhere expressed interest in the credit system. Modifying the system will clearly encourage more farmers to take out loans, and this will enhance the spread of technology tremendously. The great majority of farmers will be effectively eligible for loans. Hence, the benefit incidence will be wide-spread and will particularly benefit those families which presently do not have the capacity to repay a loan in only two years.

c. Animal Traction

Animal traction has been employed for many years by the farmers in the Haute Vallee, and about one-quarter of the families have them. The feasibility of training/research centers has been demonstrated in other African countries, especially in areas such as Haute Vallee where there are no cultural barriers against making work animals out of oxen.

d. Functional Literacy and Health

The functional literacy program, run by DNAFLA, has been operating in the Haute Vallee for several years and is very popular. So it has already proven feasible. Farmers are very aware of malaria and onchoceriasis and they accept medicine for malaria, for example, quite rapidly. Introducing avoidance techniques regarding shistosomiasis and onchoceriasis should not be very difficult since farmers are well aware that there are diseases related to the river which have debilitating effects on them.

D. Administrative Analysis

The project has 7 components of which OHV is primarily responsible for 4, and one each for Travaux Publics (roads), DNAFLA (functional literacy), and the Ministry of Health (health). The project also uses I.E.R. as the institution responsible for implementing the base line data survey.

A complete description of the organization and operation of OHV is included in Annex B6. Financially, OHV is in relatively good shape; losses in years of poor crop yields tend to be off-set by profits in years of good yields. Moreover, the financial future looks very promising. Technically, OHV is well-staffed with university-level graduates in agriculture. What is lacking in every department is management expertise, which will be adequately addressed through the training and technical assistance program previously described. OHV has almost 110 agents (4 Section Heads, 17 ZER Heads, and about 89 S.B. Agents), and these numbers are increasing every year. So lack of sufficient base level agents presents no problem. The A.I.D. -supported Agricultural Officers Training project will greatly assit OHV in obtaining talented staff. Finally, OHV is directed by a very energetic and dedicated staff. In short, the administrative capacity to handle the project exists and is being adequately assured with assistance to the organization itself.

Travaux Publics and DNAFLA have demonstrated more than adequate capacity to handle the tasks outlined for each in other projects, so their administrative capacity is not in question.

IV. Implementation and Evaluation Plans

A. Implementation Plan

Project Year	Months	
1	1-6	Commodities ordered; Contract proposals issued;
	7-12	Construction headquarters/Bancoumana Arrival Team Leader Functional Literacy program boosted; Animal Traction program gets under way.
2	1-6	Road construction begins; Polder leveling begins (100 ha.) and water user associations formed; Animal Traction Centers at Sihy and Bancoumana fully operational; I.E.R. conducts base line survey; Credit program modified; First group of PCV's arrive;
	7-12	Crop agronomist arrives and sets up food crop research program; Financial advisor arrives; Polder planted; Results of base line survey published.
3	1-6	Health program started; Construction of additional warehouses and OHV field offices begins; Polder harvested and remainder polder rehabilitated; Detailed study done of existing credit system; Beginning of one-year technical assistance given to OHV statistics department; Animal Traction Centers started at Kangaba and Narena;
	7-12	Entire polder planted; Village on-farm demonstration-extension program with village plots started; Implementation of new credit system begins.

Project Year	Months	
4	1-6	New group of PCV's arrive; Animal Traction Centers established at Ouelessebougou, Selefougou and Keniegoue; Dry season rice instructions at polder;
	7-12	Study conducted of 6 remaining polders; Construction of warehouse/field offices ends; Village level demonstration plots/ extension program extends activities; Polder planted.
	1-6	Animal Traction Center established at Kourouba; Polders harvested and dry season instructions given there; Majority of long-term technicians leave;
	7-12	Road construction terminated and maintenance brigade fully operational; Village-level demonstration plots extended to east side of Niger River; Team leader completes assignment; Functional literacy centers number 200.

Each long-term advisor will have a Malian counterpart, as follows:

Technician	Malian Counterpart
AID Project Director	Director of OHV
Admin. Spec/Team Leader	Assistant Director of OHV
Financial Advisor	Financial Division Head
Credit Advisor	Ag. Supply Division Head
Crop/Research Specialist	Head of "Vulgarization" (Ext'n)
Animal Traction Advisor	Head of "Action Betail"
Rice Specialist	Head of Bancoumana Sector
Functional Literacy Advisor	OHV-DNAFLA Agent

Because funds will be used for a wide variety of project activities, different disbursement procedures will be used depending upon the nature of the activity. A shared financing system is proposed for this project. The intention of the shared financing approach is to provide a clear understanding at the beginning of the project on the long-term allocation of costs between the GRM and A.I.D. and to provide a method of establishing the amount of project costs to be shared each year through annual revision of the work and financial plans. Cost allocation for the project will follow a "to be agreed to" cost-sharing formula based on rational partition of different

kinds of expenses. Based on the formula the percentage of operating costs of the annual work plan to be assumed by the GRM will increase on a graduated scale.

B. Evaluation Plan

At the end of each 3 month period during the life of the project, a progress report will be prepared by the Contract Team Leader. It will include a section on each component of the project and flag problems and indicate the actions being taken to resolve them. The format of the first report will be approved by the Project Manager.

Annual evaluations will be undertaken at the end of the second, third, fourth and fifth project years. Joint team meetings will be held to review each project evaluation report.

Two major socio-economic surveys will be undertaken as a part of the project evaluation process. First is the original base line survey discussed above which will be undertaken as early in the project as possible. One follow-up survey will be completed at the end of the project's fourth year. These surveys will be used to measure changes in the target groups which can be attributed to the project's implementation. Among the things, they will include are: measurable changes in farm family income; changes in farm practice and the adoption of project related technology; changes in attitude; the use of credit; the emergence of the new employment and income producing activities; etc.

OPERATION HAUTE VALLEE

TABLE 1

SUMMARY FOR FIVE YEAR FUNDING ($'000)

	Animal Traction - Research		Administrative Support/OMV		Irrigation/ Bancoumana		Agricultural Credit		Functional Literacy and Health		Link Roads/ Access Trails		TOTALS		
	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	GRAND
Technical Assistance	668	-0-	1,251	-0-	380	-0-	367	-0-	-0-	-0-	434	-0-	3100	0	3100
Commodities	352	35	530	-0-	307	-0-	58	-0-	106	5	1455	-0-	2808	40	2848
Training	171	-0-	165	-0-	199	-0-	118	5	37	9	-0-	-0-	690	14	704
Construction	64	-0-	224	175	566	40	100	-0-	-0-	2,000	3,088	-0-	4,042	2215	6,257
Credit Capital/Research Fund	125	10	-0-	-0-	-0-	-0-	1,310	-0-	-0-	-0-	-0-	-0-	1435	10	1445
Studies/Evaluations	-0-	-0-	175	-0-	75	-0-	43	-0-	-0-	-0-	50	-0-	343	0	343
Maintenance/Salaries/Prices	332	599	357	989	124	328	325	325	-0-	211	-0-	236	1138	2688	3826
Contingencies (15%)	256	127	406	175	248	51	348	80	21	334	754	35	2033	802	2835
Compounded Inflation @ 8%	277	158	349	246	244	83	557	131	8	453	871	77	2306	1148	3454
TOTALS	2245	929	3457	1585	2143	502	3226	541	672*	3012	6652	348	18395	6917	25312

*includes $500,000 for health component, not broken down into cost categories.

UNCLASSIFIED

Department of State

INCOMING TELEGRAM

PAGE 01 BAMAKO 03927 150941Z 3253 BAMAKO 03927 150941Z

ACTION AID-31

INFO OCT-01 EB-10 /042 W

----------006344 150954Z /14

P R 141746Z AUG 78
FM AMEMBASSY BAMAKO
TO SECSTATE WASHDC PRIORITY 8368
INFO AMEMBASSY ABIDJAN
AMEMBASSY NAIROBI

UNCLAS BAMAKO 3927

AIDAC

ABIDJAN FOR REDSO

E.O. 11652: N/A
SUBJ: OPERATION HAUTE VALLEE (688-0210) - EQUIPMENT MIX

REF: (A) STATE 197887, (B) NAIROBI 11636, (C) ABIDJAN 7361, (D) BAMAKO 3566, (E) STATE 172549, (F) TELECON BENBOW/LEVIN 8/10/78

1. MISSION HAS NOT REPEAT NOT RECEIVED COPY OF PROPOSED REVISION TO EQUIPMENT MIX MENTIONED REF A. NO CHEMONICS EMPLOYEE CLAIMS KNOWLEDGE.

2. IN RESPONSE TO PARAS 1 & 2 REF A: THE AVAILABILITY OF ADEQUATE FILL MATERIAL AND EVEN SURFACE MATERIAL (SELECT LATERITE OR SAND-CLAY MIX) WAS DETERMINED THROUGH AREA RECONNAISSANCE BY USAID ENGINEER AND DISCUSSION WITH ENGINEER AT DEPARTMENT OF PUBLIC WORKS. THE DESIGN IS TO BE PART OF THE PROJECT, THEREFORE QUANTITIES OF CUT AND FILL AND EXACT LOCATION OF BORROW AREA CANNOT BE DETERMINED. FOR BUDGETARY PURPOSES ENGINEER WEISS USED 0.3 METERS AVERAGE CUT OR FILL AS A BASIS FOR CALCULATIONS ASSUMING BULLDOZER WOULD DO ALL THIS WORK. USAID ENGINEER THOMPSON CONCURRED IN THIS. THE ONLY CHANGES THOMPSON MADE IN WEISS' WORK WERE:

A. AUGMENTING EQUIPMENT LIST AFTER REVIEWING IT WITH PUBLIC WORKS TO ALLOW FOR EFFICIENT CONSTRUCTION BY FORCE ACCOUNT (ASSUME REFS B, C AND D ADEQUATELY JUSTIFY THIS AUGMENTATION); AND

B. THOMPSON USED UNIT COSTS OF EARTHWORK STRUCTURES RECENTLY PAID FOR WORK DONE WITH EQUIPMENT SIMILAR TO PV LIST AND TYPICAL CROSS-SECTIONS TO CALCULATE COST PER KILOMETER OF $19,000 FOR LINK ROAD. A RECENT STUDY BY LOUIS BERGER INC. SET MINIMUM COSTS PER KM AT OVER $28,000. WEISS'S DETAILED UNIT COST ANALYSIS WHICH WAS THEORETICALLY SOUND YIELDED ONLY $6,253/KM PLUS CAPITAL COST OF EQUIPMENT; RECENT ACTUAL EXPERIENCE, HOWEVER, SHOWS THAT WEISS OVERESTIMATED EFFICIENCY. THEREFORE THOMPSON USED AN EFFICIENCY FACTOR OF 50 PCT RAISING WEISS'S FIGURE TO APPROXIMATELY $13,000 PER KM EXCLUDING CAPITAL INVESTMENT; ADDING CAPITAL COST OF EQUIPMENT AND CONTINGENCY FACTOR BRINGS THIS FIGURE TO JUST OVER $28,000 PER KTBM

3. IN RESPONSE TO PARA 3; PRESUMPTION IS CORRECT, ALL POLDER WORK WILL BE CONTRACTED FOR.

4. IN RESPONSE TO PARA 4: WHEELED SCRAPERS COULD BE USED IN FUTURE PHASE II FOR POLDER DEVELOPMENT IF DEEMED APPROPRIATE AT THAT TIME OR AS PER PARA 6 REF D, THEY COULD BE SOLD BY ONV.

5. COPY OF MEMO BY RIESE WILL BE FORWARDED FOR YOUR FILES.

6. IN LIGHT OF INFORMATION ABOVE AND IN RESPONSE REF F, USAID ENGINEER THOMPSON HAS ADVISED MISSION DIRECTOR THAT ADEQUATE PLANNING NECESSARY TO CARRY OUT ASSISTANCE FOR CONSTRUCTION COMPONENTS OF THE ONV, AND A REASONABLY FIRM ESTIMATE OF THE COST TO THE U.S. GOVERNMENT OF PROVIDING SUCH ASSISTANCE HAVE BEEN COMPLETED. MISSION DIRECTOR, WHO HAS REVIEWED THIS ANALYSIS AND OTHER INFORMATION AT THE TIME OF PP PREPARATION, THEREFORE ISSUED 611 (A) CERTIFICATION.

9/18

NOTED: RHN

UNCLASSIFIED

ACTION COPY.

UNCLASSIFIED

Department of State

INCOMING TELEGRAM

INFO 2 / 2 - 8

PAGE 01 BAMAKO 03531 251226Z 3880

ACTION AID-31

INFO OCT-01 AF-10 EB-08 /050 W

----------047011 251248Z /53

R 251046Z JUL 78
FM AMEMBASSY BAMAKO
TO SECSTATE WASHDC 0166

UNCLAS BAMAKO 3531

AIDAC

FOR AFR/DR; PASS TO SFWAP ASSELIN AND BENBOW

E.O. 11652: N/A
SUBJ: OPERATION HAUTE VALLEE (688-0210) PP 611 (E)
CERTIFICATION ON CAPACITY OF THE GOVERNMENT OF MAL
TO MAINTAIN AND UTILIZE THE PROJECT

REF: STATE 184679

TEXT OF CERTIFICATION, DATED JULY 24, 1978, IS AS FOLLOWS:

"THE OPERATION HAUTE VALLEE PROJECT IS TO BE UNDERTAKEN IN THE HAUTE VALLEE AREA OF MALI AND ADMINISTERED BY THE GOVERNMENT AGENCY, OPERATION HAUTE VALLEE (OHV). THE PURPOSE OF THE PROJECT IS TO INCREASE PRODUCTIVITY, PRODUCTION AND MARKETING OF FOOD CROPS. 398 KILOMETERS OF EXISTING ROADS AND TRAILS ARE TO BE REBUILT, UPGRADED AND MAINTAINED WITH EQUIPMENT PROVIDED IN THE PROJECT DURING A 4-YEAR PERIOD ENDING MID-1983. ALSO, A 640-HECTARE POLDER WILL BE REHABILITATED, AND NEW OFFICE AND WAREHOUSE SPACE FOR OHV WILL BE CONSTRUCTED. THE MAINTENANCE OF THE POLDER WILL BE ASSURED BY RAISING PADDY YIELDS THEREIN BY OVER 300 PCT, ESTABLISHING WATER USERS ASSOCIATION, AND, AS A SPECIAL COVENANT IN THE PROJECT, INSTITUTING A LEVY ON POLDER FARMERS. THE COSTS OF MAINTAINING THE ADDITIONAL OFFICE AND WAREHOUSE SPACE WILL BE AN INSIGNIFICANT PART OF OHV'S OVERALL BUDGET AND WILL BE ALMOST ENIRELY OFFSET BY THE RESULTING REDUCTION IN RENT PAID BY OHV FOR ITS EXISTING HEADQUARTERS.

TRAVAUX PUBLICS OF THE MINISTRY OF TRANSPORT AND PUBLIC WORKS IS THE GOVERNMENT AGENCY RESPONSIBLE FOR ROAD CONSTRUCTION AND MAINTENANCE. UNDER CONTRACT WITH OHV, IT WILL CONSTRUCT AND MAINTAIN THE ROADS, AND FORM THE BRIGADES. TRAVAUX PUBLICS HAS DEMONSTRATED IN OTHER PROJECTS IN MALI THAT IT HAD THE ABILITY TO CONSTRUCT AND MAINTAIN A ROAD PROJECT OF THIS MAGNITUDE. BETTER ROADS WILL INCREASE MARKETING OF ALL CROPS; THIS WILL INCREASE REVENUES TO OHV AND, THUS, ITS ABILITY TO FINANCE THEIR MAINTENANCE STARTING IN 1983.

IT APPEARS THAT ADEQUATE FINANCIAL AND HUMAN RESOURCES WILL EXIST IN THE PROJECT TO MAINTAIN AND IMPLEMENT ALL THESE PLANNED CATIVITIES. THE MAINTENANCE AND UTILIZATION BY THE PEOPLE OF MALI IN PREVIOUS PROJECTS FINANCED AND ASSISTED BY AID HAS BEEN SATISFACTORY.

THEREFORE I, RONALD D. LEVIN, DIRECTOR/USAID, BAMAKO, DO CERTIFY THAT IN MY JUDGEMENT, BASED UPON EXPERIENCE WITH DONOR ASSISTANCE PROGRAMS IN MALI AND THE LEVEL OF TECHNICAL AND TRAINING ASSISTANCE BEING INTRODUCED IN THIS PROJECT, MALI WILL HAVE THE FINANCIAL AND HUMAN RESOURCES CAPABILITY TO EFFECTIVELY MAINTAIN AND UTILIZE THE INPUTS PROVIDED IN THE OPERATION HAUTE VALLEE PROJECT."
BYRNE

ACTION TO: AFR/DR
DATE DUE:
SFWAP DR | AA | DCA
CRM/MO (COPIES # 2) EXT. 22000
AM: JUL 26 1978 PM
7 8 9 10 11 12 1 2 3 4 5 6

UNCLASSIFIED

Department of State

INCOMING TELEGRAM

3

PAGE 01 BAMAKO 03256 101721Z 3978
ACTION AID-31

INFO OCT-01 AF-10 /042 W
---------- -----071

ADVANCE COPY

P 101534Z JUL 78
FM AMEMBASSY BAMAKO
TO SECSTATE WASHDC PRIORITY 0007

UNCLAS BAMAKO 3256

AIDAC

FOR AFR/DR/SFWAP, PASS TO ASSELIN

E.O. 11652: N/A
SUBJ: LETTER OF REQUEST BY GRM FOR HAUTE VALLEE
PROJECT '688-0210)

REF: STATE 169758

1. FOLLOWING IS TEXT OF LETTER DATED JULY 8, 1978
TO MISSION FROM MINISTRY OF RURAL DEVELOPMENT REQUESTING
OPERATION HAUTE VALLEE PROJECT.

2. MONSIEUR LE DIRECTEUR,
J'AI L'HONNEUR DE VOUS DEMANDER DE BIEN VOULOIR
SOLLICITER AUPRES DES AUTORITES COMPETENTES DE
L'U.S.A.I.D., UNE INTERVENTION EN FAVEUR DE L'OPE-
RATION HAUTE-VALLEE DANS LE CADRE DE LA PROMOTION DE
DE L'AGRICULTURE ET DE L'AMELIORATION DES CONDITIONS
DE VIE DES HABITANTS DES ZONES COUVERTES
PAR CETTE OPERATION DE DEVELOPPEMENT RURAL.

3. COMPTE-TENU DES ANNEES DE SECHERESSE
SUCCESSIVES DE CES DERNIERS TEMPS QUI ONT
EU POUR COROLLAIRE LE DEFICIT CEREALIER EN
VU LES POTENTIALITES QU'OFFRESLA HAUTE-VALLEE
DU NIGER, JE SUIS D'ADVANCE CONVAINCU QUE VOUS
NE MENAGEREZ AUCUN EFFORT POUR UN EXAMEN FAVO-
RABLE DE LA PRESENTE REQUETE.

4. VEUILLEZ AGREER, MONSIEUR LE DIRECTEUR,
L'ASSURANCE DE MA PARFAITE CONSIDERATION.
P/LE MINISTRE DU DEVELOPPEMENT RURAL P.O.
LE DIRECTEUR DE CABINET
M. SISSOKO
BYRNE

79

81x

Agriculture 4

ANNEX A-2

TELEGRAM

ACTION: USAID
INFO

UNCLASSIFIED
Classification

CONTROL: 365
RECD: 7/15/77 1003

AMB
DCM
CHRON

R 150020Z JUL 77
FM SECSTATE WASHDC
TO RUTABO/AMEMBASSY BAMAKO 9774
INFO RUTALJ/AMEMBASSY ABIDJAN 7609
BT
UNCLAS STATE 164948

ACTION TAKEN: cable response
DATE: 18 July
INITIALS:

AIDAC

file

E.O. 11652: N/A

TAGS:

SUBJECT: MALI OPERATION HAUTE VALLEE (OHV)

1. ON JUNE 22, 1977 THE PROJECT COMMITTEE REVIEWED THE OHV INTERIM REPORT. THE REPORT WAS VIEWED AS A VERY HELPFUL RESPONSE TO QUESTIONS RAISED BY ECPR. BASED ON COMMITTEE RECOMMENDATION, AA/AFR HAS AUTHORIZED CDO TO PROCEED WITH PP. MEETING SUMMARY WILL BE POUCHED.

2. IN VIEW OF COMPLEX ISSUES REFERRED TO IN INTERIM REPORT, PROJECT COMMITTEE RECOGNIZED THAT PP DESIGN EFFORT WILL BE A DEMANDING ONE. FOR THIS REASON, CDO IS ENCOURAGED TO MAKE PRELIMINARY ARRANGEMENTS WITH INSTITUT D'ECONOMIE RURALE TO BEGIN COLLECTING ECONOMIC AND AGRONOMIC DATA ON REPRESENTATIVE FARMS IN AREA AS RECOMMENDED ON PAGE 13 OF INTERIM REPORT. WE UNDERSTAND FINANCING FOR THESE STUDIES IS AVAILABLE LOCALLY. VANCE
BT

UNCLASSIFIED
Classification

OPTIONAL FORM 151(H)
(Formerly FS-412(H))
January 1975
Dept. of State

88

H-3

6C(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?

GENERAL CRITERIA FOR PROJECT:

1. App. Unnumbered; FAA Sec. 653(b).

   (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 plus 10%)?

   Within OYB

   Page 402 of FY 1978 C.P.

2. FAA Sec. 617(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?

   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?

   No further legislative action or approval is necessary

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 Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

   Yes

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?

   Yes See Annex A.1

6. FAA Sec. 209, 619. Is project susceptible of execution as part of regional or multilateral 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 multilateral organizations or plans to the maximum extent appropriate?

6. This project was considered by the IBRD and it decided to not sponsor it because it was not capital assistance oriented to the degree desired. It is not a project being considered as part of a regional effort but it is in concert with general objectives of the Sahel drought regional objectives.

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.

7. The project will encourage and foster the organization of farmer self-help associations and improve the technology of agriculture in Mali.

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).

8. Most of the off shore purchases will be from the U.S. and all of the expatriate contracted for technical assistance

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.

The GRM will contribute the local currency equivalent of $6,917,000 in goods and 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?

N/A

8. 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?

1. This project is directed to the rural poor. It will only take place in the rural underdeveloped area of Haute Vallee. It is designed to involve the target group in self help and participation in decisions activi-

81

(5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries. — NA

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)? — N/A

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? — N/A

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. This grant is designed to raise the incomes of the poorest economic strata and improve the quality of life of the rural farm families. Progress and development as the team is commonly used is not meaningful here. Rural society in Mali is poor by any standard. The whole key to development is to bring the traditional subsistence farmer to some degree of commercial farmer That is, he has something to sell or barter so he can enter into the economic life of the country. Women will benefit from this project and be involved in income producing opportunities.

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. Appropriate measures are being taken to assure coordination of talents, agencies special interests and resources. To the fullest extent possible the target group of rural people will be involved in the decision process.

31

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.] N/A

(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.

B1

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?

Yes. It does this by providing production credit, roads, storage facilities etc. The PP provides more detail on this subject.

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.

There is no foreseeable adverse affect to U.S. economic interests. Assistance will be furnished so as to minimize U. balance of payments problems.

2. 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

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.

NA

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?

NA

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?

NA

e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources? NA

f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan? NA

3. Project Criteria Solely for Security Supporting Assistance

FAA Sec. 531. How will this assistance support promote economic or political stability? NA

4. Additional Criteria for Alliance for Progress

[Note: Alliance for Progress projects should add the following two items to a project checklist.] NA

a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America? NA

b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities? NA

5. Additional Criteria for Sahel Development Project; How will this assistance contribute to the long-term development of the Sahel region in accordance with a long-term, multi-donor development plan?

Food self-sufficiency is one of the basic goals of the S.D.P. This project which is in full accord with CILSS plans for the development of the Sahel region, will significantly expand food supply in a food deficit area with a growing population.

//

6C(3) - STANDARD ITEM CHECKLIST

Listed below are statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by exclusion (as where certain uses of funds are permitted, but other uses not).

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed?	Yes. Standard procedures will be followed
2. FAA Sec. 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him?	YES
3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the U.S. on commodities financed?	YES
4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?	NA
5. FAA Sec. 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items?	YES, if available
6. MMA Sec. 901(b). (a) Compliance with requirement that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.	Compliance will be required
7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the facilities of other Federal agencies will be utilized,	Grant financed technical assistance will be furnished primarily by private sources contracts

A7

are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

8. International Air Transport. Fair Competitive Practices Act, 1974

If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available? — YES

B. Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest? — YES

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? — YES

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million? — YES

C. Other Restrictions

1. FAA Sec. 201(d). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter? — NA

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights? — NA

3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-bloc countries, contrary to the best interests of the U.S.? — YES, This will be a part of project/AG and GRM so notified

4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the U.S. or guaranty of such transaction? — YES

13

5. Will arrangements preclude use of financing: YES

a. FAA Sec. 114. to pay for performance of abortions or to motivate or coerce persons to practice abortions?

b. FAA Sec. 620(g). to compensate owners for expropriated nationalized property?

c. FAA Sec. 660. to finance police training or other law enforcement assistance, except for narcotics programs?

d. FAA Sec. 662. for CIA activities?

e. App. Sec. 103. to pay pensions, etc. for military personnel?

f. App. Sec. 106. to pay U.N. assessments?

g. App. Sec. 107. to carry out provisions of FAA Sections 209(d) and 251(h)? (transfer to multilateral organization for landing).

h. App. Sec. 501. to be used for publicity or propaganda purposes within U.S. not authorized by Congress?

Annex A-4

Brief Description of Project and Brief TA-Job Descriptions

Description of Project.

The Government of Mali is committed to a strategy of increasing agricultural production through several regional "Operations". Operation Haute Vallée (OHV) is the office responsible for the region of the upper Niger River basin, an area of approximately 13,800 sq kilometers with a population of about 211,000 people.

The 10-year goal of the project is to improve the incomes and quality of life of about 160 poor rural families (2,000 people) farming paddy rice in this region and an additional 10,000 rural poor families (25,000 people) throughout the region. The project purpose is to increase the ability of farmers in the project area to increase food crop productivity, production and marketing.

The project implementation is for five years. There will be about 7 long-term technical advisors on contract for periods of between two to four years. The project is agriculturally oriented and includes support for 4 new activities (irrigated rice production, animal traction schools, on-farm research, and road/trail construction), and 3 on-going activities (agricultural credit, health and functional literacy classes).

The principle TA advisory services needed are outlined in the attached brief position descriptions.

TEAM LEADER

Education: University degree, preferably MA/MB in Management

Experience: At least 10 years of experience as a senior level administrative officer of a major institution or business, with responsibility for supervising a sizeable staff. Experience with directing groups of Americans in LDC's preferred.

Qualifications: Highly motivated. Ability to develop easily good rapport with others, especially Americans, as well as officials from LDC's. Good working knowledge of principles of administration. Organized working habits and demonstrated ability to manage a multi-faceted project. Minimum French language ability essential.

Responsibilities: Approximately 25% of time will be spent assisting the Director of OHV in streamlining operating procedures of OHV as well as preparing participant training schedules. Remainder of time will be spent in capacity of team leader. Supervise and coordinate work of all TA's and approve monthly reports to OHV and AID. Develop specific work plans for project. Act as liaison between USAID and OHV, and represent team in all consultations with the GRM. Responsible for suggesting to USAID needed directional changes, if any, during course of project. Responsible for quarterly and annual project evaluations.

Finance Administration Advisor (Accounting)

Education: MA in Financial Management/Accounting, or University Degree with at least 10 years of experience as a senior financial officer of a sizeable organization.

Experience: At least 7 years of experience as a senior financial officer in an agri-business, large farmers' co-operative, or similar organization of considerable size. Sufficient cost accounting, audit and financial planning experience to improve or design a system for an organization of 200 employees. Experience in credit field desirable.

Qualifications: Minimum French language proficiency of FS 2 plus level. Excellent working knowledge of the principles of finance administration, cost accounting, auditing, etc. Must have teaching abilities to instruct others in the same.

Responsibilities: Working with the head of the financial/accounting section, to advise on all financial matters relating to OHV. To determine what activities are too costly to continue and recommend changes or new activities which will generate more income for OHV and make it more economically viable. To study the finance administration system of OHV and to make recommendations for improving and simplifying existing accounting operations. To recommend training equipment and/or methods which will provide more meaningful finance information for management decisions. To supervise the preparation of financial reports of OHV.

Agricultural Credit Advisor

Education: MA or BA in Finance, Accounting or Administration, or University Education coupled with minimum 4 years experience as a senior credit advisor to a LDC credit institution.

Experience: At least 4 years of experience as a senior credit advisor to a LDC agricultural credit institution. Experience preferred where system needed a major re-organization, including training program for field officers, funds accounting, credit loan forms, inputs, auditing, etc.

Qualifications: Ability to re-design and put into operation a new credit and farm implement supply system, and train OHV counterpart to administer system. Ability to set-up training program for OHV staff in carrying-out credit operations. Minimum French language ability at FS 2 plus level is essential.

Responsibilities: Working with head of OHV's agricultural supply division, provide direction in designing and implementing a revised agricultural/supply credit system. Train OHV counterpart to continue program at the end of AID project life. Set up program for training OHV staff to carry-out revised credit/agricultural supply operations. Study problems regarding transport and storage of agricultural supplies, and make recommendations thereon. Responsible for collaborating in an in-depth study of OHV's credit system and credit situation in the Haute Vallée (including credit trends and resources, farmers' income resources, size of credit demand, working capital requirements, etc.) and in preparing a report containing recommendations for modification or overhaul of existing system, if needed. Responsible for seeing that direction is provided in planning, reorganizing and implementing the new or modified agricultural credit system. Consults and advises with officials of AID, GRM and other interested parties on the overall soundness of the existing credit system and any new one that may be proposed.

Agronomist (Crops/Research)

Education: MS or BS in agronomy with strong emphasis on cereal crops and/or research.

Experience: 3 or more years experience working in LDC's in agriculture demonstration/research program and/or with small farmers. African experience much preferred. Experience in design and set-up of farm demonstration and/or field trials. Experience in multi-cropping highly desired.

Qualifications: French language ability at minimum FS 2 plus level essential. Ability to design and supervise on-farm research trials, including training of extension agents and supervision of Peace Corps Volunteers in conducting trials. Ability to conduct general training program of extension agents in all aspects of cereal and legume farming.

Responsibilities: Design and supervise crop research/extension program using animal traction, and supervise extension agents and Peace Corps Volunteers in conducting trials and demonstrations. Train OHV counterpart to continue research/demonstration activities at end of AID project life and supervise effectively OHV extension agents. Conduct training program for OHV extension agents in cereal and legume farming, and train OHV counterpart to do same. Assist in preparation of education and training materials related to the research/demonstration program. Co-ordinate entire activities with TA animal traction specialists.

Animal Traction Specialist

Education: BS in general agriculture or minimum 2 years experience in animal traction program in Africa.

Experience: Experience in animal traction program in Africa.

Qualifications: Ability to set-up an animal traction center. French language ability at minimum FS 2 plus level is essential. Ability to train farmers and OHV extension agents in the use of oxen and cultivation equipment for dryland and irrigated farming. Ability and willingness to live outside the capital city of Mali, and to supervise Peace Corps Volunteers. Good physical condition and ability to work long hours in field demonstrations and teaching.

Responsibilities: With head of "Action Betail", set up various animal traction centers to train both OHV extension agents (as trainers) and farmers (as users) in animal traction. Assist in the design and development of oxen-drawn scraping equipment for leveling land in flood zone areas, as well as the selection of equipment to be used in training centers. Supervise Peace Corps Volunteers assisting in program. Train OHV counterparts to continue animal traction program at the end of AID project life. With OHV counterparts, set up training program in animal traction specifically for farmers in Bancoumana polder. Assist TA agronomist in animal traction aspects of research program, including designing field trials for testing animal traction input to productivity.

Irrigated Rice Production Advisor

Education: MS or BA in Agronomy with special training or experience in paddy rice production.

Experience: 5 or more years in extension/production programs for irrigated rice. Should have experience of working with small farmers in LDC's. Experience in Africa preferred to that in Asia or elsewhere. Experience with work animals preferred.

Qualifications: French language ability at minimum FS 2 level is essential. Full knowledge of rice cultivation, including seed bed preparation, pest control, rice diseases, fertility requirements, etc. Ability and willingness to live in a rural village. Ability to conduct training programs for OHV extension agents and farmers. Excellent physical condition.

Responsibilities: With OHV counterpart-agronomist, plan and implement 5-year project of rehabilitating a 640 hectare polder and planting irrigated rice varieties therein. Prepare plan for entire area, determine best cultural practices, set standards and schedules for fertilizers, water, weeding, pest control, etc. Set up training program in dry season to teach agronomists/extension agents and farmers techniques in irrigated paddy rice production. Assist in training farmer organizations to manage irrigation system maintenance and operation. Supervise work of short-term TA Water Management Advisor. Co-ordinate activities with TA Animal Traction Advisors. Train OHV counterpart so that he can take over supervision of project.

AGRICULTURAL STATISTICS ADVISOR (SHORT-TERM)

Education: Minimum M.A. level degree in statistics or in economics with statistics concentration.

Experience: Experience in planning and implementing a data gathering system, followed by an evaluation/report thereof. More than one such experience highly desired. Experience in agricultural statistics preferred.

Qualifications. Minimum French language proficiency of FS 2 plus level essential. Excellent whorking knowledge of the principles of data collection, correelation and analysis. Must have ability to instruct others in same.

Responsibilities: Working with OHV's 2-man statistics division, to advise on all matters relating to OHV's economic-social data collecting work. Help set-up an improved data collection program that will be useful for the project's annual evaluations, including drafting the outline of a 3 to 5 year data collection program to be continued after the departure of the advisor. Instruct OHV counterparts as well as OHV extension agents in techniques of interviews. Instruct OHV counterparts in drafting preliminary questionnaires, programming a data-collection campaign, analysis of data, as well as in the various ways to present statistical information in more interesting and convincing manners. Responsible for coordinating data collection program with representatives of IER and in ensuring OHV makes best possible use of the data produced by IER's base line survey of the Haute Vallee.
Responsable in addition, for advising IER a how to go about planning, conducting, and comparting base line survey, including the up of a frame to collect data which can thereafter be duplicated with ease for other agricultural "Operations" in Mali. The major goal is to develop a technical capacity in IER which with meet the need of both AID and its counterpart Malian agricultural organizations in collecting source-economic data necessary to determine either existing conditions or progress towards project goals.

Dike/Road Engineering Advisor
(Short-term)

Education: BS in Civil or Construction Engineering.

Experience: Minimum 5-10 years experience in earthwork construction engineering, at least 3 years of which in a field supervisory position. Experience as construction supervisor or superintendent for a contractor on earthworks project preferred. Overseas experience preferred.

Qualifications: Good working knowledge of all facets of road and dike engineering and construction, including, but not limited to: surveying, material selection, drainage and control structures, materials testing, construction scheduling, construction cost accounting, time and motion analyses, etc.

- Ability to transfer above working knowledge to others.
- Willingness to live and work in isolated locations and under austere conditions.
- FSI S-2+, R-2+ in French minimum or full-time interpreter/translator included in contract, or above average MLAT score and 20 weeks intensive French traning prior to commencement of work.

Responsibilities: Act as a consultant to the Director of OHV to promote efficient and quality construction and maintenance of roads and dikes at the polder. Prime responsibility is to transfer his knowledge of efficient methodologies for engineering design and construction of rural roads and dikes for polder development to the Malien supervisor of each job. Not responsible for construction himself and, therefore, must rely on his ability to (1) present different techniques in an understandable and attractive way, (2) note weaknesses in existing procedures and make recommendations for eliminating them which can be readily implemented, and (3) develop rapport with Malian counterparts. Prepare monthly progress reports to the Director of OHV identifying accomplishments, constraints and recommendations.

Water Management Advisor (Short-Term)

Education:	MS or BS in agronomy.
Experience:	3 or more years experience as a water control technician involving irrigated agricultural production. Experience in rice culture preferred. Experience in working with small farmers preferred.
Qualifications:	Ability to supervise farmer organizations and OHV technicians to manage irrigation system. Minimal ability to communicate in French is required.
Responsibilities:	Working with OHV counterpart and TA rice production specialists, supervise farmer organizations in managing irrigation system. Train OHV counterpart to continue such supervision at the end of AID project life. Train OHV extension agents in water management.

Rural Anthropologist/Sociologist
(Short-term)

Education: MA or PhD in Anthropology or Rural Sociology.

Experience: Minimum 1 year living experience in a rural area of Africa, preferably Mali or West Africa.

Qualifications: French language ability at minimum FS 2 plus level is essential. Ability and willingness to live in rural area of Mali for 2 months a year. Ability to analyze farmer and village motivations and reactions to project, and make recommendations for more effective ways for OHV to communicate with farmers and incite farmer/village interest in project.

Responsibilities: Live in a village in the Haute Vallée for at least 2 months so as to become fully acquainted with the socio-economic scene, particularly the Bambara and Malingue societies. Prepare report about the project in terms of its effectiveness in communicating with farmers, and make recommendations for improving such communication and/or changing direction of project if needed. Assist in preparation of a questionnaire to be used by OHV extension agents in determining impact of project on farmer lives. Act as trouble-shooter regarding Bancoumana polder water-users associations.

Administrative Assistant

Education: University Degree, preferably MA/MB in Management

Experience: 3 or more years' experience working in LDCs in personnel and commodity management. Experience in accounting desired.

Qualifications: French language ability at minimum FS-2 essential. Ability to manage local office staff personnel and American technicians members of multifaceted projects. Good basic working knowledge of principles of personnel/commodity management plus well-organized working habits.

Responsibilities: Approximately 80% of time will be spent managing the office of the contractor and assisting the team leader in all phases of office administration. When necessary will act for the team leader in matters of administration including personnel and commodities.

Project Manager - USAID-DH

Education:	University degree, preferably at MA level and in field economics or agriculture.
Experience:	Proven success in directing a project of significant scope and importance, with responsibility for co-ordinating professional technical staff. Experience in negotiation and other counterpart relations with a host Government agency in one or more LDC's. Experience in agricultural projects.
Qualifications:	Good speaking, writing and analytical ability. Excellent health. Ability to speak French.
Responsibilities:	To manage USAID's participation in an agricultural development project involving irrigated rice, field trials, animal traction and credit. Specific responsibilities include being Chairman of the USAID Project Team, member of the joint project team, preparing project progress reports and monitoring and co-ordinating AID inputs to the project. Providing senior policy review and evaluation of project progress.

Equipment Superintendent (24 MONTHS)

Education: High School Level

Experience: 10-15 years experience in heavy equipment maintenance and repair. Experience in managing such maintenance shops highly desirable. Work experience in West Africa preferred.

Qualifications: Ability to set up a heavy equipment repair shop and manage a heavy equipment spare parts section. (Spare parts specialist can be used on short-term basis to initially organize spare parts shop). Ability and willingness to live outside the capital city of Mali and to work with Mali mechanics. Good physical condition and ability to work long hours when repaired.

Responsibilities: Set up heavy equipment maintenance and warehouse shop--including small parts section. Teaches, assists, advises and oversees the repair and maintenance work required to keep the project equipment in operational condition. Shall be responsible to institute inventory controls, programming of standard quantities for repair and maintenance operations, in addition to establishing repair priorities of "dead lined" equipment, together with preparing and and instructing drivers of normal operator maintenance responsibilities.

Construction Superintendent (30 months)

Education	:	Higher Technical School Certificate or Civil Engineering Degree
Experience	:	10-15 years experience in road construction industry, with minimum of five years of equivalent to construction superintendent experience. Work experience in West Africa or other LDC's preferred.
Qualification	:	Ability to organize, plan and supervise road construction project on day to day basis, assuring economic and efficient utilization of resources; namely materials, equipment and manpower in the best interests of constructing project roadways in accordance with pertinent construction plans and specifications controlling the works. Ability and willingness to live outside the capital city of Mali and to work with Malian technicians and construction forces. Good physical condition, with ability to work long hours when required.
Responsibility	:	Shall organize, plan and supervise road construction program, assuring timely execution of works in accordance with realistic schedules of operations. Prime responsibility is to see that construction materials, equipment and manpower utilized are efficiently engaged during the construction program. He shall additionally be responsible to effectively train a Malian counterpart to assume the aforementioned duties prior to the expiration of his service agreement and completion of the works.

AID 1020-25 (1-72)

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY _____ to FY _____
Total U.S. Funding _____
Date Prepared: _____

Project Title & Number: OPERATION HAUTE VALLEE

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: Goal: Improve incomes and the quality of life of the rural poor in the Haute Vallee area.	**Measures of Goal Achievement:** 1. Measurable increase in family income of the target group of farmers involved. 2. Measurable increase in numbers of functional literacy courses and health services operating in villages.	Special data collection as part of project evaluation starting with base-line study and 4 statistically objective-evaluation reports on the target area project activities and their impact.	**Assumptions for achieving goal targets:** 1. GRM will continue to give priority support to rural and agricultural development. 2. Price received by target farmers for food crops will be sufficiently high as to generate more cash from employing improved technology.
Project Purpose: Increase food crop productivity, production and marketing in the Haute Vallee.	**Conditions that will indicate purpose has been achieved: End of project status.** One eighth of the Haute Vallee farm families will have been introduced to improved technology, have increased food crop productivity, production and marketing, and better support systems for agriculture-functional literacy, health and transport services and facilities are in place.	1-9 Verification of these EOP's by on-site inspections and GRM/OHV reports plus the four special statistically objective evaluation reports.	**Assumptions for achieving purpose:** An effective and viable credit system is in operation. OHV staff trained and expanded significantly. Official producer prices of food crops are raised significantly, or official commercialization remains near existin levels. Farmers make use of support systems in agriculture, health, literacy and road
Outputs: 1. A fully irrigated polder rehabilitated and in profitable operation. 2. An expanded functional literacy program in place operating with typical materials germane to project goals. 3. Key staff and extension agents of OHV trained. 4. An on-farm/village demonstration-extension program begun/expanded. 5. Basic health services focusing on cause-prevention as well as treatment of river-related diseases being provided	**Magnitude of Outputs:** 1. Irrigated polder rehabilitated and rice production therein increased over 300% to average 3 tons paddy ha. 2. 8,000 people trained in functional literacy. 3. Key staff and a majority of field agents of OHV trained. 4. Data compiled from 120 on-farm/village demonstration plots. 5. Basic health services treating and attacking causes of river-related diseases being provided in most villages. 6. 398 km of roads and trails upgraded to all-weather condition. 7. A re-designed credit system in operation with a revolving credit fund and expanded farm offices operation, and agricultural production raised by 50% for 2,000 farm families (25,000 people).		**Assumptions for achieving outputs:**
Inputs: 1. Technical Assistance 2. Commodities 3. Training 4. Construction 5. Credit Capital/Research Fund 6. Studies/Evaluation 7. Maintenance/Salaries/Primes 8. Contingencies (15 percent) (See Financial Details, Exhibit E)			**Assumptions for achieving inputs:** Personnel with basic skills is available for training and to fill field positions. Number of young people leaving the project area is reduced somewhat.

OUTPUTS CONTINUED ....

in village along rivers.

6. Feeder roads/trails rehabilitated and improved.
7. Credit system re-designed and operating andadditional credit offices in operation, and farmers increasing agricultural production therefrom.
8. Animal traction schools installed and in operation.
9. Some local blacksmiths trained by OHV and providing services to farmers, making multicultivators/carts for OHV.
10. First demographic/economic baseline survey in area completed by IER and project statistical evaluation plan written therefrom.
11. OHV headquarters constructed and additional warehouses and field offices constructed.
12. OHV auto garage staff trained and equipped and providing professional-level repair work on OHV vehicles.

MAGNITUDE OF OUTPUTS CONTINUED....

8. 8 animal traction schools in operation and 1,500 farmers/oxen teams trained.
9. 90 local forgerons trained.
10. Statistical base and agricultural production inventory and forecasting system completed (probability area frame sample) and project evaluation plan written and published.
11. OHV headquarters constructed, four warehouses constructed, and OHV field office space expanded in 6 villages.
12. More than a dozen OHV mechanics trained and value of equipment more than doubled.

ASSUMPTIONS (INPUTS)

1. Qualified American technicians can be recruited and will be willing to work in Mali.
2. Contractor is capable of transferring technology to local counterparts
3. Vehicles, equipment and commodity can be procured and arrived on time.
4. Qualified Malians for training will be forthcoming.
5. Proper final designs are completed on time prior to construction.
6. The new design credit system will benefit the farmers of OHV.
7. GRM will continue to study and evaluate the progress of the project.

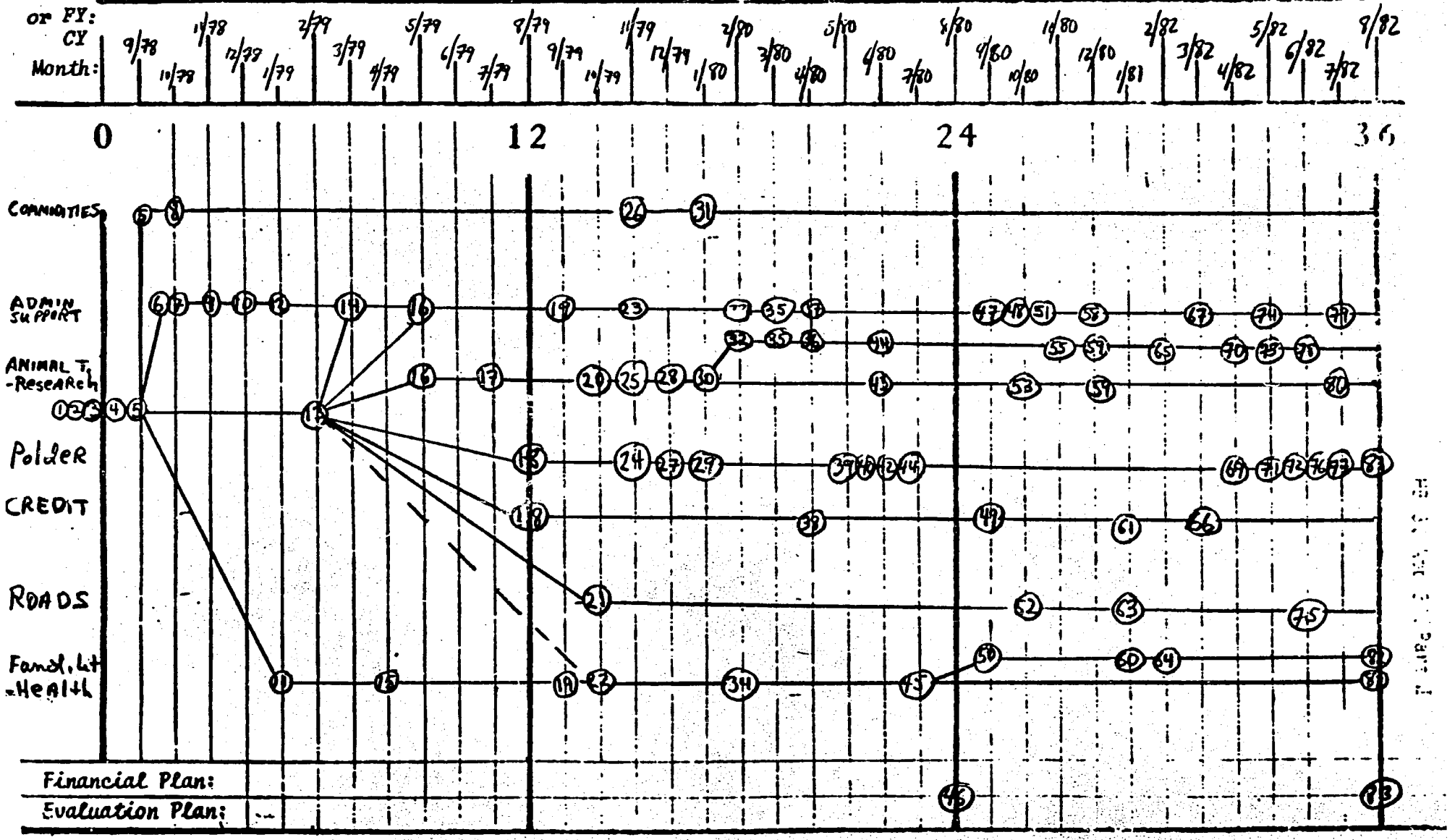
ASSURANCE

1. The GRM and people of Haute Vallee want the project and are willing to work to make it a success.
2. Milians are willing to learn from the technical assistance program in all projects.
3. Shelter facilities will be made available for the people and workers of OHV.

32

PPT FORM
(May be Expanded as Appropriate)

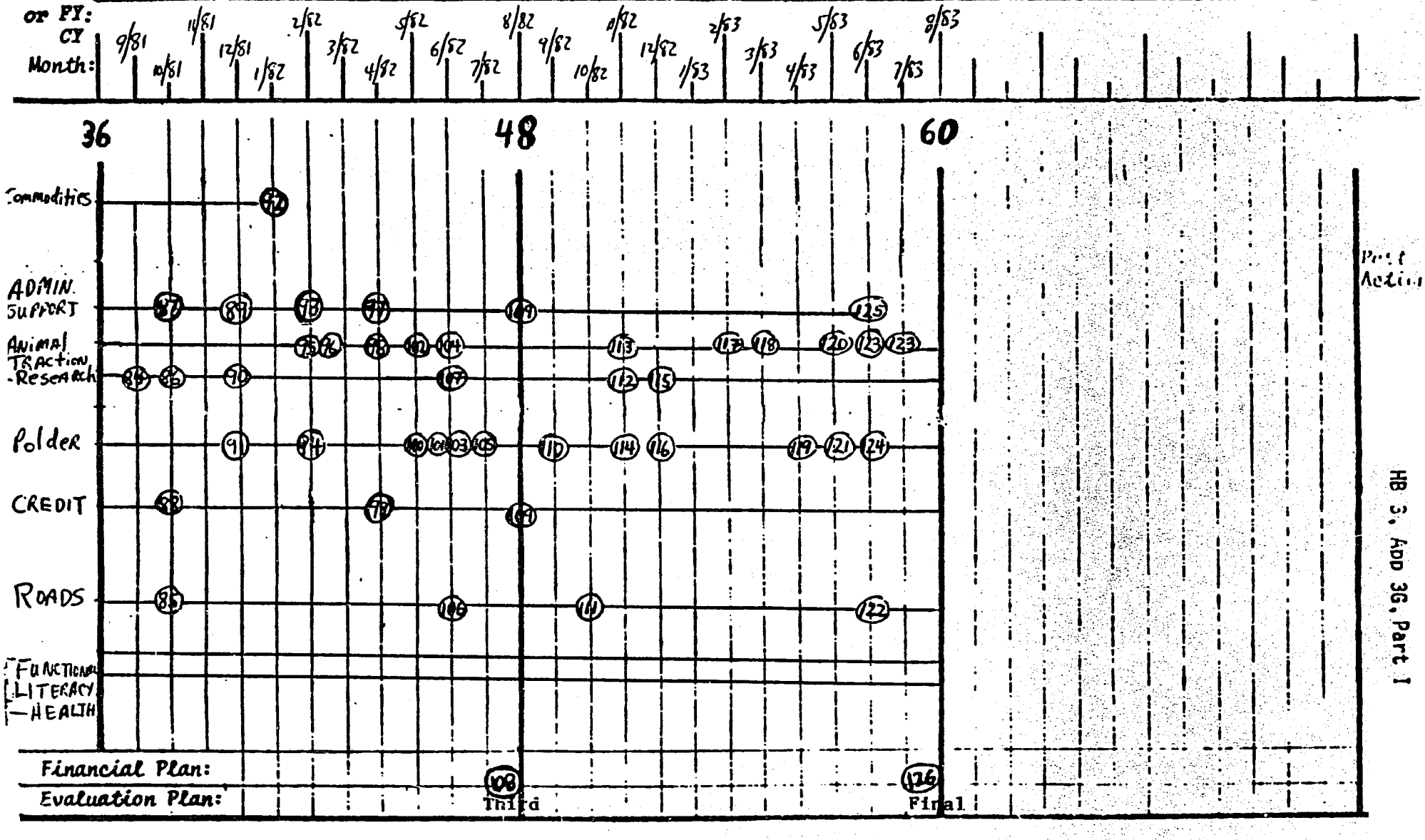
Country:	Project No:	Project Title:	Date:	/ x / Original / / Revision #	PPT expt
Mali	688-0210	Operation Haute Vallee	6/6/78		



PROJECT PERFORMANCE NETWORK

PP FORM
(May be Expanded as Appropriate)

Country:	Project No:	Project Title:	Date:	/ X / Original / / Revision #	PPT approved
Mali	688-0210	Operation Haute Vallee	6/6/78		



PROJECT PERFORMANCE NETWORK

PERT CHART INDEX

		Date
1.	Approval of PP	July 1978
2.	Make schedule/preparations for initial training in U.S.	July
3.	Prepare RFP and PIO/C's	August
4.	Request GRM to prepare construction drawings for OHV headquarters and additional structures at Bancoumana	August
5.	ProAg signed and RFP and PIO/C's issued	September
6.	AID ProAg/Manager - report to Mali	September
7.	Initial group from OHV sent to U.S. for training	September
8.	Order commodities to be obtained locally for FY 79	October
9.	Arrange with IER for Base Line Survey, and initiate search for U.S. statistics technician for advisory work with IER	November
10.	Request bids for OHV headquarters and additional structures at Bancoumana	December
11.	Functional Literacy advisor — to Mali	January 1979
12.	Award contract for construction of OHV headquarters and Bancoumana field office	January
13.	Negotiate and sign TA services contract	February
14.	U.S. short-term statistical advisor — to Mali, and base line survey with IER commenced	March
15.	Functional Literacy technician and DNAFLA counterpart to Niamey for 3 month training	April
16.	Contract team leader and animal traction advisor — to Mali	May
17.	Animal Traction advisor, OHV counterpart, and OHV blacksmith trainer begin 3 month training Senegal	July
18.	TA/Team members — Irrigated Rice Specialist and credit specialist — to Mali, and Genie Rural requested to make preparations for rehabilitation of polder	August
19.	Second group of OHV technicians sent abroad for training including statistics specialist, plus 2 Ministry of Health technicians	September

..... 20

Pert Chart Index continued ...

		Date
20.	4 PCV's Animal Traction technicians — to Mali	October
21.	Travaux Publics starts road construction	October
22.	Functional Literacy technician returns from training and begins drafting/publishing new training materials	October
23.	OHV headquarters and Bancoumana field office contruction completed	November
24.	Prepare detail work plan for modification of rice production at Bancoumana and credit system	November
25.	Two Animal Traction Centers set up at Bancoumana and Sibi	November
26.	Monitor all pipe line commodities on order — assign to project components those received — prepare all residual commodity orders (i.e. health component)	November
27.	Supervisors in place - rice polder extension agents in training - animation and promotion of water users associations started, with assistance of local sociologist	December
28.	First annual animal vaccination program	December
29.	Genie Rural to start construction Bancoumana Polder rehabilitation, including first deep plowing for wild rice eradccation	January 1980
30.	Begin training of field agents in Animal Traction Centers	January
31.	Agricultural equipment/supplies ordered by OHV for 81/82 campaign	January
32.	TA/Team members — Crop Agronomist and Financial expert and civil engineer (5 mo.) — to Mali	February
33.	Base Line Survey finished and short-term statistical expert ends assignment	February

..... 34

Pert Chart Index continued ...

		Date
34.	The functional literacy post and pre-literacy materials in Bambara manuscript for printing	February
35.	4 PCV's -- 2 mechanics and 2 research technicians -- to Mali	March
36.	Prepare detail work plan for crop research at animal traction centers	April
37.	Base line survey published	April
38.	Modified credit system propagandized with beginning of new campaign	April
39.	Lay out individual paddies, level 100 hectares, complete all drain clearing, repair control gates, maintenance causeways, etc, and second deep plowing for wild rice elimination	May
40.	TA/Team member (short-term) -- water management specialist -- to Mali	May
41.	Prepare initial report/proposals for strengthening financial administration of OHV	May
42.	Farmers associations organized at Bancoumana, farmers trained in new cultural practices, farmer leaders identified, local sociologist at site in observatio and farmers prepare fields for planting in polder	ay
43.	OHV forgeron sent to 3rd-country for more training	une
44.	Research trials set-up at and outside animal traction centers, and entire polder planted	une
45.	Ministry of Health and statistical specialists return from training	uly
46.	End of Project Year 2 - all components prepare complete comprehensive reports for 1st full project evaluation and review	ugust

..... 47

	Date
47. Prepare construction drawings and request bids for additional OHV warehouses/office extensions	September
48. OHV short-term training abroad commenced	September
49. 5 month study commenced of credit system in project area	September
50. Health program with Ministry of Health begun, including in-country training program	September
51. Two auto garage mechanics sent to Abidjan-Dakar for four month practical training	October
52. Road construction starts again	October
53. Two new animal traction centers started in Narena and Kangaba	October
54. Polder harvested	November
55. Results of research attached to animal traction centers known and distributed	November
56. Construction of additional OHV warehouses offices	November
57. Second annual animal vaccination program begun	December
58. TA/Team member — one-year statistical expert — to Mali to work with OHV stat. dept.	December
59. Water pumps installed at polder and animal traction centers, and dry-season in-country training of OHV agents begun in cereal crops	December
60. In-country training of health agents completed	January 1981
61. Study of credit system completed and results/recommendations presented to OHV and AID	January
62. Remainder of polder rehabilitation starts, including first deep plowing for wild rice eradication	January
63. Civil engineer returns for second 5-month assignment to advise on polder and road construction	January
64. Functional literacy advisor health monitor submits 6 month progress report of health program to OHV/AID	February

		Date
65.	Detailed work plans drafted for extension/demonstration program at on-farm/village level	February
66.	Credit system proposal studied and some initial changes made for the 1981/82 campaign	March
67.	Expanded statistical gathering program commences	March
68.	Additional mobylettes purchased locally, and additional equipment for the auto garage ordered	April
69.	Dry-season instructions in rice cultivation of OHV agents at polder ends	April
70.	Plots selected for village/on-farm demonstrations	April
71.	Entire polder rehabilitation completed, and second plowing for wild rice eradication begun	May
72.	Ta/Team member -- Water Management Specialist -- to Mali (short-term)	May
73.	Supplies delivered to selected village/on-farm demonstration plots	ay
74.	Warehouses and field office extensions completed	ay
75.	Road construction programs stops for duration of rainy season and civil engineer completes assignment	une
76.	Entire polder planted in irrigated rice varieties, and credit extended for inputs	une
77.	Local short-term sociologist studies operation of polder water users associations	une
78.	On-farm/village demonstration plots planted	une
79.	Ag. Economist -- TA specialist (4 mo.) -- to Mali	July
80.	Two OHV agents sent to Bombay, Senegal, for 3-month training at animal traction center there	July
81.	Sociologist submits report/recommendation regarding operation of water user associations	Augus

		Date
82.	Functional Literacy/Health monitor ends assignment	August
83.	2nd annual project evaluation	August
84.	New group of PCV animal traction specialists arrive, old group departs and OHV animal traction specialists return from training	September
85.	Road construction program started again	October
86.	Three more animal traction centers started at Oueles-sebougou, Selefougou and Keniegoué	October
87.	Construction begun again on additional OHV warehouses	October
88.	Credit trainer to Mali and training program started	November
89.	Report of intensive statistical program published, recommendations for 82/83 season made, and TA statistical expert completes assignment	December
90.	OHV blacksmith starts highest level forgeron training program	December
91.	Dry-season training program of OHV agents and farmers at polder begins again, following polder harvest	December
92.	Additional spare parts for road construction equipment ordered	January 1982
93.	TA/Team member — personnel admin. specialist — commences assignment (2 mo.)	February
94.	Study commenced by Genie Rural of 6 remaining polders	February
95.	Detailed work plans drafted for extension/demonstration program at on-farm/village level	February
96.	New group of PCV's arrive to continue this extension program	March
97.	New statistical gathering program commences, using recommendations of TA statistical expert	April
98.	Plots selected for new extension-demonstration program at village/on-farm level	April
99.	Additional changes in credit system made with 82/83 camp	April
100.	Study completed by Genie Rural of additional polders	May

.... 101

		Date
101.	Dry-season instructions at polder in rice cultivation of OHV encadreurs ends	May
102.	Materials distributed for village demonstration plots and plots laid out	May
103.	Water management engineer (short-term) arrives for final tour; polder prepared for plainting and deep plowing for wild rice eradication done	May
104.	Village demonstration plots planted	June
105.	Polder planted	June
106.	Road construction program stopped for rainy season	June
107.	Animal traction expert terminates assignment	June
108.	Third annual project evaluation undertaken	August
109.	TA credit specialist and financial adv. end assignments	August
110.	Rice production specialist and water management specialist end assignments	September
111.	Final phase of road/trail contruction program begun	October
112.	Last (eighth) animal traction center established -- at Kourouba	October
113.	Village level demonstration plots harvested and results made known	November
114.	Polder harvested	November
115.	Annual animal vaccination program commenced	December
116.	Dry-season training in rice production at polder commenced	December
117.	TA/crop agronomist terminates assignment	February 1983
118.	Detailed plans for on-farm/village level demonstration/ extension program laid out, concentrating on east side of Niger River	March
119.	Dry-season instructions in rice production at polder end	April

		Date
120.	Demonstration plots laid out and materials delivered	May
121.	Polder plowed for wild rice eradication and prepared for planting	May
122.	Road/trail construction program completed and maintenance brigade formed of villagers	June
123.	Village level domsontration plots planted	June
124.	Polder planted	June
125.	Team leader submits final report to USAID and completes assignment	June
126.	Fourth annual evaluation of project	August
127.	Project ends first five year phase	September

PROCUREMENT PLAN

1. Responsible Agency

All procurement under this Development Grant will be the responsibility of and conducted by the OPERATION HAUTE VALLEE, an entity within the Rural Development structure of the Government of Mali (GOM). Upon acceptance of the Procurement Plan and its inclusion in the Project Paper, OPERATION HAUTE VALLEE will designate the official(s) responsible for procurement actions and the office which will coordinate and control procurement documentation.

2. Equipment/Commodity List

The items listed under this heading are those that represent the general needs of the project over its five (5) year life span. More exact details and specifications will be furnished in the Project Implementation Orders/Commodities (PIO/C's), which will be issued to enact procurement.

A. Vehicles for transportation of Project Personnel/Commodities

20 Ea Utility Vehicles, 4-wheel drive	$320,000
162 Ea Mobylettes	81,000
24 Motorcycles	24,000
1 Ea Truck, Pick-Up; 1/2 ton	10,000
5 Ea 10-ton trucks	125,000
Spare parts for the above, except mobylettes, 20%	95,800
	$655,800

MALI OHV PROJECT

EQUIPMENT REQUIREMENTS FOR ROADWAY CONSTRUCTION AND MAINTENANCE PROGRAM

B. Construction Equipment

Item #	Quantity	Description	Cost
1.	2	Bulldozers (CAT D-6D or equal)	200,000
2.	2	Motorgraders (CAT 14-G or equal)	170,000
3.	1	Wheeled Loader (CAT 920 or equal)	65,000
4.	2	Wheeled Scrapers, elevating (CAT 613 or equal)	170,000
5.	1	Disc plow (Rome 10 x 36 or equal)	16,000
6.	1	Compactor, pneumatic, self-propelled (Hyster 530A or equal) 10/12T	30,090
7.	5	Dump trucks, 5 yd^3 capacity, diesel 30,000 GVW	150,000
8.	3	Water trucks, 4.5 m^3 capacity with pumps (1200 gals), Diesel, 30,000 GVW	90,000
9.	3	Water tanks, skid mounted (local fabrication) 2000 l.	3,300
10.	1	Mechanic's pickup truck, 1 ton Payload capacity, 4 x 4, with tools, 6200 GVW Min (see attached list) Diesel	20,000
11.	2	1 ton Payload pickup, 6200 GVW Min, 4x4, 4 w/drive, Diesel, w/trailer hitch	18,000
12.	1	Concrete Mixer 12S (340 l.)	5,000
13.	10	Wheel barrows, heavy duty	1,000
14.	2	Water pump, 2" intake, gas driven, with hoses, screened intake, etc.	2,000
15.	1 lot	Survey equipment (see attached list)	6,000
16.	1	Fuel/lub truck, Diesel, 30,000 WVW	30,000
17.	2	Fuel tanks, skid mounted, 5000 l. (local fabrication)	5,000
18.	1	Tanker (1500 gal) truck, Diesel, 30,000 GVW	30,000
19.	1	Low bed (30 T) tractor/trailer, Diesel	45,000
20.	2	6T trailer vans (23'L)	8,400
21.	5	10 man tents	5,000
22.	1	15 kw generators, Diesel with cables and lightening	10,000
		Sub-total	1,079,700
23.		Spare parts for items 1-4 with delivery plus 5-year contract for 25%	242,000
		Spare parts for remainder of vehicles, 20%	82,800

Item #	Quantity	Description	Cost
		Rationale for 40% spare parts on items 1-4 - their estimated life according to Travaux Publics is 10 yrs, but spare parts during period far exceeds 20%.	
24.		Shop Equipment (and preparation of maintenance facilities)	40,000
25.		Pickup truck for survey work	10,000
		Total	1.454,500

C. Maintenance Equipment

1.	2	Motor graders - 12 G - CAT	50,000
2.	2	Tow type water tanks 600 gal (2000 1)	8,000
3.	2	Water pump, 2" intake w/hoses and screened intakes	2,000
4.	2	Dump trucks, Diesel (5 yds) 30,000 GVW	60,000
5.	2	Tractor (Industrial) w/attachments - 65 HP	35,000
6.	2	Wobble wheel tyred rollers, 6-8 tons, w/trailer	20,000
7.	2	1 T payload 4-wheel drive Diesel pickup, w/trailer hitch	18,000
		Sub-total	293,000
8.		Spare parts, insurance and freight 20%	58,600
		Total	351,600
		say	352,000

D. Agricultural Equipment

3 Ea Tractors, farm; 185 HP	$54,000
3 Ea Scrapers; u/w farm tractor	18,000
3 Ea Plows, farm; u/w farm tractor	36,000
3 Ea Disc Harrow; u/w farm tractor	36,000
3 Ea Trailers, farm; u/w farm tractor	36,000
1 Ea Land Plane, 20'	12,000
13 Ea Diesel Pumps, 4 HP	31,200
Spare parts for Tractor parts, 20%	17,000
Spare parts for remainder, 10%	12,000
Sub-Total	$252,200
1 Ea Rice Mill, complete	$15,000
1 Ea Hammer Mill	1,000
40 Ea Foot Pedel Rice Threshers	12,000
50 Ea Sprayers, portable, backpack	3,000
20 Ea Multiple cultivators	4,000
20 TM Plows	2,400
20 Harrows	1,500
40 Ea Rotary Weeders	4,000
60 Ea Line Seeders	9,000
Miscellaneous Farm Implements	15,000
TOTAL	$309,780

E. General Commodities

7 Ea Radio Sets; w/generators	$77,000
8 Animal Traction school equipment	40,000
40 Sets Office Furniture/Equipment (headquarters)	70,000
16 Sets Office Furniture (OHV field offices)	24,000
4 hand operated fork lifts (for OHV's 4 "sector" offices)	4,000
— Miscellaneous demonstration materials	15,000
— Blacksmith shop equipment and hand tools	12,000
— Welders (8, for the animal traction centers)	16,000
— Field Test Equipment; soil augers, PH meters	7,000
— 200 Blackboards	6,000
— 1000 Lamps (kerosene)	5,500
— 200 Radios (battery operated)	8,000
— 12 Typewriters	8,000
— 4 Mimeograph machines	2,800
— Pens (2/student/yr.)	10,400
— 1,850 boxes chalk	3,200
— 17,700 Notebooks (1/student/yr.)	17,700
— Other funct. lit. material	17,200
— Health program matarials, equipment supplies	44,000
— Auto garage equipment (see p. 146 for detailed list)	15,000
— Furniture for 2 existing guest house of OHV	15,000
TOTAL	$ 419,000

F. Pharmaceuticals and Medical Supplies

-- Veterinary Supplies	20,000
TOTAL	$20,000

G. Construction Materials/Supplies

-- Assorted Tools, Irrigation Activity	5,000
-- Materials, Irrigation Activity	5,000
Equipment and Commodity List Total	10,000

3. Source of Procurement

The source and origin of commodities being procured for this project will be Code 941 countries and the recipient country except for motor vehicles, ocean shipping and fertilizers, and as authorized under waivers or exempted as shelf items purchased under sanctioned local currency procurement Motor vehicles will be manufactured in the U.S..

Suppliers of motor vehicles or earth moving equipment who bid on the applicable sections of any project requirement, must be aware that they should have a service representative in Mali who can assure the project of timely after-sales support. The local representative must be able to provide warranty back-up, start-up and check out checks, spare/repair parts support, and adequate service and maintenance facilities.

4. Dates of Procurement

Efforts will be made to have the speediest delivery to Mali of the following high-priority commodities:

10 Ea Utility Vehicles, 4-wheel drive
1 Ea Truck, pick-up; 1/2 ton

The purchasing agency will be notified of these priorities, and will be expected to procure and deliver them to Mali within six (6) months after receipt of a PIO/C; if this delivery is not feasible, the agent must notify the Grantee and DIR/Mali of his inability to meet the delivery date and recommend a more feasible and appropriate time.

5. Shelf Item Procurement

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 (that are not also Code 941 countries) are eligible for local cost financing if the unit cost does not exceed $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 available for purchase without restriction, except for the limitation upon the total value of local procurement established in the Agreement.

Procurement of imported 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. The Mission Director, in turn, must attest that the price being paid is a reasonable one.

6. Local Currency Procurement

Local currency authorization is required to purchase the following:

20 Ea Multiple Cultivators, plows, harros	7,900
1 lot Survey equipment (waiver requested below)	6,000
8 Blacksmith shop equipment	16,000
8 Animal Traction Center Materials (not to be purchased until arrival/advise of U.S. technician	40,000
1 1/2 ton pick-up truck (waiver request below)	10,000
Assorted tools and materials, Irrigation Activity	10,000
Road construction equipment spare parts (= portion of heavy equipment purchased during construction, as needs arise)	151,000
Shelf items	80,000
TOTAL	$320,900

7. Waivers

A. A waiver of the maximum authorized amount for shelf item procurement is requested, to raise the limit from $2,500 to 6,000 per waiver unit, for road construction and maintenance spare parts, and survey equipment only.

Justification

This waiver is needed to allow the grantee to procure repair parts for heavy equipment on the local market, for Code 935 imports as shelf items are most often above $2,500 when applicable to earth moving vehicles and tracked equipment. Buying these items in the U.S. and having them shipped to Mali can and has caused serious delays in project implementation. High cost repair parts are often available from the local distributors, and the raising of the limit

to $6,000 per transaction will permit local acquisition of needed parts and show a decline in heavy equipment down-time. A waiver is requested for survey equipment needed immediately in project year one.

B. A waiver to permit purchases of 162 mobylettes ($81,000) manufactured in Code 941 countries is requested.

Justification:

This waiver approval is needed to permit the purchase of mobylettes, a very common means of public conveyance and required in almost every segment of the project as transportation for project personnel. None of the U.S. manufacturers of mobylettes is represented in West Africa, and none of them currently export. Mobylettes manufactured in Taiwan are available through an Abidjan distributor and will most likely be purchased, although other 941 country manufacturers will be eligible. Repair parts are available in Mali, and maintenance can be performed by relatively unskilled personnel.

C. A waiver of the source restriction to permit procurement of one 1/2 ton pick-up truck from Code 935 sources is requested.

Justification: The waiver approval to permit the local purchase of one half-ton pick-up is needed to allow design work on the roads to commence as soon as possible. Construction of the roads is to commence at the beginning of PY2, and starting about 9 months prior thereto, design of the roads by Travaux Publics is required. If there is no pick-up available for survey work in the Haute Vallee, there will be no way that these roads can be surveyed in detail, which means there will be delays. In short, construction on the roads will be held-up because of delay in starting the design process, and this will cause the 4-year construction program in turn to continue beyond project life.

D. A waiver is requested to permit proprietary procurement of the following construction equipment from the Caterpillar Tractor Company, Peoria, Illinois:

2 Ea Wheeled Scrapers, CAT 613	U/P: $ 85,000 T/P:	$170,000
1 Ea Wheeled Loader, CAT 920	U/P: $ 65,000 T/P:	65,000
2 Ea Motor Graders; 120 HP 2/scarifiers, CAT 14-G	U/P: $ 85,000 T/P:	170,000
2 Ea Bulldozers; 140 HP w/ripper, CAT 6D	U/P: $100,000 T/P:	200,000
-- Repair/maintenance parts for above items (40%)		245,000
2 Ea Motor graders, CAT 12 G -	U/P: $ 75,000 T/P:	150,000
spare parts (20%)		30,000
TOTAL		1,027,000

Justification:

Procurement of the Caterpillar equipment and parts would be in keeping with the Mission's past efforts to standardize on Caterpillar equipment when required for project implementation in Mali, in order to lessen the difficulty in properly maintaining earth moving and construction equipment. With only Caterpillar parts to stock, inventory levels and costs are decreased; parts commonality is paramount, and maintenance personnel are more efficient in preventive as well as corrective maintenance procedures. Caterpillar has an excellent support program in West Africa, and a well-stocked and capable repair facility in Bamako, Mali. It would be in the project's interest to permit the proprietary procurement be directed to Caterpillar rather than to another American manufacturer.

8. Payments

In view of the high dollar value of the procurement in the United States, it is expected that a procurement services contract for commodities only will be negotiated with the Afro-American Purchasing Center (AAPC) One World Trade Center, NY, NY 10048. Payment for services rendered will be made by the Direct Letter of Commitment method; upon receipt of the PIO/C in AID/W (SER/FM/BFD), the Letter will be sent to AAPC to initiate procurement. When AAPC has completed its purchasing actions, documents will be presented to the AID Controller's office in New York for payment.

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

9. 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 requirements for overseas shipments will be enforced by AAPC.

10. Receipt and Utilization

The Grantee is responsible for the proper reception and clearances of incoming project commodities, with the assistance of the DIR/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 Grantee and DIR/Mali 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 annoted, 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.

Grantees are required to put into project use all commodities procured for the project within one(1) year of recepit; the local AID representative (DIR/Mali) will inspect the Grantee's utilization reports as a matter of course.

11. PROCUREMENT SCHEDULE

Schedule supposes that preliminary work on procurement actions can begin immediately. Target dates are keyed to date of the signing of the grant.

TARGET DATE	ACTION TO BE TAKEN
+ 15 days	PIO/C's prepared for procurements not requiring conditions precedent (CP).
+ 30 days	Designate and appoint Procurement Services Agent (PSA). Procurement of local source items begins.
+ 45 days	PIO/C's prepared with Mission Assistance
+ 90 days	Input of PIO/C's to PSA.
+ 90-239 days	Procurement and shipment.
+ 240-270 days	Arrival of commodities at West African ports.
+ 270-365 days	Arrival of commodities at Bamako, Mali.

PROJECT INPUTS AND OUTPUTS

I. Animal Traction Centers

A. Inputs

(1) Technical Assistance

a. Long-Term

1 Animal Traction Specialist	36 PM
1 Cereal Crop Specialist	36 PM
16 PCV's (2 years; groups coming to Mali in PY 2 and PY 4)	768 PM

b. Short-Term

Short-term consultants on call	8 PM

(2) Commodities

a. Equipment

Forgeron equipment, including welders, yokes ropes, plows, seeders, multicultivators, desks, etc., 8 water pumps (4 HP); field test equipment (soil augers, etc.)

b. Vehicles

11 Four-wheel drive utility vehicles

8 Mobylettes (for SB agents at centers)

24 Motorcycles (for 16 PCV's and 8 ZER heads)

c. Miscellaneous Farm Implements/Materials

Seeds, fertilizers, feeds, insecticides, land wire, cement, veterinary supplies

(3) Construction

8 storage facilities

(4) Training

a. Long-Term

2 Crop Specialists (NA)	24 PM

b. Short-Term

2 Extension Agents (NA)	12 PM

c. In-Country 100 PM

d. Third-Country

3 Animal Traction Specialists 9 PM

1 OHV-Blacksmith/trainer 6 PM

(3) Research Fund - for crop, implement, oxen and water use research

B. Outputs

(1) 8 functioning animal traction centers, each training 100 oxen teams per year, and conducting basic research in oxen-drawn agricultural implements.

(2) 8 blacksmiths attached to the animal traction centers, modifying and re-designing agricultural implements.

(3) 90 trained local blacksmiths and equipped with forgeron equipment provided on credit making improved farm implements and spare parts.

(4) A functioning crop research program.

(5) A functioning on-farm/village demonstration program providing technical assistance to farmers with respect to both animal traction and crops in general.

(6) An improved agricultural staff at OHV capable of conducting basic research in animal traction and food crops and of conducting an effective extension service.

(7) 100 OHV field staff personnel complete in-country training necessary to assume complete responsibility for operation of program.

II. Bancoumana Polder

A. Inputs

(1) Technical Assistance

(a) Long-term

1 Irrigated Rice Specialist	36 PM

(b) Short-term

1 Water Management Specialist	12 PM
1 Civil Engineer (see road section)	
short-term consultants on call	8 PM

(2) Commodities

(a) Equipment

5 diesel pumps (4 HP)(for dry season irrigation for research at the polder only)
3 tractors (185 HP) with attachments
40 foot pedal threshers, one hammer mill, one rice mill, 40 weeders and 64 line seeders, 50 sprayers, and 20 plows, harrows and multiple cultivators

(b) Tools
Shovels, machetes, pick mattocks, tamping rods, wheelbarrows, or carts and assorted small tools for making form work, masonry, etc.

(c) Materials

Portland cement, culvert pipe, turnouts, steel slide gates and aggregate for concrete work. Also materials for conducting research during dry season including fertilizers, seeds, insecticides and tools.

(3) Training

(a) Long-term

1 Engineer, post graduate level (A)	24 PM
3 Rice Production Specialists (NA)	18 PM

(b) Short-term

2 Technical Specialists totaling six months observation work/study with U.S. Bureau of Reclamations, Denver, or third country	6 PM
Other short-term training (third country)	8 PM

(c) In-country (training at the polder) 100 PM

(4) Studies - Remaining Polders (PY 4)

B. Outputs

(1) A functioning irrigation system within a 640 polder which includes the physical infrastructure necessary for effective water control, and highly productive irrigated rice production therein.

(2) Improved water-use efficiency, resulting from:
- smaller paddies (maximum .5 hectares)
- ground leveling, and
- effective water control

(3) A cadre of technicians capable of providing:
- technical support to the operation of the irrigation system, and
- extension services to the water-users association.

III. Credit Program

A. Inputs

(1) Technical Assistance

(a) Long-Term	
I Credit/implement Supply Advisor	42 PM
(b) Short-Term	
I Credit Trainer (2 months)	2 PM

(2) Loan Capital ($1,300,000)

(3) Commodities

2 Utility vehicles (4-wheel drive)	
Veterinary supplies	5 PM

(4) Studies/Credit System design

(5) Training

(a) Long-Term	
I Agricultural Credit (a)	24 PM
(b) Short-Term	
5 Supervised Credit (na)	30 PM
In-service supervised credit seminars	30 PM

(6) Construction (4 warehouses)

B. Outputs

(1) A new credit system and loan fund established and functioning in an economically viable manner.

(2) An expanded storage capacity in OHV to meet growing demands for fertilizers/implements.

(3) An administratively strengthened and improved OHV staff and field agents responsible for executing the credit system, with key personnel trained abroad and in-country.

IV. Functional Literacy

A. Inputs

(1) Technical Assistance

(2) Training

Third Country (probably Naimey)

1 OHV-DNAFLA agent	3 PM
1 Technical Advisor	3 PM

In-Country

12 ZAF agents	24 PM
200 CAF instructors (1/3 of this includes retraining of instructors 18 months after initial training)	112 PM

(3) Commodities (this commodity list is based in large part on OACV's existing budget modified to the OHV program in terms of agents and centers)

1 4-wheel drive vehicle

12 Mobylettes

12 Limographs

12 Sets of Office Equipment (desk, 2 chairs, filing cabinet small metal case & table)

12 Typewriters

12 hand calculators

4 hand-operated mimeograph machines (one for each "secteur")

4 cameras plus film, and 4 battery operated cassettes

200 Battery operated radios ($8,000)

1,000 small kerosene lamps ($5.50/lamp x 5/center x 200 = $5,500)

200 blackboards

CAF materials (chalk, pens, notebooks, and brochures).

Desks, lamps, chairs (a 100% village contribution)

Stencils

Paper

(4) Construction - - 200 CAF buildings (a 100% village contribution)

(5) Funds ($20,000) — $100 for each CAF as a start-up fund for village/CAF agricultural plots (similar to type to those sponsored very successfully in OACV program)

(6) Studies

— Annual Evaluation

B. Outputs

(1) 12 ZAF agents will be trained and equipped and giving professional guidance and supervision to 200 CAF's;

(2) 8,000 villagers/farmers/women will become functionally literate;

(3) 200 CAF's will be constructed/provided by almost an equal number of villages, equipped and operating, and at least 50 of these wil have classes for women only;

(4) At least 150 CAF's will have moved into the post literacy stage, training villagers beyond the level of mere functional literacy; and

(5) 200 CAF's will have group-run agricultural plots every year, financed by a self-sustaining $100 fund, with any profits above this being used to defray village operating expenses of the CAF's.

Roads

A. Inputs

(1) Special Study -- Road/OHV Financial Study (3 PM)

(2) Technical Assistance
1 Equipment Specialist (maintenance) 24 pm
1 Construction Engineer 18 pm
1 REDSO Engineer, TDY - 4PM, and 1 short-term civil engineer - 10 PM

(3) Commodities

Construction equipment:

2 Bulldozers, CAT D-60

2 Motorgraders, CAT 120G

1 Wheeled loader, CAT 920

2 Wheeled scrapers, elevating, CAT 613

1 Disc plow, Roma 10x36

1 Compactor, pneumatic self-propelled, Hyster 530A

4 Dump trucks, 6 yd^3 capacity

2 Water trucks, 10 m^3 capacity with pumps

3 Water tanks - skid mounted (local fabricated) 2000 l.

1 Mechanic's pickup truck, 1 ton capacity, 4 x 4, with tools

2 Half-ton pickup trucks, 2 x 4 with limited slip diff.

1 Concrete mixer 125 (340 L)

10 Wheel barrows, heavy duty

1 Water pump, 2" intake, gas driven with hoses, screened intake, etc.

1 Lot survey equipment

1 Fuel tank, skid mounted, 5000 l.

(4) Construction/Maintenance

203 km of link roads and 195 km of access trails

B. Outputs

(1) 203 km of improved link roads and 195 km of improved access trails

(2) Road construction/maintenance brigade equipped and functioning under auspices of Travaux Publics.

VI. Institutional Support for OHV

A. Inputs

(1) Technical Assistance

a. Long-Term

1 Administrative advisor (team leader)	48 PM
1 Financial Management advisor	30 PM
1 Agricultural Supply/Credit Management advisor (under credit section)	
2 PCV mechanics (2 years each)	48 PM

b. Short-Term

1 Agricultural economist	4 PM
Agricultural Statistics advisors, on call	24 PM
1 Personnel Admin. advisor	2 PM
Short-term consultants on call, including 6-mo sociologist and 3 mo. mechanic (1)	11 PM

(2) Commodities

5 ten-ton trucks, and 1 half-ton pick-up

122 mobylettes

7 short wave radios and generators, and 4 hand operated fork lifts

5 jeep-type 4-wheel drive vehicles

Garage equipment, including an assortment of tools

Furnishings for two guest houses

40 sets of office equipment for the new headquarters and 16 sets for OHV field offices in 8 villages

---

(1) Other technical support necessary for the project will be solicited from the centrally funded service contracts of the Development Services Bureau, AID/Washington. These services include; seed multiplication, seed technologies, grain storage, etc.

(3) Training

a. Long-Term, U.S. or Third Country

1 Management (A)	24 PM
1 Agricultural Statistics	12 PM
2 Finance	24 PM
1 Agricultural Extension (NA)	12 PM

b. Short-Term

4 Marketing/Management/Extens	12 PM

c. In-Country

Courses and seminars given by expatriate experts and OHV counterparts on subjects related to job responsibilities	40 PM

(4) Construction

1 Headquarters

6 Field Offices (155 sq. meters)

(5) Contracted studies (base line survey and annual project evaluation)

B. Outputs

(1) An improved capacity in IER to collect, analyze and report agricultural data and to specifically make crop forecasts, land use surveys, agricultural production assessments, etc;

(2) A trained statistical economic-planning collection/evaluation staff in OHV;

(3) An administratively strengthened and improved OHV with key staff members trained in management, finance, agricultural extension, marketing and program planning and project evaluation;

(4) An improved trucking capacity in OHV for delivering agricultural supplies and marketing produce;

(5) Expanded in-field office space;

(6) OHV operating out of its own headquarters building.

Agricultural Productivity and Production in Haute Vallee

CROP	MAXIMUM	AVERAGE
	kg/ha	
Millet, sorghum	1,100	700
Paddy	2,000	650
Peanuts	1,200	700
Cotton	1,500	1,000
Tobacco	2,000	1,700

Agricultural Production Haute Vallee
1976/77

CROP	TONS
Millet/sorghum	33,000
corn	7,000
paddy rice	6,800
peanuts	8,894
cotton	2,976
tobacco	450
total	57,133

Marketing in the Haute Vallee

(1976/1977)

Crop	MARKETING		MARKETING THROUGH OFFICIAL CHANNELS	
	Total (T)	As % of Production	As % of Production	As % of total marketing
Millet/sorghum/corn	7,500	20%	3%	15%
Rice	2,740	40%	9%	22%
Peanuts	6,225	70%	25%	38%
Cotton	2,950	99%	79%	80%
Tobacco	448	99%	99%	99%

SOURCE: GRM and OHV statistics, plus Mission estimates.

TECHNICAL SECTION

ANNEX B-1

IRRIGATION

Foreword

The PRP recommended the rehabilitation of the 640 hectare irrigation rice polder at Bancoumana and the formation of a water-users association to take over some of the maintenance and operations. The Interim Report recommended an increased level of irrigation development in the Project to all seven polders in the area with initial starts in two, Bancoumana and Krina — the former suitable for irrigated rice, the latter only for deep water rice. Variety trials in Mali and elsewhere suggest that an intensive deepwater rice production campaign would not produce the high yields possible (3 tons/ha. and more) from irrigated paddy rice. Moreover, AID is already involved in deep water paddy rice production in Action Riz Sorgho. Finally, the Bancoumana polder rehabilitation will take 2-3 years; so OHV capacity to do more than one polder, initially, might over-stretch its capacity. So the decision has been made to leave these polders to the project's second 5-year period.

A review of Mali's five year plan indicates that even though highly ambitious targets are established for new irrigation development, the most consistently mentioned problem pertains to operation and maintenance. For this reason, an anthropological/sociological team with two years living experience in Mali was sent out (after those on the PP team) to explore potential ways to assure farmer cooperation in water control; their recommendations have been incorporated into the design of this project. So considerable thought has gone into this whole question.

and every effort possible made to ensure that the irrigation system will be operated and maintained in good order and that the system of operation and maintenance is one which fits well into the Malian social context.

Finally, it should be pointed out from the beginning that the rehabilitation of the Bancoumana polder will involve no mechanical things such as pumps, and all the major equipment necessary to level the polder will be rented from Genie Rural, which has agreed to do all the leveling needed on a contract basis. So no machinery purchase is required and no maintenance center needed. And, great encouragement will be given to the farmers via the animal traction program to level as much of the land as possible using scrapers dragged by work oxen so as (1) to reduce the cost to them of land leveling and (2) more importantly, to ensure that farmers outside the polder will see that they themselves are capable of doing the same without machinery.

Background

The Bancoumana irrigation system is in a state of disrepair and has not had regular, over-all maintenance for a number of years, probably not since it was built 15 years ago. However, maintenance work is done by some farmers to improve the flow of water in their own immediate lateral.

The most seriously neglected part of the system is the drainage. Drains are nearly non-functional as a result of vegetative growth choking the drainage ways. The canals and laterals are also in need of cleaning. Some turnout gates are clogged or partially clogged and need attention. Bridges and culverts are still in fair condition and do not require major repairs.

The headworks dam on the Koba River needs some masonry repair as does the main canal intake gate and some of the checks. The earch embankments of the canals, laterals, and dikes have been eroded to varying degrees and in some places almost removed. The greatest need on the earth canals and laterals is the removal of silt, brush, weed growth and reshaping the channels to the required size to allow water to flow freely and smoothly. The dikes need reinforcing in some places and reshaping of their tops and side slopes.

Land within the polder is not level and bunded paddies are far too large to effect reasonable water application. The land must be graded and the paddies rearranged if a reasonable level of water application efficiency is to be achieved. Even the best of farmers would have difficulty irrigating these uneven, oversized paddies with any effective efficiency.

The operation and maintenance of this system is currently carried out by one man from the Ministry of Rural Development's Rural Engineering Department (RED) who lives in Bancoumana. He is not an engineer nor would he be a qualified water management technician. His designation is foreman and he has had little training either in water distribution, system operation and maintenance, or water use practices. There is no operation plan for the system. The foreman is conscientious and well liked by the farmers.

The fact that Bancoumana Polder still operates at all (five other polders in OHV have been completely abandoned) could be attributable to his attempts and personal interest. He will receive training.

Trained irrigation and water use engineers have not been generally available for advising farmers on proper water use practices. The low water use efficiency (estimated in the 10% range) in the Bancoumana Polder area points up the need for training programs for OHV technicians and intensive education and extension information for the participating farmers.

a. Polder Rehabilitation

The perimeter dike will be repaired and reconstructed, including raising the crest level where necessary to a level of 21 cm above the estimated 100 year flood level. Crest width 3 meters with slide slopes of 2:1.

The PRP recommended a topographic study upon which to base the designs and cost estimates for rehabilitating the Polder system.(1)

In the absence of the completed survey, the estimate of costs for polder rehabilitation are derived from discussions with Genie Rural officials involved in the survey and estimates from Genie Rural's October, 1976 proposal. The estimated costs herein are 67% higher than the October 1976 estimates, and are much more realistic. Earthwork and structural repairs were initially computed at $100 per hectare, but this appears to be much too low and is being raised to $300 per hectare. This is broken down into 3 general categories: (1) reinforcement, repair and reshaping of the perimeter dike, (2) repair and reconditioning of all gates, and (3) cleaning and shaping of canals.

---

(1) As of June 9, 1978, this study was about two-thirds complete.

Other elements of the proposal to be included in this project are: (4) extension of the irrigation project service area to an additional 100 hectares at $1,000 per hectare (this was initially calculated at $600/ha), (5) land leveing on selected farms to a total of 100 hectares of project land at $800 per hectare (double the original estimate), (6) deep plowing in two replication of 540 hectares for wild rice rhizome elimination at $120 per hectare per ploughing or $240 per hectare, (7) cleaning and extension of the drainage system comprising an estimated $5,000 for the existing mai drain, and (8) excavating of a drainage net at an estimated cost of $4,000.

Cost Detail for Polder Rehabilitation

(1, 2, 3)	Rehabilitation of dikes, gates, canals - 650 ha x $300/ha	$195,000
(4)	New Project - 100 ha x $1,000/ha	$100,000
(5)	Land Leveling - 100 x $800/ha	$ 80,000
(6)	Deep Plowing - 540 x 240	$129,600
(7)	Clearing Main Drain	$ 5,000
(8)	Collector Drains - 3,000 M at $1	$ 4,000
(9)	Field Drainage Net on 540 ha at $40	$ 21,600
(10)	Project Maintenance Causeways - 9,300 M at 1.50	$ 14,000
	Total Rehab Cost	$549,200
	Minus half cost of land leveling to be paid by farmers themselves, with the use of project's credit fund	$ 40,000
	Contingencies (15%)	$509,200
	Engineering	$ 57,000
	TOTAL	$642,580

This activity will rehabilitate physical components of the irrigation polder so that an efficient water delivery system will be in place. The project further provides for an operation and maintenance program wherein water user organizations will be formed and lead farmers trained in the management and maintenance of the system. Expatriate technical assistance is provided to supply necessary expertise in modern methods of water management and improved rice cultivation. A training program for GRM/OHV staff members which provides for both in-country training and training abroad will be established. Moreover, a farmer education element will be added as part of the on-the-job-training of extension staff.

b. Polder layout, water management and weed control

In the current situation land is allocated within the Polder to families on the basis of one hectare per working member of the family. There are 160 land assignments covering, at present, 540 hectares or an average of about 3.35 hectares per family of irrigated land. In many instances the entire holding is bunded into a single paddy. The average paddy size is, however, 2 hectares. Given the uneveness of the land surface in micro-relief, it is extremely difficult to apply water with an acceptable level of accuracy. The water supply in the main canal during the rice growing season is 3 cubic meters per second. Considering

a generous allowance of 1.5 liters per second per hectare from the canal there is sufficient water to irrigate 2,000 hectares, provided reasonably good irrigation practices are followed and the supply from the Koba River remains steady. It has been indicated that the Koba River runs up to 5 cumecs during the wet season and the Polder's main camal only draws 3 cumecs from the intake gate at the headworks.

In view of the magnitude of investment indicated below it is necessary to devise a way to upgrade the efficiency of water application to the rice crop after the receipt of water delivery to the farm unit. The on-farm infrastructural requirements for achieving higher overall water efficiencies are level land, manageable sized paddies or check basins, well formed bunds with small spillways for regulating depth of water in the paddy, and a good on-farm and collector drain system of water disposal. Also critical in the Bancoumana Project is the elimination of wild rice infestation. This must be done otherwise the expected benefits will fall far short of predictions. The rhizomes of the wild rice plants are rooted as deep as 25 to 30 centimeters (10 to 12 inches) To start control it is planned to deep plow to expose the roots to the sun during the dry season. Implications of the wild rice are that (1) heavy equipment will be required, (2) the deep plowing operation must be replicated,

(3) the entire Polder area will have to be plowed, and (4) a weed control program during the rice growing season will have to be established and enforced.

The plan is to level 100 hectares of the project area in PY 2, deep plow the entire infested area, re-arrange the paddy enclosures within each farm to a modular size of 0.5 hectares (the slope of the land within each bund will be leveled to a 0.10% slope and bund heights will be 40 centimeters with spillway control for regulating water levels to any desired depth of water or to permit complete drainage of the paddy. All land will be leveled using oxen and/or by Genie Rural, which has agreed to do all the leveling work if necessary, using its own equipment. The concentration of effort using a complete package of practices, on-job technician training, farmer training, and the U.S. technical assistance element will be applied first to this 100 hectare area. The credit program will provide credit for agricultural inputs, the purchase of work oxen and implements, and the cost of land leveling in the polder. The credit program will be flexible in that if for any reason a farmer's harvest is very poor, the loan repayment schedule can be restructured.

Cost implications are taken from section II above and are generally: $40/ha for on-farm drainage, $400/ha for leveling and paddy re-arrangement. To provide the polder farmers with a continual supply of capital reserve for their use in carrying out operation and maintenance of the irrigation system and to reimburse OHV for operating expenses, the existing Commission de Vulgarization will increase, initially, its levy to 100 kg per hectare.

c. Operation and Maintenance

In most instances water diversion into canals and laterals is currently regualted by a Government appointed foreman. Sometimes the farmers do it themselves. The main cause of unequal water distribution in the project area is the lack of measuring facilities, impaired functioning of turnouts and headgates, and uncontrolled openings in canal banks. There appears to be a lack of understanding and training in the principles of water use and management for operation of the system which further contributes to unequal distribution of water over the project area.

Present farm irrigation systems and methods of applying water are haphazard. Consideration must be given not only to rehabilitating the irrigation system but also to the operation and maintenance of the diversion dam, main canals, lateral system and the drainage ways.

The nature of the headworks facilities consisting of the dam and the intake gate together with the main canal and the Polder dike is such that the farmer/water users view it as an overwhelming task to assume its operation and maintenance. However, the supply laterals from the main canal and the interfield distribution channels can be operated and maintained by the water users themselves.

One thing very clear is that full advantage should be taken of any existing village structures than can potentially be of assistance in ensuring good water management. Creating an entirely new structure is, by nature, problematic in almost any situation, and existing structures usually have a certain logic appropriate to the social setting.

At Bancoumana, there are three existing structures which should be taken full advantage of — the extended family and its inherent unity and extended connections, the village council headed by the village chief, and the "Commission de Vulgarization" ("Commission"). The village council in Bancoumana is composed of 13 heads of family, including the village chief; this council is popularly elected by all the heads of extended families in the Bancoumana area. Most of these representatives have interests at the polder because those who had influence were undoubtedly in large part the recipients of the plots in the polder when it was originally distributed. Influence within the community does not depend entirely on money; for this reason there are numerous poor farmers in the polder. What is clear is that only those with some influence received a plot. As a result, the village council strongly represents the interests of the polder farmers.

When OHV rehabilitates the polder, it will impose certain condition to which the polder farmers will have to agree. OHV should and will use the village council to ensure that all agreements are kept and that all farmers comply with OHV directives, such as weeding for wild rice. The village council is a very powerful body of elder family heads, and there is no group which approaches it for power even though, like many village councils, it no longer has such a completely strong hold over the younger generation. The latter has more education and aspirations which extend beyond merely the family and village, such as earning cash. There is absolutely no doubt that the polder farmers and the village council want the polder, and will agree to OHV's conditions

one of which will undoubtedly be that all produce marketed therefrom will have to be marketed through OHV. Rehabilitating the polder gives OHV this power, even though it presently has no authority to purchase/market any cereals in the area. But it can be expected that the polder farmers and village council will have a degree of healthy skepticism since the French have already tried to rehabilitate the polder and failed completely. OHV will not use the council to do any work itself; rather, when orders are to be given or when those given have not been made, OHV will so inform the village council and insist that the needed commands be given or complied with.

OHV will continue dealing with the village council via the Commission. The Commission is a farmer/peasant organization that represents the farmers directly and not through the family heads as such. This commission exists in most villages and is composed of 7 representatives elected by the villagers. The Federation of Cooperatives uses this Commission to unite the farmers and get them to sell their cereals to the GRM. This same Commission used to run the polder; it collected fees for its management and paid laborers to assist in upkeep.

Because of the polder's design defects, good water control was impossible, yields poor, and so the polder went into disrepair. So the Commission no longer collects fees from the farmers.

This Commission can be very useful to OHV in dealing with the village council. At present, OHV channels its ideas/complaints through the representatives of this Commission, which in turn addresses the village council. The polder farmers are represented in both organizations

so this channel of communication involves everyone (village leaders, the GRM, polder farmers) and should be continued. Power and authority lie with the village council, but organizing the farmers is something the Commission has expertise in. Hence, OHV will obtain this Commission's cooperation in organizing the farmers into workable units.

Meetings will be held by OHV with the polder farmers and the Commission, OHV's conditions clearly stated, and the farmers organized. The village council will be called in and/or consulted whenever its authority/wisdom is needed. OHV agents will do the organizing and their numbers at Bancoumana will be temporarily increased at the beginning of the project to do this. OHV's relations with the farmers are excellent and appear much better than those of the Federation of Cooperatives. The farmers can be organized along two different patterns — i.e. family connections or by the land served by one lateral supply line (taken from the main canal), of which there will be seven. From a sociological viewpart, the farmers would best be grouped according to family relationships, but the arrangement of the lateral canals strongly suggests that farmers should be organized re the seven canals. Fortunately, when the polder land was distributed, related families were given adjoining lands. Therefore, grouping farmers re canals will tend to be supported by family units as well. This is crucial because some families are undoubtedly at odds with each other; in such instances they should never be grouped together. For this reason, provision is made for a local sociologist to be at the polder at the beginning to ensure that farmers are grouped so as not to unite un-cooperative families.

These associations will form the base through which OHV technical assistance will be provided to the polder farmers. With these associations, instructions can be given in group-fashion, rather than attempting to reach each farmer individually. These associations will be formed well before the beginning of the polder rehabilitation; OHV will meet regularly with both the village council and the Commission to utilize their force in compelling their formation and ensuring the cooperation of the farmers.

These associations will have three principal functions: (1) provide for the operation, maintenance and management of all irrigation water distribution facilities under one lateral supply line, from the main canal turnout serving that lateral to the outfall point of the drainage network into the main drainageway; (2) monitor all members' field practices to minimize cultural malpractices. (It makes little sense for one farmer to invest heavily in the elimination of wild rice only to be threatened with renewed infestation by encroachment of weeds from a neighboring field); and (3) monitor to assure that inter-field supply channels as well as portions of the inter-field drainage collection networks are not interfered with through lack of maintenance or otherwise deliberate interruption.

Villagers in the Haute Vallée are already accustomed to elections — both on the village council and the Commission. So requiring the polder farmers to unite into water users associations and elect representatives to fill certain roles conforms with existing Malian models. The elected representatives of each association will be responsible

for all dealings with OHV, the village council and the Commission. He will receive training in both water management and rice cultivation by OHV agents, and will be responsible for controlling water distribution and monitoring water use and field cultural practices. Finally, and very importantly, these polder farmer representatives will be paid by OHV to ensure their full efforts. In this way, they will become as much a part of OHV as a part of the polder farmers themselves — but it will be the polder farmers who chose them.

Adequate financing is critical for polder upkeep. Hence, OHV will charge a fee of all polder farmers, by hectare. These fees will have to set high enough to cover all OHV's cost plus an additional amount for the associations themselves. It is suggested that this fee be 200 kg paddy/ha (.066% of a 3 ton/ha yield); this would produce 4,140,000 MF ($9,000). If half were invested in an account for each association, this would mean $642/year for each of the 7 associations. $150 should be set aside for each association representative. With $492 remaining and at 350 MF/day laborer, this would provide each association with money for 647 salaried labor days, which is more than enough to ensure upkeep of each lateral canal, repairs, weeding of wild rice, etc. OHV will keep financial accounting with each of the seven associations. Fees collected from the polder will be invested in their accounts, and the association representatives will be made aware of their amounts. In short, there will be forced savings for polder upkeep, and each association will be able to use this money for whatever purpose to ensure maintenance — whether paying for laborers or whatever. But the

OHV ZER office at Bancoumana will guard these funds. From these polder fees OHV will also pay the 7 association representatives as well. Each time OHV has periodic meetings with each association, the status of funds for the association will be given. So OHV will act as a bank on which the polder farmers through these associations can draw. The OHV office in Bancoumana already has a secretary who is fully capable of handling this accounting.

In addition, part of the polder fee going to OHV itself will be used by OHV for work on the main canal as needed. As for the lateral canals, OHV will mandate uniform water user member contributions to an annual cleaning of the lateral system works.

OHV will hire a watermaster who will control all facilities on the master or trunk line system. These consist of the diversion dam, main canal intake gate, main canal, main drainageway and the protection dike. He will serve as the link between all the water user associations and the Commission. The watermaster will receive training from and be closely counseled and advised by the full time project superintendent presently assigned by Genie Rural to OHV. This project superintendent will have overall supervisory responsibility for the project and will be trained in the U.S. He will supply all the surveys, designs and construction inspection activities to assure the systems maintenance and preservation in accordance with GRM standards.

It is estimated that 40 to 50 percent of the work required for rehabilitation of this project can be achieved by labor intensive procedures. Manpower availability in the area should not be constraining

because much of the rehabilitation work, starting in January, will occur at the time when farmers have the least activity (January-April). If manpower constraints should develop, they may be somewhat modified if wage payments are provided. Moreover, workers are accustomed to supervision and are clearly more productive when compensated with cash. Also, by working on the rehabilitation, local people learn more about their irrigation system, its parts, and even learn something about certain skills (masonry, simple farmwork, concrete work, etc.) But 20% of wages to polder farmers will be invested directly into the water users accounts kept by OHV to provide initial capitalization of their operations and maintenance fund. After the initial capitalization, the fund will be resupplied from OHV's polder fee so that a continuing and viable association will be perpetuated.

d. Technical Soundness

The inputs included in this sub-project are namely: (1) technical assistance (one rice production specialist, one water management specialist, and one animal traction specialist) in the introduction of more modern techniques in water management, (2) training in irrigated rice production as well as in on-farm irrigated agriculture, (3) commodities such as tools and equipment for system rehabilitation, land improvement and its preparation, and irrigation system management, (4) a reinforced extension element, (5) on-farm demonstrations in improved methods of rice culture, (6) an evaluation and review process which in addition to providing project management with valuable management information also measures the socio-economic indicators of impact on target beneficiaries. Surveys, detailed engineering designs and supervision of

construction will be carried out by the Genie Rural design office.

The outputs will be: (1) increased yields of rice, of over 300%/ha, (2) improved water use efficiency, (3) farmer participation in irrigation system operation and maintenance, (4) a better prepared technician base in irrigation and extension, and (5) a strengthened organization of farmers capable of administering to their own common problems.

The assessment of the project to be made during project evaluation will indicate needs, if any, for modification of the input mix in the third year of project implementation.

e. Equipment Use and Needs (Contract Services)

3 D-4 or equivalent tractors (not contract)	- Jan 1 to May 1
1 D-6 or equivalent tractor	- Jan 1 to Jun 1
4 Wheatland Type Plows	- Jan 1 to May 1
4 6m3 Capacity Wheeled Scrapers	- Feb 1 to Apr 1
1 Bund Former	- May 1 to Jun 1
1 Land Plane	- Feb 1 to May 1

Tools Needed (Local Procurement)

40 Shovels
210 Hoe Type Shovels
40 Machetes
30 Pick Mattocks
20 Tamping Rods (Dames)
20 Wheel Barrows or Wheeled Carts
various small tools for making form work, masonry, etc.

Materials (Local Procurement)

50 Bags Portland Cement
30 - 1 meter x 1 meter diameter culvert pipe
30 - 1 meter x 0.6 meter diameter culvert pipe
30 - Lateral Turnouts -
2 meter long pipes with steel slide gates
10 - Cubic Meters aggregate for concrete work.

Estimated Cost - $5,000

e. Equipment Use and Needs (Contract Services)

3 D-6 or equivalent tractors	- Jan 1 to May 1
1 D-6 " " "	- Jan 1 to Jun 1
4 Wheatland Type Plows	- Jan 1 to May 1
4 $6m^3$ Capacity Wheeled Scrapers	- Feb 1 to Apr 1
1 Bund Former	- May 1 to Jun 1
1 Land Plane	- Feb 1 to May 1

Tools Needed (Local Procurement)

40 Shovels
210 Hoe Type Shovels
40 Machetes
30 Pick Mattocks
20 Tamping Rods (Dames)
20 Wheel Barrows or Wheeled Carts
various small tools for making form work, masonry, etc.

Estimated Cost = $3,000

Materials (Local Procurement)

50 Bags Portland Cement
30 - 1 meter X 1 meter diameter culvert pipe
30 - 1 meter X 0.6 meter diameter culvert pipe
30 - Lateral Turnouts -
2 meter long pipes with steel slide gates-
10 - Cubic Meters aggregate for concrete work.

Estimated Cost = $5,000

f. Required Work

1. Deep Plowing for Elimination of Wild Rice 530 Ha.
Repuires D-6 w/Wheatland Plow @ 6,000 m/hr
2 meter width plow = 12,000 m^2/hr or 1.2 ha/hr
Using 45 min/hr 8 hr day = 6 hr/day effective
6 X 1.2 ha/day 530 ha ÷ 7.2 = 74 days @ 6 days/week = 12 1/2 weeks
Need 2 D-6 size Tractor/Wheatland Plows (from Jan to June 1979 or 4 for 2 mo.)

2. A. To repair structures - Estimated need
5 m^3 concrete or 25 bags cement, 5 m^3 aggregate, 3 wheelbarrows, 6 shovels, 2 trowels.
3 man crew + mason & helper.
B. To clear and reshape 2,500 meters main canal with average x-section perimeter = 6 meters and depth of trim 15 cm or 0.15 X 6 = 0.90 m^3/m
Estimated manpower capability @ 1.6 m^3/day

f. Required Work

1. Deep plowing for elimination of wild rice 540 ha.
   Requires D-6 w/Wheatland Plow at 6,000 m/hr
   2 meter width plow = 12.00 m2/hr or 1.2 ha/hr
   Using 45 min.hr 8 hr day - 6 hr/day effective
   6 x 1.2 ha/day 530 ha ÷ 7.2 - 74 days at 6 days/week
   = 12 1/2 weeks
   Need 2 D-6 size Tractor/Wheatland Plows (from Jan to June 1979 or for 2 mo)

2. A. To repair structures - Estimated Need
   5 m3 concrete or 25 bags cement, 5 m3 aggregate, 3 wheelbarrows, 6 shovels, 2 trowels.
   3 man crew and mason & helper
   B. To clear and reshape 2,5-0 meters main canal with average x-section perimeter = 6 meters and depth of trim 15 cm or 1.15 x 6 - 0.90 m3/m
   Estimated manpower capability at 1.6 m3/day
   Must complete in 60 days; Need 38 man crew. Say 40 men plus 4 foremen and 40 shovels, 4 machettes, 8 tamping rods, 20 P.M./hoes.

3. Polder repair 10 man crew & 1 foreman for spot repairs and vegetal clearance. 10 shovels, 10 machettes, 2 tamps, 5 wheel barrows - for 2 months.

4. Main Drain - 2,000 meters at 12 meters x-section perimete and ave. 25 cm DEPTH = .25 x 12 = 3 m3/m
   3 x 2,000 = 6,000 m3; 6,000 - 1.6 = 3,750 man days.
   Complete in 2 months
   3,750 ÷ 50 - 55 man crew - 5 foremen and one (1) supervisor; 60 shovels, 6 machettes; 12 pick mattock/hoes. In 4 months, then 3,750 ÷ 100 - 38 men and 4 foremen.

5. Laterals - 3,800 meters

   A. Cleaning and shaping - 2,800 meters
   B. New Excavation - 1,000 meters
      A. .3m3/m x 2,800 = 840 m3
         A = 1.6 m2; R = 1.82; S = .001
         Then Q - 320 L/S; O.K.
      New Ex. 1.6 m3/m x 1,000 m = 1,600 m3
   A & B - 840 - 1,600 = 2,400 m3
         2,440 ÷ 1.6 = 1,520 man days.
   Need 20 men - 2 foremen for 3 months; 20 shovels, or hoe-type shovels plus 4 machettes plus 10 pick mattocks.

6. Collector Drains
   1.6 x 3,800 = 6,090; 6.090 ÷ 1.6 = 3,800 M.D.
   3,800 ÷ 78 = 49 & 5 foremen, plus 10 machettes, plus 20 pick mattock/hoe plus 50 shovels.

7. Lateral Roads - 3,800 m
   3,800 x 2 x 0.4 - 3,040 m3
   3,040 ÷ 1.6 - 1,900 man days
   1,900 ÷ 78 - 25 men and 3 foremen and 6 tampers

8. Land Levelling Survey at 25/ha - $2,500

9. Land Levelling - 100 ha at 600 m3/ha - 60,000 m3
   Estimate 50 m3/hr and 6 EFF hrs per day x/D-6 & 6 m3 scraper
   60,000 m3 ÷ 50 m3/hr 6 hr/day - 200 Tractor days
   Need 3 tractor/scrapers for 67 days or 67 ÷ 26 - 2 1/2 mo.

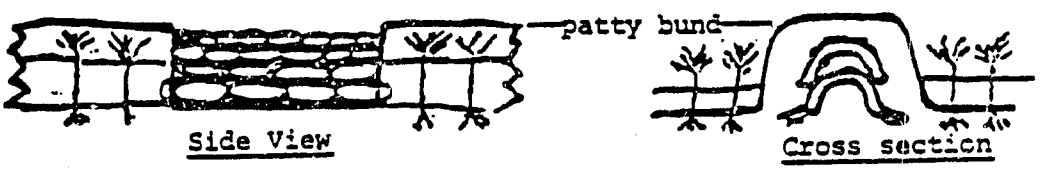
10. Paddy Rearrangement - 200 m/ha x 750 ha - 150,000 m
    150,000 ÷ 6,000 m/hr - 25 hr
    Need tractor attachment - Bund former & farmer supplied hand labor.

DETAILS FOR BANCOUMANA IRRIGATION POLDER

Notes on Paddy Irrigation of Rice

Pondage levels of water in the paddy field can be better controlled by forming interior check basins within the 0.5 hectare modular sized field bunds. These small basins are sized in accordance with the land surface topography. The more irregular or unlevel topography dictates smaller paddies, and levelled surfaces permit larger paddies. There is a recommended limit to the depth of submergence of the rice plants at various growth stages. To attain and maintain the various critical depths it is necessary to install a paddy spillway in the paddy bund. Excessive submergence during early stages of crop growth retards the tillering of the rice plant

Adjustable sandbag spillway — Adjustable bamboo spillway



Stage of Crop Growth	Recommended Height of Spillway Crest
Land Soaking and Preparation	15 cm
Transplanting to early Tillering	2-5 cm
Active Tillering	5-10 cm
Maximum Tillering to Dough Stage	15 cm
Terminal Drainage (2 weeks before harvest)	0

Control of Irrigation Water Turnouts to Fields in Rainy Season

Previous day's rainfall	Close Water Deliveries for:
5-10 mm	1 day
11-11	2 days
19-27	3 days
28-36	4 days
37-45	5 days
above 45	6 days

Demonstrations

Approach and encourage a leading farmer to allow the use of his farm as a demonstration plot within the water use section.

Establish demonstration plots on:

1. Variety-Plant varieties commonly planted by the farmer on the area together with the high yielding varieties, to form a base in comparing the yield performance.
2. Fertilizer - Try different rates of fertilizer recommendations according to results of soil analysis.
3. Plant Protection - Try pesticides on a small scale to show the farmers the effects of farm chemicals in the prevention/control of pests including the economic advantages to be derived.
4. Weeding - Compare the growth and yield performances of rice plants in weeded and unweeded paddy fields.

ANNEX B-2

PROJECT TECHNICAL DETAILS

Link Roads and Access Trails

The project will improve 398 km of existing roads and trails in the Haute Vallee so as to be passable year round and enable extra food production resulting from the project to be marketed. The roads and trails will, in addition, act to stimulate agriculture production itself and facilitate the provision of technical assistance to farmers and social services to rural farmers. 203 km will be improved to Class B standards, including laterite surfacing; the remainder will be graded but, nevertheless, will be made all-weather by installation of drainage structures.

1. Existing Conditions

There are, at present, 5 all-weather roads in or effecting the projec area:

(1) the 120 km Bamako-Guinea border road;

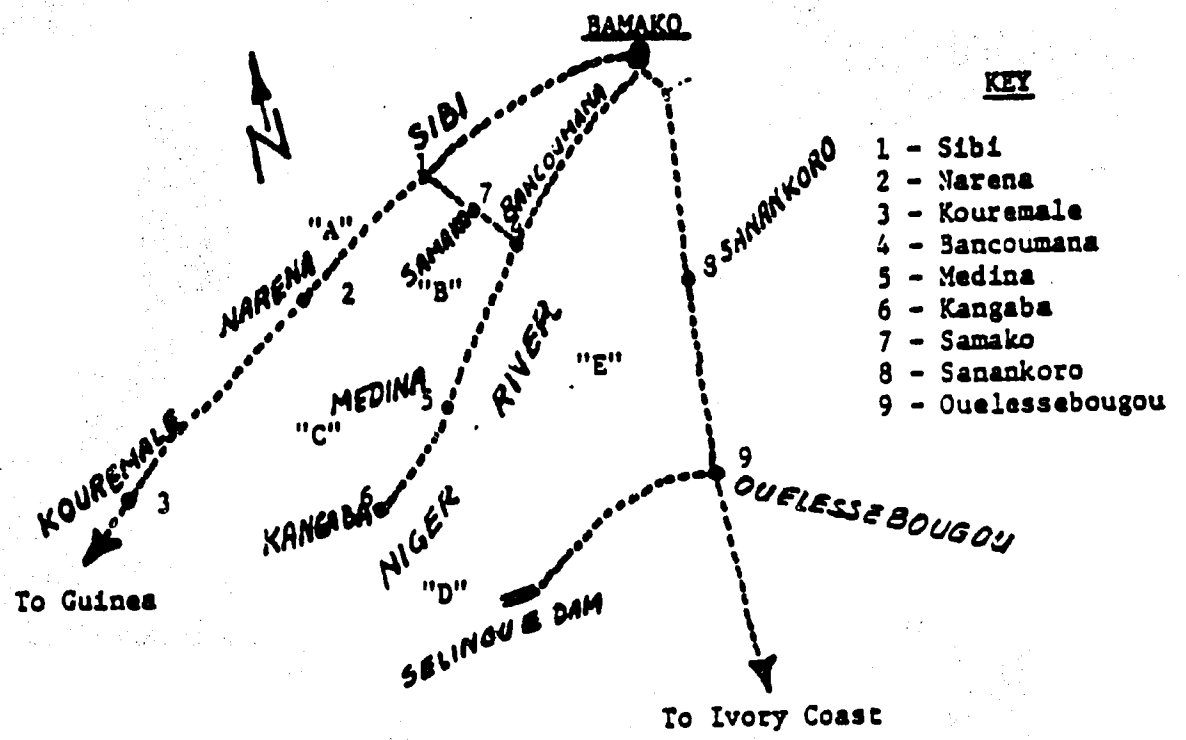
(2) the 89 km Bamako-Bancoumana-Medina-Kangaba road along the Niger River (which often becomes too muddy for passage in the rainy season);

(3) the 21 km Bancoumana-Sibi road connecting the two (which the report agreed needs regraveling and reconditioning, especially on the low-level paved fords);

(4) the asphaltic paved Bamako-Ivory Coast border road; and

(5) the new asphaltic road from Selingue Dam to Ouelessebougou under construction (part outside project area).

The table below shows these all-weather roads:



In the peninsula area ("D"), the marketing output is presently via the Kangaba farry or by small river canoes; when the Selingue Dam-Ouelessebougou road is completed, the marketing output will stretch eastward. The area east of the Niger and Sankarani rivers ("E") is presently provided transportation infrastructure via an access trail from Bamako southward on the east side of the river to Kourouba, where the two rivers meet. At this point, the trail swings eastward and connects with Ouelessebougou. This trail is above the flood plain, but is still not always passable in the rainy season.

The road pictured alongside the west side of the Niger River is in the flood zone; during the rainy season (starting usually in late June and ending sometime in October) the road becomes too muddy below Kangaba for passage;

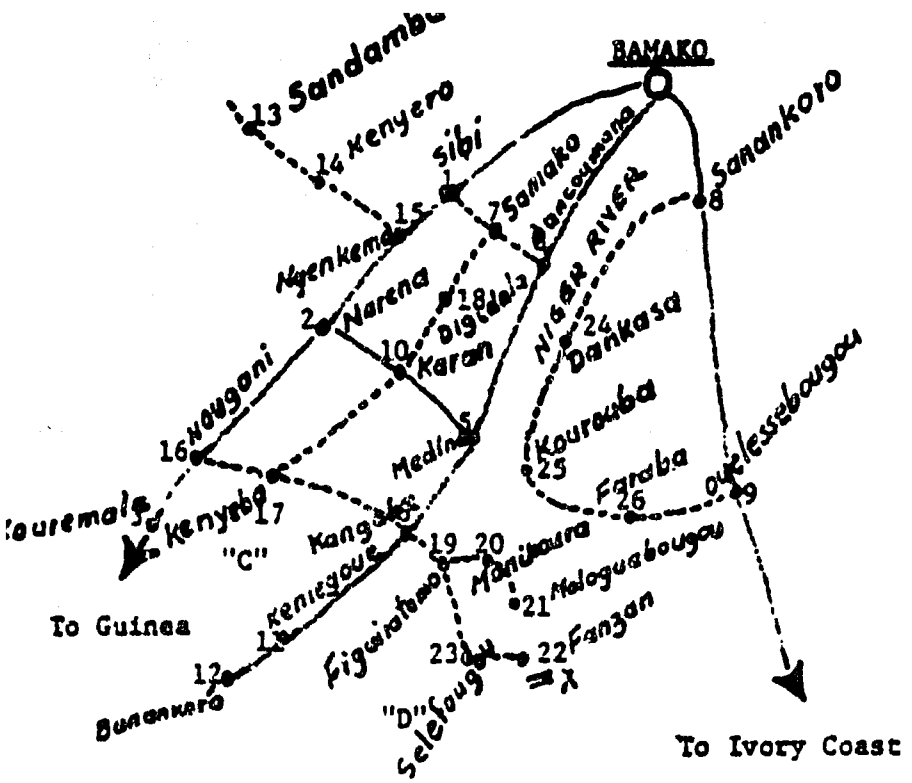
between Bancoumana and Kangaba the road is somewhat better but not always passable when the river is at its highest level because it, too, passes through marshland.

Remaining roads are mostly bush tracks which cannot be used during the rainy season because of poor surfacing and difficult stream crossings. The limiting factor is water flowing in fords and the time necessary for these trails to dry out after a rain. While the villagers open them up in the dry season, most of them are unsuitable not only for trucks but for Land Rovers as well. Scraping of these trails would enable them to be used by oxen-drawn carts and pedestrians to move farm output to pick-up points on the all-weather roads.

When interviewed by the project paper team, villagers almost uniformly put better trails and roads on their list of top priorities. On the west side of the river, the problem is marsh in the lowlands and stream crossings in the upland areas. It only takes several bad stream crossings to make a trail impassable during the rainy season, and there are frequently many such crossings. As a result, the principal food products exported outside the area tend to be from only those farmers along the all-weather roads. There are numerous collection points along these roads where government marketing agencies (i.e. SOMIEX, CMDT, OPAN, etc.) pick up the produce.

2. <u>FAO/IBRD and Interim Report Proposals</u>

Because of the conditions of these roads, both the FAO/IBRD and Interim Reports proposed road programs, which were almost identical. The IR proposed 324 km of roads; the table below shows that structure:



KEY

10 - Karan
11 - Keniegoné
12 - Bananokoro
13 - Sandanba
14 - Kenyero
15 - Nyenkema
16 - Nougani
17 - Kenyeba
18 - Digidala
19 - Figuiratomo
20 - Manindoura
21 - Mologuebougou
22 - Fanzan
23 - Selefougou
24 - Dankasa
25 - Kourouba
26 - Faraba

The sections from Kangaba (6) to Banankoro (12) and Medina (5) to Narena (2) were to be financed by the IBRD at the time of the writing of the Interim Report; the IBRD no longer intends to finance these sections -- totaling 83 km. Food produced in peninsula area "D" was to be ferried across the river and trucked westward to Nougani (16) and then on to Bamako.

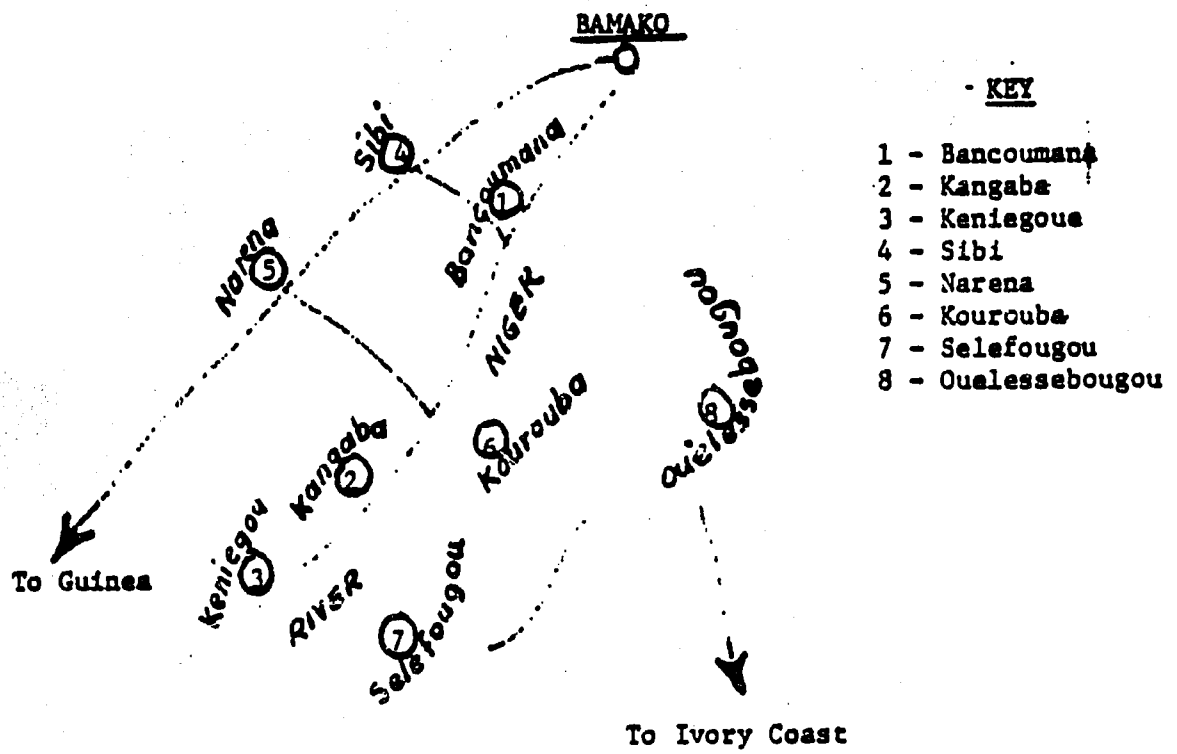
While this plan seems logical in that it touches most of the area (except the lower parts of region "C"), there are some significant problems or oversights in the Interim Report which together require a redesigning of the plan. The most significant oversight is that the report leaves out entirely the new asphalt road from Ouelessebougou (9) to Selingue Dam (marked "X" on the above diagram). As a result, all of the food produced in the peninsula area "D" should naturally be evacuated on this road rather than ferried across the river and trucked out on the west side. It also

means (a) that 18 km of the Kourouba (25)-Ouelessebougou road (9) is unnecessary and (b) that the Dankasa (24)-Sanankoro (8) section is not critical

Second, despite the FAO/IBRD draft report's statement that stream crossi make the trails unpassable during the rainy season, the Kenyeba (17)-Samako (7) road cuts across numerous streams flowing eastward and generally perpendicular into the Niger River.

There are two additional problems not addressed by the Interim Report road proposal. The most populated area outside Kangaba is Digidala (18) and Samako (7) and Bancoumana (4), but no improvement in the Bancoumana-Samako-Sibi (1) road is planned even though the FAO/IBRD report noted the need for regraveling and reconditioning. Moreover, almost all of the approximately 2,000 tons of paddy from the Bancoumana polder will have to be trucked out to Bamako (the polder also needs easy access to realize its showpiece potential). Second, there is no road proposed to connect the southern part of "C" with the Bamako-Guinea border road, which is necessary because while the Kangaba (6)-Banankoro (12) road will be improved, it cannot be made all-weather because of flooding from the Niger River (which is still rising when the harvest season begins).

Finally, there has been a significant change since the Interim Report — Animal Traction/Credit Centers have been added to the project. They are being located as follows:



An animal traction center at "6" makes the Dankasa-Sanandoro road less critical because with one of these centers in Kourouba, farmers in the Dankasa area will have an incentive to go to Kourouba rather than to Sanankoro, and truckers will prefer the fact that all but 35 km of the road from Bamako to Kourouba will be asphalted. The building of the road to Selingue Dam has an additional impact on road selection in the peninsula area. Rather than trucking foods on the ferry to Kangaba, farmers and truckers will pass through Selefougou to Selingue Dam, and with one of these schools in the middle of the peninsula (Selefougou), farmers will need better access to this village.

3. Criteria for Road/Trail Selection

The criteria used for road selection in the Interim Report (IR) were population served and market produce. To this are being added three others:

(1) population served;

(2) market production;

(3) existing road structure;

(4) geographical considerations (stream avoidance and river flooding); and,

(5) location of animal traction/credit centers.

4. Proposed changes in Road/Trail Component

With these criteria and the problems of the Interim Report road proposal in mind, the following changes have been made:

1 - one trail in the peninsula area (D) totaling 17 km has been eliminated and 3 trails totaling 49 km added (all lead to Selefougou) so as to permit evacuation eastward over Selingue Dam-Ouelessebougou (9) paved road and easy access to the Selefougou farm service center;

2 - 18 km of the Kourouba-Ouelessebougou road has been eliminated because it is already being asphalt paved;

3 - the 50 km Dankasa (24)-Sanankoro (27) road has been eliminated as no longer essential;

4 - the 36 km Kenyeba (17)-Karan (10)-Digidala (18) trail has been eliminated as crossing too many streams;

5 - two short access trails totaling . km leading into Digidala (18) have been added because of its populous character and the Somono-Bancoumana (4)-Sibi (1) road included for improvement because it is in need of repair and because of the polders' importance (with the Digidala-Samako trail being retained so as to connect thereto); and

6 - the existing 31 km trail connecting Keniegoue and Kouremale (3) has been added for improvement to ensure access of farmers and truckers in the southern area of "C" to the Bamako-Guinea border during the rainy season and the river flood stage period.

Retained are the following trails and roads:

1 - the 40 km Niger River-Kangaba-Nougani connecting road;

2 - the 11 km Digidala-Samako trail;

3 - the 42 km Sandanba-Nyenkema trail;

4 - 58 km of the Dankasa-Ouelessebougou road (retaining the 3 km road from Dankasa to Makono, with the 18 km Sankama-Ouelessebougou portion deleted);

5 - 40 km Kangaba-Banankoro road (originally planned for IBRD financing); and

6 - 43 km Medina-Karan-Narena trail.

Broken down into the 8 resulting component parts, the proposed trail and road program does not appear such a significant departure from the Interim Report (IR):

(1) Sandanba-Nyenkema trail (proposed in IR);

(2) Dankasa-Sankama road (proposed in IR, including the 3 km Dankasa-Makono leg);

(3) Digidala-Samako trail (proposed in IR) plus upgrading of Bancoumana-Sibi road (suggested by FAO/IBRD draft report);

(4) Niger River-Kangaba-Nougani connecting road (proposed by IR);

(5) Keniegoue-Kouremale connecting trail (not previously proposed);

(6) 100 km of trails and roads in Peninsula area ("D"), all of which lead into Selefougou -- expanded to improve access to the proposed farm service center in Selefougou and permit eastward evacuation over Selingue Dam.

(7) 40 km road from Kenyeba to Banankoro (IR proposed for IBRD financing); and

(8) 43 km Medina-Karan-Narena trail (IR proposed for IBRD financing).

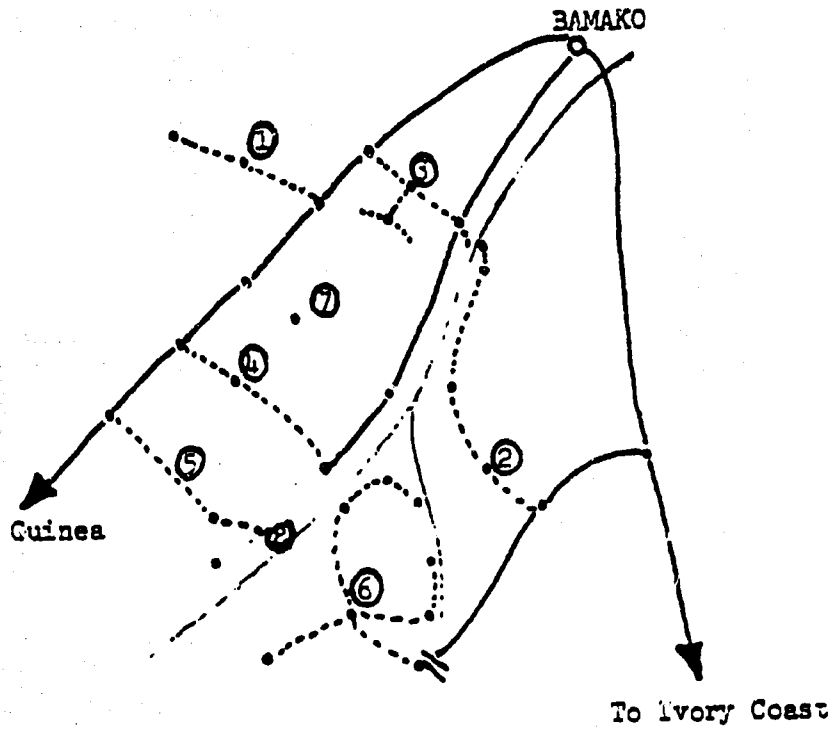
The link roads and access trails proposed for construction are listed in the table below. Cost figures are shown only for roads and trails proposed for AID funding under this project.

	Length (kms)	Type	Cost - $ 1/
1. Area West of Niger			
Sandanba-Kenyero	30	AT	69,000
Kenyero-Nyenkema	12	AT	27,600
Keniegoue-Kafoulate	11	AT	25,300
Kofoulate-Kouremale	20	AT	46,000
Niger R. - Kangaba	2	LR	26,000
Kangaba-Kenyeba	27	LR	351,000
Keneyeba-Nougani	11	LR	143,000
Nyame-Digidala	4	AT	92,000
Gwansolo-Digidala	3	AT	6,900
Digidala-Samako	11	AT	69,000
Bankoumana-Somono	5	LR	273,000
Bankoumana-Sibi	21	LR	273,000
Kangaba-Banankoro	40	LR	520,000
Medina-Karan	25	AT	57,500
Karan-Narena	18	AT	41,000
		Sub-total	1,676,200

1/ Construction costs include labor and machine operation only. They do not include costs for equipment acquisition or spare parts.

Section	Length (km)	Type	Cost $
2. Peninsula area			
Sanankoro-Selafougou	17	AT	39,100
Maninkoura-Figuiratomo	15	AT	34,500
Figuriratomo-Selafougou	22	LR	286,000
Selafougou-Selinkenyi	17	LR	221,000
Kotouba-Fanzan	15	AT	34,000
Fanzan-Selafougou	14	AT	32,200
		Sub Total	647,300
3. Area East of Niger & Sankarani			
Makono-Dankosa	3	LR	35,000
Dankosa-Kourouba	20	LR	260,000
Kourouba-Faraba	21	LR	273,000
Faraba-Sankama	14	LR	182,000
		Sub Total	750,000
		GRAND TOTAL	3,073,500
			or $3,074,000

Structurally, the proposal appears as follows:



5. Justification of Proposed Changes.

Components 1-4 have already been justified in the IR on a population-tonnage marketing basis and, contrary to its expectations, the recently completed census does not allow any refinements because population data are not given at the village level (hence, only the population of Kangaba can be updated). Moreover, the 7 km of trails for Digidala are equally justified on a population/tonnage basis --- and the IR shows the Digidala-Samako route to have the highest population per km.

Each of these 8 road and trail groupings are justified on the previously mentioned criteria. First, regarding the 42 km Sandanba-Kenyero-Nyenkema trail, it was justified in the IR on grounds of population served and produce marketed. There is no better statistical evidence to contradict or refine this judgement, so it still stands. Moreover, the fact that it is an existing

trail is evidence of the present direction of marketing activity in the area In addition, this trail will enable farm families in the area to reach the animal traction/credit center to be located in Sibi.

Second, as for the shortened route connecting Dankasa and Kourouba with Ouelessebougou, the grounds in the IR for the Kourouba-Ouelessebougou route are very strong (189 persons per km and 2,300 tons food marketed). The grounds for the Dankasa-Kourouba road are enhanced by this new scheme because some of the projected marketing on the eliminated Dankasa-Sanankoro exit road will be transferred to the Dankasa-Ouelessebougou exit because it will be a much better road and because two animal traction schools (at Kourouba and Ouelessebougou) are planned on this exit. Also the fact that it is an existing trail is evidence that this plan coordinates with existing marketing patterns.

Third, regarding the 11 km Digidala-Samako access trail, its population served (300 persons/km) was the highest of all roads proposed by the IR. Because of this area's high population density, two short existing trails totaling 7 km serving the populated villages of Gwansolo and Nyame, are proposed for upgrading. This connects with an animal traction/credit center in Bancoumana as well as that on the Bamako-Guinea border road at Sibi.

The Somono-Bancoumana-Sibi road is proposed for upgrading because it is in disrepair and because the project has been redesigned with a major focus on Bancoumana --- a proposed animal traction credit center and the polder are both to be located in Bancoumana and Somono, respectively. This center seems unlikely to realize its great potential if all vehicles must pass by way of the road alongside the Niger River, which can become almost impassable in the rainy season --- the time when OHV will be at its busiest. Merely repairing the Bamako-Bancoumana road would not avoid the problem of river flooding because it passes over marshland, and the Bancoumana-Sibi road does not cross many streams. Finally,

OHV statistics show that the two most populated ZERs in the Haute Vallee are Sibi and Bancoumana.

Fourth, as for the Niger River-Kangaba-Nougani road (included in the IR proposal), Kangaba is the largest town in the region -- the population served per km between it and Kenyeba (204 persons/km) is the third highest in the IR, and even without the food from the peninsula being marketed westward, the tonnage shipped through Kenyeba will not be insignificant. The IR proposed a completely new road, connecting Kenyeba and Karan (so as to hook up with the IBRD financed Karan-Narena road), which would have to pass over three streams (and is being dropped for this reason). Therefore, the significant produce expected to pass over this route can be expected to be diverted in large part to the Kenyeba-Nougani exit. A credit office will be located in Narena, and the Kenyeba-Nougani-Narena link road is no longer than the Kenyeba-Karan-Narena route and more surely all-weather. Moreover, the Karan area is being provided for in this project by upgrading the Medina-Karan-Narena road.

Fifth, the only entirely new trail proposal is the upgrading of the existing Keniegoue-Kafoulate-Kouremale trail. An animal traction school will be constructed in Keniegoue. A basic reason for improving this route stems from topographical considerations -- even though the Keniegoue-Kangaba trail is scheduled for improvement, passage will not be guaranteed during the rainy season and river flood stage because the route passes through considerable flood zone marsh. It would be too extremely costly to raise the level of this road sufficiently high to make it completely all-weather. The only way an exit can be guaranteed for farmers, truckers and the animal traction program in this area is to pass upland to the all-weather Bamako road -- and no stream crossings are required. Moreover, this route would serve four significant population centers -- Kafoulate, Keniegoue, Banankoro and Diolafoundou. Also the fact that it is an existing trail indicates produce is already moving out this way. Finally, because it is only a trail and thus costs $2,300/km compared to $13,800 for link roads, the addition is not costly.

Sixth, the road structure in the peninsula zone has been restructed somewhat for two principal reasons — to permit food evacuation over Selingue Dam and provide easy access to the animal traction/credit center in Selefougou located directly in the center of the peninsula. Three of the four peninsula trails in the IR are being retained:

1) Maninkoura - Niger River (22 km)

2) Niger River - Fanzan (14 km)

What is being added are:

1) Selefougou - Sanankoro (17 km)

2) Selefougou - Selingue Dam (17 km)

3) Fanzan - Kotouba (15 km)

What is being dropped is the 17 km Maninkoura - Mologuebougou trail which does not now exist and which is unnecessary since Mologuebougou is on the existing Katouba - Fanzan - Selefougou trail.

The justification for the Selingue Dam - Selefougou route is obvious — to permit evacuation eastward. As for the Fanzan - Kotouba trail, it was included in the FAO/IBRD draft report but dropped from the IR because the forecasted tonnage and population served were too small. Now, however, with the Mologuebougou trail eliminated, at least half of the produce projected for this trail will move out via the Kotouba - Fanzan trail and the population effected will be more than projected as well. Moreover, the dam will open up significant new irrigated agricultural possibilities below the dam; the Fanzan - Kotouba road is programmed to evacuate the significant increase in irrigated food production resulting therefrom. So the projected tonnage in this road (650 tons compared to 750 tons in the IR for the Maninkoura - Mologuebougou route) is very conservative. It is also an existing trail, crosses no streams or marshes, and connects easily with the Selefougou farm service center via Fanzan.

As for the 17 km Selefougou - Sanankoro connecting trail, the FAO/IBRD draft report recommended its inclusion but the IR eliminated it for the same two reasons --- population served and tonnage marketing. This is the one trail where the IR's technique of estimating population served (by estimating the population living within 3 km of the road) seems inappropriate because the justification of this trail stems primarily from the fact that it will serve the entire lower section of the peninsula and not just the population alongside the road. The southern portion of the peninsula is separated from the rest of the peninsula by a continuous marsh stretching from the Niger River to the border. The exit point for marketed produce is at Sanankoro; produce not passing this way has only Guinea as an outlet. Again, it is an existing trail, involves no stream crossing, and provides access to the Selefougou traction/credit center and Selingue Dam exit for all farmers and produce from the peninsula's southern portion. So the population served and marketed produce (estimated by the IR to be only 1,000 persons and 250 tons produce) are conservatively estimated to be 80% higher than what the IR's formula shows.

As for the three peninsula trails in the IR to be retained, they are all existing trails, cross no streams and feed into the Selefougou farm center. Moreover, the produce moving on the Fanzan - Selefougou trail will be considerably more than the 350 tons estimated in the IR not only because of the re-inclusion of the Katouba - Fanzan link (and the elimination of the Maninkoura - Mologuebougou exit trail) but also because irrigated food production there is expected to show spectacular increases. The same is true of the Figuiratomo (Niger Ferry) - Selefougou trail --- it will receive most of the 800 tons expected from the Maninkoura - Figuiratomo trail (which will more than off-set the 350 tons forecasted in the IR to move westward to Figuiratomo from Fanzan via Selefougou.

Two segments of the road/trail program were originally to be financed by the IBRD -- the 40 km road on down to Banankoro, and the Medina-Karan-Narena connecting trail. These are now incorporated into the project. The Medina-Karan-Narena trail was to be a Class B road under the IBRD program, but the tonnage which can be expected to pass over it does not seem to justify such treatment. The Banankoro-Kangaba stretch, however, does seem to warrant Class B treatment both from a population served and tonnage basis. An animal traction school will be established eventually in Keniegoue, and the health program will extend southward down to the existing dispensary at Banankoro. And, eventually, a credit office will be hooked up with the animal traction school. So project activities, too, suggest a strong need for improving this route.

Summary Conclusion Regarding Criteria of Road Selection

While the use of 5 criteria to justify the selection of the trails and roads is clearly more complicated than calculating merely population densities and estimated market produce, it is clear that the simplier method can result in significant oversights. For this reason, the complete picture can never be presented in a simple chart with figures justifying each choice. From the above discussion, certain points stand out. First, all roads are designed to provide easy access to both the animal traction/credit centers and the region's two major highways -- the Bamako-Guinea border road and the Bamako-Ivory Coast border road. So there is structural logic to the proposed scheme.

Second, unlike the IR proposal, no new roads or trails are proposed -- all trails and roads follow existing marketing patterns. This fact gives

added guarantee that the proposed roads will not conflict with farmers' present marketing behavior. Indeed, the fact that certain roads appeared to be more used than others was a factor given considerable weight.

Third, topographical considerations have been given their due weight. Several trials proposed by the IR have been eliminated in part on the basis that they cross too many streams, which would make them unpassable in the rainy season. A second significant topographical consideration concerns marshes -- some roads (including the ones improved or to be improved) pass through marshland next to the river -- these sections of the roads cannot be made all-weather without great cost.

Finally, the IR road selection criteria have been retained and, where appropriate, revised in the following table:

FROM	TO	TYPE	LENGTH (km)	POPULATION SERVED	POPULATION PER km	MARKET PRODUCTION TONS
1. [illegible] f Niger						
[illegible]	Kenyero	T	12	3,000	250	1,300
Kenyero	[illegible]andanba	T	30	3,000	100	650
[illegible]	[illegible]amako	T	10	3,000	300	650
[illegible]	[illegible]vansolo	T	3	900	300	200
[illegible]	[illegible]yama	T	4	1,200	300	200
[illegible]	[illegible]ibi	R	21	6,000	285	3,650
[illegible]	[illegible]ncoumana	R	5	500	100	2,000
[illegible]	Niger River	R	2	—	—	300
[illegible]	[illegible]ayeba	R	27	5,500	204	1,800
[illegible]	[illegible]ogani	R	11	1,400	127	2,000
[illegible]	[illegible]foulate	T	11	2,500	227	500
[illegible]	[illegible]uremale	T	20	1,500	75	900
[illegible]	[illegible]an	T	25	2,500	100	700
[illegible]	[illegible]ma	T	18	1,200	67	1,000
[illegible]	[illegible]oro	R	40	7,000	175	1,500
2. [illegible] Niger						
[illegible]	[illegible]sa	R	3	500	166	200
[illegible]	[illegible]ba	R	21	3,000 1/	137 1/	675 1/
[illegible]	[illegible]a	R	35	6,300	186	2,300
3. [illegible]						
[illegible]	[illegible]atomo	T	15	3,400	155	300
[illegible]	[illegible]ugou	R	22	2,300	158	1,750
[illegible]	[illegible]	T	15	1,600	107 2/	650
[illegible]	[illegible]ougou	T	14	1,300	107	950
[illegible]	[illegible]ougou	T	17	1,300 3/	206 3/	450 3/
[illegible]	[illegible]ougou	R	17	1,300	88	3,800

T = Trail
R = Road

1/ This exceeds IR estimates by 50% because OHV figures show that the village of Dankasa alone had a population of 1,977 in 1972, and a population in the ZER of 9,777.

2/ Average population per km of Manankoura-Kotouba-Fanzan link, as estimated by FAO/IBRD draft report.

3/ This estimate is, as explained, 80% higher than the IR estimate, which fails to take into consideration traffic from the southern peninsula area.

(SOURCE: AID/[illegible] estimates combined with FAO/IBRD Draft Report estimates.)

This table shows that the 398 km of proposed access trails and roads would directly serve an estimated 61,000 persons, or about 30% of the total rural population of the project area. The number of inhabitants served per km of road ranges from 67 to 300 persons with an overall average of about 153 persons per km.

At the project's 5th year midway point, about 35% more market production is expected over the Selingue Dam than what the IR predicted over the ferry at PY 5, because the peninsula trails are being lengthened. To the northeast of the Niger, slightly more traffic can be expected on the Dankasa-Ouelessebougou route because of the elimination of the Dankasa-Sanankoro section. And while the Kangaba-Kenyeba-Nougani exit will have less than half as much traffic as the IR predicted, the Kenyeba-Nougani section will have over four times more traffic because of the elimination of the Kenyeba-Karan section. On none of the roads does the population effected/market production appear too little as to warrant elimination. This is not surprising since the only entirely new trail proposed is the Keniegoue-Kafoulate-Kouremale exit route (in addition to the Somono-Bancoumana-Sibi road). The table's food production estimates conform with the previous food marketing projections. Total food produce evacuated out of the area on the 8 exit roads and trails is shown to be 15,150 tons, or about 80% of the estimated food produce (not cotton) marketed in project year 5. Much of the remainder of the marketing will pass on the Dankasa-Sanankoro and the Bancoumana-Bamako roads. So on all bases, the proposed road and trail component appears rationally justified.

6. Design Criteria and Justification

In terms of proposed design standards, the IR proposed that all roads have laterite surfacing, with slightly less depth for Class C[1/] roads. The

[1/] "Type C: All-weather access with the exception of short closures when fords are [illegible]erged; 6 meter cleared width with 4 meter roadway formation surfaced wi[illegible]erite to a depth of 10 to 13 cm over an average of 50 percent of road leng[illegible] draining provided by lateral ditches, hardcore aggregate in water courses, and paved fords and culverts where necessary." Interim Report, p. 25.

present proposal reduces this to 51% (203 km); the trails will simply be cl[illegible] & graded -- at a cost of 1/6 of that of the roads -- and have a maximum grading of 20% (15% for the roads). Their total inflated cost with contingencies is only about $449,000. As for type B[1/] grading, the present proposal calls for the Nougani-Kangaba-Selefougou-Selingue Dam route, which connects the Guinea border road with the Ivory Coast border road, to have such grading and laterite surfacing. In addition, the 26 km Somono-Bancoumana-Sibi road, which is already all-weather, will have the same type of surfacing and grading, as well as the 59 km Makono-Dankasa-Kourouba road connecting with the Selingue Dam road, and the 40 km Kangaba-Barankoro stretch.

(a) Link Road Design Criteria (See appendix for typical cross section)

The link roads will be laterite topped for the entire length of road constructed. Clearing width will be 15 meters minimum and the necessary cuts and fills shall be made so that the maximum grade will normally be no greater than 15%. The road shall be surfaced with no less than 0.3 meters above the natural ground. The roadway shall have shoulders on each side and ditches to intercept sheet flow and divert to culverts installed for cross drainage.

This class of road has a load-carrying capacity of less than 3,000 equivalent 9 ton single-axel dual-wheel load operations.[2/] Therefore since most of these roads usually have less than 3 vehicles per day, usually Land Rover type and only one truck per week carrying a full load (10 tons) the expected life for this road would be 50 operations per year for trucks plus

---

1/ "Type B: All-weather access; 12 meter cleared width with 4.5 meter roadway formation surfaced with laterite to a depth of 13 to 15 cm; water courses crossed mainly by culverts and small bridges but also by paved fords on some non-perennial streams." Interim Report, p. 23.

2/ Department of Army Technical Manual TM 5-330 ch 10 Road Design.

0.05 x 3 x 365 or 54 operations for small vehicles, less than 29 years based on these equivalent operations. If agricultural marketing in the Haute Vallee area is doubled from the present 17,000 ton level (project 10 year goal), the expected life of this class of road would be less than 15 years.

(b) Access Trail Design Criteria (See appendix for typical cross section)

The term access trail used in relation to this project is no more than an improved track, that is, a dozer is utilized to clear the trail to a minimum width of 10 meters and make the necessary cuts and fills to provide a trail with grades normally no steeper than 20 percent. The trail shall also be graded to provide roadway surface drainage and side ditches to intercept sheet flow and divert to culverts installed for cross drainage.

The trafficability of these trails is generally considered very good[1/] in dry weather because of the general nature of the soil in Haute Vallee. The occurence of soil types are: Alluviums (20%)[2/] sandy flood plain soils (2%), highly mineralized Colluviums Lithosols and Regosols (65%), etc.

(c) Selection Criteria

The justification is solely in terms of expected tonnage traffic, and the previous table shows that these will be the most used routes. As for the Dankasa-Kourouba leg, tonnage on this leg is derived from IBRD estimates and is underestimated since traffic was expected to pass northward from Dankasa. With a good road connection to Kourouba and Ouelessebougou and no improvement on the northward bound trail, traffic can be expected to shift more to the Ouelessebougou exit. Moreover, in the FAO/IBRD draft report, this road segment was likewise scheduled to have type B laterite surfacing and grading.

1/ Surface area of the Haute Vallee covered by such soils.

2/ Department of Army Technical Manual TM 5-330 ch 9 Soil Trafficability.

As for the Kangaba-Kenyeba-Nougani exit road, the estimated traffic in the above chart is much less than that predicted in the IR because traffic from the peninsula area will be, if not nil, much less. If it has laterite surfacing and grading, truckers can be expected to prefer this route to the existing Kangaba-Bancoumana-Bamako road; so the tonnage may easily exceed that shown in the above chart.

None of the link roads should have less than 1,500 tons marketed over them by project year 5 and considerably more than that by the end of the project. The IR divided its roads at the estimated 2,000 tons mark, with roads with expected tonnage less than that receiving class C treatment, including laterite surfacing. So the present cutoff line (1,500 tons) between graded trails and class B roads with laterite surfacing and maximum 15% grading seems both reasonable and economical.

7. Sequence of Road/Trail Rehabilitation

The principle criteria for determining the sequence of road construction is the location and sequence of project activities. This suggests that the first roads and trails to be constructed should be those around Bancoumana, and then proceeding sourthward and, eventually, across into the peninsula and the east side of the river — because this will be the project's progression. However, if consideration is given first to those roads in poorest condition but not insignificant traffic, the road from Kangaba on down to Banankoro should be the first, followed by the Medina-Narena link from the Niger River Ferry to Selefougou and Selingue Dam.

For these reasons, the following sequence, over a 4-year period, is recommended:

PY 2

	R	T
Kangaba-Banankoro	40	
Madina-Narena		43
	40	43

PY 3

Sibi-Bancoumana-Somono	26	
Nyame-Digidala-Gwonsolo-Samako		18
Nougani-Kanoyeba + 13 km	24	
Sandanba-Nyekoma		42
	50	60

PY 4

Kaneyeba-Niger R.-Figuiratomo-Senlinkenyi-(Selingue Dam)	55	
Kanieqoue-Kouremali		31
Sanakoro-Selefougou		17
	55	48

PY 5

Faguiratomo-Maninkoura		15
Koutouba-Fanzan-Selefougo		29
Sankana-Makono	58	
	58	44

8. Inputs

The following inputs are required:

A. Construction Equipment

Item #	Quantity	Description	Cost
1.	2	Bulldozers (CAT D-6D or equal)	200,000
2.	2	Motorgraders (CAT 14-G or equal)	170,000
3.	1	Wheeled Loader (CAT 920 or equal)	65,000
4.	2	Wheeled Scrapers, elevating (CAT 613 or equal)	170,000
5.	1	Disc plow (Rome 10 x 36 or equal)	16,000
6.	1	Compactor, pneumatic, self-propelled (Hyster 530A or equal) 10/12T	30,090
7.	5	Dump trucks, 5 yd^3 capacity, diesel 30,000 GVW	150,000
8.	3	Water trucks, 4.5 m^3 capacity with pumps (1200 gals), Diesel, 30,000 GVW	90,000
9.	3	Water tanks, skid mounted (local fabrication) 2000 l.	3,300
10.	1	Mechanic's pickup truck, 1 ton Payload capacity, 4 x 4, with tools, 6200 GVW Min (see attached list), Diesel	20,000
11.	2	1 ton Payload pickup, 6200 GVW Min, 4 x 4 4 w/drive, Diesel, w/trailer hitch	18,000
12.	1	Concrete Mixer 12S (340 l.)	00
13.	10	Wheel barrows, heavy duty	00
14.	2	Water pump, 2" intake, gas driven, with hoses, screened intake, etc.	2,000
15.	1 lot	Survey equipment (see attached list)	6,000
16.	1	Fuel/lub truck, Diesel, 30,000 GVW	30,000
17.	2	Fuel tanks, skid mounted, 5000 l. (local fabrication)	5,000
18.	1	Tanker (1500 gal) truck, Diesel, 30,000 GVW	30,000
19.	1	Low bed (30 T) tractor/trailer, Diesel	45,000

Item #	Quantity	Description	Cost
20.	2	6T trailer vans (23'L)	8400
21.	5	10 man tents	5,000
22.	1	15 Kw generators, Diesel, w/cables and lighting	10,000
		Sub total	1,079,700
23.		Spare parts for items 1-4 with delivery plus 5-year contract for 25%	242,000
		Spare parts for remainder of vehicles, 20%	82,800
		TOTAL	1,404,500
		Rationale for 40% spare parts on items 1-4 - their estimated life according to Travaux Publics is 10 yrs, but spare parts during period far exceeds 20%.	

B. Shop Equipment (including maintenance facility prepa preparation) 40,000

C. Pick-up truck for Survey 10,000

112

D. Maintenance Equipment

Item #	Quantity	Description	Cost
1.	2	Motor graders - 12 G - CAT	150,000
2.	2	Tow type water tanks 600 gal (2000 l)	8,000
3.	2	Water pump, 2" intake w/hose and screened intakes	2,000
4.	2	Dump trucks, Diesel (5 cyds) 30,000 GVW	60,000
5.	2	Tractor (Industrial) w/attachments - 65 HP	35,000
6.	2	Wobble wheel tyred rollers, 6-8 tons, w/trailer	20,000
7.	2	1 T payload 4-wheel drive Diesel pickup, w/trailer hitch	18,000
		Sub total	293,000
8.		Spare parts, insurance & freight 20%	58,600
		TOTAL.....	351,600
		say	352,000

AFR/DR/ENGR/AT:a:7/20/78

192
191

E. Surveying Equipment

Item No.	Description	Qty.	Unit Cost	Extension
1.	Transit - Level combo w/tripod, (Weld T05 or equal)	1	3,000	3,000
2.	Hand level (Abney or equal)	2	15	30
3.	Level rod metric (4 meter)	2	150	300
4.	Tape steel, 50 m.	2	100	200
5.	Tape steel, 20 m.	2	50	100
6.	Tapes w/case, 30 m., woven metalic	2	45	90
7.	Refil woven tape for 8	4	30	120
8.	Range poles	5	10	50
9.	Plumb bobs, 12 oz.	3	10	30
10.	Tools - 8 sledge hammers, 2 axes, 3 machetes, 1 sharpening stone, 2 shovels	1 lot	300	300

TOTAL..... $4,220

Say $5,000

F. Staff

Road construction (under aegis of Ministry of Public Works)

11 Equipment operators/drivers

1 Mechanic

1 Assistant mechanic

1 Foreman, road construction

20 Laborers and watchmen

1 Survey crew

9. Construction and Maintenance

The above mentioned equipment will be given to OHV which will contract with the Ministry of Transport and Public Works (MTPW) and make equipment available to construct the roads and trails. The construction itself will be done by the Division of Travaux Neuf of the Direction Nationale de l'Infrastructure des Transport of said Ministry with the assistance of a U.S. civil engineering expatriot advisor attached to the MTPW. The Direction will also have responsibility for maintaining the equipment since it has the equipment, personnel and the experience of doing such. This is the same arrangement being made in Operation Mil Mopti, and GRM agreement to such — a condition precedent in this project — should present no problem.

The Division of Technical Operations with the assistance of the U.S. engineering advisor will provide the final engineering design and supervise the construction including inspection, measurement, interpretation of plans and specifications, interpretation of contract provisions, approval of mater workmanship, work progress and satisfactory completion. Questions on major changes, the Division of Technical Operations will discuss with the OHV and USAID.

Contracts for the construction of the link roads and access trails are not suitable for international competitive bidding because of the project component size and minimal scope of construction.

And AID will approve GAM's final engineering design before dispersement of operating funds.

The same Ministry responsible for the construction work is also legally responsible for maintaining all roads in Mali. The Ministry is quite willing to do such but says funding is an absolute requirement thereof. So, to insure the serviceability of the trails and roads, OHV will contract with the same Ministry to maintain the roads/trails/equipment. General labor for both construction/maintenance will be the villagers which already clear the trails. The great advantage of this approach is that it relieves OHV from having to maintain an equipment maintenance center and training of personnel in maintenance.

10. Construction Costs

1. Operating Cost for Equipment

a. Labor

Equipment Operators -
70,000 FM/mo. x 12 mo/yr ÷ 1,000 hr/yr = 840 FM/hr or $1.75

Common Labor -
15,000 FM/mo. x 12 mo/yr ÷ 1,000 hr/yr = 180 MF/hr or $0.40/hr

b. Fuel

140 HP (Dozer and Lg Truck) 23.1 l/hr x 130/l = 3,000 FM/hr or $6.20

120 HP (Grader/Compactor/Truck) 16.1 l/m x 130/l - 2,100 FM/hr or $4.35

Lubricants, filters, grease and hydraulic oils are taken at twice the approximate hourly cost U.S. plus 25% added because of the dust.

140 HP = $0.60/hr
120 HP = $0.50/hr

(Tire life for motor grader is assumed at 4,000 hrs because of sun, heat, etc.)

c. Repairs

Repair factor x delivered price - 1,000 = 140 HP $4.35/hr

120 HP $3.25/hr

2. Production Rates - Access Trails

a. Land clearing[1/]

Width of cut 3 m speed 2 km/hr = 0.3 ha/hr D6 Dozer

100,000 m^2/km or 2 hr/km x use[2/] = 2.67 hr/km

b. Grading

Cut ditches and slope for drainage width of cut 1.5 m speed

2 km/hr, 0.25 ha/hr = 0.5 ha/km or 2 hr/km x use = 2.67 hr/km

c. Ripping - loosening

For a D6 ripping sandstone is 250 cm/hr quantity per average

1 in Hauts Vallee is estimated at 0.3 m deep x 5 m width and

[illegible]% of length or 300 m^3, time is 300 - 250 = 1.2 hr x use = 1.6 hr.

3. Construction Cost per km of Access Trail

a.	140 HP Dozer	16.64 hr	Operator	$1.75	29.12
			fuel	$6.20	103.17
			lub etc.	$0.60	9.98
			repairs	$ 4.35	72.38
b.	120 HP Grader	2.67	operator	$1.74	4.67
			fuel	$4135	11.02

1/ Catepillar performance handbook, 9th edition

2/ A 45 minute hour is assumed.

	lub etc.	$0.50	1.34
	repairs	$3.25	8.38
	tires	.80	2.14
c. Labor	80 hr	$0.40	$32.00
d. Structures/culverts	4 ea.	$150.00	600.00
		Sub total	510.00
e. Supervision and support equipment			87.40
	Sub total		961.50
f. Contingency			149.00
		Total	1,111.50
		at 50% efficiency	2,223.00
		Total	$2,300.00/km

4. Production rates - Link Roads

a. Clearing[1]

Width of cut 3 m, speed 2 km/hr = .5 ha/hr D6 Dozer

16,000 m^2 [2] km or 3.2 hr/km

140 HP Dozer x use = 4.27 hr/km

b. Earthworks

Dozing cuts, fills and 0.3 meter base[2]

Average distance 80 m or 100 m^3

Bank quantity per km 0.3 x 7.5 x 1000 = 2,250 plus 25% swell = 2,813 m^3

1/ Ibid

2/ Ibid

Time/km 2815 - 100 = 28.15 hr/km

140 HP x use = 37.5 hr/km Dozer.

- Compacting fill 6 in. lift, 6 passes 2250 m^3 - 314 m^3/hr = 7.16 hr ; 120 HP x use - 9.6 hr/km Compactor
- Grading - ditches and subgrade [2]

Width of cut 1,5 m, speed 2 km/hr = 0.25 ha/hr

1 ha/km or 4 hr/km 120 HP x use = 5/3 hr/km Grader

- Ripping, loosening

140 HP Same as access trails, use 1.6 hr/km

- Water Truck (10,000 liters)

2250 m^3/km x 3400 lb/m^3 x .45 lit/lb x 5% = 170,000 lit/km

170,000 lit/km - 10,000 lit = 17 trips/km

Assume average distance to haul water from source to work site if 10 km, each truck average velocity is 30 km/hr, travel time is 40 min. Load trucks from elevated storage tank, 10 min., and discharge on fill, 20 min, or 1.17 hr/trip. Seventeen trips/km x 1.17 hr/trip = 19.32 hr/km.

120 HP Truck use[2] 26.4 hr/km

c. Laterite Surfacing

Ripping, loosening[1/]

As per access trail 250 cm/hr, 4.5 m x 0.15 m x 1000-m =

1/ IBID

Ripping, loosening (cont'd)

= 675 m^3/hr 675 - 250 = 217 hr/km

140 HP use[2] = 3.6 hr/km Dozer

Loading trucking with wheel loader with a 1 m^3 capacity bucket using below average cycle time (0.65) or 92 cycles/hr yielding 125 ton/hr or 18 truck loads per hour of 4 m^3 loose measure of 3.6 m^3/load = 6.8 ton compacted in roadway.

From above 675 m^3/km - 3.6 m^3/load = 187.5 loads.

Assume average distance of haul to be 10 km at average velocity of 30 km/hr travel time is 30 min., load time 3.25 min., unload and spread 6 min, or 0.67 hr/load, 187.5 loads/km x 0.67 hr/trip = 125.6 hr/km.

Trucking 140 HP use[2] 167,5 hr/km

675 m^3/km x 3400 m^3 - 2000 lb/ton - 125 ton/hr = 9.18 hr/km

Loading 120 HP use[2] 12.24 hr/km

For a balanced operation 13 truck/loader; if 4 trucks are used use[2] 39.8 hr/km loading

Water truck (10,000 liter)

675 m^3/km x 3400 m^3 x .45 lit/lb x 5% = 51,000 lit/km

51,000 - 10,000 = 5.1 trips/km

5.1 x 1.17 hr/trip = 6.2 hr/km

120 HP use[2] 8.0 hr/km

Compacting

675 m^3 at 314 m/hr 2.15 hr/km

Grading

Use same as earth work

120 HP 5.3 hr/km

Construction cost per km of link road

140 HP 214.5 hrs Equipment	Operator	$1.75	$375.38
	Fuel	6.20	$1,392.90
	Lub etc.	.60	128.70
	Repairs	4.35	993.08
120 HP 110.5 hrs	Operator	1.75	193.38
Equipment	Fuel	4.35	480.68
	Lub., etc.	0.50	55.25
	Repairs	3.25	359.12
	Tires	.80	88.40

Labor 100 hr	$0.40	$400.00
Structures/culverts 4 ea.	1.50	600.00
		SUB-TOTAL $4,943.89
Supervision and support equipment		494.11
		SUB-TOTAL $5,438.00
Contingency		815.00
		TOTAL $6,253.00
		@ 50% efficiency $12,506.00
		Use $13,000.00/km

The Ministry of Transport and Public Works agrees with this cost for construction of modified Class B roads in the Haute Vallee type of terrain.

10. Maintenance Costs

Discussions with Travaux Publics concerning maintenance reveal the following:

(1) That for normal maintenance an average of 2-4 km of roads or trails can be worked daily;

(2) That 16 days/month should be calculated as the number of work days per month, or 8.3 months to repair 389 km of roads and trails;

(3) That, accordingly, the work should begin each year on October 1 after the rainy season and will finish about June 10 just before the rainy season;

(4) That the most damage done to the roads occurs in November-January;

(5) That the brigade would have to consist of no less than 15 specialists (drivers, repairmen, etc.) from Travaux Publics, and 20 village laborers;

(6) That the roads and trails will have major maintenance done every 5 years, or 20%/year;

(7) That the graders and bulldozer can be expected to have a lifespan of about 10 years, while 5 years is the estimated lifespan of the trucks and all lighter vehicles.

A 1975 study by Travaux Publics suggests that the full cost/km of one ordinary repair on class B and class C roads is $120/km (inflated at 8% year x 3 yr - $151/km) and $826/km (inflated - $1,040) for complete overhaul of roads/trails. This estimate includes all overhead expenses (but free of government taxation) as well as amortization of equipment. Assuming one complete overhaul every 5 years, this would suggest a figure of $330/km or about $130,000/yr for road maintenance for 398 km.

A very detailed study in 1973 by the French of the proposed 82 km Macina-Tenenkour dirt road, which at that time was not used extensively (2 vehicles/day) concluded that the cost of maintaining the road in the present condition was $87 ($128 inflated at 8% year)/km, and that if the road were completely repaired and increased traffic resulted therefrom, road maintenance could be expected to be 20% higher ($154/km) over a 20 year period (due to wear and tear from increased traffic), with the percentage being less in the initial years but growing constantly with the increases in traffic. Amortization of equipment and all overhead costs were included in the estimate, as well as the necessity for complete road overhaul. This same study suggests that for roads having less than 35 vehicles/day, the road overhaul can be expected to occur every 10 years rather than 5 and that one annual repair is normally sufficient. For roads

with at least 50 vehicles/day the estimate was an overhaul every 6 years. (This estimate is for a road frequently flooded by the Niger River.) Accordingly, it seems that Travaux Publics' estimate of 5-year intervals for road overhaul is high for the road/trail proposal for the Haute Vallee. Accordingly, for the trails a 10-year period is a better estimate while at least 6 years is a better estimate for the roads, or an average of one overhaul every 8 years. (Note: number of km in roads and trails is about even.)

At $154/km, the French estimate comes to about $61,000/year for 398 km of roads and trails. However, the following table suggests that the cost to OHV of ordinary upkeep (no complete overhaul every 6-10 years) for 398 km of road will be on the order of $50,000/year, not including equipment amortization:

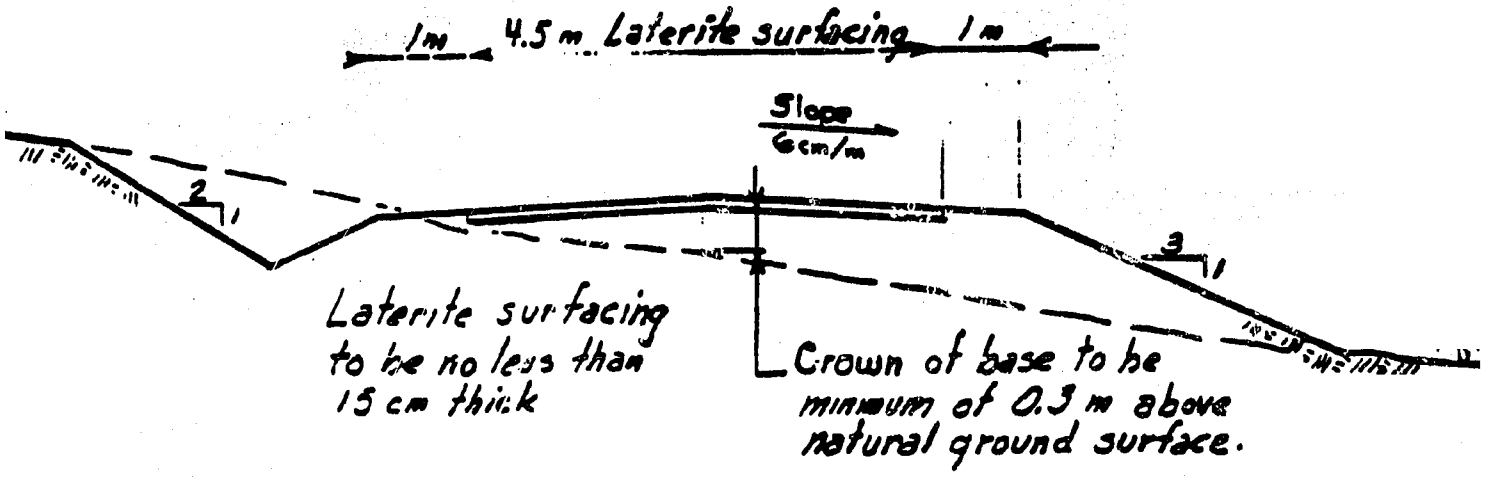
	FM/$
Operation costs of equipment (including repairs) 2-3 graders (600 km at $20/km)	5,520,000/12,000
4 trucks (one water truck, one fuel truck, 2 trucks for hauling) at $40/day/truck x 16 days/mo. x 8.3 mo.	9,774,000/21,248
Travaux Public personnel (15 persons x 40,000 MF/mo. x 8.3 mo.	4,980,000/10,826
Common laborers (20 persons x 15,000 MF/mo. x 8.3 mo.	2,490,000/ 5,413
	22,764,000/49,487

So the French estimate (which includes amortization and periodic road overhaul) seems unrealistically low; consequently, the $130,000/yr. figure derived from Travaux Publics statistics is accepted.

LINK ROAD

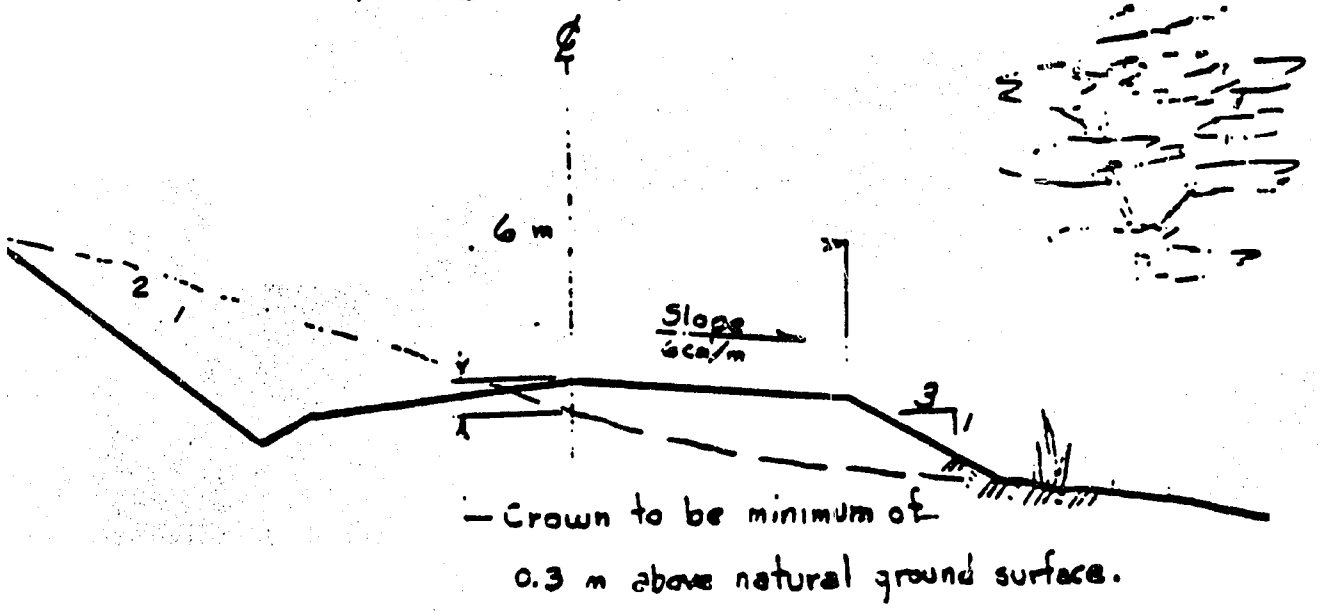
℄

Clearing 12 to 16 m.



TYPICAL SECTION

ACCESS TRAIL



PICAL SECTION

with at least 50 vehicles/day the estimate was an overhaul every 6 years. (This estimate is for a road frequently flooded by the Niger River.) Accordingly, it seems that Travaux Publics' estimate of 5-year intervals for road overhaul is high for the road/trail proposal for the Haute Vallee. Accordingly, for the trails a 10-year period is a better estimate while at least 6 years is a better estimate for the roads, or an average of one overhaul every 8 years. (Note: number of km in roads and trails is about even.)

At $154/km, the French estimate comes to about $61,000/year for 398 km of roads and trails. However, the following table suggests that the cost to OHV of ordinary upkeep (no complete overhaul every 6-10 years) for 398 km of road will be on the order of $50,000/year, not including equipment amortization:

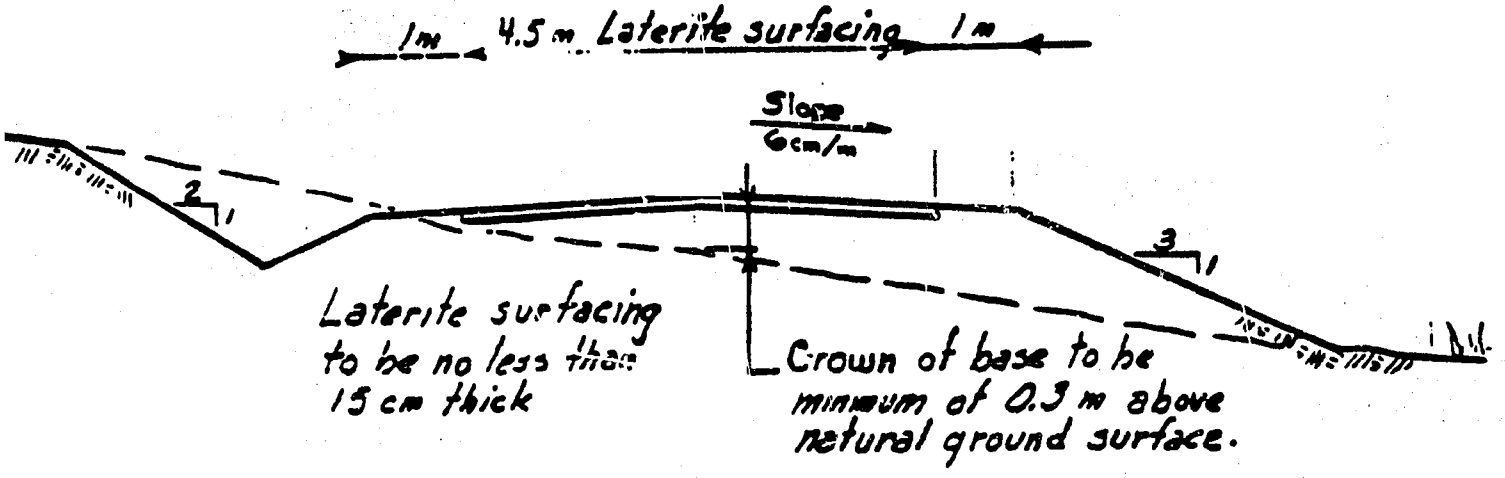
	FM/$
Operation costs of equipment (including repairs)	5,520,000/12,000
2-3 graders (600 km at $20/km)	
4 trucks (one water truck, one fuel truck, 2 trucks for hauling) at $40/day/truck x 16 days/mo. x 8.3 mo.	9,774,000/21,248
Travaux Public personnel (15 persons x 40,000 MF/mo. x 8.3 mo.	4,980,000/10,826
Common laborers (20 persons x 15,000 MF/mo. x 8.3 mo.	2,490,000/ 5,413
	22,764,000/49,487

So the French estimate (which includes amortization and periodic road overhaul) seems unrealistically low; consequently, the $130,000/yr. figure derived from Travaux Publics statistics is accepted.

LINK ROAD

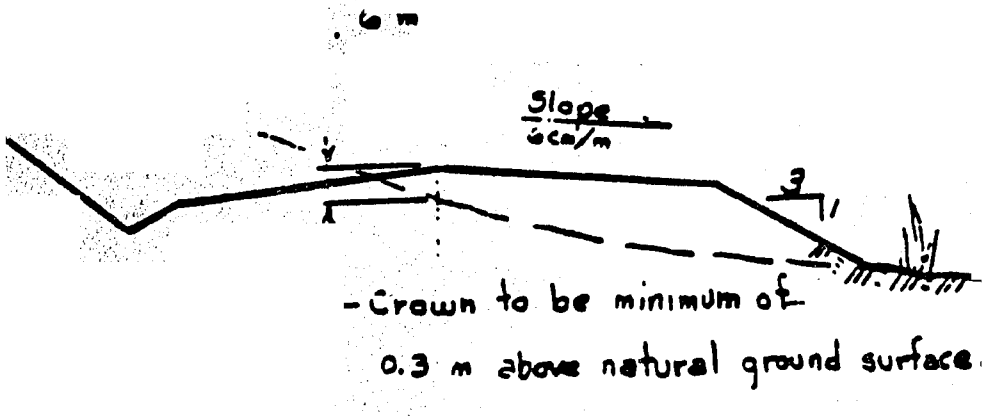
℄

Clearing 12 to 16 m.



TYPICAL SECTION

ACCESS TRAIL



TYPICAL SECTION

PROJECT TECHNICAL DETAILS

AGRICULTURAL CREDIT ACTIVITY

A. Background (see Part II, pages 49 and 63)

B. Proposed Credit System

The existing credit system will be continued initially, but will be modified in certain significant respects. Following a detailed study, it will be completely overhauled -- after the project is well under way. It will continue to rely upon the village credit council which has been very successful in endorsing loan applicants and assuring repayment. This village council will obviate the need for numerous credit supervisors and maintain the present low loan dilivery cost. Farm plans and budgets will be developed with the assistance of the OHV extension agent who will receive training in farm plan analysis.

Flexibility must be built into the system to take advantage of "technological packages" as they are developed by research. It is recommended that, initially, loan terms be extended from 3 years to 5 years, with no downpayment requirement except for work animals (25%), and that credit be available not only for implements, seed, and fertilizers, but also for purchasing work oxen and labor costs for land leveling and/or deep plowing at the Bancoumana polder.

The credit system involves 3 initial components: fertilizers/insecticides, implements, and work oxen. Regarding fertilizers and insecticides, there will be no initial change whatsoever in the present system. OHV will continue to purchase 100% from SCAER, sell at SCAER prices on one-year credit, and receive a commission on sales. And credit loses will continue to be borne by SCAER. The same is true of water pumps -- five year loans will

continue to be the rule and supplies will continue to come from SCAER (OHV had decided to begin again requesting these pumps).

Regarding agricultural implements, for those SCAER implements purchased on terms not exceeding 3 years, there will be, similarly, no change whatsoever in the present system. The big initial change will be that loan terms of up to five years will be offered. If the farmers choses this term, then OHV will buy the implement on cash from SCAER using a loan fund established for this purpose and receiving its 5% commission as always; but now OHV will be the loser if there is a default. It is suggested that SCAER's interest rate (which is 3.1%/year) be almost doubled to 6%. Thus, the price schedule offered to the farmer would for 1978 be as follows, the only change being the addition of "5th YEAR", the latter of which reflects the interest rate:

	Cash Price	Credit Plan Price			
		1st Year	2nd Year	3rd Year	5th Year
Plow	52,870 FM	54,510	55,440	56,155	62,390
Multicultaur	88,795	91,548	93,110	94,310	104,775
Seeder	58,010	59,810	60,830	61,610	67,060
Donkey Cart	71,060	73,265	74,515	75,470	83,850

Most implement prices are increasing about 5%/year. For example, the price of a plow in 1975 was 44,500; in 1976 45,650; in 1977 47,330.

It would clearly be preferable for higher interest rates to be applied but this is effectively impossible without undermining the purpose -- increasi... implement sales -- and would completely ingore the existing agricultural supply situation in the Haute Vallee. In other words, farmers would not buy. When SCAER raised its prices in 1974, for example, sales fell significantly. Indeed, farmers biggest complaint concerning multicultivators is their high price in comparison to plows -- so raising the price significantly would likely have exactly the opposite intended effect of encouraging a high

expansion in the use of multiple cultivators. Indeed, raising prices significantly will simply force farmers to rely more than ever on locally made plows, which do little to increase productivity since weeding must continue to be done by hand.

Now, it takes a year from the time the farmer first orders the equipment to receive it; so even under the proposed modification the effects will not be seen until PY 3 when the first implements purchased on 5-year terms are used. For this same reason, the credit specialist is being brought in as early as possible to ensure that the new terms are available for the November, 1979—January, 1980 campaign when implement orders are taken. The fact that the existing default rates are less than 1% on such loans (excluding those for water pumps) and the fact that sales prices of implements are increasing only about 5-6% annually, strongly suggests that the loan fund will not lose any significant amount to value.

Once this system has been in effect a year, the credit design specialist will do a detailed study of the whole credit situation in the Haute Vallee, and his recommendation will be directed towards setting-up a credit system that will be 100% viable.

The long-term objective should not be lost sight of — building a capacity of local blacksmiths to make both multiple cultivators, donkey carts, and seeders, in addition to improving the quality of plows and making spare parts. With the GRM covenant that OHV is free to purchase supplies from sources other than SCAER, OHV will be in a position to buy these locally-made multiple cultivators and improved quality plows and offer them to farmers on terms which the local blacksmiths cannot — namely, medium-term credit instead of cash. This is the only way prices for such implements can ever be brought down. Once the local blacksmiths are making these implements, OHV

will then be in a much better position to raise its interest rates while at the same time cutting its prices to the farmer. Hence, substantial blacksmith training ranks at the top of project priorities and is being adequately addressed in this project. Indeed, it is a new on-going program of OHV.

Regarding work oxen, the proposed fund for financing 5-year implement loans will be available for financing work oxen purchases on credit as well. The effective interest rate need not be the same, however. Indeed, because there is no history of these types of loans in the project area or competing factors, a fully viable interest rate of 12%, including insurance, can be started from the beginning. The cooperative in Gao which gives entire villages loans for purchasing cattle has an interest rate of 8% annually. This is possible because repayment has been 100% and because U.N. statistics show that Mali has about the lowest rate of inflation in West Africa (because of its pricing policy). With an insurance premium, 2-1/2%, this would bring the effective rate to 10-1/2% -- still 1-1/2% below the proposed rate. Malians, however, do not think in terms of interest rates -- they are fully accustomed to paying higher for things which must be paid at a later time, however.

With a 12% interest rate (1) and 25% down payment, the price of a 3-year old oxen team would be as follows:

	Credit	
Cash	5-Year Loan	Down Payment
$326	$414	$81.50

As for the final new object of credit -- land leveling at the polder -- a 12% annual interest rate is also suggested; the polder farmers clearly will have the capacity to pay it. Again, Malians do not think in terms of interest rates and none will be publicized; so varying interest rates for different things is not a problem.

(1) Actually, 2-1/2% represents the insurance premium.

Loan Forms

With the assistance of the OHV technicians, 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 credit office and will serve as a valuable data base for future analysis. To insure as best possible the accuracy of the information, the village credit 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 credit office for approval after signature by the extension agent and 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 dollars may be sent to the OHV Director for approval if the repayment ability of the applicant is questioned. All loans to applicants related to the extension agent or credit officer within the third degree of consanguinity or any loans to other OHV employees must be approved by the Director of OHV.

CREDIT PROJECTIONS

Prior to acceptance of loan applications, the area credit officer will determine the seasonal credit demand by type of loan (short or medium-term). Based upon this determination, "credit lines" will be opened to credit officers. This will enable the OHV Director and his Director of the funds to establish lending ceilings to each area office according to demand. Credit offices whose total loan applications exceed their "credit lines" must submit a justification to the OHV Credit supervisor for approval of an adjusted credit line.

A suggested format for determining credit needs is found below:

AREA CREDIT OFFICE APPLICATION FOR CREDIT LINE

1. No. of farmers in zone of intervention _____
2. No. of credit supervisors in intervention _____
3. Estimated value of individual loans for:
   a. Work animals _____ MF
   b. Plows, harrows, other _____ MF
   c. Fertilizers _____ MF
   d. Agro-chemicals _____ MF
   e. Animals for fattening _____ MF
   f. Labor costs _____ MF
   g. Other _____ MF

4. Estimated value of group/association loans _____ MF

   Total estimated credit needed _____ MF

5. Total Loan Applications Approved last year..... _____
6. Credit line application last year..... _____
7. Line 5 as a percent of line 6..... _____ %
8. Percent repayment of short-term credit last year _____ %
9. Repayment rate of medium-term credit _____ %

SUGGESTED FARM LOAN PAPER

Credit Office _____

Name _____ Village _____

I.D. No. _____ Date _____

No. of Immediate Family Members _____

Size of Farm _____

No. of Work Animals _____

No. of Cattle _____

CROPS GROWN	NUMBER OF HECTARES	ESTIMATED YIELD
1.		
2.		
3.		
4.		
5.		
6.		

OTHER INCOME SOURCES (SPECIFY)

1.
2.
3.

Signature of Applicant _____

Attestation of Village Credit Council _____

OHV Extension Agent Signature _____

LOAN APPLICATION

STATUS

Approved _____

Not Approved _____

Due _____

Paid _____

Credit Office _____

Farmer's Name _____ Village _____

I.D.No. _____ Date _____

ITEM(S) TO BE FINANCED:

Description	Unit Price	Total
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

Repayment terms:

Date Due _____

% p.a. to be applied _____

Signature of Applicant _____

Attestation of Village Credit Council _____

OHV Extension Agent Signature _____

C. Credit Fund Accounting and Responsibility

The OHV agricultural credit system will continue to be under the direct supervision of the Director OHV, and day to day supervision and administration will continue to be the responsibility of OHV's marketing division. Loan approval authority will continue to be at the sector and ZER level offices of OHV and at the level of the OHV Director.

A 1,300,000 dollar[1] USAID grant will establish an OHV agricultural loan fund. It will be released in quarterly advances against OHV's annual credit projections to meet scheduled credit needs. The loan fund advances will be deposited in the BDM in a special account. The Director of marketing will continue to be responsible for accountability and reporting, but he will have no loan approval authority. He will monitor with-drawls to ascertain that they are in conformity with the general loan policies and specific regulations.

All loan repayments and interest earnings will, immediately upon receipt, be deposited back into the OHV agricultural loan fund account in the BDM.

The Director of Marketing shall prepare and submit a monthly report to OHV Director and USAID Project Manager containing:

1. Cash balance at beginning of month
2. Deposits of principal and interest payments
3. By category, number, and value of loans outstanding at the beginning of month, number and value of loans made during the month.
4. Number and amounts of loans past due broken down by category will be reported to reveal delinquent period

(1) See page 453 for how figure is arrived at.

30 days, 60 to 180, etc.

In addition to the credit fund, $10,000 will be set aside to establish a Special Insurance Fund to insure the deaths of traction animals from any cause except slaughter. This program will be funded in the future by the 2 1/2% premium in the 12% interest charged on loans made for the purchase of traction animals. The ten thousand dollars of grant funds will be deposited in the insured account at the outset to start this insurance. The insurance funds will not be comingled with the regular credit fund.

Each of the supply outlets/credit offices at the animal traction centers will have limited security cash safes. Small loan contracts may be presented to them if they were the approving officer, for payment subject to the availability of funds. Any vendor or supplier can be given cash for equipment, supplies or service authorized in the loan contract. Only the original of the loan contract is negotiable. All other loan contracts must be presented to OHV in Bamako. Cash payments can be transferred to any credit office after approval by OHV headquarters if the vendor, supplier or borrowing farmer requests it.

D. Credit Training

OHV staff members responsible for operating the existing implement supply supply system will be trained in the U.S. in operating a large scale credit operation. OHV agents at the ZER level will be trained in-country in all aspects of agricultural credit systems. These will include among other things to:

a. analyze resources and credit problems;

b. make operational changes and adopt improved methods;

c. to identify medium and long term agricultural investment opportunities, capital requirements, rates of return to the farmer and benefits to the economy;

d. to undertake fundamental research on institutional credit for agricultural development and to utilize this information in planning annual and long term credit programs; and

e. to operate field farmer service centers and a diversified supervised credit program.

E. Initiating the System

A full-time U.S. technician will have the overall responsibility to assist OHV to (1) modify OHV's existing credit system, and (2) (following the proposed study resulting in a recommendation for a new credit system) to organize and administer the new credit program. He will be responsible for working with the short-term credit specialist in the study which will result in a recommendation for an entirely new system. This credit adviser will prepare the details and finalize the credit delivery system for OHV and USAID/Bamako approval. The project will also provide in-country, third country, and U.S. participant training. They will also recommend methods, time frame, curricula and content of training programs. Funds are provided in the Grant to purchase office equipment and supplies to equip the credit offices and to provide transportation for credit office staff.

F. Other Considerations

This project recognizes that the development of a major, well-institutionalized credit program is a must for the long-term development of Agriculture in Mali. Credit requirements as projected in all development efforts are very high. Interest rate policies for small farmer credit have not yet been clearly addressed in Mali, and the establishment of credit offices or branch banks in the rural areas is still a dream. The establishment of a viable, agricultural credit system is a major, long-term investment in Mali's future and is clearly outside the scope of this project. The establishment of laws, rule and regulations governing lending practices is a time-consuming effort and will only be based upon sound analysis of lending experience. Furthermore, the capitilzation of an agricultural loan fund, complete with re-discounting window, would require an enormous investment, and worthy of a separate project. Noting the need for and growing interest in a national agricultural credit system, this project will do the following: (i) utilize the existing credit arrangements with SCAER which is working effectively in this part of the country for short and medium term credit. The reliance on this system, acknowledging certain weaknesses, is planned so as not to delay the production aspects of this project. As mentioned earlier, the preferential credit rate has been determined to be a positive incentive on farmers' use of the multiple cultivator which is a major component of the production increases planned.

Secondly, the project will examine credit demand, terms and lending practices (both formal and non-formal credit sources) in a discrete area of the country and thus offer data, analysis and observations for the development of a major institutional lending framework, clearly needs for the entire country.

In the Philippines, where the private rural banking system is used as a model for agricultural lending in other developing countries expatriate technical assistance began in 1951 and continues to this date. During this time, lending practices were tested, modified and retested in certain areas of the country or with certain crops. Analysis of successful lending operations were incorporated into the by-laws of the banking system and promoted or encouraged through appropriate financial incentives to the borrower or lender. The lessons learned in the continuing evolution of the Philippine credit experience (as well as those learned in similar credit programs elsewhere) are directly applicable to plans for a national agricultural credit system in Mali. The point is that no credit system can be created overnight and experience must be gained through well designed applications. The initial experience gained with the proposed credit system and its modifications, coupled with a re-design effort during or before PY3, is an excellent beginning in this direction. It is the recommendation of this paper that the credit system as proposed above be approved with the further recomendation that observational tours be establised for senior Malian policy makers in countries where small farmer lending programs are successfully being implemented. Funds for these obersavtional tours have been included in the short-term training line item (30 PM) in the credit section. Furthermore, if deemed appropriate, invitations for visits from bankers from these countries is recommended and budgeted for under the short-term technical assistance line item in the Administrative support section.

Economic and Financial Analyses

Simplifying Assumptions for Economic Analysis:

1. Project will have introduced 9360 average size farm units to project by 1993 (PY 15).

2. Productivity of food crops other than rice due solely to plowing, extra weeding, improved extension and training, and road network will rise 13% from 750 kg/ha to 850 kg/ha on the average for land in its 3rd year of cultivation, I and will be higher in earlier years (See #4).

3. "Average" non-rice food crop farmer w expand hectarge under cultivation from 5ha to 8 ha in Py 1, to 10 ha in PY and maintain hectarge under cultivation at 10 ha. per farm unit.

4. Expanded areas under cultivation will be "well-rested", i.e. food crop yields will be 1000 kg/ha the first year of cultivation, 900 kg/ha in the second and third year, and continue at 850 kg 1 ha after year 3 using project's proposed farming methods.

5. Of the farmers benefiting from project's improved method (i.e. animal traction training centers), 10% will buy additional oxen teams in Year 4, and further expand area under cultivation to 14 ha. on the average

6. Productivity on the rice polder will rise at the following rate:

Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10	...
10%	30%	40%	60%	80%	85%	90%	90%	90%	90%	90%

By year 7, 90% of the rice polder will have a rise of level of productivity fro 1000 Kg/Ha to 300 Kg/ha.

7. "Average" farm size for polder owners is 11.5 ha, 10 ha of non-polder land (see Ass. #3) and 1.5 ha of polder land.

8. Essential bottleneck (constraint) to introduction of new farm units into improved agriculture system will be animal traction centers. Rate of graduates from these centers will determine rate of improved farm units. These will rise at following rate:

Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8
0	80	240	440	640	760	800	800

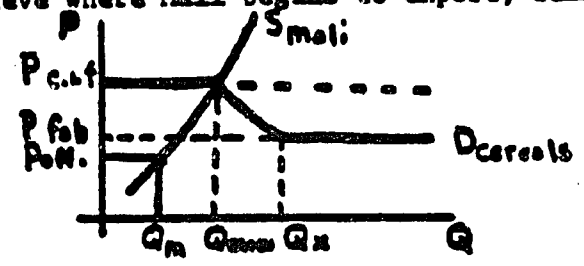
Animal Traction Training Centers will continue to produce graduates at 800/yr after Year 6. (There will be a marginal "spin-off", i.e., non-graduates will also improve productivity and expand cultivation as a result of watching their neighbors and benefiting from other project components, but this is not assumed in the model).

9. Credit System will not be a constraint for LOP. (See Table XV).

10. Roads will be constructed at such a level of quality so as to assure economic integration of Haute Vallee into Malian economy (i.e. Haute Valle will not remain a fragmented market oustide Malian economy where there is a differential price structure). These roads will service directly marketable surplus of 9360 farms.

11. Road maintenance will be at such a level to assure #10.

12. As Mali is a net importer of rice and sorghum, value of improved yield level of crops is equal to c.i.f.price (at Mali border) until imports equal zero, at which time, given the fact that all neighbors are deficit countries, value will fall to fob.price at Mali border. Levels B under improts = 0 and above leve where Mali begins to export, demand is assumed to be totally elastic.



13. No World price analysis was done. Data from 1976 showed incre sing price trend from 1965. Conseravtive C.I.F. price used was 111MF; = 100 MF(1976).

14. Project is not expected to cover projected Mali imports of rice, sorghum millets.

15. Foreign Exchange has no shadow price in the model. (While this assumption does not hold, the effect would be more advantagrous to benefits than costs which have relatively smaller foreign exchange component.)

16. Labor is not and will not be a constraint and will remain valued at 350 MF/day. (In year 15, 3,110,315 labor days will be required by new methods).

17. Relative prices will not change; terms of trade will not turn against agriculture.

18. Farm unit will require no additional inputs or costs other than those foreseen in PP to get yields forecast. (eg. fertilizers,)

19. Government and/or OHV will incur no new costs other than those already provided for in analysis; road maintenance, increase administration burden of OHV, Basic Health Facilities.

20. Construction components have a life of 15 years with no significant repairs (some Polder Constr. excepted) and after which time, they have no resale value.

21. Commodities and vehicles have life of 5 years with no major rc ts or alternations, and after which time they have no resale value.

22. Expected life of oxen in area is 7 years on average.

23. Oxen appreicate in value to society due to better feeding , etc. Thus, in Year 15, oxen team will be worth at least 150,000 MF.

24. Life of farm implementsneeded to increase yields is 15 years with only minor repairs. (seeder, donkey carts, multicultcurs) Multi-cultcurs will need 10,500 MF worth of repairs every 5 years, and donkey carts will need 7000 MF work of tires (For. Exchange) every 2 years

25. Animal Traction Research will no longer be necessary for projectec yield increases after Project Year 5.

A. Economic Analysis

The economic/financial analysis was undertaken at three levels: a macro-economic analysis examining the project's impact upon and value to the country of Mali as a whole; a macro-financial analysis examining the project's impact on key institutions involved and assuring their financial viability; and a micro-financial analysis looking at the project's impact on the farm unit (target group).

The macro analysis had two goals: firstly the socio-economic need for and desirability of activities aimed at increasing food crop production in the Haute Vallee; secondly, to identify major constraints to further development in the area and to determine whether or not the project would adequately address these constraints.

The economic analysis defines the need for such a production program in terms of the "need to raise the income and quality of life of the rural poor in Haute Vallee" --the project goal -- while subsequently reducing Mali's dependence on grain imports in years of poor harvests and strengthening its foreign exchange position through possible grain exports in better years. All countries surrounding Mali are net importers of cereals.

The proposed project, as described by the list of simplifying assumptions provided below, shows an internal rate of return of 8%, which is considered to be a conservative estimate. Key assumptions concerned thevalue of rice, millet, and sorghum, projected yield increases for cereals, and the rate at which farmers would be induced to adopt new agricultural methods. The general approach was to consistently use modest assumptions for benefits and somewhat heavy assumptions for costs. The affects of variations in key assumptions were discussed at length, and it was concluded that the assumptions upon which the 8% return was based were safe since they were conservative and that the 8% return should be taken as the minimum which can be expected.

For the economic analysis, world prices of rice and millet/sorghum were used,with the conventional neo-classical approach that should a deficit occur, Mali would be forced to go to the world market, as has consistently been the case. In surplus years, Mali could provide neighbors -- all of which are deficit countries -- with cereals. Relevant data from official sources showed an upward trend from 41 to 111 MF/KG Malian border, c.i.f. (p. 18, CILSS, Club du Sahel Work Group on Marketing, Price Policy and Storage) from 1971 to 1974.

Yield increases were projected quite modestly at 13% fathe than the 20% used in similar projects by other agencies, permitting an 7% margin of error in price without changing the results.

The assumption of constant relative prices was adopted. Although this is common in such analyses, it should be recognized that changes in relative prices will affect the return received. Historically, terms of trade have worked against agriculture since the prices of inputs have teneded to rise more quickly than commodity prices. It is impossible to predict how relative prices in Haute Vallee will move, but there is hope that the donor community will be able to convince the GRM of the benefit of increasing official grain prices.

Although there is evidence that a shadow price for foriegn exhange does exist, none was used in the project analysis. Since both benefits of product valued on the international market and the relatively smaller amount of imported capital were valued in Malian francs at the official rate, the shadow price would have had the effect of increasing the value of benefits more than costs.

The analysis points to three major factors which account for the relative modesty of the IRR: 1) Terminal year for the analysis was year 15, although benefits after that period exceeded costs by $900,000 discounted at 15%; 2) values of assets (with the exception of value of oxen which was easily quantifiable) were not added in as benefits in final year of analysis; 3) projected yield increases due to improvements on unrested land was from 750 kg to 850 kg/ha (100 kg/ha 13%) whereas similar projects by other donors in the area estimated an increase from 750 to 900 (150 or 20%).

As table IV.B, row 5 indicates, net benefits discounted at 15% were almost $1 million in year 14, indicating considerable returns remaining from the project. After year 15, it is difficult to project assumptions regarding prices, costs, and yields. Had the assumptions been considered to extend until year 17, the 15% IRR would have been approached, ceteris paribus.

In addition, with the exception of the oxen, which appreciate over the years and whose resale value, depending upon age, varies between MF 150,000 and MF 270,000 per team, no resale value for assets aquired during the project was made. Some of these, such as the roads and the polder, have considerable value.

Lastly, it should be noted that because of the difficulty in quantifying both benefits and costs and the lack of studies on increased productivity due to these inputs, calculations in the analysis do not include the health or functional literacy components. This does not mean they are not considered essential to the project. On the contrary, the considerable increase in demand for labor and timeliness of agricultural activities assume the good health of labor and its ability to retain information provided by extension services.

B. Macro-Financial Examination

A macro financial analysis was done to determine the viability of the credit pool supplied by AID (Table XIV) and the financial viability of Operation Haute Vallee.

The credit pool will be sufficient to meet farmers' demand for credit. A 10% interest rate (not counting 2% for health insurance) for animals and 6% on implements, may still not be enough to cover decapitalization and overhead in a country with almost 10% inflation. The project makes provision for technical assistance by credit specialists, who will design a revised program. The examination was made to determine the sufficiency of AID's allocation for credit. It was determined to be adequate.

Using the lowest assumption that only 50% of the increased production will be marketed and only 40% of that amount will be handled by OHV at 20 MF per kilo, a comparison of increased revenues and increased costs incurred by OHV was undertaken. The examination showed that OHV -- even if it were to impose the suggested tax of $41 per hectare on the polder -- will not be receiving sufficient revenues after termination of AID assistance to cover the increased operating costs of the project. The analysis emphasized that cost projections beyond year 5 were particularly speculative; however, this does not necessarily imply that the projections were exceedingly high.

This issue bears further examination, even though modest assumptions were made in the analysis about OHV involvement in the market. OHV might be tempted to encourage farmers to produce non-food crop over which it has a near monopoly in marketing. As this project is economically beneficial to the country, revenues should be tappable, even though subsidies may be the means employed. Alternative ways of raising revenue must be examined as the project proceeds. A covenant will be included in the Grant Agreement calling for a joint study of alternative ways of increasing OHV revenue as the project proceeds and recommendations will be adopted by project yearthree. This strategy has already been successfully applied in other AID-supported operations in Mali.

C. Micro-Financed Analysis

In addition to the assumption employed for the economic analysis, the assumptions given below were made for the micro-financial and cash analyses.

1. Crops - The analysis assumed that only millet will be grown by the farmers outside the polder. Rice is grown in the

polder. The present marketing system provides incentives for the farmersto increase production in cash crops - cotton, peanuts, tobacco. However, the mix which the farmer considers optimal was considered indeterminant. So, to be consistent with the project goal of increasing food production, the analysis undertook to determine the financial feasibility to the farmer of increasing food production without altering government pricing policy.

2. Prices - The analysis assumed a price of 40 MF/KG for millet, and 60 MF/KG for rice. These approximate official market prices. All prices are assumed constant, and no relative price changes are assumed.

3. Loan repayment was assumed to be made in accordance with the recommended credit program: a 25% down payment on the oxen, with an interest rate of 12%; the other implements (multicultivator, plow, or cart, seeder) were assumed to have no down payment requirement, and an interest rate of 6%.

4. Repairs: repairs were assumed to be necessary for the donkey and multi-cultivator. These amounted to 7,000 MF every two years for wheels and bearings, and 10,500 MF every five years for shoes, respectively. Repairs on plows were assumed to average 2,200 MF every two years.

5. For the financial analysis, the assumptions on depreciation were that the oxen would not depreciate; that the implements (multi-cultivator, seeder, plow, donkey cart) would have a life of 20 years, and were depreciated using straight line depreciation; and that the simple implements would have a three year life, and again were depreciated using straight line depreciation.

The micro-financial analysis was based upon projected farm budgets for those groups of farmers considered to be target groups of the project: farmers who cultivate 1.5 hectares in the Bancoumana rice polder in addition to an average of ten hectares of other farm land elsewhere, and those farmers who do not have access to the Bancoumana polder. A comparison was made between the cash-flows to the farmer resulting from project inputs as opposed to farming with traditional methods.

The cash-flow analysis was directed only toward changes in income related to inputs and outputs specifically within the project's sphere. Thus, while the non-polder farmers may appear in a "cash" sense to be worse off during the first five years of operation using project inputs, there may , in fact, be income flows which will improve their position. Furthermore, it is important to note that extending the projected farm budget over 18 years,

and liquidating farmer assets, the initial investment in project inputs will yield an internal rate of return of almost 17%. Since farmers' assets increase significantly during the early years of the project, they are, in fact, economically better off.

On the other hand, for those farmers who cultivate 1.5 hectares within the polder area, the project inputs will result in an immediate improvement of income. In fact, over 18 years, their income will increase annual income by 80,675 MF ($183), or by 40%.

The financial analysis indicates the great increase in net worth accruing to the farmers, especially during the early years when the non-polder farmers would receive less cash income. This may serve as an incentive for them to purchase project inputs. Further, given the fact that the interest rate on the loans is exceeded by the inflation rate, farmer income is understated since it is presented assuming constant prices.

Lastly, this analysis illustrates the central importance of increasing prices paid to farmers for food grains marketed through official channels. The FAO has just submitted a report to the GRM on its grain policies which will be used as a basis for concerted donor community discussions with the Government with a view toward increasing official market prices.

TABLE I : Social Value of Benefits: Polder Rice

Year	Year Increase Per ha	Total Increase: #of ha under improved cultivation	Total Increase: # of kg of rice yielded	Est. Social	Total Value (MF)	Total Value ($US)	Discount Factor	Total Value Discounted
1	2,000	64	128,000	280 MF	35,840,000	81,454		81,454
2	2,000	192	384,000	280 MF	107,520,000	244,364	1.15	212,490
3	2,000	256	512,000	280 MF	143,360,000	325,818	1.32	246,832
4	2,000	384	768,000	280 MF	215,040,000	488,727	1.52	321,531
5	2,000	512	1,024,000	280 MF	286,720,000	651,636	1.75	372,364
6	2,000	544	1,088,000	280 MF	304,640,000	692,364	2.01	344,460
7	2,000	576	1,152,000	280 MF	322,560,000	733,091	2.31	317,355
8	2,000	576	1,152,000	280 MF	322,560,000	733,091	2.66	275,598
9	2,000	576	1,152,000	280 MF	322,560,000	733,091	3.06	239,572
10	2,000	576	1,152,000	280 MF	322,560,000	733,091	3.52	208,265
11	2,000	576	1,152,000	280 MF	322,560,000	733,091	4.05	181,010
12	2,000	576	1,152,000	280 MF	322,560,000	733,091	4.66	157,316
13	2,000	576	1,152,000	280 MF	322,560,000	733,091	5.36	136,771
14	2,000	576	1,152,000	280 MF	322,560,000	733,091	6.16	119,008
15	2,000	576	1,152,000	280 MF	322,560,000	733,091	7.08	103,544

Table IIA: Yield Increases Estimates (per average farm units)

	Current	Improved	Total
Year 1 (8 ha)			
5 ha	750	850 kg/ha	500
3 ha	0	1,000 kg/ha	3,000
			3,500
Year 2 (10 ha)			
5 ha	750	850	500
3 ha	1,000	900	2,700
2 ha	0	IT	2,000
Year 3			
5 ha	750	850	500
5 ha	IT or 80	900	4,500

Year 4 8 families will buy additional animals 10%

(14 ha	10 ha of 850	4,750
w/2 teams)	4 ha at 1 Ton	4,000

Year 4 for 72 families

10 ha @ 850

5 x 100
5 x 850

Year 5 8 families	4,750 + 4(9000)	
10 ha of 850	4,750) + 4 (900) = 3,600	3,600
		4,750
Year 6 4 ha 900		1,400

TABLE II.B.1 PROJECT YIELDS INCREASES FROM MILLET, SORGHUM OFF POLDER (No. of families times predicted yield from Table II.A)

	80	240	440	640	760	800	800		800	800	800	800	800	800	800
	PY 2	PY 3	PY 4	PY 5	PY 6	PY 7	PY 8	Farm Year	PY 9	PY 10	PY 11	PY 12	PY 13	PY 14	PY 15
	80x3500 280,000	240x3500 940,000	440x3500 1,540,000	640x3500 2,240,000	760x3500 2,660,000	800x3500 2,800,000	800x3500 2,800,000	1	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000	2,800,000
		80x5200 416,000	240x5200 1,248,000	440x5200 2,288,000	640x5200 3,328,000	760x5200 3,962,000	800x5200 4,160,000	2	4,160,000	4,160,000	4,160,000	4,160,000	4,160,000	4,160,000	4,160,000
			80x5000 400,000	240x5000 1,200,000	440x5000 2,200,000	640x5000 3,200,000	760x5000 3,800,000	3	800x5000 4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
				8x8750 72x4750 412,000	24x8750 216x4750 1,236,000	44x8750 396x4750 2,266,000	64x8750 576x4750 3,296,000	4	76x8750 684x4750 3,914,000	80x8750 720x4750 4,120,000	80 4,120,000	4,120,000	4,120,000	4,120,000	4,120,000
					8x8350 72x4750 408,800	24x8350 216x4750 1,226,400	44x8350 396x4750 2,248,400	5	64x8350 576x4750 3,270,400	76x8350 684x4750 3,883,600	80x8350 720x4750 4,088,000	4,088,000	4,088,000	4,088,000	4,088,000
						8x8150 72x4750 407,200	24x8150 216x4750 1,221,600	6	44x8150 396x4750 2,139,600	64x8150 576x4750 3,257,000	76x8150 684x4750 3,868,400	80x8150 720x4750 4,072,000	4,072,000	4,072,000	4,072,000
							8x8150 72x4750 407,200	7	1,221,600	2,139,600	3,257,600	3,868,400	4,072,000	4,072,000	4,072,000
								8	8x8150 72x4750 407,200	1,221,600	2,139,600	3,257,600	3,868,400	4,072,000	4,072,000
								9		407,200	1,221,600	2,139,600	3,257,600	3,868,400	4,072,000
								10			407,200	1,221,600	2,139,600	3,257,600	3,868,400
								11				407,200	1,221,600	2,139,600	3,257,600
								12					407,200	1,221,600	2,139,600
								13						407,200	1,221,600
								14							407,200
								15							
TOTAL	2 280,000	3 1,256,000	4 3,188,000	5 6,140,000	6 9,832,800	7 13,861,600	8 17,933,200		9 21,912,800	10 25,989,600	11 30,062,400	12 34,134,400	13 38,206,400	14 42,278,400	15 46,350,400

Table 11.6: Value of Produce Yield Increases (in Current Dollars) of Soybeans, Millets

	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10	Yr. 11	Yr. 12	Yr. 13	Yr. 14	Yr. 15
Total kg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Value [illegible] Total kg x [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Value in Dollars	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

148

232

230

TABLE III: Itemized Benefits and Costs of Haute Vallee Integrated Rural Development Project

Item	PY 1	PY 2	PY 3	PY 4	PY 5	PY 6	PY 7	PY 8	PY 9	PY 10	PY 11	PY 12	PY 13	PY 14	PY 15
Social Benefits															
Millet, Sorghum		70,000	316,855	804,245	1,548,955	2,480,800	3,496,904	4,524,057	5,528,002	6,556,467	7,583,924	8,611,178	9,638,433	10,665,687	11,692,942
Rice	81,454	244,364	325,818	488,727	651,636	692,364	733,091	(733,091)	(733,091)	(733,091)	(733,091)	(733,091)	(733,091)	(733,091)	(733,091)
TOTAL	81,454	314,364	1,642,673	1,292,972	2,200,591	3,173,164	4,229,995	5,257,148	6,261,093	7,289,558	8,317,015	9,344,269	10,371,524	11,398,778	15,072,193
Social Costs															
On Farm (Polder Owners)	13,244	31,383	28,732	46,871	57,156	48,037	50,133	45,954	46,206	45,954	45,954	46,332	46,3[illegible]	46,206	45,954
External Costs for Polders	447,000	577,000	777,000	368,000	149,000	245,000	237,000	242,000	227,000	262,000	410,000	196,000	250,000	250,000	185,000
On Farm (Non-Polder Areas)	80,690	271,985	566,225	927,711	1,287,933	1,620,490	1,931,166	2,248,429	2,527,131	2,882,109	3,201,515	3,520,674	3,804,685	4,152,338	4,427,490
Animal Traction Training	0	38,530	43,330	49,926	56,522	25,588	26,384	26,384	26,384	26,384	26,384	26,384	26,384	26,384	26,384
Animal Traction Research	577,000	631,000	611,000	584,000	355,000	0	0	0	0	0	0	0	0	0	0
OHV	1,362,000	851,000	856,000	712,000	468,000	976,000	500,000	468,000	468,000	976,000	468,000	468,000	468,000	468,000	468,000
Credit Inst.	169,000	448,000	551,000	385,000	349,000	256,000	230,000	230,000	230,000	308,000	266,000	230,000	230,000	252,000	252,000
Credit Fund	0	224,000	265,000	388,000	524,000	0	0	0	0	0	0	0	0	0	0
Road Construc.	2,027,000	811,000	981,000	1,040,000	923,000	-	-	-	-	-	-	-	-	-	-
Road Maint.	0	0	27,058	62,918	96,496	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000
	4,675,934	3,884,898	4,806,345	4,564,426	4,266,107	3,301,115	3,104,683	3,390,767	3,654,721	4,630,447	4,547,923	4,617,390	4,955,407	5,259,928	5,577,828
						3,173,164	4,229,995	5,275,148	6,261,093	7,289,558	8,317,015	9,344,269	10,371,524	11,398,778	15,072,193

TABLE IV : Projected Economic Benefits and Costs of Operation Haute Vallee Integrated Rural Development Project discounted at 15%, 10% and 8%.

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Benefits	81,454	314,364	642,673	1,292,974	2,200,591	3,173,164	4,229,995	5,257,148	6,261,093	7,289,558	8,317,015	9,344,269	10,371,524	11,398,778	15,072,193*
Costs	4,675,934	3,884,898	4,806,345	4,564,426	4,266,107	3,301,115	3,104,683	3,390,767	3,654,721	4,630,447	4,547,923	4,617,390	4,955,407	5,259,92[illegible]	5,577,828
B-C	4,594,480	3,570,534	4,163,672	3,271,452	2,065,516	127,951	1,125,312	1,866,381	2,606,372	2,659,111	3,769,092	4,726,879	5,416,117	6,138,850	9,494,365
r=15%	1	1.15	1.32	1.52	1.75	2.01	2.31	2.66	3.06	3.52	4.05	4.65	5.36	5.15	7.[illegible]
discount value of benefits	4,594,480	3,104,812	3,154,297	2,152,271	1,180,295	63,657	4,87,148	701,667	8,51,756	755,429	930,640	1,014,352	1,010,470	996,567	4,941,04[illegible]
r=10%	1	1.10	1.21	1.33	1.46	1.61	1.77	1.95	2.14	2.36	2.59	2.85	3.14	3.45	3.8
discount value of benefits	4,594,480	3,245,94[illegible]	3,441,051	2,459,738	1,414,737	79,473	635,769	957,118	1,217,930	1,126,742	1,455,248	1,658,556	1,724,878	1,779,377	1,802,159
r=08%	1	1.08	1.17	1.26	1.36	1.47	1.59	1.71	1.85	2.0	2.16	2.33	2.52	2.72	2.94
discount value of benefits (NPV=0)	4,594,480	3,306,050	3,558,694	2,596,390	1,518,761	87,041	7,07,743	1,091,451	1,408,850	1,329,556	1,744,950	2,028,703	2,149,253	2,256,93[illegible]	3,229,376

*includes resale value of cattle: but not other capital stock.

TABLE V.A.

I On-Farm Social Costs (Non-Polder Areas) = 12 ha Farm

INPUTS	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10	Yr. 11	Yr. 12	Yr. 13	Yr. 14	Yr. 15
Oxen Team	150,000						-20,000							-20,000	
Feed & Vet	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560
Multicut	88,795				10,500					10,500					10,500
Seeder	58,000														
Donkey	71,060		7,000		7,000		7,000		7,000		7,000		7,000		7,000
Labor	91,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000
Fungicide			150	250	250	250	250	250	250	250	250	250	250	250	250
TOTAL	463,415	144,560	151,810	144,810	162,310	144,810	151,810	144,810	151,810	155,130	151,810	144,810	151,810	124,810	162,310
$	1,053	329	345	329	369	329	300	329	345	353	345	329	345	284	369

II. On Farm Social Costs (Non-Polder Areas) = 13.5 ha Farm, 1.5 of which rice polder

Oxen Team (150,000 / 11.5 X10)	130,435						-17,391							-17,391	
Feed & Vet. (4560 X 10)	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560	4,560
Multicutter	88,795				10,500					10,500					10,500
Seeder 58,000 / 11.5 X 10	50,435														
Donkey 71,060 / 11.5 X 10	61,791		6,086		6,086		6,086		6,086		6,086		6,086		6,086
Fungicide			150	250	250	250	250	250	250	250	250	250	250	250	250
Labor	91,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000	140,000
TOTAL (HF)	427,016	144,560	150,796	144,810	161,396	144,810	133,505	144,810	150,896	155,130	150,896	144,810	150,896	127,419	161,396
TOTAL ($)	970	329	343	329	367	329	303	329	343	353	343	329	343	290	367

III. On Farm Social Costs (Non-Polder Areas) = 14 ha farms (expanded from 10 ha)
= 10% of "modernized" farmers*

OX Team	150,000			150,000			-20,000				-20,000			-20,000	
Feed & Vet.	4,560	4,560	4,560	9,120	9,120	9,120	9,120	9,120	9,120	9,120	9,120	9,120	9,120	9,120	9,120
Multi	88,795			88,795											
Seeder	58,000			58,000											
Donkey															
Fungicide			150	250	250	450	450	450	450	450	450	450	450	450	450
Labor	91,000	140,000	140,000	238,000	238,000	238,000	238,000	238,000	238,000	238,000	238,000	238,000	238,000	238,000	238,000
TOTAL	392,355	144,560	144,810	544,165	247,370	297,570	247,570	247,570	247,570	247,570	227,570	247,570	247,570	227,570	,570
$	892	329	329	1,237	563	563	512	563	563	563	517	563	563	517	

TABLE V 26

POLDER: Social Costs (Aus 1.5ha per farm unit)

	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr.6	Yr. 7	Yr. 8	Yr.9	Yr. 10	Yr. 11	Yr. 12	Yr. 13	Yr. 14	Yr. 15
Oxen 11.5 X 1.5	19,565						-2,609							-2,609	-
Plow 10	54,000														
Fertilizer	20,625	20,625	20,625	20,625	20,625	20,625	20,625	20,625	20,625	20,625	20,625	20,625	20.625	20,625	20,625
Seed	8,478														
Threshing	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000	27,000
Feed	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
Labor 10X350X1.5	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250	5,250
Total (MF)	135,338	53,295	53,295	53,295	53,295	53,295	50,568	53,795	53,295	53,295	53,295	53,295	53,245	50,568	53,295
Total ($)	308	121	121	121	121	121	115	121	121	121	121	121	121	115	121

TABLE V C On - Polder Costs of Increased Rice Production by Operation Year of Farm Unit (rows) and Operation Year of Project (columns)

	Yr. 1	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10	Yr. 11	Yr. 12	Yr. 13	Yr. 14	Yr. 14
Hectares	64	192	256	384	512	544	576	576	576	576	576	576	576	576	576
Yields	13,244	26,180	13,244	26,180	26,180	6,776	6,468	0	0	0	0	0	0	0	0
VALUE		5,203	10,285	5,203	10,285	10,285	2,662	2,541	0	0	0	0	0	0	0
			5,203		5,203	10,285	10,285	2,662	2,541	0	0	0	0	0	0
					10,285	5,203	10,285	10,285	2,662	2,541	0	0	0	0	0
					5,203	10,285	5,205	10,285	10,285	2,662	2,541	0	0	0	0
						5,203	10,285	5,203	10,285	10,285	2,662	2,541	0	0	0
							4,945	9,775	4,945	4,945	9,775	2,530	2,415	0	0
								5,203	10,285	5,203	10,285	10,285	2,662	2,541	0
									5,203	10,285	5,203	10,285	10,285	2,662	2,541
										5,203	10,285	5,203	10,285	10,285	2,602
											5,203	10,285	5,203	10,285	10,285
												5,203	10,285	5,203	10,285
													5,203	10,285	5,207
														4,945	9,775
															5,203
TOTAL	13,244	31,383	28,732		57,156	48,037	50,133	45,954	46,206	45,954	45,954	46,332	46,338	46,206	45,954

TABLE V.D.: SOCIAL COSTS OF NON-POLDER AREAS INCREASED PRODUCTION BY PROJECT YEAR (Colums) AND BY FARM YEAR (Rows)

Project Years	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Farmer Year	41,710	82,450	41,710	82,450	82,450	21,340	20,370								
								0	0	0	0	0	0	0	0
1	38,980	163,215	418,041	584,415	710,775	819,234	820,287	842,400	842,400	842,400	842,400	842,400	842,000	842,000	842,000
		26,320	78,960	144,760	210,560	250,040	263,200	263,200	263,200	263,200	263,200	263,200	263,200	263,200	263,200
2															
			14,749	29,155	14,749	29,155	29,155	7,546	7,203	0	0	0	0	0	0
3			12,765	53,475	136,965	191,475	232,875	268,410	268,755	276,000	276,000	276,000	276,000	276,000	276,000
				26,320	78,960	144,750	210,560	250,040	263,200	263,200	263,000	263,200	263,200	263,000	263,200
4				7,136	21,408	39,248	57,088	67,797	71,360	71,360	71,360	72,360	71,360	71,360	71,360
					15,781	31,195	15,781	31,195	31,195	8,074	7,707	0	0	0	0
					13,653	57,195	146,493	204,795	212,175	287,082	287,451	295,200	295,200	295,200	295,200
5					2,632	7,896	14,476	21,056	25,004	26,320	26,320	26,320	26,320	26,320	26,320
						26,320	78,960	144,760	210,560	250,560	263,200	263,200	263,200	263,200	263,200
						2,632	7,896	14,476	21,056	25,004	26,320	26,320	45,040	45,040	45,040
6													26,320	26,320	26,320
							13,029	25,755	13,029	25,755	25,755	6,666	6,363	0	0
							11,100	46,500	119,100	166,500	202,500	233,400	233,700	240,000	240,000
7							9,896	29,688	54,428	79,168	94,012	98,960	98,960	98,960	98,960
								26,320	78,960	144,760	210,560	250,040	263,200	263,200	263,200
8								4,496	13,488	24,728	35,968	42,712	44,960	44,960	44,960
									14,749	29,155	14,749	29,155	29,155	7,546	7,203
									12,765	53,475	136,965	191,475	198,375	268,410	268,755
9									4,504	13,512	24,772	36,032	42,788	45,040	45,040
										28,240	84,720	155,320	225,920	268,280	282,400
10										4,136	12,408	22,740	33,088	39,292	41,360
											14,749	29,155	14,749	29,155	29,155
											12,765	53,475	136,965	191,475	198,375
11											4,504	13,512	24,772	36,032	42,788
												-	-	-	-
												26,320	78,960	144,760	210,560
12												4,504	13,512	24,772	36,032
													14,749	29,155	14,749
													12,765	53,475	136,965
13													4,504	13,512	24,772
														12,470	24,650
														10,508	44,020
14														4,136	12,408
															15,781
															13,653
15															4,504
TOTALS	80,690	271,905	566,225	927,711	1,287,933	1,620,490	1,931,166	2,248,429	2,527,131	2,882,629	3,201,585	3,520,674	3,804,685	4,152,338	4,427,490

Table VI: Disaggregation Phasing of Polder and Non-Polder Farmers Integrated into Haute Vallee Project

Farmer Year \ Project Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	$x_1 \cdot 43$ $y_1 \cdot 37$	$x_1 \cdot 85$ $y_1 \cdot 155$	$x_1 \cdot 43$ $y_1 \cdot 397$	$x_1 \cdot 85$ $y_1 \cdot 555$	$x_1 \cdot 85$ $y_1 \cdot 575$	$x_1 \cdot 22$ $y_1 \cdot 778$	$x_1 \cdot 21$ $y_1 \cdot 779$	$x_1 \cdot 0$ $y_1 \cdot 800$	$x_1 \cdot 0$ $y_1 \cdot 800$	$x_1 \cdot 0$ $y_1 \cdot 800$	$x_1 \cdot 0$ $y_1 \cdot 800$	$x_1 \cdot 0$ $y_1 \cdot 800$	$x_1 \cdot 0$ $y_1 \cdot 800$	$x_1 \cdot 0$ $y_1 \cdot 800$	$x_1 \cdot 0$ $y_1 \cdot 800$
2		$x_2 \cdot 43$ $y_2 \cdot 37$	$x_2 \cdot 85$ $y_2 \cdot 155$	$x_2 \cdot 43$ $y_2 \cdot 397$	$x_2 \cdot 85$ $y_2 \cdot 555$	$x_2 \cdot 85$ $y_2 \cdot 575$	$x_2 \cdot 22$ $y_2 \cdot 778$	$x_2 \cdot 21$ $y_2 \cdot 779$	$x_2 \cdot 0$ $y_2 \cdot 800$	$x_2 \cdot 0$ $y_2 \cdot 800$	$x_2 \cdot 0$ $y_2 \cdot 800$	$x_2 \cdot 0$ $y_2 \cdot 800$	$x_2 \cdot 0$ $y_2 \cdot 800$	$x_2 \cdot 0$ $y_2 \cdot 800$	$x_2 \cdot 0$ $y_2 \cdot 800$
3			$x_3 \cdot 43$ $y_3 \cdot 37$	$x_3 \cdot 85$ $y_3 \cdot 155$	$x_3 \cdot 43$ $y_3 \cdot 397$	$x_3 \cdot 85$ $y_3 \cdot 555$	$x_3 \cdot 85$ $y_3 \cdot 575$	$x_3 \cdot 22$ $y_3 \cdot 778$	$x_3 \cdot 21$ $y_3 \cdot 779$	$x_3 \cdot 0$ $y_3 \cdot 800$	$x_3 \cdot 0$ $y_3 \cdot 800$	$x_3 \cdot 0$ $y_3 \cdot 800$	$x_3 \cdot 0$ $y_3 \cdot 800$	$x_3 \cdot 0$ $y_3 \cdot 800$	$x_3 \cdot 0$ $y_3 \cdot 800$
4				$x_4 \cdot 43$ $y_4 \cdot 37$ $z_1 \cdot 8$	$x_4 \cdot 85$ $y_4 \cdot 155$ $z_1 \cdot 24$	$x_4 \cdot 43$ $y_4 \cdot 397$ $z_1 \cdot 44$	$x_4 \cdot 85$ $y_4 \cdot 555$ $z_1 \cdot 64$	$x_4 \cdot 22$ $y_4 \cdot 778$ $z_1 \cdot 80$	$x_4 \cdot 21$ $y_4 \cdot 779$ $z_1 \cdot 80$	$x_4 \cdot 0$ $y_4 \cdot 800$ $z_1 \cdot 80$	$x_4 \cdot 0$ $y_4 \cdot 800$ $z_1 \cdot 80$	$x_4 \cdot 0$ $y_4 \cdot 800$ $z_1 \cdot 80$	$x_4 \cdot 0$ $y_4 \cdot 800$ $z_1 \cdot 80$	$x_4 \cdot 0$ $y_4 \cdot 800$ $z_1 \cdot 80$	$x_4 \cdot 0$ $y_4 \cdot 800$ $z_1 \cdot 80$
5					$x_5 \cdot 43$ $y_5 \cdot 37$ $z_2 \cdot 8$	$x_5 \cdot 85$ $y_5 \cdot 155$ $z_2 \cdot 24$	$x_5 \cdot 43$ $y_5 \cdot 397$ $z_2 \cdot 44$	$x_5 \cdot 85$ $y_5 \cdot 555$ $z_2 \cdot 64$	$x_5 \cdot 22$ $y_5 \cdot 778$ $z_2 \cdot 80$	$x_5 \cdot 21$ $y_5 \cdot 779$ $z_2 \cdot 80$	$x_5 \cdot 0$ $y_5 \cdot 800$ $z_2 \cdot 80$	$x_5 \cdot 0$ $y_5 \cdot 800$ $z_2 \cdot 80$	$x_5 \cdot 0$ $y_5 \cdot 800$ $z_2 \cdot 80$	$x_5 \cdot 0$ $y_5 \cdot 800$ $z_2 \cdot 80$	$x_5 \cdot 0$ $y_5 \cdot 800$ $z_2 \cdot 80$
6						$x_6 \cdot 43$ $y_6 \cdot 37$ $z_3 \cdot 8$	$x_6 \cdot 85$ $y_6 \cdot 155$ $z_3 \cdot 24$	$x_6 \cdot 43$ $y_6 \cdot 397$ $z_3 \cdot 44$	$x_6 \cdot 85$ $y_6 \cdot 555$ $z_3 \cdot 64$	$x_6 \cdot 22$ $y_6 \cdot 778$ $z_3 \cdot 80$	$x_6 \cdot 21$ $y_6 \cdot 779$ $z_3 \cdot 80$	$x_6 \cdot 0$ $y_6 \cdot 800$ $z_3 \cdot 80$	$x_6 \cdot 0$ $y_6 \cdot 800$ $z_3 \cdot 80$	$x_6 \cdot 0$ $y_6 \cdot 800$ $z_3 \cdot 80$	$x_6 \cdot 0$ $y_6 \cdot 800$ $z_3 \cdot 80$
7							$x_7 \cdot 43$ $y_7 \cdot 37$ $z_4 \cdot 8$	$x_7 \cdot 85$ $y_7 \cdot 155$ $z_4 \cdot 24$	$x_7 \cdot 43$ $y_7 \cdot 397$ $z_4 \cdot 44$	$x_7 \cdot 85$ $y_7 \cdot 555$ $z_4 \cdot 64$	$x_7 \cdot 22$ $y_7 \cdot 778$ $z_4 \cdot 80$	$x_7 \cdot 21$ $y_7 \cdot 779$ $z_4 \cdot 80$	$x_7 \cdot 0$ $y_7 \cdot 800$ $z_4 \cdot 80$	$x_7 \cdot 0$ $y_7 \cdot 800$ $z_4 \cdot 80$	$x_7 \cdot 0$ $y_7 \cdot 800$ $z_4 \cdot 80$
8								$x_8 \cdot 43$ $y_8 \cdot 37$ $z_5 \cdot 8$	$x_8 \cdot 85$ $y_8 \cdot 155$ $z_5 \cdot 24$	$x_8 \cdot 43$ $y_8 \cdot 397$ $z_5 \cdot 44$	$x_8 \cdot 85$ $y_8 \cdot 555$ $z_5 \cdot 64$	$x_8 \cdot 22$ $y_8 \cdot 778$ $z_5 \cdot 80$	$x_8 \cdot 21$ $y_8 \cdot 779$ $z_5 \cdot 80$	$x_8 \cdot 0$ $y_8 \cdot 800$ $z_5 \cdot 80$	$x_8 \cdot 0$ $y_8 \cdot 800$ $z_5 \cdot 80$
9									$x_9 \cdot 43$ $y_9 \cdot 37$ $z_6 \cdot 8$	$x_9 \cdot 85$ $y_9 \cdot 155$ $z_6 \cdot 24$	$x_9 \cdot 43$ $y_9 \cdot 397$ $z_6 \cdot 44$	$x_9 \cdot 85$ $y_9 \cdot 555$ $z_6 \cdot 64$	$x_9 \cdot 22$ $y_9 \cdot 778$ $z_6 \cdot 80$	$x_9 \cdot 21$ $y_9 \cdot 779$ $z_6 \cdot 80$	$x_9 \cdot 0$ $y_9 \cdot 800$ $z_6 \cdot 80$
10										$x_{10} \cdot 43$ $y_{10} \cdot 37$ $z_7 \cdot 8$	$x_{10} \cdot 85$ $y_{10} \cdot 155$ $z_7 \cdot 24$	$x_{10} \cdot 43$ $y_{10} \cdot 397$ $z_7 \cdot 44$	$x_{10} \cdot 85$ $y_{10} \cdot 555$ $z_7 \cdot 64$	$x_{10} \cdot 22$ $y_{10} \cdot 778$ $z_7 \cdot 80$	$x_{10} \cdot 21$ $y_{10} \cdot 779$ $z_7 \cdot 80$
11											$x_{11} \cdot 43$ $y_{11} \cdot 37$ $z_8 \cdot 8$	$x_{11} \cdot 85$ $y_{11} \cdot 155$ $z_8 \cdot 24$	$x_{11} \cdot 43$ $y_{11} \cdot 397$ $z_8 \cdot 44$	$x_{11} \cdot 85$ $y_{11} \cdot 555$ $z_8 \cdot 64$	$x_{11} \cdot 22$ $y_{11} \cdot 778$ $z_8 \cdot 80$
12												$x_{12} \cdot 43$ $y_{12} \cdot 37$ $z_9 \cdot 8$	$x_{12} \cdot 85$ $y_{12} \cdot 155$ $z_9 \cdot 24$	$x_{12} \cdot 43$ $y_{12} \cdot 397$ $z_9 \cdot 44$	$x_{12} \cdot 85$ $y_{12} \cdot 555$ $z_9 \cdot 64$
13													$x_{13} \cdot 43$ $y_{13} \cdot 37$ $z_{10} \cdot 8$	$x_{13} \cdot 85$ $y_{13} \cdot 155$ $z_{10} \cdot 24$	$x_{13} \cdot 43$ $y_{13} \cdot 397$ $z_{10} \cdot 44$
14														$x_{14} \cdot 43$ $y_{14} \cdot 37$ $z_{11} \cdot 8$	$x_{14} \cdot 85$ $y_{14} \cdot 155$ $z_{11} \cdot 24$
15															$x_{15} \cdot 43$ $y_{15} \cdot 37$ $z_{12} \cdot 8$
Total Number of Farmers in Project	80	320	360	1400	2160	2760	3560	4260	5060	5860	6660	7460	8260	8060	9860

x_i = Cost of Improved Agric. methods to Polder participants in their i-th year of participation.

y_i = Cost of improved Agric. methods to Non-Polder participants in their i-th year of participation

z_i = Cost of expanding animal traction inputs in i-th year of expanded farming.

Table VII: Costs of Setting Up and Operating Animal Traction Centers (8)

Costs:

(1) Animal Traction Centers Costs (Trng)

Type of Cost	Yr. 2	Yr. 3	Yr. 4	Yr. 5	Yr. 6	Yr. 7	Yr. 8	Yr. 9	Yr. 10
K-Costs	16,500 16,500	16,500 16,500	16,500 16,500	16,500 16,500					
Number of Centers in operation									
Operating Costs (p. 322)	3.6 2,2650(OY 1) 2,265	2,265 2,265	2,265 2,265	2,265 2,265					
		2,900 2,900	2,900 2,900 3,298 3,298	2,900 2,900 3,298 3,298 3,298 3,296	2,900 2,900 3,298 3,298 3,298 3,298 3,298 3,298	3,298 3,298 3,298 3,298			
(B) Total Rec. Costs	5,530	10,330	16,926	23,522	25,588	26,384	26,384	26,384	26,384
Total Costs by year for Animal Tr. Centers (A) + (B) (Undiscounted)	! 38,530	43,330	49,926	56,522	25,588	26,384	26,384		

240
238

TABLE VIII: BUDGET: ANIMAL TRACTION--RESEARCH ($'000)

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	PY6 AID	PY6 GRM	PY7 AID	PY7 GRM	PY8 AID	PY8 GRM
TECHNICAL ASSISTANCE:																
Long-Term																
1 Animal Traction Spec.	35		100		100		6>									
1 Crop Specialist			60		100		100		40							
14 PCV's (over 4-yr. period	(not costed)															
Short Term																
Consultants on call	17		17		17		17									
CONSTRUCTION:																
8 Storage facilities	8		8		24		24									
TRAINING:																
Long-Term																
2 Crop Specialists			7		7											
1 Extension Agent			28													
2 Agronomy (NA)	23		20		20		20									
Third Country																
3 Animal Traction Spec's	8		8													
1 Blacksmith Trainer	4		4													
In-Country	3		6		6		6		4							
RESEARCH FUND FOR CROPS, ETC.			35	1	35	2	35	3	20	4						
COMMODITIES:																
Welders	8		8									8		8		
Blacksmith equipment	6		6									6		6		
8 Diesel Pumps (4 HP)	5		12									5		12		
24 Motorcycles	14		10													0
8 Mobylettes	4											4		5		0
11 4-wheel Drive Vehicles	176											176		10		3
Field Test Equipment	2		5									2		10		3
Miscellaneous Implements	5	2	10	2		3		3		4		5				10
Spare Parts	35				10							5		4		8
Animal Traction Supplies			4		8		6	2	3	5		35				
MAINTENANCE/SALARIES/PRIMES																
Salaries (30% of OHV total)		69		74		79		85		90		90		90		90
Primes (30% of OHV total)	29		37		33		36		38			38		38		38
Maintenance of project veh.*	18	14	39	23	39	23	39	23	24	46		50		50		50
General Maintenance*		13		13		14		16		17		17		17		17
Sub-Total	402	100	434	115	399	124	148	135	129	180		341		350		219
Contingencies (15%)	60	15	65	17	69	19	52	49	19	27		46		46		46
Inflation (8-17-26-36-47%)			85	22	119	37	144	90	70	97						

Table IX: Budget: GHV Administrative Support ($000)

CATEGORY	PY1 AID	PY1 GHM	PY2 AID	PY2 GHM	PY3 AID	PY3 GHM	PY4 AID	PY4 GHM	PY5 AID	PY5 GHM	PY6	PY7	PY8	PY9	PY10	PY11	PY12	PY13	PY14	PY15
MENTITIES:																				
ick-up truck (1/2 ton-2 yrs)	10										20				pick-ups	30				
on-ton trucks	125										243				15 5-10	375				
Mobylettes	61										100				tons					
hort-wave radios & gen'trs	77										7					8				
our-wheel drive vehicles	80																			
age Equipment	10		5								13					15				
urnishings Guest-House	15										15					15				
Sets office equipment for	60	10	10								69					74				
HV headquarters																				
sets office furniture	20		4								28					33				
r the field agents																				
e parts	40		13								44					50				
TENANCE/SALARIES/PRIMES																				
aries (30% of GHV Total)		69		74		79		89		90										
ses	29		31		33		36		38		40	43	46	48	51	54	56	58	59	61
n. Assistant	7		7		7		7		7											
ntenance of Project Related																				
hicles	18	14	39	23	39	23	35	23	24	46	70	80	89	93	97	105	126	137	180	197
eciation Reserve on 11 New				60		60		60		60	60	60	75	78	80	85				
hicles and short wave																				
dios																				
ral Maintenance		30		36		43		52		52										
Total	962	223	547	193	494	250	379	240	145	258										
ingencies (15 percent)	144	35	82	29	74	38	57	36	22	39	71	79	88	96	99	106	109	118	125	130
ation (8-17-26-31-40%)	89	20	107	38	148	75	157	99	78	297										
D-TOTAL	1,195	276	736	260	716	363	593	375	245	694	782	183	210	315	427	1,055	291	313	344	388

242

TABLE X: Agricultural Credit Institution

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	PY6	PY7	PY8	PY9	PY10	PY11	PY12	PY13	PY14	PY 15
TECHNICAL ASSISTANCE:																				
1 Credit Advisor	10	-	100	-	100	-	100	-	40	-	-	-	-	-	-	-	-	-	-	
1 Credit Trainer	-	-	-	-	17	-	-	-	-	-	-	-	-	-	100	-	-	-	-	
CONSTRUCTION:																				
4 Warehouses (125 sq m ea)	25	-	-	-	75	-	-	-	-	-	-	-	-	-	75	-	-	-	-	
TRAINING:																				
Long-Term																				
1 Agricultural Credit (A)	-	-	20	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Short-Term																				
5 Supervised Credit (NA)	-	-	28	-	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
In Country (30 m)	-	1	2	1	2	1	2	1	2	1	3	3	3	3	3	3	3	3	3	
REVOLVING CREDIT LOAN FUND:																				
Animal Insurance Fund	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
STUDIES/CREDIT DESIGN	-	-	43	-	-	-	-	-	-	-	10	-	-	-	20	-	-	-	-	
COMMODITIES:																				
2 4-wheel drive vehicles	32	-	-	-	-	-	-	-	-	-	32	-	-	-	-	32	-	-	20	
Veterinary supplies	3	-	4	-	5	-	5	-	3	-	-	-	-	-	-	-	-	-	-	
Spare Parts	4	-	-	-	2	-	-	-	-	-	4	-	2	-	-	4	-	-	2	
Maintenance/Salaries/Primes																				
Salaries (30%)	-	69(1)	-	74	-	70	-	85	-	90	96	103	110	118	126	135	149	154	165	177
Primes (30%)	28	-	31	-	33	-	36	-	38	-	42	44	47	50	53	57	61	65	70	75
Maintenance costs of vehicles transporting agricultural implements (30%)	18	14	39	23	39	23	39	23	24	46	80	80	80	80	80	90	90	90	90	90
Sub-Total	125	84	462	98	652	103	519	109	563	137	256,000	230,000	230,000	230,000	308,000	266,000	230,000	230,000	252,000	230,000
Contingencies	19	13	69	15	98	15	78	16	84	21										
Inflation (8-17-26-34-47%)	12	8	90	19	195	31	215	45	304	74										
GRAND TOTAL	156	105	621	132	945	149	812	170	951	232										
	169,000		448,000		551,000		385,000		949,000		256,000	230,000	230,000	230,000	308,000	266,000	230,000	230,000	252,000	230

(1) 30% of OHV total with 7% growth factor

PY6 thru PY 14 estimated without sound data.

TABLE 21 Irrigation/Beneficiaries (0'000)

CATEGORY	FY1 AID	FY1 GRN	FY2 AID	FY2 GRN	FY3 AID	FY3 GRN	FY4 AID	FY4 GRN	FY5 AID	FY5 GRN	FY 6 AID / GRN	FY7 AID / GRN	FY8 AID / GRN	FY9 AID / GRN	FY10 AID / GRN	FY11 AID/GRN	FY 12 AID/GRN	FY13 AID/GRN	FY14 AID/GRN
TECHNICAL ASSISTANCE:																			
Long-Term																			
1 Irrigated Rice Spec	10		100		100		90				-	-	-	-	50	50	-	-	-
Short-Term																			
1 Water Management Spec			4		4		4				10	10	10	10	10	10	10	10	10
Consultants on call	9		17		17		17		8										
CONSTRUCTION:																			
Construction			150	10	359	30					100	150	100	150	100	150	100	150	100
Engineering			57																
TRAINING:																			
Long-Term																			
1 Engineer (A)			20		20							20				20		20	
3 Rice Production Spec's	14		14		14														
Short-Term																			
2 Technical Specialists			6								6	6	6	6	6	3	3	-	-
4 Others			6		5						6	6	6	6	6	3	3	-	-
In-Country (100 m)			15		35		35		15		20	20	20	20	20	10	10	-	-
STUDIES:																			
(Additional Polders)							75						75					75	
COMMODITIES:																			
Assorted Tools			5									10				20			
Materials			5									10				20			
5 Diesel pumps (4 HP)	12																		
3 Tractors (MF 185)	54																		
3 Scrapers (Reynold 4m 3)	18																		
3 Plows (MF 1.24)																			
3 Disc Harrows (MF 95)	36											6				10			
3 Trailers (MF 2.16)	36																		
1 Land Plane (Marion tri-plane)	12															4			
1 Harmar M111	1											2							
50 Sprayers, portable	3																		
20 Multiple cultivators	4																		
20 TM Plows	2															4			
20 Harrows	2											2				10			
Spare Parts	41											40							
Maintenance/Salaries/Prices:																			
Vehicle Maintenance	6	5	13	5	13	5	13	6	8	15		25	25	25	30				
Machinery Depreciation				40		40		40		40			40		40	30	30	35	35
Reserve																	30		40
Salaries (1)		23	10	25	11	26	12	28	13	30									
Prices (1)	10																		
Other/Start-up Items	15																		
Sub-Total	361	28	422	80	578	101	246	74	44	85									
Contingencies (15%)	54	4	63	12	87	11	37	11	7	13									
Inflation (8-17-26-36-47%)																			
GRAND TOTAL	447,000		577,000		777,000		368,000		149,000										

(1) 10% of GNV total

TABLE XII: ROAD CONSTRUCTION

CATEGORY	FY1 AID	FY1 GRM	FY2 AID	FY2 GRM	FY3 AID	FY3 GRM	FY4 AID	FY4 GRM	FY5 AID	FY5 GRM
TECHNICAL ASSISTANCE:										
Short-Term										
1 Civil Engineer			42		42					
1 Engineer, REDSO, TDY (2 PM as in FY's 1,2,3)			6		6					
CONSTRUCTION:										
203 km roads			550		650		725		714	
195 km trails			100		150		125		74	

COMMODITIES:

2 Bulldozers	200,000
2 Motorgraders	170,000
1 Wheeled Loader	65,000
2 Wheeled Scrapers	170,000
1 Disc plow	16,000
1 Compactor	30,090
5 Dump Trucks	150,000
3 Water Trucks	90,000
3 Water Tanks	3,300
1 Mechanic's Pickup truck	20,000
2 1 ton Payload pickup	18.000
1 Concrete Mixer	5,000
10 Wheel Barrows	1 000
2 Water pumps	2,000
1 lot Survey equipment	6,000
1 Fuel/lub Truck	30.000
2 Fuel Tanks	5,000
1 Tanker	30,000
1 Low bed tractor/trailer	45,000
2 6T trailer vans	8,400
5 10 man tents	5,000
1 15 Kw generators	8,000
Sub-Total	1,077,700
Spare parts for items 1-4 with delivery plus 5-year contract for 25%	242,000
Spare parts for remainder of vehicles. 20%	82 800
TOTAL —	1,402,500

Rationale for 40% spare parts on items 1-4 - their estimated life according to Travaux Publics is 10 yrs, but spare parts during period far exceeds 20%

2 Motor graders	150,000
2 Tow type water tanks	8,000
2 Water pumps	2,000
2 Dump trucks	60,000
2 Tractor (Industrial)	35,000
2 Wobble wheel tyred roller	20,000
2 1T payload 4-wheel drive Diesel pickup	18,000
Sub-total	293,000
Spare parts, insurance & freight 10%	58,600
TOTAL	351,600
say	352,000

		FY1 AID	FY1 GRM	FY2 AID	FY2 GRM	FY3 AID	FY3 GRM	FY4 AID	FY4 GRM	FY5 AID	FY5 GRM
STUDIES — ROADS/OHV FINANCES (3 months)							25				
SUB-TOTAL	1,075	7	692	13	872	13	1,086	13	888	13	
CONTINGENCIES 15%	263 400	1	104	2	131	2	163	2	133	2	
INFLATION (8-17-26-36-47%)				3	261	4	451				
GRAND TOTAL	2,027,000	811,000		961,000		1,040,000		923,000			

Table XIII **Road Maintenance Costs (Estimates)**

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6 . . .
km of Roads Constructed	8	83	110	103	102	
Cumulative total kms to be maintained			83	193	296	398
at $336/km			x $326/km	x$326/km	x$326/km	x$326/km
	0	0	27,058	62,918	96,496	130,000 (see p. 28 8 pp.)

Table XIV: Financial Viability of Credit Fund

Projected Credit Needs of OHV

Demand for Credit	Year 2	3	4	5	6	7	8	9	10	11
	(80)	(240)	(440)	(640)	(760)	(800)	(800)	(800)		
Start-up K (720)	57,600	172,800	316,800	466,196	563,400	605,700	619,200	627,300	630,000	
Expenses K (675)	-	-	-	-	16,200	29,700	43,200	51,300	54,000	
Cart	12,420	38,860	71,280	103,680	123,120	129,600	129,600	129,600	129,600	
		1.05	1.1025	1.16	1.22	1.28	1.34	1.41	1.48	
Total Credit Needs:	+70,020	(+211,660)	+388,080	575,272	702,720	765,000	792,000	808,200	813,600	
Total Credit Available:	- 9,120	- 45,814	-122,866	-243,716	397,384	550,428	685,592	770,466		
Credit Support Nec:	+60,900	+165,866	+265,214	+326,160	305,336	214,572	106,408	37,734		

*(if no multiplier effect of project assumed)

Supply of Credit (=Pay Back)	2	3	4	5	6	7	8	9	10	11	
	(80)	(240)	(440)	(640)	(760)	(800)	(800)	(800)	(800)	(800)	
D Yr. 1 (114)	-6,800	-27,360	-50,160	72,960	86,640	91,200	91,200	91,200	91,200	91,200	
Yr. 2 (233)		-18,640	-55,920	-102,520	-149,120	177,080	186,400	186,400	186,400	186,400	
Yr. 3 (219)			-17,520	-52,560	-96,360	140,160	166,440	175,200	175,200	175,200	
Yr. 4 (206)				-16,480	-49,440	90,640	131,840	156,560	164,800	164,800	
Yr. 5 (194)					-15,520	46,560	85,360	124,160	147,440	155,200	772,786
Yr. 6 (0)											
Default = P	0	(18,646)	(33,440)	(171,560)	(310,440)	(454,440)	(570,040)	(642,320)			
.01 x P	0	+186	+ 734	+1,716	+3,104	+4,544	5,700	6,423			
		-45,814	-122,866	-242,804	-393,976	-541,096	-685,592	739,952			
Yr. 1 (exp)											
(183) Yr. 2 (exp)					-1,944	-3,564	-5,184	-6,156	6,480	6,480	
(172) Yr. 3 (exp)					-1,464	-4,392	-8,052	-11,712	-13,908	-14,640	
(161) Yr. 4 (exp)						-1,376	-4,128	- 7,568	11,008	13,072	13,760
(152) Yr. 5 (exp)							1,288	- 3,864	7,084	10,304	12,236
(0) Yr. 6 (exp)								+ 1,216	3,648	6,688	9,728
					-3,408	-9,332	18,652				

TABLE XV **Increased Cost Flows of OHV due to Project**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Increased Yield (millet)	280,000	1,256,000	3,188,000	6,140,000	9,833,800	13,861,600	17,933,200	21,912,800	25,989,600	30,062,400	30,062,400	34,124,400	38,206,400	42,278,400	46,350,400
Mkt'd (.20)	56,000	251,000	637,600	1,228,000	1,966,760	2,772,300	3,586,640	4,382,560	5,197,200	6,012,480	6,012,480	6,826,280	7,641,280	8,455,680	9,270,080
Revenue Increases of OHV due to Project millet, sorghum x20	2,545	11,409	28,982	55,818	89,398	126,014	163,029	199,205	236,236	273,294	273,294	310,313	347,331	384,349	421,367
Cost increases of OHV due to project															
Increased Yield (Millet)	128,000	384,000	512,000	768,000	1,024,000	1,088,000	1,152,000				1,152,000	1,152,000	1,152,000	1,152,000	1,152,000
Marketed	25,600	76,800	102,400	153,600	204,800	217,600	230,400				230,400	230,400	230,400	230,400	230,400
	1,163	3,491	4,655	6,982	9,309	9,891	10,473	10,473	10,473	10,473	10,473	10,473	10,473	10,473	10,473
Stream of revenue to TOTAL	3,708	14,900	33,637	62,800	98,707	135,905	173,502	209,678	283,767	320,786	283,767	320,786	357,804	394,822	431,840
Cost Increases to OHV to project					782,000	183,000	210,000	315,000	327,000	1,055,000	1,055,000	291,000	313,000	316,000	388,000

TABLE XVI: ON-FARM (NON-POLDER) FINANCIAL ANALYSIS

		2	3	4		
ASSETS						
LIVESTOCK						
Oxen	150,000	150,000	150,000	150,000	150,000	150,000
FARM IMPLEMENTS						
Multiculteur	88,795	84,355	79,916	75,476	71,036	66,596
Seeder	58,000	55,100	52,200	49,300	46,400	43,500
Donkey Cart	71,060	67,507	63,954	60,401	56,848	53,295
Simple Implements	8,100	5,400	2,700	8,100	5,400	2,700
RECEIVABLE						
Value of Crop	290,000	358,000	350,000	340,000	340,000	340,000
Total Assets (MF)	665,955	720,362	696,340	683,277	669,684	656,091
($)	1,513.53	1,637.19	1,582.59	1,552.90	1,522,000	1,491,120
LIABILITIES						
Loans Due						
Oxen	150,000	112,500	84,375	56,250	28,125	
Multiculteur	88,795	88,795	66,596	44,398	22,199	
Donkey Cart	71,060	71,060	53,295	35,530	17,765	
Seeder	58,000	58,000	43,500	29,000	14,500	
PAYABLE						
Simple implements	8,100	-	-	8,100	-	-
Oxen feed & Vet. Cost	4,560	4,560	4,560	4,560	4,560	4,560
Harvest Implements	810	810	810	810	810	810
Seed	2,560	3,200	3,200	3,200	3,200	3,200
Fungicide	250	250	400	500	500	500
Labor	91,000	140,000	140,000	140,000	140,000	140,000
Repairs	-	7,000	-	7,000	10,500	7,000
RETAINED EARNINGS	190,820	234,187	299,604	353,929	927,525	500,021
TOTAL LIABILITIES (MF)	665,955	720,362	696,340	683,277	669,684	656,091
($)	1,513.53	1,637.19	1,582.59	1,552.90	1,522.00	1,491.12
TRADITIONAL						
Total Assets (MF)	158,100	155,400	152,700	158,100	155,400	152,700
($)	359.32	353.18	347.05	359.32	353.18	347.05

BLE XVII: ON-FARM (POLDER) FINANCIAL ANALYSIS

YEAR	1	2	3	4		
LIVESTOCK						
Oxen	150,000	150,000	150,000	150,000	150,000	150,000
FARM IMPLEMENTS						
Multiculteur	88,795	84,355	79,916	75,476	71,036	66,596
Seeder	58,000	55,100	52,200	49,300	46,400	43,500
Donkey Cart	71,060	67,507	63,954	60,401	56,848	53,295
Simple Implements	8,100	5,400	2,700	8,100	5,400	2,700
Plow	54,000	51,300	48,600	45,900	43,200	40,500
RECEIVABLE						
Value of Crop	472,500	560,500	552,500	542,500	542,500	542,500
Total Assets (MF)	902,455	974,162	949,870	931,677	915,384	899,091
($)	2,051.03	2,214.00	2,158.79	2,117.44	2,080.42	2,043.39
LIABILITIES						
LOANS DUE						
Oxen	150,000	112,500	84,375	56,250	28,125	-
Multiculteur	88,795	88,795	66,596	44,398	22,199	-
Donkey Cart	71,060	71,060	53,295	35,530	17,765	-
Seeder	58,000	58,000	43,500	29,000	14,500	-
Plow	54,000	54,000	90,500	27,000	13,500	-
PAYABLE						
Simple Implements	8,100	-	-	8,100	-	-
Oxen feed & vet. cost	4,560	4,560	4,560	4,560	4,560	4,560
Harvest Implements	810	810	810	810	810	810
Seed	11,560	12,200	12,200	12,200	12,200	12,200
Fungicide	250	250	400	500	500	500
Fertilizer	20,625	20,625	20,625	20,625	20,625	20,625
Threshing	27,000	27,000	27,000	27,000	27,000	27,000
Tax	13,500	13,500	13,500	13,500	13,500	13,500
Labor	96,250	145,250	145,250	145,200	145,200	145,200
Repairs	-	9,200	-	9,200	10,500	9,200
RETAINED EARNINGS	297,945	356,412	437,259	497,754	584,350	665,446
TOTAL LIABILITIES (MF)	902,455	974,162	949,870	931,677	915,384	899,091
($)	2,051.03	2,214.00	2,158.79	2,117.44	2,080.42	2,043.39

TABLE XVIII: ON-FARM CASH-FLOW ANALYSIS

A. Non-Polder Participants (10 Hectar Units)

Oxen 150,000 MF 12%	Oxen Training 20,000 MF	Oxen Feed & Vet. Cost	Multi-Culture 88,795 MF-6%	Seeder 58,000 MF	Labor	Tax	Simple Farm Implements	Year	Fungicide, Fertilizer & Seed	Basket	Donkey, Carts 71,060 MF	Repairs	Total Cash Outlay	Total Cash Revenue	Net Cash Revenue	Tradition - Projec
37,500.00	20,000	4,560			91,000		8,100	1	2,810	810			164,780	290,000	125,220	- 13,010
34,875.00		4,560	27,526.45	17,983.10	140,000			2	3,450	810	22,028.60	7,000	258,233	358,000	99,767	- 46,563
32,782.50		4,560	25,874.86	16,904.11	140,000			3	3,600	810	20,760.88		245,292	350,000	104,708	- 41,622
30,815.55		4,560	24,322.37	15,889.87	140,000		8,100	4	3,700	810	19,464.47	7,000	254,622	340,000	85,338	- 52,892
28,966.62		4,560	22,863.03	14,936.47	140,000			5	3,000	810	18,296.60	10,500	244,633	340,000	95,367	- 50,963
		4,560			140,000			6	3,700	810		7,000	156,070	340,000	183,930	+ 37,600
37,500.00		4,560			140,000		8,100	7	3,700	810			194,670	510,000	315,330	+ 177,100
34,875.00		4,560			140,000			8	3,700	810		7,000	190,945	340,000	149,055	+ 2,725
32,782.50		4,560			140,000			9	3,700	810			181,852	340,000	158,148	+ 11,818
30,815.55		4,560			140,000		8,100	10	3,700	810		17,500	205,485	340,000	134,515	- 3,715
28,966.62		4,560			140,000			11	3,700	810			178,037	340,000	161,963	+ 15,633
		4,560			140,000			12	3,700				156,070	340,000	183,930	+ 37,600
37,500.00		4,560			140,000		8,100	13	3,700	810			194,670	510,000	315,330	+ 177,100
34,875.00		4,560			140,000			14	3,700	810		7,000	190,945	340,000	149,055	+ 2,725
32,782.50		4,560			140,000			15	3,700	810		10,000	191,853	340,000	148,147	+ 1,817
30,815.55		4,560			140,000		8,100	16	3,700	810		7,000	194,986	340,000	145,014	+ 6,784
28,966.62		4,560			140,000			17	3,700	810			178,036	340,000	161,964	+ 15,634
		4,560			140,000			18	3,700	810		7,000	156,070	340,000	183,930	+ 37,600
				LIQUIDATED VALUE AT YEAR 19												+ 171,785
				IRR ALMOST 17%												

B. Polder Participants: (10.5 Hectare Units)

37,500.00	20,000	4,560			96,250	13,500	8,100	1	50,435	810			240,155	472,500	252,345	+ 54,615
34,875.00		4,560	44,266.45	17,983.10	145,250	13,500		2	51,075	810	22,028.60	9,200	352,548	560,500	207,952	+ 2,112
32,782.50		4,560	41,610.46	16,904.11	145,250	13,500		3	51,225	810	20,760.88		333,403	552,500	216,097	+ 10,257
30,815.55		4,560	39,133.83	15,889.87	145,250	13,500	8,100	4	51,225	810	19,464.47	9,200	346,949	542,500	195,551	- 2,179
28,966.62		4,560	36,766.81	14,936.47	145,250	13,500		5	51,225	810	18,296.00	10,500	333,811	542,500	208,689	+ 2,849
		4,560			145,250	13,500		6	51,225	810		9,200	232,545	542,500	308,955	+ 103,115
37,500.00		4,560			145,250	13,500	8,100	7	51,225	810			269,945	712,500	442,555	+ 244,825
34,875.00		4,560			145,250	13,500		8	51,225	810		9,200	268,420	542,500	274,080	+ 68,240
32,782.50		4,560			145,250	13,500		9	51,225	810			257,128	542,500	285,372	+ 79,532
30,815.55		4,560			145,250	13,500	8,100	10	51,225	810		19,700	287,960	542,500	259,540	+ 61,810
28,966.62		4,560			145,250	13,500		11	51,225	810			253,312	542,500	289,188	+ 83,348
		4,560			145,250	13,500		12	51,225	810		9,200	233,545	542,500	308,955	+ 103,115
37,500.00		4,560			145,250	13,500	8,100	13	51,225	810			269,945	712,500	442,555	+ 244,825
34,875.00		4,560			145,250	13,500		14	51,225	810		9,200	268,420	542,500	274,080	+ 68,240
32,782.50		4,560			145,250	13,500		15	51,225	810		10,500	267,628	542,500	274,872	69,032
30,815.55		4,560			145,250	13,500	8,100	16	51,225	810		9,200	272,461	542,500	270,039	+ 72,309
28,966.62		4,560			145,250	13,500		17	51,225	810			253,312	542,500	289,188	+ 83,348
		4,560			145,250	13,500		18	51,225	810		9,200	233,545	542,500	308,955	+ 103,115
				LIQUIDATED VALUE AT YEAR 19												+ 177,185

Income for Polder owners is 197,730 in year 1, 4, 7, 10. 13, and 205,840 MF in years 2, 3, 5, 6, 8, 9, 11, 12, 14, and 15 — 000 — - 9.000

For Farmer averaging 203,137 (462), Increase of 80,675 ($183) (Increase of 40 %)

TABLE XIX: DISCOUNT VALUE OF NON-POLDER FARMERS NET REVENUE FROM IMPROVED AGRICULTURAL METHODS (BENEFITS (NEW)-- BENEFITS (TRADITIONAL))

Undercounted Value of Net Income Differences Due to Project	15%		20%		17%	Value of Net Income Differences Due to Project Discounted at 17%
- 13,010	1	- 13,010	1	- 13,010	1	- 13,010
- 46,563	1.15	- 46,489	1.20	- 38,803	1.17	- 40,490
- 41,622	1.32	- 31,531	1.44	- 28,904	1.37	- 30,381
- 52,892	1.52	- 34,797	1.73	- 30,573	1.60	- 33,058
- 50,963	1.75	- 29,122	2.07	- 24,620	1.87	- 27,253
+ 37,600	2.01	+ 18,710	2.49	+ 15,100	2.19	+ 17,169
+ 177,100	2.31	+ 76,667	2.99	+ 59,231	2.56	+ 69,180
+ 2,725	2.66	+ 1,024	3.58	+ 761	3	+ 908
+ 11,818	3.06	+ 3,862	4.30	+ 2,748	3.51	+ 3,367
- 3,715	3.52	- 1,055	5.16	- 719	4.11	- 904
+ 15,633	4.05	+ 3,860	6.19	+ 2,526	4.81	+ 3,250
+ 37,600	4.66	+ 8,069	7.43	+ 5,060	5.62	+ 6,690
+ 177,100	5.36	+ 33,041	8.92	+ 19,854	6.58	+ 26,915
+ 2,725	6.16	+ 442	10.70	+ 254	7.7	+ 354
+ 1,817	7.08	+ 256	12.84	+ 142	9.01	+ 202
+ 6,784	8.14	+ 833	15.41	+ 826	10.54	+ 643
+ 15,634	9.36	+ 1,670	18.49	+ 846	12.33	+ 1,268
+ 37,600	10.76	+ 3,494	22.19	+ 1,694	14.43	+ 2,606
+ 171,685	12.38	+ 13,876	26.62	+ 6,453	16.88	+ 10,177
		+ 15,801		- 21,134		- 2,367

Relevant lin[illegible] and 17%

Agriculture/Animal Traction

1. Introduction

From an agronomic viewpoint, it is possible to divide the project into three sections. First, there is the animal traction program; credit will be funneled into it but will remain small, in terms of loans and farmers covered, until a new credit system commences and the results of agronomic research in the area become known. The credit program has at its base, initially, an improved package of deep plowing and better weeding through animal traction plus seed treatment. The animal traction/credit component will make oxen and implements available to approximately 2,000 small and medium size farm families during the project's first five years. This is the most important agricultural phase of the project in terms of people affected and its potential over-all impact on increasing productivity in food crops. No time-lag for the implementation will be required because work oxen are already being used extensively in the Haute Vallee for cultivation purposes (i.e., demonstrations to convince farmers of the utility of animals for cultivating, and tests of soil conditions for suitability, are not needed). In conjunction, there will be a trail/road improvement component and various credit offices to support animal traction, sell the needed implements and serve for training work animals as well.

Second, there is the irrigated rice phase of the project which will involve the rehabilitation of 640 hectare polder. Its yields are expected to be about 3 tons paddy/ha. which should make it

a showpiece for OHV and will make an incalculable contribution to stirring up farmer interest in working closely with OHV — an element so necessary to the project's overall success.

Third, there is a research phase. A base line study (via IER) will be taken by the U.S. Department of Agriculture Statistical Service Bureau, for use during the rest of the project by OHV and all technicians involved. There will also be research at the animal traction centers followed by demonstration extension work in the villages using the assistance of Peace Corps Volunteers and two American Agronomists (one animal traction) to test plows, plant spacing, varieties, planting dates, weeding techniques, etc. When the results of all this work become clear, the forth coming recommendations will be incorporated into the improved "package" on which the credit program is based.

While these three phases are, thus, very much integrated from a project perspective, their technical aspects are different, and so are being treated separately here. These three phases are preceeded by the following section, which gives an overall view of project design.

2. Project Design

The design of all project components is based on the actual situation existing in Haute Vallee. The project funded infrastructure and social services will benefit a large percentage of the people living there. The agriculture production components are heavily weighed to help the smaller and economically disadvantaged farmers and to increase productivity so as to ensure the desired increases in farm family incomes.

The project is designed to improve the incomes, employment opportunities and the quality of life of the rural population in Haute Vallee. This can be made possible only, (1) by increasing productivity in food crops, and (2) by an approach to agricultural development which reaches the population of the target zone. This improvement in total farm output in the target area will be accompanied by augmenting the CHV functional literacy program and the area's road structure to allow farmers to learn and take advantage of new techniques to improve productivity.

The judgement has been made to introduce improved technology expand animal traction and continue supervised credit. It is expected that by the end of the project's fifth year, over 2,000 farmers will have purchased farm implements and/or work oxen for the first time through the credit program. So as to ensure the success of this phase of the project, the initial emphasis will be more on applied research, data collecting, systems testing, and the involving of smaller farmers in the research and production activities. It will also encourage individual innovation and permit expansion of existing farm production for those farmers who are successful and for others desiring to join in the program.

On the basis of prudence and caution, the more traditional crops will be emphasized in the first years of the project. It is expected, however, that a wider variety of useful crops can be grown in Haute Vallee than those presently cultivated. This will be studied carefully in the first several years of project implementation, to explore what promising possibilities exist.

Numerous farm families will be involved in an extensive and intensive applied research and farmer demonstration program. It will test production variables and what is the best crop/animal mix, again testing the production. Chemical fertilizer and insecticides will be restricted in the project to research. Extensive studies of response to manures, compost, and chemical fertilizers have been carried out at research stations but to a more limited extent in Haute Vallee. It is expected that continued research in the project area will benefit any future design of the second phase of Haute Vallee.

The initial impact of these applied research experiments will be known after several years of the project. During this time proven varieties and animal traction will be extended, management techniques developed, and fertilizer response tested. New farm models will be developed establishing base line data including farm budgeting and labor analysis. When the most appropriate technology and mix of food crops is proven, the CHV extension agents will be in a much better position than ever before to help the farmers to increase production and shift them to commercial farming. So there is no viable substitute for the applied research and demonstration trials to obtain the information needed.

The project's 5 year goal is to increase total production by 50% per farm family, of which 2,000 will be effected.(1) As will be shown, the Mali Agricultural Sector Assessment forecasts about a 100% increase in productivity in corn, sorghum and millet, and more than that in rice if animal traction is introduced in conjunction with better seed

(1) In addition, the 160 polder families should increase rice production over 400%.

varieties, seed treatment, and better plant density and weed control, and this does not include the benefits of animal traction in expanding total hectares planted. So the goal of a 50 % increase in production is very realistic and represents a total production increase from an average of about 3.5 tons of grains and legumes per farm family to 5.25 tons, or 3,500 tons per year with respect to 2,000 farm families, plus an extra 1,542 tons for the Bancoumana polder farmers.

3. Animal Traction/Credit Program

a. Existing Conditions - Crops

The agricultural practices of the Haute Vallee have remained very close to tradition in grain crops. One of the reasons for this is that to date, outside financial assistance has been mostly into cash crops, especially cotton and tobacco, and has proven effective in expanding cotton production. Grain crops, fruits and vegetables have not received the same kind of inputs.

The target area of OHV is one of the most promising areas in Mali. Altitudes in the OHV area vary; in general, the topographical conditions permit the cultivation of almost all crops grown in Mali. It is impossible to stress too much that annual rainfall, which begins in June and ends in September, in the Haute Vallee ranges from 1,000 to 1,400 mm a year, which is roughly equivalent to that in the states of Virginia and North Carolina. The biggest difference is that in Haute Vallee precipitation is confined to the 3 to 4 month wet season, while in North Carolina, it is spread over the entire year. The temperature ranges are most stable and tend to be hotter in the dry season and similarly hot in the wet season.

Concerning rice production, about 40% of the rice grown in the target area is high water rice. Six percent or less is of the upland culture. Fifty-four percent of the rice is rain fed. Farmers usually take advantage of the first rain to prepare their soil for planting whose season begins in June and continues until after mid-July. The low sub-soil permeability favors rice culture.

There is no shortage whatsoever of land for farming in Haute Vallee. Moreover, since the land most suitable for cultivation is close to the city of Bamako, market opportunities are very favorable — provided the road network is improved. Few of the roads and trails are passable in the rainy season, and even in the dry season many villages away from the river cannot be reached by truck. These trails and roads are the only means of getting the expected surplus production to market. So if they are not improved as provided in the project, much of the surplus production will never get to Bamako, thereby depressing prices seriously in the Haute Vallee and thwarting the objectives of the project of getting these farmers more into the cash economy. (See economic section).

The number of hectares estimated in agriculture production are about 78,000 hectares. The number of hectares and yields per crop for the region as a whole can be estimated from OHV figures and the IER "Socio-Economic Study of the Area Covered by Operation Haute Vallee" November 1977, ("Socio-Economic Study") as follows:-

Haute Vallee 1976/77

Crop	Hectares	Yields/ha (kg)	Production (tons)
Millet/Sorghum	45,000	700	30,000
Rice (paddy)	9,700	700	6,800
Corn	9,000	700	6,300
Peanuts	11,100	800	8,800
Tobacco	360	1,700	440
Cotton	3,000	1,000	3,000

For 1977, a medium severity drought year, the "Socio-Economic Study" (pp. 12-25) estimated the following yields from the two major ecological zones of the Haute Vallee:

Crop	Irrigated Zone (1)	Dry Crop Zone
Millet/Sorghum/Corn	700 kg/ha	600 kg/ha
Rice	650	500
Peanuts	750	750

(1) The zone that is or could be irrigated.

While the reliability of these figures is not known, they at least confirm field-sight estimates. They also confirm general observations that production in the Haute Vallee was not affected to a great degree by the drought and that, in general, because of better than average rainfall conditions, the Haute Vallee is a region where farming risks due to drought are somewhat less than in other regions, where yields can sometimes be cut to zero by a severe drought.

b. Animal Traction

The principle objectives of the animal traction and credit programs are to allow OHV farmers the means of obtaining animals and farm implements and the knowledge about how to increase food crop productivity from employing them.

Animal traction can raise food crop production in two ways: by increasing land under cultivation and by increasing crop productivity per hectare. The Mali Agricultural Sector Assessment suggests a 20% expansion of land under cultivation is typical whenever animal traction is introduced in Mali. This suggests that in order to reach the project's intended 50% increase in food crop production per family, the increment in productivity need only be 25%.[1/] Research in Africa suggests the expanded productivity gains can be much greater.

The most authoritative report on the effects of animal traction, based on years of research by the French all over West Africa but particularly in Senegal, is the AID supported report by Claude Charreau, "Soils of Tropical Dry and Dry-Wet Climatic Areas of West Africa and Their Use and Management", (Cornell 1974). It points out extremely well how and why animal traction does, in fact, increase productivity per hectare in West Africa (pp. 235-37):

> "Weeds are a major problem for farmers in the dry tropical area... Plowing is of special interest because it makes weeding noticeably easier and can eliminate one or two weedings."

> "Many measurements of rooting density of various crops have been made in Senegal and other countries of dry West Africa, comparing unplowed and plowed treatments. In all cases, it has been found that plowing increased noticeably the density of rooting, and especially in deeper layers...."

1/ This takes into consideration the additional land as well.

"Improvement of rooting results in greater potential for exploiting water and mineral soil resources, and for increased yields."

"About 250 experiments comparing unplowed controls and plowed treatments, with or without incorporation of organic matter, were carried out in the French-speaking countries of dry West Africa on various crops between 1952 and 1969...."

"As can be seen from these data, plowing had beneficial effects on yields of all crops (corn, millet, sorghum and rice all showed yield increases of over 33%; peanut yield increases were about 15%). Plowing in the dry tropical areas is one of the important factors for yield improvement."

As for Mali, the Mali Agricultural Sector Assessment (pp. 228-232) makes the following estimates (based on results from IRAT agricultural experiment stations in Mali) of food crop productivity increases which can be expected from employing animal traction:

Projected Yields in Zone
900-1100 mm rainfall (kg/ha)

	Sorghum	Millet	Corn	Peanuts	Paddy*
Traditional method	700	700	700	5-600	750
Animal traction seed treatment, improved variety seed and planting density	1,400	1,300	1,400	1,2-1,400	2,100

*(Based on semi-controlled-water rice, Operation Riz Segou)

Much of the animal traction research in Mali is being done at Samanko near Bancoumana . The most recent study (1978) to be published on the results there states that, with corn, for example,

"the effect of mechanization is favorable regarding animal traction with light equipment as well as with heavy equipment such that the effect of work animals appears to be very favorable (at Samanko, without fertilizers, the yield is doubled or a gain of more than 1 ton/ha)." (SRCVO, Rapport Synthetique de la Campagne 1977-1978 (Bamako), section 3, page 4)

For sorghum, the effect of using animal traction with light equipment was said to be "important" but less so than with heavy equipment. (For millet, yields were too low as a result of drought conditions to draw any kind of conclusion.) Most important, perhaps, the same report goes on to state that the effect of combining animal traction with fertilization was "very important for all plants; one often obtains increases in yields over a ton (per ha)." Ibid., at p. 4. Below is a table compiled from that report (from trials at Samanko) for the last two years:

	Yields (kg/ha)				
	Traditional 1/	Animal Traction Only	Gain	Animal Traction Plus Fertilizers 2/	Total Gain
Corn					
1976	900	1,250	39%	1,600	78%
1977	1,034	1,200	16%	2,044	98%
Sorghum					
1976	1,275	2,050	61%	2,500	96%
1977	928	1,200	29%	1,868	94%

Since average rainfall in the Haute Vallee is good, there is no reason why yields throughout the area cannot be expected to be at least this good from teaching the farmers at the animal traction centers and introducing the same recommended practices such as seed treatment, improved selection of seed, and planting density.

1/ Note: What is labelled "traditional" here really involves a number of improved cultural practices, such as optimum planting density, and planting date plus seed treatment and excellent weeding. Therefore, the yields shown under this column are about 30% higher than what farmers are typically harvesting. So the gain from "traditional" to an "improved package" employing animal traction but not fertilizers is really much greater for the typical farmer harvesting 700-800 kg/ha than shown in this table.

2/ Fertilizer use is "moderate", i.e. that being recommended to the farmer.

Based on the following table, Mali may now be the leader in West Africa in terms of both the number and percentage of animals used for crop cultivation:-

Country	Total Number of animals (oxen, donkeys, cattle)	Number Used For Animal Traction
Mali	3,640,000	200,000
Chad	3,250,000	111,000
Senegal	2,320,000	105,000
Cameroon	2,200,000	25,000
Upper Volta	2,250,000	20,900
Nigeria	8,500,000	?
Benin	646,000	6,400
Mauritania	1,115,000	5,500
Niger	2,200,000	3,000
Ghana	700,000	?
Togo-Gambia		1,000

SOURCE: L. Hasif, "l'Employ de la Traction Animale Dans le Exploitations Agricoles" (presented 2/78 at the Club du Sahel Collogue on "Les Systems de production agricole integrés")

As for the Haute Vallee itself, the "Socio-Economic Study" discovered that over 95% of all Haute Vallee farm families of 20 or more persons use work oxen for cultivation. The Mali Agricultural Sector Assessment (pp. 94-95) estimates that in 1971-72 there were 2,631 plows in the Haute Vallee, or one plow for every 23 hectares under cultivation, and that the number in 1976-77 could be estimated to be roughly 25% higher. The report goes on to state:

> "At any rate it is clear that adoption of animal traction has moved rapidly in Mali ... and has accelerated in recent years ... thus about one fourth of Mali's farmers are already equipped with the basic element for modernization. And at the rate of adoption that has prevailed in the last two years, one half of the farmers could be equipped within five to eight years." (p. 96)

So modifying the credit system is an attempt to make this recommended expansion possible. And the fact that so many farmers are already using animal traction is a great assurance of the success of this part of the project. There are three reasons for this. First, demonstrating and convincing farmers of their effective use is not needed; so the program can start off immediately without any time lag for convincing farmers. Discussions with farmers in the OHV area indicate that lack of credit is the single greatest obstacle. Second, there is no risk, present in some projects, that soil conditions are unfavorable to animal traction. Third, there appears to be no lack of availiable animals; oxen are plentiful in the area. There are a number of other reasons why conditions are extremely favorable to a successful animal traction program in the Haute Vallee. First, feed costs are low due to the availablity of cotton seed (4-5 MF/kg compared to 36 MF/kg for millet, for example), which is used in present Mali animal feeding programs, and due, second, to the fact that there is no lack of available land for grazing. Third, the fact that these animals will also undoubtedly be used on some cash crops as well adds to the farmer's repayment capacity. Fourth, the fact that an oxen retains its value (oxen are the animals used in the Haute Vallee for cultivation purposes) while animals like donkeys or mules (not used in the Haute Vallee for cultivation purposes) depreciate, is still another factor pointing to the viability of this input. Fifth, there are the previously mentioned agronomic benefits of better weeding and a breaking up of the sub-soil to better tap its moisture. Sixth,

animal traction is part of every "package" of improved practices in Mali. Finally, their economic viability is greatly increased by the fact that during the dry season they can be used for transport purposes; similarly they could also be easily used for pumping water along the Niger River during the dry season.

So there are a number of factors present which favor the success of an animal traction/credit program in the Haute Vallée. Nevertheless, the "Socio-Economic Study" (p. 3) found lack of better credit terms a severe draw-back. Only 26.5% of all exploitations in the Haute Vallée have plows, and 23.5% of the plows are not being used for lack of work oxen. So a modified credit system providing loans for animals and implements and on more favorable terms is a must. The Appendix focuses on the oxen schools and their contribution to productivity increases.

4. Irrigated Rice - Bancoumana Polder

The rice production project in Bancoumana is an exciting aspect of the project because of its excellent potential for producing very good rice yields and also because it amlost certainly will result in being the show piece of OHV and the entire project. Rice yields in the 5 ton paddy per hectare category have not been obtained by farmers in Mali largely because of the absence of complete water-control; this is true for instance, in both Action Riz Mopti and Action Riz Segou. In the Office du Niger, water control is theoretically complete, but the land is not level and the water management very poor. So the high yields possible have not been obtained even though numerous rice varieties are being tested.

This significant constraint will be entirely eliminated by the restoration of the polder which will provide an entirely adequate water delivery system, as shown in the irrigation section of this paper. This will permit a changeover from deep water (floating) rice varieties to irrigated rice varieties which have yield capacities of at least 5 tons paddy/hectare, or at least 60% higher than the top yields of the best floating rice varieties being planted in Mali.

The polder itself consists of about 640 ha; 540 ha. are presently cultivated by about 160 families. The farmers are not presently distributing water well because the water control under the irrigation system as presently designed is so poor. The original polder project failed for this reason. The failure to level the land means that water frequently must completely flood one field in order to arrive at another, and one side of a plot may be submersed in water while the other side is dry. The entry of considerable amounts of water may be needed by one farmer but damaging to another. The same type of problem exists with respect to the timing. So there is a clear built-in structure which makes managing the polder extremely difficult and has prevented the polder farmers from co-operating effectively.

The polder is presently planted in rice because of its superior price and because soil conditions are favorable — its clay content and low sub-soil permeability favors rice cultivation. The varieties of paddy presently planted in the polder are local deep water varieties with low yield potential. A typical yield in the polder in a year of

adequate rainfall is approximately 800 tons/hectare, but average yields over a 5-10 year period are at least 100 tons/hectare because of frequent droughts against which the present irrigation system does not provide complete protection. Control of wild rice and other weeds is not good in part because good control requires the co-operation of all polder farmers. Most of the rice is broadcast which makes weeding very difficult. In Bancoumana the improved practice of straight row planting will be used and effective weeding simplified, thus assuring higher yields. The typical response of farmers as to why they do not now plant in rows is simply that they are not familiar with the practice and that it is not their custom. They believe that the spaces between rows is a waste of the land. Animal traction is not used by most farmers in the polder, although this can be attributed largely to the unavailability of credit to buy work oxen.

The principal project inputs contributing most directly to the increase of yields will be the rehabilitation of the polder, technical assistance from the U.S. in the form of two specialists (an irrigated rice specialist, and a water management engineer), the use of improved variety seeds and improved cultural practices (like planting in rows, better weed control and employment of animal traction and fertilizers). With these inputs, yields of 3 tons paddy/hectare can be expected.

As for paddy yields presently being obtained in Mali, much of the research has been in deep water varieties due to the absence of complete water control. Average yields in Action Riz Segou from

such varieties with only better land preparation and weed control are 1.5 tons paddy/ha; test plot yields with fertilizers are slightly over 3 tons/ha.

As for irrigated rice varieties which typically have better yields, the government of Mali and the West Africa Rice Development Association (WARDA) have been conducting research in such varieties, the best of which is exceeding 6 tons/ha. as shown by the following table.

		Yields (ton/ha)	
Variety	Cycle (days)	1976	1977
Mahrat DK3	163	2.6	6.2
IET 2885	149	5.3	5.9
D52 - 37	152	4.0	5.8
Hi523 - DA	140	5.7	5.7
IER 2911	141	6.1	5.7
Jaya	138	5.4	5.3
Malirat BH2	167	4.8	5.1
IR 269-26-3-3-3	141	5.7	5.0
IR 1529 - 677	134	5.1	4.8
Gambiaka Kokoum	155	-	4.7
Segadis	149	3.4	4.1
N'TU - 770 - 7 - 2	118	4.0	3.8
Paugern	123	3.4	3.2
KN - TH 351 - 1 -86	112	4.2	2.5

Source: SRCVO (Mali): Rapport Synthetique de la Campagne 1977-78 (4.78) p. RIZ-10

As for typical non-test trial yields, yields in Action Riz Segou in the few areas where irrigated varieties are being tried and at the nearby FAO seed farm have been no better than those of deep water varieties. At the seed farm, this is due to very poor land (700 kg/ha yields the first year) and wide row planting. At Action Riz Segou, this is due to poor water control; agronomists agree that with complete water control, average yields would average at least 3 tons paddy/ha with satisfactory weed control. As for the Office du Niger, average yields in 1976 were 2.4 tons/ha with fertilizers and work oxen. The same report projects average paddy yields there for 1980 (WARDA, Prospect of Inter-regional Trade of Rice in West Africa (11/77) Table F-6) will be 3.5 tons/ha with improved water.

As for Haute Vallee, while the paddy planted along the river is not of the irrigated variety, lands there are fertile. OHV statistics and field trips reveal that some farmers using deep plowing and perhaps some chemical fertilizers are obtaining yields of 2 tons/hectare. Applying fertilizers is a practice already employed by some farmers, especially those using tractors as well as some polder farmers, most of whom use work oxen too. The amount to be applied in the polder is moderate (40-50 kg/ha of N and P nutrient-wise). WARDA research shows that much Urea is effectively lost when side-dressed on flooded paddy fields and that this is not the most economical use of fertilizers. No urea side-dressing avoids nitrogen run-off problems, to Since the seed will have to be drilled with single row seeders, the fields cannot be flooded until after plants emerge: so application of N at planting might result in leeching. To avoid this, N will be applied after plants emerge next to rows and then covered with soil followed by flooding of fields. As long as fields stay flooded, N will remain in NH_4 state without leeching. Worldwide, too, all fertilizer is applied at planting time.

In order to reach average yields of 3 kg paddy/ha number of conditions must be met. First, the water users associations must operate effictively. The irrigation section establishes how this objective will be met. Second, farmers must in fact change over from deep water varieties to irrigated paddy varieties. From the standpoint of the farmer, this presents no problem because they have no particular attachment to using deep water varieties. The seeds will be given to them on an exchange basis --- the farmer will return to OHV at harvest time 120 kg of clean rice for each 100 kg of seed given to him.

Obtaining irrigated paddy varieties of international origin is no problem. OHV will be able to take advantage of the research in Mali and to use whatever variety is recommended. Since these are non-photo period varieties that are adaptable to regions not exceeding 2,500 feet elevation (the Haute Vallee is about 1,000 feet above sea level), adaptability should present no serious problem, especially since they are already being tested in near-by Segou. Nevertheless, for 1979 ARDA has given OHV 14 of its best international irrigated rice varieties to be planted in test plots next to the polder to check adaptability. These results will be known by the end of 1978.

Third, the rice must be straight row planted[1/] and weed control must be maintained. Regarding these last two mentioned requirements, OHV is taking no chances and plans to use a direct approach. OHV will insist as a condition of participation and use of the land that the

---

1/ Single row seeders, of type used in Operation Riz Segou, will be available for purchase or rental.

farmers agree to follow recommended practices, including weed control, straight row planting and using seed recommended. This is necessitated in large part because without the co-operation of all farmers, effectiv control of wild rice is impossible. Very close supervision is planned and is possible because the project is in a single area. For this reason farmer acceptance of these improved practices is a potential constraint which is being effectively eliminated.

A final requirement for obtaining an average of 3 tons paddy/hectare yields is that farmers must learn how to use animals in flooded fields. This will require American technical assistance and it will be necessary for trained technicians and farm leaders to closely supervise the individual farmers to assure their proper use of water and equipment. The project calls for technical assistance, animal training centers / training of OHV personnel precisely for this reason. Moreover, OHV has found the Haute Vallee farmers to be receptive to new practices when their value has been demonstrated; so it is not believed that this presents a major problem in view of project technical support if there is an animal traction program.

In view of the foregoing, the production of an average of 3 tons paddy/ha on the entire polder starting FY 2 is both feasible and realistic. While it will require considerable effort on the part of OHV, including organizing the farmers, this presents no problem since the staff of OHV is particularly enthusiastic about this phase of the project in view of its excellent potential. All of the above mentioned inputs will be provided to the farmers on credit (with the

possibility of loan restructuring in case of crop failure to assure acceptance by the farmers) — so obtaining the inputs is assured.

Timing is critical to this rice production because the rehabilitation of the polder must be completed before the start of the rains and planting season following the dry season in which the construction is started. This will be carefully planned and implemented.

Storage — the lack of storage space for agricultural produce is not a severe problem as to food crops marketed through official channels. One reason is that almost all food crops are sold in the dry season. Farmers who sell to the government bring their produce to the major roads where it is encercled with a temporary wooden fence and protected by a temporary guard until OHV or the Federation of Cooperatives picks it up, which may not be for several months later. The Federation of OHV pay for these guards and since there is almost no threat of rain, this storage is quite adequate. There are even less problems at Bancoumana because it is only a little more than 1 hour (60 km) from Bamako in the dry season, and trucks pass through all the time in December-March. As for marketing though unofficial channels, sich encirclements are impossible. Nevertheless, home storage is possible, and technical assistance is budgeted to help design better storage facilities if the need seems sufficiently strong to warrant the expenditure. Finally, there is a 300 ton village warehouse near Bancoumana that could be used by the polder farmers if needed, and rice stores better than most other grains.

So this is a production activity which clearly has an excellent potential for success. Moreover, the number of people benefitting from this component will be sizeable — 2,000 people (160 farmers) — and the average cost/person within reasonable limits. Finally, the production potential in the polder is entirely replicable with some modification using the catchment bunds on slopes where only rain is available (about 1,000 hectares).

APPENDIX
Jerry Johnson
Agronomist
Mali.

AN OUTLINE OF THE ANIMAL TRACTION TRAINING-RESEARCH CENTERS

A. Introduction

Animal traction centers are not new to West Africa. They have operated successfully in Northern Nigeria and Benin, Northern Ghana, Sierra Leone and Senegal. This will be the first program of its kind in Mali. The object of this section is, first, to explain exactly how animal traction schools operate and, second, why animal traction training and research involves a lot more than just training oxen how to pull a plow — and why a program involved in such with U.S. technical assistance for the Haute Vallée area will have a broad-scale impact on the total agriculture picture there.

B. Problem

The problem with animal traction in the Haute Vallée is two-fold: First, there are many farmers who want to use oxen for agricultural work but who cannot obtain the credit to purchase the animals. An oxen team typically costs $325 - $390, but no credit is available for their purchase. A multicultivator can add another $190 to this. Other farmers have the implements but lack the oxen because, perhaps, one died; the "Socio-Economic Study" of the Haute Vallée estimates over 23% of the plows are not being used for this reason, even though work oxen considerably out number plows in the area.

Second, and perhaps more important, the oxen are not being used to perform certain essential tasks, such as weeding (except by those farmers who own multicultivators). This is because planting is not done in rows. Also, the animals are thinnest when the rainy season begins, so they are at their weakest when the hard plowing starts. This is problematic to using the multicultivator

which is harder to pull than a plow. Hence, maximum use of them at the beginning of the season is usually impossible. So they cannot plow as much land as possible. Also, the yokes appear to be poorly designed causing strain on the ox's neck when pulled in front. Also, 2-3 persons are used per team, when in most other areas of the world, one person per team is more often the rule. Some of these problems are due to inappropriate implement design. Locally made plows are inferior in design; expensive seeders for planting in straight lines are not necessary. In short, the true economic value of work oxen is not being realized, so that the economic viability of this input is only marginal, even though its potential is great.

C. Objective.

An animal traction program can increase the income of the farmers in the flood zone and upland areas of the Haute Vallée in two ways: (1) improving animal traction so that animals perform more economically beneficial tasks, and (2) increasing the number of improved animal traction teams or increasing the total number of pairs.

Stated differently, farmers are not using animals to their best advantage; hence, their economic return is lower than it should be. The challenge is to maximize the number of essential tasks possible and practical for animals and animal driven equipment. So the project should first focus on improving the tasks performed by work oxen — expansion of the numbers of pairs and equipment will follow the success of the first part of the program and necessary credit. There are 5 tasks where properly equipped work oxen could be more effectively used: plowing, planting, weeding, thinning and harvesting.

This requires not only training of oxen and their owners but considerable research in developing better implements; so increasing forgerons' talents and variety of tasks is a very important objective, too.

D. Means to Achieving Objective

These are at four means to achieving the above objective. First, readily available credit on terms sufficiently long to fit within the repayment capacity of small farmers, including loans for animals as well as implements, and insurance to accompany the oxen. The credit program is directed at this.

Second functional literacy can help tremendously in the transfer of new ideas relating to how to better utilize work animals so as to realize their full potential. The functional literacy program is directed at this.

Third, the animal traction schools can serve to train both the oxen how to plow and weed and the owners in the various ways to utilize them better. A description of these schools follows.

Fourth, research attached to the centers, and coordinating activities with a crop agronomist/research specialist, is needed to test varying inputs. Also he will work closely with forgerons to develop better implements. This is explained below.

E. Animal Traction Centers

1. Training

The objectives of the training program at the centers are (1) linemaking --- showing farmers how to plant in rows, (2) teaching the oxen and owners to weed, (3) harvest transport, (4) cattle nutrition and care, (5) tool fabrication and wagon carpentry --- working with forgerons to develop better tools and learning how to make simple carts, and (6) using oxen for irrigation --- a real potential along the Niger River which is not being realized.

The centers are basically easy to operate and cost little to equip and establish. They consist of the following:

(1) Corral — An uncovered barbed wire corral 50 meters square, in which to keep the oxen, located near a source of water. The corral needs gates and cement feeding troughs for cotton seed and other feeds;

(2) A simple 5 x 6 meter storage facility for equipment, feed, salt ropes, yokes, etc. The building can be very simply constructed and can be made of mud walls with cement crepisage and a tin roof. This storage facility should have a roof extended to one side to provide shade for a place to do forgeron work;

(3) A dormitory for participants is not essential because participating farmers can usually find their own places to stay; nevertheless, since some of the animal traction schools will be connected to credit centers, a 5 meter square dormitory could be built into the credit center to serve for animal traction participants as well as visiting agronomists, etc.;

(4) A 4-wheel drive pick-up for U.S. technician and mobylettes for PCV's are needed;

(5) A cleared area for training pairs of oxen and the owners, and demonstrating agronomic techniques;

(6) Foregaron equipment; and

(7) A 2 hectare field for demonstrations.

The total initial cost excluding vehicles is no more than $15,000 - $17,000. The economic section shows how inexpensive these centers are to operate. The price charged to farmer should cover the cost of training completely because getting oxen on credit will be sufficient inducement. As enthusiasm mounts, the cost might even rise to a level where it pays for vehicles costs too. The price of a pair of oxen can increase by 50% just from being trained and some experience thereafter.

Farmers with oxen bring them to the center for a period of about 2 weeks where they and the oxen are trained. For instance, the animals must be trained to walk in a straight line and within the rows. The farmers must learn to plant in rows of equal distance apart so that the animals can pass through at weeding time. Another example is that oxen must be trained to work with one person rather than three. The wide-spread custom in Mali is to use two or three persons per pair of oxen, one guiding, one on the plow, one person following. This is not only wasteful of manpower but is contrary to the world-wide practice of one man per team.

Since Bambey, Senegal is the most advanced center of study in animal traction, the U.S. technician(s) and their Malian counterparts should spend 2-3 months there during the first year to profit from their work. At each training school there should be 2 PCV's and 2 OHV moniteurs. During the project's first year, the centers should be built at Bancoumana and one in the highland area, for dry-cropping. Thereafter, the centers can be expected to increase by two, or three each year, or eight by the end of the project. The OHV encadreurs should not become involved in the project until after several years when the results of the program are clear (encadreurs have not had the 3-years agriculture schooling that moniteurs have). One or two animal traction experts with experience in Africa are quite sufficient to run the

program. It should be co-ordinated with the crop agronomist. Once excitement is generated in the program, then credit for purchasing work oxen and implements can be expected to increase dramatically - but this can take at least a year.

The forgeron workshop is essential in finding out how to make the most appropriate equipment in the least expensive way. Technicians working with local forgerons in neighboring West African countries, for instance, have developed weeding tools, better yokes, muzzles for oxen when weeding, parts of plows, line makers, irrigation systems for dry season use, and parts of a wagon. The animal traction technician(s) can be expected to bring these ideas with them and, with the PCV's, refine them for the Haute Vallée area. At that point in time is when it becomes sensible to start training forgerons at a more intensified level than OHV now does.

2. Animal Traction Research

There are a lot of variables involved in animal traction, and a crucia part of the animal traction centers will involve more than just training the oxen --- the most appropriate techniques for the Haute Vallée area and best use of oxen there must be researched thoroughly. At present, CMDT is the most advanced government agency involved in animal traction, yet it does no training or research but merely gives credit and recovers it at the cotton harvest time. A Dutch farming systems team is looking into the effects of animal traction in three villages in the Third Region. They have found farmers are not using the teams for weeding, even though this is the highest labor requirement of all operations. This needs applied research. They have also found that there is a great difference in the completeness of equipment among farmers. The remainder of section will attempt to explain some of the

intra animal traction that make such research an exciting but complex task.

lowing

ver animal traction is introduced in Mali (and elsewhere) it is prima:ommended for plowing on the hypothesis that once the farmer learn:ow, he will be freed to undertake other tasks. A majority of the H:lée farmers practice flat plowing, but in some areas farmers do not p:land flat, but, rather, make ridges. The reason why they plant;es is that this is the way it is done with a hoe; so when a farme: team of work oxen, he tends to do the same with his team and plow. cause the typical farmer has only a plow and not a multicultivato the fies the plow first to throw the dirt one direction, and then he returne other side of the furrow to complete the ridge. This means that idge requires two passes with a plow. However, a ridger (which is pamulticultivator) throws dirt in two directions with one pass, thus ig only one pass to make a ridge. Farmers usually do not have a mul:ator for 2 reasons. First, the plow is cheaper (false economy), and sihe French have never recommended ridgers because their research over : tends to show that flat plowing gives better results. However. plowire time consuming, and if the farmer waits until June to plow. plant: is delayed — this reduces yields more than improved land prepa: So these farmers prefer making ridges and rushing to plant all withiia 2-week period when the rains begin on a regular basis in June. Howavis begin in April in the Haute Vallée, and it is very likely that much icould be done in April and May so that planting could be done durinist optimum weeks in June. A research program would determine

whether flat plowing gives better yields and, if so, whether more plowing in April is feasible.

b. Planting (dryland crops)

Existing seeders are expensive, and a good deal of research could go into designing more economical alternatives. Planting in straight rows is critical because if the rows are not perfectly straight, this can make weeding with work oxen impossible — which is critical if animal traction is to prove profitable. But $125 seeders from SCAER are not essential. What's needed is a line-maker. This can be a light piece of wood or bamboo that has holes drilled in it at 80 cm (distance between the rows of sorghum). Narrow thin pieces of metal are put through the stick in the holes so that when a handle and supports are added it can be pulled quickly along the field by a child to have lines. To get proper plant spacing, the pieces of metal are placed in holes in the same sticks, or bamboo, at 30 cm. and the child then passes the rows at a 90 degree angle, giving a checkerboard effect — at each crossing is where the seed should be planted. Since improper plant density is a serious drawback to higher yields, this can be very beneficial.

c. Weeding

Research results at Samanko shows great differences in yields of sorghum depending on weeding dates. Lack of animal traction almost guarantees poor weed control. Weeding through animal traction can be very economical by two means: First, weeding can be done more timely so that productivity per hectare goes up remarkably. Second, a farmer can plant more land because animal traction cuts weeding time from about 6-10 days labor/hectare to one. But to be able to weed, the rows must be regularly spaced so the oxen can

walk between two outside rows while the multicultivator passes down the center row. Second, the ridger on the multicultivator must be modified --- something forgerons can do easily with forges they have. It requires putting wings on the ridger so it can scrape the sides of the ridges instead of digging deeper ridges at the time of weeding. So this would be one of the first jobs in the project of the U.S. animal traction technician,

d. Thinning

This is one of the most time-consuming and critical jobs of the farmer. Therefore, the U.S. Technician will have to be involved in researching processes to speed this process up for upland crops.

e. Harvesting

This is done by hand, but a wagon pulled by oxen can help move harvest rapidly from the field to the house so as to reduce losses due to birds and rats in the field. And of course, oxen could be used to thresh rice, as they do in India (but not Mali, yet).

f. Feeding

If oxen are not well fed (which is frequently the case), they become so weak that some cannot pull the heavy plow with the multicultivator at the beginning of the rainy season --- and so their value is greatly diminished. For the same reason, they are given very little economic activity in the dry season, even though they could be used for transport, dry season irrigation, etc. And highly nutritious rice processing by products are completely wasted by Malian farmers. So cattle feeding research is crucial (oxen strength is very important to be able to plow the ground with the first rains) and must go hand-in-hand with the project. Fortunately the Embouche Paysanne Program is extending its activities into the Haute Vallée area; so the burden on OHV to increase its cattle fattening/feeding program is lessened somewhat.

g. Other areas of research

(i) Investigate use of bulls versus steers (castrated bulls) and the use of female cattle. (Castration is not necessary but is common practice in Mali);

(ii) Study breed of cattle most tolerant (with preventative) to trypanosomiasis;

(iii) Hours of work for oxen as a funtion of — nutrition, depth of plowing, type of plow and race of cattle.

So the research aspects of the program (which will be conducted at the schools as well as in conjunction with the on-farm crop trials) are thus clearly laid out. In closing, it should be simply stressed that animal traction research is a very dynamic process because the economic return to animal traction is a function of many different variables all needing study — the major challenge still being to maximize the number of essential tasks possible and practical for work oxen and animal-drawn equipment.

COST ESTIMATE OF CENTERS

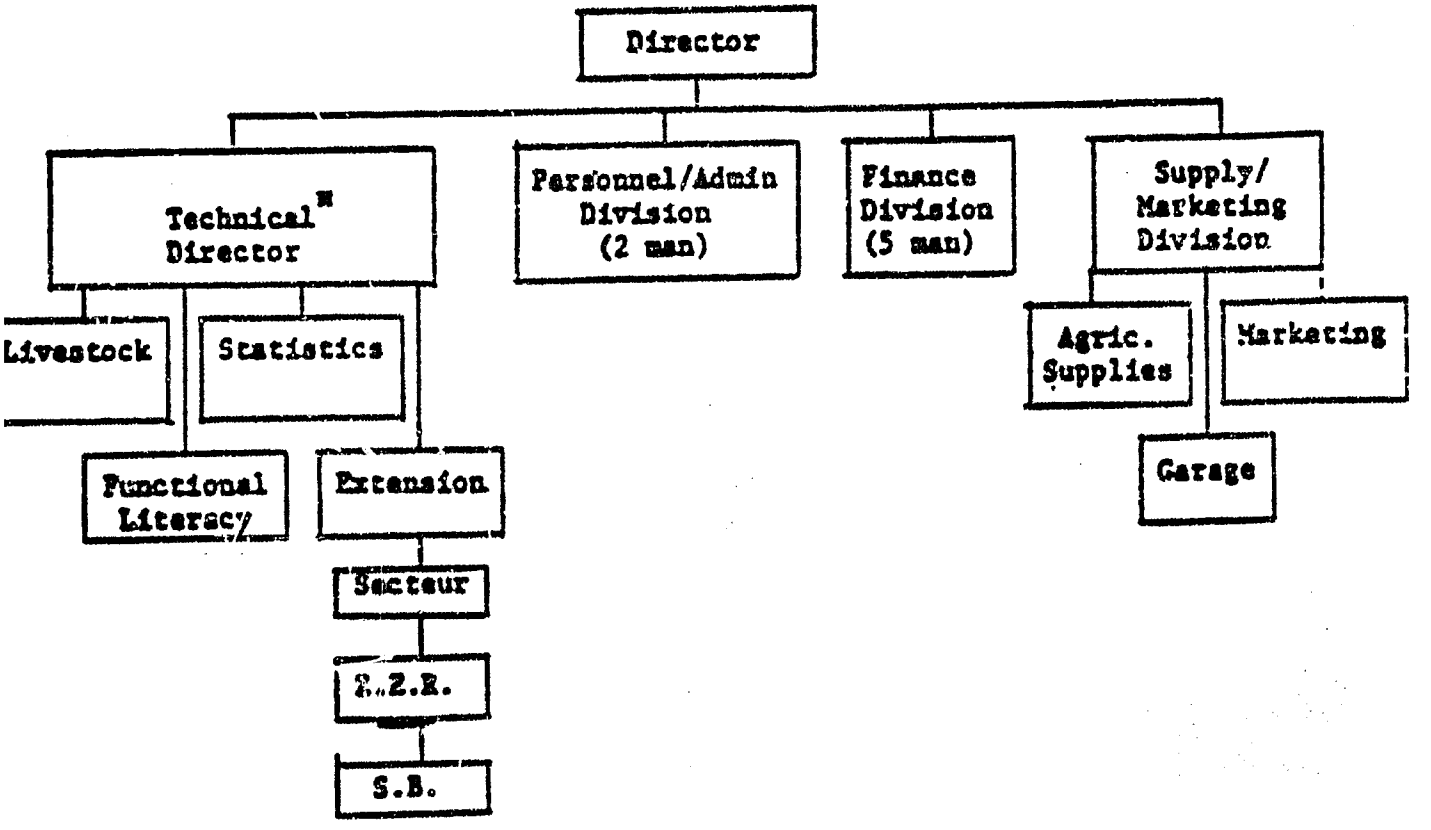
	$
1. Construction	
- 3 x 5 m one-room storage facility ($200/sq m)	8,000
- uncovered barbed wire corral, 50 m x 50 m, with cement feed containers	1,000
2. Commodities	
- Forgeron equipment including welder	3,500
imal traction equipment and supplies (oxen teams, yokes, feed, multicultivators, plows, seeders, ropes, etc.)	4,000
TOTAL	$16,500

. Operation Haute Vallee (OHV)

1. Organization

OHV is headquartered in Bamako and located in 2 buildings, plus a mechanic garage. While initiated in the 1960s, OHV was effectively reorganized in September 1972 with more autonomy and responsibility for coordinating and directing agriculture development of the Haute Vallee area. Administratively under the Ministry of Rural Development, OHV has its own Board of Directors which is presided over by the Minister of Rural Development. The Board approves OHV's program, salary schedules and budgets. OHV is administratively supervised by a Director, who is responsible for OHV administration, its program, planning and for the preparation of its support budget. He supervises an organization of about 180 persons. The administrative breakdown of the headquarters' organization is into 4 divisions:

Organizational Chart of OHV



*He is Assistant Director, too.

The OHV's principal functions are purchasing agricultural products; administering an in-kind credit system; training and supporting an extension program; and coordinating social services such as functional literacy.

The project area is divided into 4 districts called Rural Development Sectors (SDRs). Each of these is further divided into 17 zones called Rural Expansion Zones (ZERs). These ZERs are again divided into 89 resident extension areas called "Secteurs de Base" (SBs). OHV's 110 extension agents all live in one of the villages they serve. The four SDR field offices are located at Bamako, Bancoumana and Kangaba (serving the left bank of the Niger River), and Oualessebougou (serving the right bank).

2. Staffing

OHV has a 31-man headquarters staff, a 16-man auto garage (mostly mechanics), 9 chauffers, and a 124-man field staff (110 being extension agents), or 180 persons in all. This is a ratio of 2.2 field agents to every 1 OHV employee living in Bamako, and a ratio of 4 field agents to every OHV headquarters staff member. OHV has 8 university level graduates — 1 doctor of agronomy, 1 engineer (B.S.) in livestock/veterinary science, and 6 engineers (B.S.) in agriculture. There are also 5 engineers in Agricultural Labors ("Travaux Agricoles") which is less than a full university level degree. The majority of these engineers are in the field as opposed to being at the headquarters staff. At present there are 22 moniteurs (primary school plus 3 years specializing in agriculture), almost all at the ZER and Base Sector (Secteur de Base) level. Each "secteur de base" agent typically covers 3-4 villages. OHV plans to add 13 moniteurs from this year's graduates and reach 62 by 1981, as the following table prepared by OHV shows:

Year	Moniteurs	Encadreurs	Veterinarians
1978	(22 + 13) = 35	(51 + 4) = 55	1
1979	45	60	1
1980	53	60	4
1981	65	60	17

This chart shows clearly OHV's intention of expanding its veterinary/cattle program ("Action Betail") beyond the present one-man staff. It also shows that OHV intends to stop adding "encadreurs", who do not have the special training that moniteurs have.

This entire staff is divided into 4 sections:

Financial (5-man)
Administrative (2-man plus 4 secretaries)
Ag. Supply (6-man plus auto garage and chauffers)
Technical (12-man plus entire field staff)

The technical division has all but two of the university-level graduates and is headed by a Doctor of Agronomy who specialized in rice production. Under the technical division, there are several programs. There is a one-man cattle program ("Action Betail") headed by the engineer in livestock. The program includes 3 activities: cattle fattening, pit silos, and vaccination/animal care. There is close collaboration between OHV and the AID-financed "Embouche Paysanne Program" -- 11 head of cattle, recruited by Action Betail, are being fattened under the Embouche Paysanne program. During the 1978/1979 program, this will expand to 30 head of cattle. In addition, under this activity "Action Betail" supplied salt and 30 tons of cotton seed feed to OHV farmers in 1977/78. As for the pit silo program (which was abandoned by the Peace Corps but which proved appropriate for, and successful in, the Haute Vallee), 15 pit silos

were installed during the 1977/78 campaign, and 30 is the goal for 1978/79. Finally, "Action Betail" conducts a vaccination/anti-parasite program, especially against the tsetse fly (trypanosomiasis), with 2 visits/year to each village. $1,500 in medicine is provided under this program for the 1978/79 campaign.

Secondly, there is a one-man "vulgarization" division. This is run by an engineer in agronomy whose principal responsibility is to formulate the themes for the extension service ("Formation") program. He must, then, keep close contact with all research institutions. There is a closely related 3-man "Formation" program in which these themes (early plowing, planting in rows, seed treatment, importance of weeding, etc.) are propagandized to the lowest field agents and from them to the farmers. This activity involves considerable training of agents at all levels. One of these technicians specializes solely in radio broadcasts. Within this section there is also a new blacksmith trainer who is now giving 2-week classes to local forgerons who, on finishing the course, receive new equipment on credit. The objective is to improve their quality of plows and show them how to make spare parts for implements sold by OHV. There is also a tobacco specialist doing research at the government's research station at Samanko in tobacco varieties, as well as a newly formed 2-man statistical section. This latter program is well planned and will begin in 1978 collecting data (13 different types) through the field agents, including production by crop, commercialization by crop, estimated ha. per crop, farms with work oxen, average population per farm family, estimated production by ha., etc. Finally, there is a DNAFLA agent.

The 2-man administrative staff is concerned solely with personnel problems, such as vacation leave, sick pay, "warnings" to poorly-performing employees, meeting with the labor union representatives, etc.

In the financial division, there are 5 persons all with 12 years of schooling with a specialty in accounting. Each has a separate responsibility, such as the cash box, dealings with SCAER, etc. In this department, budgets are formed, inventories of equipment kept, etc.

The final section ("Approvisonment") is divided into 3 sub-sections: agricultural supplies, repair shop, and marketing. The 3-man implement-fertilizer supply/credit business of OHV is run under the first mentioned sub-section. All supplies but seed come from SCAER; OHV's credit business is about 60% in fertilizers and 25% in implements. OHV's annual report states that this section's major problem is lack of 10-ton trucks. There is also a 2-man team that is responsible for marketing, headed by an engineer in agronomy.

Finally, the 160 sq. foot auto garage constructed in 1951 and located on land designated for OHV's new headquarters is staffed by a head technician, accountant and parts specialist, plus 9 mechanics, 2 automobile electricians, and one water pump specialist, plus 9 chauffers. About half the mechanics are apprentices. Several of the mechanics can read and write, and one has had training in Abidjan at the Peugoet dealer. Their equipment consists of an assortment of tools, 2 battery chargers, an electric tire pump, and small electric welder.

The one principal difficiency running throughout OHV's program is management expertise. Even though the managers are mostly university graduates, their training has been entirely in agricultural science with no management training. This is why section heads should be among those on 3-month training in the U.S., and this training should be largely confined to management.

The training program as outlined below provides for 23 employees trained in the U.S. and 12 more in French West Africa.(1)

	Number
2-year MA level training: 1 in management 2 in agronomy 1 in credit management 1 in engineering	5
1-year academic training: 1 in management 2 Ag Extension 1 statistician 2 in finance	6
6-month training: 3 mechanics 5 credit specialists 1 water management engineer 3 Rice Production	12
3-month training: 8 in crops/management 1 in marketing management 3 in animal traction 1 in functional literacy	13

OHV's training and technical assistance needs are outlined below according to OHV's 4 divisions — financial, personnel administration, agricultural supply/marketing and technical. Those training needs under specific project activities are budgeted thereunder rather than under administrative support here.

---

(1) Only some of these are budgeted under administrative support.

Regarding the 5-man financial division, all have the equivalent of a high school education with majors in accounting. OHV's book-keeping is elimentary and gives the Director of OHV very little understandable information on which to make financial decisions for OHV. Accordingly, technical assistance is needed and will be provided for a period of 2 years starting in mid-FY2, after the project's new agricultural activities have taken off ground. Training will include 1-year training in more advanced accounting at a French speaking institution for 2 persons from this department; one in FY2 and one in FY3. This will allow the U.S. advisor to work with each one separately on his return.

Regarding the 2-man personnel administration division, neither of these persons has the equivalent of a secondary school education. Their needs are minimum, and include knowledge of Malian labor laws (which are very detailed and protective to the employee). Assistance will be in the form of a 2-month advisor to help outline desirable personnel practices both from a legal standpoint and from a professional standpoint

OHV's garage has 12 mechanics and 2 automobile electricians, few of whom can read and write. The mechanics have good basic skills which need improving. Accordingly, it is proposed to send 3 of them to Abidjan or Dakar for 6-month training at one of the "practical" mechanic training courses there. In addition, there will be 2 PCV mechanic advisors, starting FY2, to advise OHV's mechanics and electricians, and who will be responsible for conducting training programs for OHV field agents in the up-keep of motorcycles and mobylettes. Their counterparts will be the head of the garage and the head mechanic.

Regarding OHV's 2-man marketing division, the needs here are management expertise as well as large trucks. The marketing operations of OHV are problematic in terms of coordinating the trucking activities. So the director of this division (a university graduate) could definately profit from a MA in management at a U.S. institution with emphasis on marketing — especially that of large agricultural cooperatives.

Accordingly, 2-year academic training abroad for one person starting FY2 is provided as well as 3-month short-term for an assistant in FY3.

Regarding OHV's agricultural supplies/credit division, the director of this division (who has a high school education plus 1 year of agricultural training in France) needs assistance in learning how to manage an agricultural supply/credit system. It is this department which will operate the new credit system, and the burdens on it will be substantially increased. Accordingly, two years training in the U.S. are planned for someone in this department to learn how to handle a major credit operation. One and a half years academic training at the University level could be followed by a half year on-the-job/observation training in the U.S. Training should focus on credit concepts and management in general. In addition, if OHV is ever to install a substantially more complicated credit system, it is clear that there will have to be agents operating the system who have basic knowledge in credit operations. Accordingly, 5 OHV staff/field agents will be sent for 6-months training abroad for academic and non-academic training, preferably at a French-speaking institution or classes. Finally,

starting the beginning of FY2, a U.S. credit specialist will be on hand for 3 1/2 years to help modify the credit system and advise regarding it. There will also be a 5-month credit design specialist to study the whole credit situation in the project area, as well as a 2-month credit trained for FY3 and FY4 when a more elaborate credit system is installed as a result of this study.

Regarding the technical division, the head of "Action Betail" (a university graduate) and two OHV field agents will be sent to Senegal for 3-month training at the animal traction center there. There will also be a 3-year animal traction specialist to work with them throughout the project. No further training is necessary because Mali Livestock II has already begun giving 8-month training to OHV field agents (5 in 1977/78). OHV's goal is to have all its agents go through this training so that they will have expertise in livestock as well as agriculture.

Regarding the 2-man statistical section, these two technicians do not have the equivalent of high school educations. Their program as outlined for 1978/79 is elaborate; so their goals are high. It is proposed to send one of them for 1-year training abroad or third-country to receive academic training in statistics. On his return, a U.S. agricultural statistical advisor will arrive to work with them for 1 year, helping them to develop a more professional data collecting office and coordinating their efforts with I.E.R. This office will also plan and execute data collection specially aimed at determining project success in terms of its stated purposes and goals.

Regarding functional literacy, the proposed technical assistance is outlined in Part III, and involves a U.S. technician for 30 months.(1)

The extension division is the largest and is headed by a Doctor of Agronomy. There are numerous agricultural specialists in this division who have the educational background to profit from further training in the United States including those in management positions. Only three have had any training abroad. Moreover, this division will be expanding over the life of the project. Thus it is proposed that two of these university graduates receive 2-years training (starting PY2) at the Masters level in agriculture who could be expected to assume leadership of OHV's research program. Another will receive 1 year academic training in management, particularly large agricultural enterprises. Regarding the polder, it is proposed that two OHV agents receive 1/2 year non-academic training in the U.S. in rice production starting PY2. One could be expected to manage the polder thereafter. There is only 1 with water management or engineering skills; therefore, the Genie Rural agent assigned to OHV will receive water management/engineering training in the U.S. at the Masters level. The existing water manager of the polder will be sent to the U.S. for 6 months observation (non-academic training), with emphasis on water management control. In addition to this, because the technical section is the largest and has the most expertise, it is proposed that up to 3 persons from this division, includin the Director of OHV,(2) be sent for short 3-month non-academic training/observation in the U.S. for special crops and agricultural management.

As for U.S. technical assistance to the extension division, this will include one 3-year crop agronomist, one 3-year rice production

---

(1) He will also monitor the health project starting PY 3.
(2) If not available for long-term training.

specialist (for the polder), one water management specialist (4 mo x 3 years), and 16 months of short-term consultant services as needed and agreed. Finally, provision is made for a 4-month agricultural economist to give advice wherever it is felt needed. And an anthropologist (with living experience in Africa) is scheduled to work with the project on three different occasions for 2 months each, to make recommendations regarding the polder water user associations and to judge the project's communication with the farmers.

Finally, there will be over 200 hours of in-country training (all budgeted under [illegible] activities) in credit and agriculture for OHV's 104-man field staff of which there are 86 agricultural specialists (the remainder are mechanics, warehouse men, guards, tractor drivers and gasoline pump attendants) — or about 2 months training being given free by Mali Livestock II (nor any of the training in the functional literacy program or health program which, however, will not involve OHV agents). Lastly, included under administrative support are 60 man-months in-country training in extension work for OHV's field staff.

3. Financial Situation of OHV

In a normal year OHV gets 85- 0% of its revenues from marketing peanuts, cotton and tobacco; only cotton is showing any upward movement in marketing and/or production:

Production/Marketing Through OHV (MT)

CROP	72/73	73/74	74/75	75/76	76/77	77/78
PEANUTS						
Production	5524	6183	8950	9100	8894	
Marketing	3588	1389	4725	3177	2216	1610
COTTON						
Production	671	935	1100	2500	2976	
Marketing	618	849	1082	2340	2356	2105
TOBACCO						
Production	549	280	179	430	450	
Marketing	523	267	171	427	445	

Tobacco production is stagnant because of GRM prices; the GRM, in turn, cannot raise prices without a glut on the market because Mali still cannot find a suitable export market for tabacco. As for peanuts, production is stagnant for very much the same reason; official marketing, however is going down because of increasing competition from Bamako merchants. The table below shows that while cotton production is rising, it is still tobacco which is the major revenue producer (from OHV annual reports):

	1974	1975	1976	1977
REVENUE				
Commission				
Cotton	$33,478	$53,615	$113,040	$103,391
Peanuts	45,652	228,733	260,870	87,120
Tobacco	80,435	74,006	165,217	196,148
SCAER	3,023	5,877	10,852	6,296
Subsidy (FED)	60,402	30,199	34,783	-
Trucking Services	-	92,667	14,737	40,919
Other	18,929	76,091	2,050	13,460
	[illegible]09	$621,193	$601,349	$447,329

	1975	1976	1977
EXPENDITURES			
Personnel	$193,002	$230,435	$206,282
Gasoline	98,389	123,913	90,606
Maintenance	113,928	147,906	64,765
Truck Rentals	16,119		34,680
Amortization	66,970	56,522	42,654
Administration/ trips	14,591	17,174	32,176
Taxes	10,652	13,913	15,393
Other	15,744	13,656	41,977
TOTAL	$621,193	$605,519	$528,533
Net gain or loss	$ 91,798	$ 4,170	-$ 81,204

There are several other things which can be noted about the above table. First, OHV's profits or losses are largely determined by production. Second, the Commissions from SCAER do not begin to cover the real costs of transport (but, OHV does not suffer from loan defaults). Third, the subsidy from the European Common Market (FED) may have ended for good. Fourth, in terms of making OHV more viable, about the only category subject to cost reduction are trucking contractor fees (and rent for OHV headquarters). As for revenue producing activities, OHV's tractor at Bancoumana is producing revenues in a typical year of about $2,000. Considering the costs of operation, it is clear that little or no profits are being made. Fifth, in an off year such as 1977 (due to drought conditions), what suffers the most is maintenance. But there are other areas, such as personnel expenditures, which OHV cuts down on in a bad year. So there is flexibility in expenditures.[1] Finally, there is a government agency (O.R.S.P.) which lends money to "Operations" having financial difficulty.

The brightest spot without a doubt in the financial picture is that starting with the 1978/79 campaign, OHV's territory will be expanding

(1) Nor is there much of an upward movement in expenditures generally.

to take over two ZER's previously occupied by CMDT; production and marketing estimates for cotton for the 1978/79 campaign are 6,500 and 6,000 tons,[1] respectively, which would mean an estimated increase in cotton commissions on the order of $150,000 over 1977. This is the reason for the decided optimism presently observable at OHV.

Another additional source of income to OHV will be the rice from the Bancoumana polder. Marketing 1,800 tons of the 1,920 tons expected by the end of FY3 should give net commissions to OHV on the order of $35,000. This explains its enthusiasm about supervising the rehabilitation of the polder.

In short, the financial picture for OHV looks bright, and even now it is a financially viable institution within the framework of a 3 to 4 year period.

(1) This is based on an estimated increase of hectares in cotton from 3,000 to 6,000, mostly as a result of the increased area to be covered/marketed by OHV.

4. Implement - Fertilizer Supply/Credit

For the 1978/79 campaign, OHV ordered from SCAER in early 1978 $187,475 in farm implements and $372,157 in chemical products:

	Amount	MF Unit Price	$ Total Value
Fertilizers	1,385 tons	-	262,505
Insecticides	69,821 liters	700	106,249
Fungicides	31,310 packets	50	3,403
Plows	334	56,200	40,806
Multicultivators	370	94,300	75,850
Seeders	278	61,600	37,228
Carts	78	80,000	12,209
Peanut Pickers	199	7,225	3,126
Harrows	226	34,400	16,900
			$558,276

The table below shows that this is a big jump over previous years, during which time OHV has been operating an implement-fertilizer supply/credit business more on the order of one-half this amount.

	1973/74	1974/75	1975/76	1976/77	1977/78
Fertilizer (tons)	334	492	400	-	466
($)					$154,625
Insecticides (liters)				-	17,726
($)					$ 38,535
Fungicide (25 grams)				-	2,905
($)					$ 316
IMPLEMENTS:					
Plows	58	55	87		72
Multicultivators	20	236	225		72
Carts	33	60	12		-
Seeders	25	30	118		109
Pumps	174	62	12		-
Other	70	73	61		91
Total (no.)	380	576	515		354
($)					$ 63,420
Seed (not provided by SCAER)					$ 21,900
GRAND TOTAL					$278,796
Loans outstanding (from each campaign)	$5,256	$12,761	$58,937		$130,646
Total outstanding since 70/71					$216,402

(Less than 1% of the above was purchased on a cash basis)

Several things can be deduced from the above table:

(1) OHV's commissions from SCAER are typically between $10,000 and $15,000;

(2) Implements constitute considerably less than half of all credit;

(3) Until 1978, the sale of most implements and fertilizers was stagnant, while that for multicultivators had fallen considerably. As for water pumps, OHV has stopped their sale altogether because of repayment difficulties. (Since they are by far the most expensive item, typically over $1,000, this is hardly surprising.);

(4) With sales of only 72 plows in 1977/78, OHV is by no means the major supplier of this item — rather, local blacksmiths are the major suppliers. With regard to the other implements, OHV is the sole supplier in the area;

(5) Finally, the default rate is very low but the number of loans requiring a rescheduling of payments is high. In 1977/78, for example, all but $42,280 of the $256,896 in loans should have been repaid because the only loans exceeding 1-year terms are those for implements, which totalled $63,420. Accordingly, only 64% of the loans given in 1977/78 and which should have been repaid that year were in fact repaid. Loans for 1975/76 should be totally repaid except for the 12 water pumps, yet $38,937 remains unpaid. Nevertheless, the table shows clearly that most of these loans are eventually paid — only $5,256 of the loans given in 1973/74 remains unpaid, and only $12,761 of those given in 1974/75, and the larger part of this represents loans for water pumps. This confirms OHV's statements that it is very rare for a farmer to completely default on implement loans other than motor pumps. (About 3-5% of the loans for pumps remain outstanding.) So, excluding water pumps, the default rate appears no more than 1%, but the number of loans requiring an extension is frequently over a third — which justifies farmers' complaints that longer terms are needed.

There are several reasons why the default rate is low — village pressure, the threat of imprisonment, and OHV supervision. In Mali, one can be put in jail for refusing to repay a loan. As for fertilizers, the OHV agent must first measure the farmer's land and calculate the need prior to approving the loan. Moreover, the village structure is well-used to bring pressure on the farmer to repay. While it is the OHV agent who processes all loans, it is the village council (along with 4 other officials) which must approve it. So if the village council thinks

a farmer is not sufficiently reliable or does not have the repayment capacity, the loan will never be approved. Moreover, when loan payments are not up-to-date, the OHV agent can request the village council to put pressure on him to repay. As a result, there is considerable pressure on farmers to repay, and it is hardly surprising that they say they "fear" taking out a loan which must be repaid after several harvests. If a farmer's crop is bad, OHV does not want to put itself in the position of causing the farmer difficulty. So it will typically extend the loan a year. Theoretically, OHV can send SCAER a list of creditors in default, but it has not done so to date. So numerous loans are extended beyond the agreed term, and as a result, except in the case of water pumps, it is extremely rare for OHV to receive a letter from an agent stating that a farmer refuses to repay.

g. Warehouses

The most frequently heard complaint at OHV after lack of trucks is lack of warehouses for storing fertilizers, insecticides and implements. The 7 warehouses owned by OHV have a total space of only about 1,000 square meters. Nevertheless, OHV pays nothing for warehouse space for several reasons. First, the Federation of Cooperatives, which is responsible for purchasing/marketing all cereals (but has no responsibility for delivering agricultural supplies) lends OHV a number of its warehouses free of charge. In Kangaba, for instance, OHV stores more fertilizers and implements than anywhere else; yet OHV itself owns no warehouse space. Second, at the Secteur de Base (S.B.) level, OHV uniformly stores it implements and fertilizers in round mud huts donated by the village.

None of this warehouse space is used for storing agricultural produce because it is not needed — the produce is easily kept in sacks in fenced-in surroundings during the dry season until picked up by a truck. The following table shows that including the warehousing space donated freely by the Federation, OHV has the most warehousing space in Siby followed by Bancoumana, Kangaba and Oualessebougou (all section headquarters except Siby):

Warehouse Space Compared to Fertilizer Deliveries During 1977/78 Campaign

ZER	Warehouse Space (sq. m) OHV owned	Warehouse Space (sq. m) Loaned Free 1/	Fertilizer Requested and allocated Tons
Kangaba	-	250	339 3/
Karan	-	50	121
Bancoumana	230	125	219
Narena	60	-	100 3/
Kati	-	- 2/	83
Oualessebougou	120	-	63
Siby	450	-	51 3/
Kalifabougou	-	-	43
Keniegoue	60	-	39 3/
Dankassa	-	30	37
Figuera-tomo	-	25	26
Faraba	-	50	25
Sanakoroba	-	-	25
Djoliba	-	50	19
Sandama	-	50	13
Baguineda	-	-	13
Bamako	-	-	5
TOTAL	920	580	1,131

1/ Loaned free of charge by village or the Federation of Cooperatives

2/ No central warehouse used; all fertilizers sent directly to small village level

3/ Warehouse space is insufficient and in these villages, OHV has tobacco drying houses, part of which are used to store fertilizers/implements

6. Office Space

Following the lack of warehouse space, OHV's biggest complaint is lack of adequate office space — in the field and in Bamako. OHV owns and provides lodging for about half of its sector and ZER agents in the field; the remainder of the sector and ZER agents are reimbursed for rent. Where OHV provides housing, the typical arrangement is for the OHV agent to use one of the rooms (open to the street) for an office. In Bancoumana, for example, crammed into a (3m x 3.3m) room (part of sector head's house) are 3 desks and cabinets for the sector head, the ZER agent, the S.B. agent, the warehouseman, and a secretary. In Siby, the ZER and S.B. agents have seperate offices. In Narena, one has an office. In Kangaba, the sector head has an office (3m x 3.3m seperate from the main OHV-owned office (3m x 5m), where the ZER and S.B. agents, secretary and warehouseman are located. (There are 2 other offices in the same building, reserved for 2 other GRM agencies.) In Oualessebougou, OHV has to rent office space (5m x 3m) for the sector, ZER and S.B. agents plus warehouseman.

The following table shows the office space used by OHV:

Office Space (sq. m.)

ZER	OHV Owned	Rented	No. of people
Bancoumana	10	-	5
Kangaba	25	-	5
Oualessebougou	-	15	4
Siby	20	-	3
Narena	10	-	2
Keniegoue	15	-	3
Dankassa	14	-	2
Figuera-tome	-	14	2

The remainder of the houses rented by OHV agents have no offices as such. (in Karan, Kourouba and Selefougou for example).

7. Vehicles

The following table shows that OHV's fleet of operating vehicles is ageing:

4 Five-Ton Trucks (1972)
4 Pick-Ups (1975) (1974)
1 Rangerover (used for special trips only) (1976)
1 Peugeot 404 (1973)
2 Renault 12 (1977)
2 Tractors (1975)

OHV's annual report regarding the implement-fertilizer supply/credit section forcefully states what is OHV's number one problem — lack of large trucks to transport the fertilizer and implements to the Haute Vallée and bring back agricultural produce. Only 3 of its 4 five-ton trucks are normally in working order at any given time; so OHV's trucking capacity is effectively 15 tons.

The demand for trucking capacity comes in December through February when OHV delivers all of its agricultural supplies; it is also the time when all the agricultural produce purchased by OHV is picked-up in the Haute Vallée. Because OHV's fleet is so small most of this shipping is done by private truckers. The main distribution points are Kangaba, Siby, Bancoumana and Ouelessebougou. The fee of a 10-ton truck to Kangaba is typically 90,000 MF ($195). In a normal marketing campaign, there are over 1,000 trips, the great majority of which are made using private trucks contracted by OHV, since OHV's effective 15-ton capacity is far too small for the job. The total cost to OHV in 19777 was $ 35,000 for the services of the private truckers.

Finally, two tractors are owned by OHV and contracted for $27/ha. for plowing — one at Bancoumana and, for the first time in 1978, one at Kangaba. The Bancoumana tractor operator generated in 1977

revenues of over $2,000. All of this contract work occurs between April and July. The tractor operator says that he cannot meet all the demands at this period. In July, the tractor is sent to the OHV garage at Bamako for a complete tune-up.

Role of WOMEN

A. Agriculture Components of Project

Any project which directs its attention to agricultural activities in the Haute Vallee automatically effects women because of the fact that women play a much more substantial role in agriculture in Mali than in many societies. While men perform much of the work requiring great strength, such as plowing, it is the women who do most of the work characterized by very long hours of activity. The men tend to be responsible for preparing the land for planting, weeding and harvesting; the women tend to be responsible for both weeding and harvesting as well. Women, however, are not generally the ones who use the work oxen for weeding. And, of course, women are entirely responsible for food preparation. The hours of food preparation are incredibly long; anything which goes to reducing those hours is very much appreciated (including, sometimes, the husband's acquisition of a second wife, who then shares much of the work).

Increased use of work oxen in the Haute Vallee will relieve both men and women somewhat in terms of weeding time (typically 20 labor hours per hectare per year); so animal traction will have a beneficial impact in terms of reducing weeding work of both women and men. The irrigated rice polder project at Bancoumana will also have threshers to reduce from 15 to 3 days per hectare the time spent by both men and women in this activity. Most important, because there are few rice mills in the area, credit will be available for purchasing rice mills. The

amount of time spent in milling rice is incredible. The milling and hulling is all done by pounding; this alone can consume 2 to 4 hours a day of a woman's time. Precisely for the reason of reducing women's time spent in this tedious time consuming task, small rice mills sold on credit are included in the project.

A. Road Component

This component will clearly be of benefit to everyone in the project, women and men.

C. Functional Literacy/Health

Where women have to gain the most may be through the functional literacy campaign. At present, half as many women in Mali are literat as men. At present, getting women to enrole in functional literacy classes is problematic because most of the teachers are men --- and Malian husbands do not like sending their wives to classes taught by men. This is the case in the project area as well as other areas of Mali. Accordingly, a special effort is being made to assure that wome do participate. In other areas where DNAFLA operates, there are literacy classes specifically for women only and taught by women only, in addition to mixed classes of men and women. This will be duplicated in the functional literacy program, and one of the project goals is that 50 of the 200 new functional literacy centers will have courses specially designed for women only.

The health activities to be directed through the Ministry of Health and its existing dispensaries along the Niger River will be directed at everyone equally — men, women and children.

Hence, the project has been designed with complete awareness of, and concern for, the role of women in the village, agricultural society in the Haute Vallée, and every aspect of the program will have a beneficial impact not only in terms of freeing women from some very strenuous labor that the men often refuse to do, but, in addition, via the functional literacy program, women will be in a stronger position to determine themselves the role they wish to play in village societies.

C2
Barbara Cashion
Jerry Cashion
Anthropologists
May 13, 1978

123

REPORT ON THE HAUTE VALLEE

I. INTRODUCTION

A. Purpose of Inquiry

As anthropologists living in Mali for over 2 years, we were asked to go in to the Haute Vallee for about a week to talk with farmers and OHV agents at all levels so as to provide some additional information which might assist A.I.D. in the scope of its planned assistance to operation Haute Vallee (OHV). Our inquiry was directed to the field structure of OHV; credit system, traditional and governmental; farmers' need or desire for credit, and their thoughts about the OHV credit system; the extensiveness of animal use in farming; the need for or feasibility of animal traction training-research centers; OHV's need for buildings; the plan for the renovation of the Bancoumana polder and farmers' involvement in this plan; the road system; and farmers general views of the usefulness of OHV.

B. Contents

1. Introduction
   a. Purpose of Inquiry
   b. Contents

Methods, Locations, Time
   a. People
   b. Places of Interviews

Findings
   a. General services of C
   b. Credit
   c. Animal Traction
   d. Roads
   e. Bancoumana Rice Pold
   f. Need for Buildings
   g. Health
   h. Wage Labor
   i. Mills

Summary/Observations

Appendix - Interview Guides

II. Interviews

A. People Interviewed

We did all our interviews speaking in French with the civil servants, and Malinke with everybody else.

1. Local Government Officials at Kangaba, including the Commandant de Cercle.

2. Local Administrators of OHV on three levels — Chief of Sector, Chief of Sub-Sector (ZER), and Agents of Base Sectors (SB) — at Kangaba, Bancoumana, Keniegoue, Karan, Nyame and Siby.

3. Group interviews with village chief and group of farmers at Balanzan, Kofoulate, Karan, Nyame, Samako, Tabou and Dalakana.

4. Interviews with individual farmers, usually in their fields, at Samale, Samayana, Kole, Kenieba, Balanzen, Sonmbo, Kangaba, Tarawali and Kara.

5. Drivers of heavy trucks, pick-ups and private cars, including 6 drivers of Peugeot 404 pick-ups with passengers and truck drivers from Djoliba, Bancoumana and Bamako.

B. Places of Interviews

We spent all of our field time in the area between the two main north-south roads, Bamako - Siby - Narena - Kouremale, and Bamako - Bancoumana - Kangaba - Dioulafoundou, and much of the area between.

III. Findings

A. General Services of O.H.V.

OHV provides two (among others) basic services. First, it introduces and demonstrates, through its agents, modern farming methods-new seed varieties, fertilizers, crop rotation, weed-insect-pest control, use of tools and machinery, animal traction, and production techniques. Second, OHV buys the farmers production of these crops, providing for the transport right from the farmers' fields.

Farmers everywhere we visited seemed to indicate a general satisfaction with OHV. We found this quite a contrast to our experience in the Kita area where we felt that a majority of farmers were dissatisfied with Operation Arachide. Some minor complaints about OHV are discribed further on in the report. The main complaint we heard was low government purchase prices. The table below shows how little cereals are marketed through official channels:

PRODUCE PURCHASED BY GOVERNMENT

SECTOR OF KANGABA

Product	1974-75	75-76	76-77	77-78
Millet	159.6 tons	16.2 tons	36.2 tons	
Peanuts	2000 tons	780 tons	470 tons	not yet
Cotton	540 tons	1200 tons	1128 tons	available
Tobacco	200 tons	171.4 tons	200 tons	

SECTOR OF BANCOUMANA

Peanuts			746.6 tons	381.7 ton
Cotton			853.6 tons	733.8 ton
Tobacco			231.7 tons	205 tons*

* expected purchase, as of April 30, 1978.

The greatest complaint concerning prices are those of tobacco. In 1973/74 the official purchase price of tobacco dropped from 500 FM per kilogram to 300 FM. The quantity of tobacco planted and sold to OHV dropped immediately, but is now back to the previous level. As for peanuts, although the government price has been increasing, the amounts purchased by OHV have been decreasing because of increasing competition from merchants who are willing sometimes to pay double the official price. Moreover, farmers not only increasingly prefer to sell their peanuts in the parallel market, but they are willing to contend with police road blocks to try to reach the Bamako market.

As for cereal prices, very little is presently marketed through official channels. As for the parallel market, while prices are much better, even they are not particularly attractive to the farmers at harvest time in years of very good yields. In 1976, merchants' prices were typically 25-50% higher at harvest time. But the government pays for transport directly from the farmer's field, which eliminates the need for the farmer to transport his produce to the nearest large village. So when the cost of transportation is considered, the government's price at harvest time is, typically, only slightly higher. Beyond this, since the farmers need for cash is greatest at this time, he will sell to OHV if the agent is there with money. However, if the produce is harvested and ready to sell but the government delays in buying it, the farmer will transport the produce to Bamako. This, they tell us, is because of cash needs at that time.

Shortly after the harvest is in, the merchant purchase prices begin to rise. They continue to increase until peaking just before the next harvest is in. Since government prices remain the same, there is an increasing attraction to the farmer to sell what he can to

private merchants even though he may pay the cost of transportation himself.

Farmers are quite aware of changing market prices. For example, just north of Kangaba we met farmers planting an early crop of peanuts which they hope to harvest and get to Bamako when peanut prices are at their peak. They told us they will sell the unshelled peanuts at 160 FM per kilogram. What is more, they say they will provide less peanuts to the kilogram because the moisture content of peanuts and shells will be high - the rainy season will not have ended. This latter fact means that there is no vehicular transport available at that time because all the roads in their area are impassable. Thus, they carry their early peanut crop by donkey cart to the river and transport it to Bamako by boat. When we learned this, we began to ask other farmers about it. Many farmers who are fortunate enough to live near the river do the same thing, but those further away from the Niger River do not. They are aware of the possibilities, but say their roads get so bad that even donkey carts could not transport an early harvest from their villages to the river.

B. Credit

Besides the demonstration of modern techniques and the purchase of crops, OHV also provides credit to the farmers. In traditional society, loans are not uncommon. The words for loan and interest (or benefit) are part of the language. However, we were not able to learn about any custom which determines an interest rate or amount of benefit derived by the lender. Agreements between individuals - farmers - are based only on repayment, in cash or kind, of what is lent. Sometimes there is not even a schedule for repayment. So, for example, a loan of 25,000 FM could be repaid in one year or five years, depending on the will and resources of the borrower. Such loans are often made within the extended family and no

stiff demands on the borrower can be made.

A loan agreement between a farmer and a merchant is different. The profit and the repayment schedule is determined before the loan is made. There is no fixed interest rates. Rather, the amount of payment which exceeds the loan - that is, the effective cost of the loan - is agreed upon by the two parties. Our best estimate is that the minimum interest rate on this type of loan is about 10%. The rate of interest depends, of course, on the individual's need for the loan and the merchant's willingness to make it - in other words, on market conditions.

OHV grants credit to selected farmers to buy seed, fertilizer, insecticides, and also for larger items - plows, seeders, spray pumps, carts. The OHV credit system works as follows: at the individual village level there is a committee composed of the chief, the village council, and some farmers. Usually, but not always, the village chief is the head of the committee. When a villager wants a major loan - for example, to buy a plow - this committee decides whether or not the loan should be made. It is assumed that the committee members know the applicant, whether he is a good farmer and responsible person, and if he will be able to repay the loan.

Should a farmer be unable to meet his payments, OHV might demand that he sell some of his cattle or something else of value to get cash for the payment. What happens most often, though, is that the local committee will recommend to OHV, through its agent at the base sector level, that the payment be postponed until the next harvest. The OHV agent passes the recommendation on and it passes through the various levels until it finally reaches the S.C.A.E.R. office in Bamako where the administrators either concur with or reject the village committee recommendation.

The farmers we talked with seemed generally satisfied with the system. We found that the village-level committees exist and do function. Oft-heard complaints about the credit system were that the repayment schedule is too short and that the required one-third down payment is too high.

In every interview, we asked farmers for their thoughts about buying plow oxen on credit. Response to the idea was positive in every instance. The farmers themselves made several cogent points. In Balanzan they suggested that even farmers who already have plo oxen should be allowed to buy additional oxen on credit. They note that if a man has two oxen and one gets sick, neither of the oxen nor the plow are any good to him - at least as far as plowing is concerned. He would not be able to borrow another ox from someone because normally everyone is plowing at the same time of year.

Kofoulate is a village that has had trouble with cattle illnesses. The villagers said that presently there are only eight head of cattle in the entire village. Farmers pointed out that buying two oxen on credit was risky because if the oxen died you lost your down payment plus whatever you had already repaid and you were still obliged to pay off the balance of the loan. These men stated that the local veterinary office (in Keniegue) would have to provide good service to farmers buying oxen on credit so the buyers would not lose their investment.

Farmers in several villages added the price of oxen (2 for 150,000 FM) to the price of a plow (50,000), saying that if you buy the oxen, you have to buy a plow also. It appeared to them to be too expensive, especially if a one-third down payment was necessary. We posed the possibility that

they might be able to finance 75% of the cost of the oxen and 100% of the cost of the plow and repay the loan over five years.

A number of alternatives were proposed by farmers. In one case, it was suggested that the initial down payment be very low and that payments increase from year to year during the life of the loan. For example, on a 210,000 FM purchase (two oxen, a plow, plus 10,000 financing cost), they would put 25,000 FM down and make four payments. The first year would be 35,000 FM, the second 45,000 FM, the third year 50,000 FM, and the last year 55,000 FM. Farmers in Niame proposed a seven year repayment schedule. Some others suggested that the repayment schedule be more flexible so in a good harvest year they could repay more than would be required. Likewise in a year of poor harvest, perhaps they might pay less than the scheduled requirement.

Overall, we found farmers to be very interested in the possibility of buying plow oxen with credit assistance from OHV.

C. Animal Traction

First, we wanted to find out, if possible, how extensively plows and oxen are used. The following chart, though its figures are incomplete, gives some idea of the ratio of plows to farmers to total population. The numbers, with the exception of those for "total cattle", were provided by the sector chiefs at Kangaba and Bancoumana and by the Z.E.R. Chief at Siby. The "total cattle" numbers we got from the local elevage offices. We do not know how accurate the figures are, but they are more recent than the government census. Apart from the "total cattle" numbers, the data was gathered over the past farming season by the OHV agents at the level of the <u>secteur en base</u>.

AREA	TOTAL POPULATION	NO. OF FARMERS (M&F)*	TOTAL CATTLE	PLOW OXEN	PLOWS	DONKEYS	CARTS	MULTI-CULTEUR	SEEDERS
Sector of Kangaba	43,254	24,200	23,500	5,161	1,526	212	236	247	88
Z.E.R. of Siby	15,313	,724	2,208	582	178	115	100	161	46
Sector of Bancoumana				2,535	749		507	427	121

* male and female

The plow ratio is approximately 1 for every 16 farmers in the Kangaba sector and 1 for every 32 farmers in the Siby sub-sector. It may be that the more mountainous terain around Siby restricts the use of plows. Of this we are not sure.

We feel these figures are misleading, because they may be interpreted to suggest that 3% of the farmers around Siby use plows, 6% of those around Kangaba. If we take a number that we have for the Siby sub-sector, this being the number of chefs de famille - 739, and balance this against the number of plows - 178, we see that there is a plow for every four families. Still, not every family member would have access to the plow, especially if the farmer - family member was working in a satellite farming hamlet.

All three areas show about 3 plow oxen for each plow. Our village interviews indicated that some farmers have as many as 8 plow oxen (not including other cattle) for their plows. Others who have plows may not have any cattle or plow oxen because their oxen have died and have not been replaced. Many farmers reported that sickness has decreased the numbers of their cattle over the last few years and Konate, the chief of sector at Bancoumana, confirmed this.

We were told that there are no specialist for training oxen to plow. The traditional method is to put an untrained steer next to a trained steer. Fields are plowed counterclockwise - that is, at the end of a furrow the oxen always turn left. The trained ox is always placed to the right (as you are walking behind the animals) of the untrained one. This means that as the pair is pulling the plow, the trained ox is walking in the the furrow made on the last pass, thus helping to ensure that the furrows are straight. Usually, in addition to the person guiding the plow,

someone leads the untrained ox by a rope attached to a ring on its nostri The yokes used, usually made by local blacksmiths, are wood with a metal ring or eye attached at the rear center. The yoke is bound just behind the horns of the oxen with simple rope. A chain is attached to the metal ring on the yoke, the opposite end of the chain being attached to the plow.

Farmers told us that how long the training took depended on the ox. Some learn in hours, some a few days, some two weeks, and some never. If the farmer has other steers and recognizes that the one being trained may be one of those which will not learn, he will replace it with a less recalcitrant trainee. Farmers without this option must continue training the steer he has. This can lead to a problem we have seen several times. The hard-to-train steer balks at the left turns. The chain between plow and yoke will scrape across the lower right rear leg of the trainee and eventually can chafe it raw. After a few days of plowing, the steer may be put out of action because of the leg problem. However, this is not a problem with steers that learn quickly.

The OHV agents use another, quite simple, three step method for training single steers. First, the animal is adapted to pulling something heavy, perhaps a log, behind it. Second, it is introduced to the noise of the plow, and commands. And third, it is attached to and pulls a plow. The OHV method for training a new steer alongside a trained one is the same as that of the farmers, but presumably more sophisticated. We did not personally observe OHV agents training steers, however.

The farmers who plow with steers use the animals on all their fields if possible, and they are used for all crops — food crops as well as

cash crops. Like American farmers, the Malian farmer's plowing schedule is affected by the weather. He wants to plow right after a rainfall when fields are soft but not flooded. In the Kangaba sector donkeys ar often used for seeding, but not for plowing. They are too small to plow, but can easily pull the seeder and thus the farmer can conserve the energy of the oxen for the plow.

Donkeys are not used to pull seeders in the Bancoumana sector, according to the sector chief and the responses we got in interviews. They are used to pull carts. But we have never seen an ox attached to a cart in the Old Mande.

We feel that the value of plowing with oxen is well recognized. We think also that farmers utilize their oxen wisely, tending to limit their workday, see that they are well fed and cared for, and protected from predators.

Our opinion is that lack of money to purchase oxen and plow limits their more extensive use in the OHV area. Everyone's response to out inquiry about a sufficient amount or lack of farmable land was that this presents no problem. Farmers stated that with oxen and plows they would increase crop production as well as the diversity of crops they now plant Furthermore, two newly-purchased, untrained steers present no problem. The farmer who has no trained steer will simply borrow one from a friend or family member. The training method previously described is used, the untrained steer being hooked up with the trained one. The farmer who borrows the trained steer trains his two new steers on his own field. He does not pay the owner of the already-trained steer anything. His responsibility is to see that the borrowed steer is well fed and cared for. The owner of the trained steer will agree to lend it for the training

of the new [illegible] will not forget what it has learned. In other words, training another steer reinforces its own training. Thus, the lack of an OHV oxen-training research center would not prevent a steer from being trained to plow. But, having a center operating along with the demonstration of improved planting methods might convince farmers that they can also weed with the oxen. Weeding with oxen is not now done; the spacing of plants prevents this. We feel that there may be good reasons why farmers do not presently plant in rows so as to allow weeding with oxen, but further research clearly needs to be done in this area.

D. Roads

Two fairly heavy rains provided us some first hand knowledge of rainy season road conditions in the OHV area. The night before we left Bamako it rained hard. The next morning the section to Bancoumana was heavily flooded. The part between Samanko and Samayana was especially bad, short stretches at Katibougou and Farabana being the worst places. At Katibougou three Peugeot 404 pick-ups were stalled out, water having reached and grounded out their distributors.

After a second rain, we went south of Kangaba as far as Keniegue. Near Kayla the road was almost impassable.

We had interviewed a number of drivers on our trip from Bamako to Kangaba. They indicated that the pick-ups could normally make this journey (Bamako-Kangaba, 90 kilometers) in 2-3 hours. On that day it was taking them 5-6 hours. During the months of steady rain it will take them 2 days. The heavy trucks were not having any difficulty with the water on the road but were slowed down by the pick-ups. The pick-up drivers are

now making 3 to 5 round trips per week between Kangaba and Bamako. All of them would increase this if road conditions permitted. Other drivers, not taking the same routes, said the same thing.

Most of the villages we visited between the two main roads (Bamako-Kouremale, Bamako-Dioulafoundou) are cut off during the rainy season. Some farmers from Balazan and Keniegue carry early-harvested produce to the Niger on their heads to send it by boat to Bamako. At this time of the year, they say, not even donkey carts are of any use.

Karan is another village cut off during the rains. The villagers would like to market an early peanut harvest and even some vegetables but have no access to transportation during the rains.

In the town of Dalakana, less than 50 kilometers from Bamako, farmers grow tomatoes, onions, and watermelons in addition to their other crops. They market their produce in Bamako but every year some of it rots because they cannot get it out quickly enough.

The sector chief at Kangaba cited the most important roads in his area, west of the Niger River:

Bamako-Kangaba-Dioulafoundou
Kangaba-Narena
Kangaba-Figuiratomo (across the Niger)
Narena-Kenieba-
Narena-Karan-Madina

Of these, only Bamako to Kangaba is passable in the rainy season.

The sector chief in Bancoumana listed these roads:

Bancoumana-Siby
Bancoumana-Karan
Djoliba-Kakele
Siby-Sandama

All are impassable during the rains; our impression was that simple culverts alone might keep some of them open.(1)

(1) All are included in the proposed road program.

We wanted to know if the farmers would grow more if their roads were improved. We asked what changes would be brought about by better roads. The responses were interesting. First, they point out, better roads would bring more trucks into the area and increased competition might lower the cost of transport. Further, they say the bad roads tear up the vehicles so that the cost of vehicle maintenance keeps transport prices high. Farmers feel that better roads would lower maintenance costs and thus lower maintenance costs and thus lower transport costs also. All the village interviews showed that not only would more land be cultivated but other crops would be grown too. If they could market them, vetetables would be grown. They mention various melons and early peanuts also. Farmers mention that if more trucks would come into the area, they would be less dependent on OHV vehicles and could seek alternate buyers if they so desired. They realize that more transportation would mean more communication and commerce which would benefit everyone. People say that not only are they locked out of the markets during the rainy season, but they cannot buy anything either. We concluded that farmers' second major concern - the first one being weather - is roads and transport.

The OHV sector chiefs also were concerned with the roads. Two points were made. First, the local agents only have bicycles for the most part. If they could buy mobylettes they could cover more ground, but riding bicycles over the terrain in the OHV area is difficult. Second, the rains effectively cut off communication between OHV administration, the local agents, and the farmers. Even bicycles are useless during the months of heavy rain and the Peugeot pick-ups the administration has are not much better. This means that if, for example, a farmer finds worms or bettles devastating his crop, no insecticide will get to him.

E. Bancoumana Rice Polder

There are presently three OHV people assigned to the polder. Madou Fofana is in charge. There is also a water regulator who takes care of pumps and pipes. The third person is a tractor driver, Mamadou Doumbia, we found at Samanko preparing to plow a field. Doumbia said the farmers do want the polder reworked because it is unlevel and water cannot reach all parts of it. Moreover, he states that the farmers are willing to try new seed varieties and to control the wild grass. All the farmers working in the polder now pay a fixed amount for water. In addition, Doumbia said that all the farmers want the tractor to plow their sections and will pay the necessary 12,500 FM per hectare. Doumbia notes that with only one tractor, OHV cannot meet the demand for mechanized plowing. The tractor plows for tobacco in the dry season and rice in the rainy season.

There is a Commission de Vulgarization already functioning at Bancoumana. It will regulate the operation, maintenance, fees, and collections of fees of the polder. According to the sector chief, the commission is working well. The water taxes can be paid in cash or rice and much of the tax receipts pays workers to weed the plain.

Our impression is that the polder farmers are willing to accept, indeed have already accepted, the conditions set forth by OHV for the renovation of the plain. According to OHV the problem at this point is that it does not have the means to provide the necessary services.

F. O.H.V. Need For Buildings

Since AID is considering providing funds for construction of new buildings, we were asked to look into the current situation. In Bangaba and Bancoumana and probably in the other two sectors as well,

it is clear that a number of buildings are needed.

1. Kangaba sector - Here, there are seven people working in a 15'X20' office equipped with two desks. There is no warehouse. Presently, OHV is using some space in a C.A.R. storage facility. Two structures are used to house all the personnel. These are inadequate and in poor repair. There is no visitors' facility. However, there is a campment in Kangaba.

   The sub-sectors are better off. All except Karan have some cement block housing, some storage space, but limited office space. Keniegue is well off in all respects, but Karan has nothing. In this latter place, there is a dynamic agent, Dadio Traore, and, if cotton production is an indicator, the farmers are highly motivated. The specifically asked during our interview that Traore be provided with housing and storage space.

2. Bancoumana sector - The sector location itself has a large, but inadequate, warehouse. We saw produce stacked in the open for lack of space inside. The office is worse than at Kangaba. All personnel work out of one 13'X19' room, again equipped with two desks. The same building has three other rooms used for housing. Three mud round houses have been constructed for additional housing.

   The sub-sector of Sidy has a large warehouse but is open on the sides. There is a very small office and some housing. The other sub-sectors have virtually nothing and need offices, storage facilities, and housing

We consider it important that the agents, at least at the sub-sector level but probably at the base-level also, be provided with nice but simple housing. This may help to ensure that competent and dedicated people

continue to be attracted to work in the rural areas. Also, some office and storage, perhaps a combination, should be provided at the sub-sector level. As to the need for dormitories for trainees, visitors, or personnel there are fine, virtually unused, facilities in both sectors that might be available for use by OHV. First, at Keniegue just south of Kangaba there is a large CAR facility that the OHV sector chief at Keniegue said is little used. Second, at the state farm of Samanko, north of Bancoumana, there also appear to be a number of sound physical structures that seem to be little used and might be available to OHV.

If these are not available, then there appears to be a significant need to construct new buildings, especially for office space, and, secondarily, additional storage space.

G. Health

People in the Haute Vallee have better access to medical services than other more remote parts of the country. What we wanted was the villagers' own thoughts about what their health problems are. The farmers always identified onchocerciasis as the worst hazard with malaria coming a close second. In one village - Samako - tuberculosis (sógosógoninje translates as tuberculosis we believe) was cited as being the second most serious problem after oncho.

A complaint we often heard was that the local pharmacies are poorly stocked. Not much can be bought from them so the villages may have to go to Bamako in search of medicine.

A problem in the area related to health is finding good drinking wa---- In the dry season, wells go dry in many places. Kangaba itself had an acute water problem when we were there. One AID financed well was supplying countless people. The caretaker at the campment suggested that if we wanted

to wash ourselves, we should drive to the river. The project should not neglect this problem.

H. Wage Labor

In every village, farmers told us they have difficulty finding young men to work as wage-laborers. What causes the difficulty is not clear. One reason may be that some young men leave the village to go to Bamako or the Ivory Coast looking for work. But leaving one's village to go off for 2-3 years is an old custom and not motivated by economics alone. A second reason may be that most people are occupied in their own fields during the farming season and cannot work for someone else. We think that a third possibility is the most likely reason — the daily wage is too low.

A laborer is paid 200-250 FM plus food during the dry season and 250-300 FM plus food during the farming season. Another plan is that a laborer works three days a week in his employer's field and can work in his own the other four days. He receives all his food from the employer but no money. Under this plan, the worker gets fed and can still plant and harvest a crop of his own.

I. Grain Mills

We asked about rice mills, the idea being that OHV might be able to extend credit for their purchase. We posed the possibility to villagers and were surprised at the very positive responses. People expressed much interest in being able to reduce the labor load of women.

We learned of only 5 power-operated mills in two sectors: there are 3 in Bancoumana, all of which are heavily patronized, according to the sector chief; in the Kangaba sector, there is a broken-down mill in Kangaba itself, and one other operating in Narena.

IV. Summary/Observations

Operation Haute Vallee already has a good infrastructure which can help make an AID-supported project a success. We were impressed by the attitude of the OHV personnel we met, and particularly the agents in remote villages who have no decent housing or other provisions for transport or personal comfort. The number of agents in place seems adequate but their effectiveness would be enhanced by some means of transport, especially mobylettes.

It is clear that some new buildings are needed and should be constructed. The credit system, with participation of the local village committees, seems to be working and its structure ought to be retained as is. Credit should be expanded to allow financing for the purchase of oxen and mills. However, the required down payment should be lowered and the time for repayment extended. Improved veterinary service must be part and parcel of the expanded credit system to ensure that oxen buyers do not lose their investment.

Road improvement is very important. We believe that this should be an important aspect of the project from its outset. You might consider using some teams of Peace Corps Volunteers whose jobs could be multi-purpose. Fo example, with vehicular and other material support from AID , P.C.V.'s could quickly install the bolt-together type of culvert. These would help keep interior roads open and the Public Works Department could concentrate on the main roads. Our short time in the area tells us that villagers woul likely contribute their labor to this effort. Volunteers could also assist with improving wells and with animal traction programs.

Road improvements, we feel, will lead to increased crop production, will give villagers better access to medical facilities, will facilitate collaboration and communication between OHV and the farmers, and may attract more vehicles to the area, thereby offering alternative markets to the farmers and perhaps

lowering transport costs.

If AID is going to provide support for road-improvement equipment, it should also consider financial support for supplementing the number of tractors OHV has. In the Kangaba and Bancoumana sectors there are exactly two tractors. The one in the Bancoumana sector is 6-7 years old, has had one set of rings, and smokes enough now to be ready for a second set. These tract cannot fulfill the demands already being made on them. In terms of priorities we put improved roads and expended credit first. As for animal traction, we think it is possible that well-informed OHV agents could work with individuals or groups of farmers and their oxen in their own fields to demonstrate the more efficient methods of animal and equipment use learned at the centers. In other words, OHV should not work solely out of the centers.

As for the polder, the conditions asked of the Bancoumana polder farmers do not appear to be unreasonable. Moreover, the farmers seem to have agreed to them. The polder commission ought to buffer the problems that arise and peer pressure should be effective in resolving such problems.

Finally, we think that AID support for this project will be a tremendous help to the people of the Haute Vallee.

Ethnographic Background of the Haute Vallée

Ethnic Groups

Four ethnic groups, defined primarily by language differences, occupy the Haute Vallée: Malinke (Mandingo), Bambara, Somones and Peulh (Fulani). The Malinke comprise the majority (an estimated 60%), with the Bambara, divided into the Bambara proper (2/3 rds) and the Somonos (1/3 rd), making up the remainder excepting for a small percentage of Fulani (1%). The Malinke and Bambara languages belong to the Mande sub-family of the Nigritic Stock. The vast majority of people in the Haute Vallée speak or understand the Bambara dialect spoken in the Bamako-Segou areas; so communication is not problematic. The Malinke and Bambara are closely related and share a common culture. Both groups tend to be pagan, although the Samono are Moslems. OHV works primarily with the Malinke-Bambara peoples and to only a minor extent with the Somonos, because they are fishermen and live in their own villages on the Niger River. The Peulh, however, live together with the Malinke and Bambara in the same villages and tend their livestock. The total population in the Haute Vallée is estimated at about 211,000.

The Communities

The Malinke and Bambara live in compact permanent villages or towns, earlier fortified by encircling palisades. The prevailing house type is a round hut with cylindrical walls of mud covered sun-dried brick and a conical roof of thatch. The huts are grouped in circular compounds (du) around a courtyard containing animal pens and houses. The huts are linked

by mud walls which enclose lavatory facilities consisting of a hold-in-the-ground (with cover). A cluster of small thin huts encircles the compound. These are granaries. Nearby is a square-dug well extending to water some 5-10 meters below the surface. Frequently, the huts of descendants of former slaves will cluster nearby the compound. The various kinds of communities are made up of such compounds with market and shop areas, administrative and government buildings including soldiers' barracks, schools, dispensaries and other specialized structures (mosques, soccer fields) depending on the size of the community.

There are three sizes of communities. The small cities or large towns like Kangaba, Kati, Sibi, Ouelessebougou have from 2,500 to about 5,000 inhabitants. Many towns have from one to two thousand inhabitants. There are a large number of villages surrounding such towns with from 100-1,000 inhabitants.

Each village is controlled by a village chief who exercises priestly functions such as sacrificing to ancestral spirits. With the aid of a council of family heads they handle local administrative and judicial matters. Villages are grouped into districts with priest-chiefs similar to those of the individual village. Until recently also, slavery was universal and debt slavery widespread. In addition, there are endogamous castes, including smiths, leatherworkers, other artisans, fishermen and griots who function as musicians, bards and genealogists.

Kinship Pattern

The Malinke/Bambara practice a general polygyny. For a rich man, 5 or more wives is not uncommon, but most men cannot afford more than 2 or 3 wives at the most. The first wife is the head wife with superior status

over the ensuing co-wives. Marriage regularly involves a bride-price. The minimum bride-price is about 20,000 Malian Francs ($43) which can be a very significant sum of money for any family. The married sons typically take up residence with their father forming along with the father's brothers an extended family.

The extended family consists of the father's offspring, the wives of his descendents and their offspring, comprising in all two or three generations. His wives continue to belong ultimately to their own conjugal and extended family. All typically live in the same compound. The families vary in size but seldom number over about 50 people. About half the members of the family are economically active people. In the Haute Vallée, women and children do much of the weeding and work at harvest time.

Age-grades (ton)

Most male and female inhabitants join organizations called "tons" based on the age and sex of its members. The tons cut across family and caste lines and are controlled by an elected head chosen from among the members. These age-grade societies are well organized and disciplines and are also hierarchical. These ton provide much of the agricultural manpower needed for the heavy work in the field. The requesting land-controller pays each member 250-300 Mali francs plus lunch. All of this money is turned over to the ton treasurer and kept for an annual village celebration paid for by the ton. Other activities of the ton include: brush fire control, maintenance of public places, policing of markets, repair of public buildings, guarding of mango trees and construction of village schools

While the extended family is responsible for the basic farming of their land, they sometimes call on the tons during peak labor requirement periods in the fields. They also provide basic aid to families lacking sufficient manpower. Refusal to participate in collective work without a good excuse could result eventually in exclusion from the society or a heavy find of kola nuts. Even tardiness in attendance sometimes results in small fines. In the 1960's the ton were organized by the national political party into Mali-ton and used to generate national identity and pride. They farmed collective fields of the communities and performed other vital tasks. Today, the ton treasurer saves most of the money earned and then throws a week-long festival for the town with all activities and food gratis to all villagers. This is so popular that many young men sometimes postpone their yearly trips to the Ivory Coast to enjoy the festivities.

Land Tenure

In earlier times all land belonged to the king who apportioned its use to local satraps and community chiefs who adjudicated its use in perpetuity to family heads of the communities. Today local government still rests on a special supernatural relationship between the land of a community and the lineage which first settled it. The village chief, who invariably belongs to the founding family, controls the land, at least in theory, and it is parceled out in collective usufruct among the various extended families whose head in turn controls his portion.

Land users have sold rights to the use of the land, but cannot sell it. Once the land is assigned, however, the heads of the extended families can reassign it to their descendants. Typically, the old father will go with the son to the village chief who is informed of the bestowal of land. The chief usually agrees, but there is no paper transaction or other recording. Theoretically all men can claim land if it is not in use, and strangers are not barred from using land that is not assigned (with the payment of a token sum or proportion of the produce), but the father usually makes the claim for the land and this follows hierarchical lines.

Social Classes

There are three social classes in Haute Vallée society: (1) noble families, (2) people of caste, and (3) descendants of slaves.

Noble families. These families attach themselves to the historical and mythical origin of their communities. While many of the political and social prerogatives of this group have been lost today, they still have privaleged powers in relationship to land tenure and dealing with other segments of the population. For example, lands in irrigation projects are typically assigned to families on the basis of their genealogical affiliation.

People of Caste. In the intermediate stratrum of the society are the blacksmiths, leatherworkers and griots (musicians). They often live under the protection and as part of the noble families. Many pursue agriculture as do other farmers of the area while still retaining their traditional labor specialities. Griots are important for their recitation, from memory, of

Descendants of Slaves. Until recently, slavery was universal and debt slavery was widespread. Slaves born into a household usually enjoyed a preferred status as compared with those acquired by purchase, and after three or four generations they became freemen. Slaves freed in the past have gradually built up villages around the hamlets where they used to cultivate their master's land. But they seldom acquire prominence in village affairs.

Farming Methods

The farmers of the Haute Vallée are primarily horticulturalists utilizing hand tools and, when they can afford it, animal traction. There is more use of oxen and plow for cultivation in the softer soils of the river valley than in the hills.

A typical family farm is 12 hectares. Four hectares will be in cultiv ation at any one time and 8 hectares will be fallow. The fertility of the soil is depleted in form 3 to 8 years after which it must be allowed to lie fallow from 3 to 25 years. Crops are rotated to allow maximum use of the nutrients in the soil. Sorghum will be planted the first year, millet or fonio the second. The third year the field may be left fallow. Land is plentiful but the trend is to fallow land use in the area assigned to the family. Intercropping is frequent with cowpeas, green beans, gourds, potatoes, and the like placed between the cereal plants.

The annual growing season is as follows:

April-May — After the rain has been absorbed by the soil, the grass is removed by the daba (hoe). This forms a compost, and small mounds 70 cm. wide, and 30 cm. high are made with the long-handled hoe. About

16,000 such mounds are to be found in one hectare, yet they cover only about 1/3 of the area of the field. The succeeding years utilize the remaining space for additional millet/sorghum mounds. The mounds contain grass cut from the surface, and 4-5 seeds are put into each mound.

July-October The fields are weeded twice a season taking 15-20 days per hectare. During the growing season children with strings of cans, sling shots and vigor attempt to keep the birds, which feed on the crops, at bay. Mound-making goes on continuously. The farmers use a stroke which cuts the weeds and forms the mound at the same time. Compost mounds made during the dry season are ready for the next seaons's planting.

October-February This is harvest time with the early variety being cut October-December, and the late variety January-February. The ripe plants are cut with a knife and gathered by women in large baskets. The rate of cutting is 3/100 of a hectare/hour/person.

Religion

Magical forces play a significant role in the view of the Malian farmer. The tenets of Islam have been superimposed, rather loosely and with local interpretations, on a strong animistic base. This pagan religion consists of a multiplicity of spirits which control, with greater or lesser force, nature and man. Ininimate objects, especially anthropomorphic carvings of wood and stone (fetishes), may be imbued with a spirit of greater or lesser power in one or a number of fields. Such fetishes may belong to individuals or to priest-like groups who attend to the functions of the spirit. The spirits ar often manifested as "dancing masks" which appear in public to amuse and harass the villagers at festival times.

The bad spirits are used to cast spells causing illness and misfortune. The sorcerers carrying out the black magic are highly feared. They are constantly fought by curers who also cast spells.

Today mosques are found in the larger towns and villages. The big farmers of the noble families are frequently participants in the Moslem religion, but they continue to believe in and practice the pagan religion. The marabour, or Islamic holy men, are teachers in the mosques and also practice the casting and curing of spells for a fee.

Traditional Medical System

While a substantial part of the traditional medical system deals with supernatural forces and the casting of spells, the diagnosis and cure of the illness, as discussed above, there is an extensive pharmacopoeia which is generally known to the farmers and their families. This is the medicine consisting of leaves from trees, roots and portions of the bark. The older women of the family often dispense these as home remedies. Such women are also the midwives.

A popular medical specialist is the bone setter who is frequently considered superior to modern practicioners in his skill in setting fractures. The traditional medicine is usually that which is first used in cases of sickness. It is considerably cheaper than the modern remedies and, apparently, sometimes effective.

Changing Patterns of Agricultural Production

Farm life in the Haute Vallée is by no means static. Tractors are now seen frequently along the river. A 500 kg cart has not lost out in preferan to one twice that size. Forgerons are prevelant in the area selling their own plows at rates significantly below the government's, but the quality is inferior though maybe improving. Farmers try to plant their crops as early

as possible with an eye towards the Bamako market. Land tenure, working methods, and family structures are particularly affected by all modernization which began with the introduction of the cash economy during the last decades of the colonial period. Up until this time the traditional pattern was that of barter exchange between agriculturalists (Bambara and Malinke), cattlemen (Fulani) and fishermen (Somono). This barter system was still strong until the drought of the Sahel in 1973, at which time more than half of the agricultural production fell to the drought. While the old system continues (on a cash basis), each group is more willing to practice the production methods of the other as a hedge against starvation in any ensuing drought. Some Fulani and Somono are practicing agriculture, and the many agriculturalists are increasing their herds.

Traditionally, agricultural production involving the collective efforts of the extended families and the village ton were tied to storage facilities, restrictions of the barter economy. Now with the cash economy wealth is accumulated independently of crop storage. Money is spent on kerosene lamps, steel plows, bicycles, clothes, corrugated iron and the like. Young men typically farm several days a week on their own to get money for their desired purchases, including brides, whose dowries were no longer necessarily paid in cattle.

The cohesiveness of the extended family remains but slightly less so as younger members migrate to the cities. With education, the youth are less dependent on their families and the old agricultural system. This results in manpower shortages at peak labor demand periods. Many farmers rely on paid ton labor, but it is not so easy to find as it once was. So most village production activities must continue to rely mostly on labor from the extended family.

Conclusions

The society and culture of the people of the Haute Vallée area are changing. The impact of Bamako and western culture appears to be a cause of this change. Conditions, such as the roads, remain bad, but hopes are being raised, especially with the extension of education and functional literacy programs. While the OHV organization is seeking to improve conditions, the traditional culture still forms the matrix within which it must operate if it is to be successful. It is therefore obligatory that in the course of introducing innovations that the village and family potential for development not be stiffled or discarded. Indeed, they are a positive benefit in providing an existing structure through which OHV can operate. It is especially important for the OHV to be continuously aware of the impact of its innovations on the core of community life and its institutions. So this is why an anthropologist is needed, and planned, for the project during several short-term periods of the project.

245
C-4

INITIAL ENVIRONMENTAL EXAMINATION

Project Country: Mali

Project Title: Haute Vallee

Funding: FY(s) 1978-84 $ 10.4 million

Period of Project: 5 years

IEE Prepared by: David Dibble

Environmental Action Recommended: Negative determination

Concurrence:

Ronald D. Levin, Mission Director, USAID/Bamako

Assistant Administrator Decision:

APPROVED _____

DISAPPROVED _____

DATE _____

325

INITIAL ENVIRONMENTAL EXAMINATION

Operation Haute Vallee

Project Overview

This is an ambitious integrated rural development project which will ultimately affect a large number of people living in a rather extensive area. Overall responsibility for the development of the area was given by the GOM fourteen years ago to a legally constituted entity called the Operation Haute Vallee. AID assistance to the Operation is contemplated to occur in a phased manner. In the initial period, this will consist of the rehabilitation of an existing irrigated polder, the improvement of some 315 kilometers of tracks to a minimum all weather usability state, a credit component, a health component, animal traction training, and assistance of an institution building nature to the Operation as such. The design concept is one of evolution. The eventual dimensions the project may assume are not now all known in any sense. It is expected that planning for the future will proceed from and with initial and subsequent interventions. It is intended that various experts will be put in place, among other things, for just this purpose. By interacting with Malian counterparts and farmers and by observations of what the needs are and what succeeds, the future directions and evolution of project activities will emerge over time in a dynamic sense.

The Setting

The project area covers about 13,800 km^2. It lies mostly SSW of Bamako on both sides of the Niger River and extends to the Guinea border on the Southwest. On the west or left bank of the river, upstream from Bamako, it includes the catchment from the border; part of the Baoule catchment south of the Kenyebaoule forest reserve, and the district of Kati north of Bamako. On the east or right bank of the river, the area extends from the border to the Bamako-Bougouni road (which goes to the Ivory Coast). On the south it extends to the limits of the Kangaba and Bamako Districts. The area also stretches north of Bamako to a strip formed by the flood plain of the Niger between Baguineda and Katibougou. Although Bamako falls geographically within the area, the city, its environs, and the State Farm at Baguineda are excluded.

The Niger River flows through the project area from the southwest to the northeast. On the left bank, a plain, bisected by numerous non-perennial streams, slopes gently from the escarpment of the Mandingue Plateau to the river. On the right bank, low hills terminating in a well defined terrace above the flood plain, provide a much more marked

relief. Two major perennial tributaries of the Niger, the Sankarani and the Fie, intersect this plateau.

The Niger flood plain in the area varies around 5 km in width.

The climate in Haute Vallee is characterized by well defined wet and dry seasons. Annual average rainfall is good. It ranges from 1300 mm in the south to about 1000 mm in the north. The rainy season is from mid-April to mid-October. Average annual temperature is hot, about 29 degrees centigrade, ranging from a low of around 17°C in December/January to 39°C in April. Relative humidity ranges from 97% in August/September to 12% in February with an annual average of 51%. Average annual evaporation is about 2050 mm, the maximum being around 300 mm in April.

Soils in the areas are loamy clay, modestly porous and quite fertile. Crop yields can be reasonable even without the use of fertilizers.

Haute Vallee's population totals about 211,000 (excluding Bamako pop. 500,000 +) with 45% on the left bank, 25% on the right bank and 30% in the Kati area north of Bamako. Population density is low, averaging 15/ km^2. About 94% of the people are farmers and they live in over 200 rural villages and several small towns.

Social structures range from small nuclear families averaging 9 members (41%), to medium sized groups averaging 15 members (45%), to a few very large extended families with up to 50 members (14%)

There is about 5000 km^2 of land in the area suitable for agriculture. Presently 2000 km^2 are cultivated, but only about 1/3 is cropped in a season, the remainder lying fallow. Approximately 36 km^2 is irrigated.

Land for agriculture is not in short supply, but there is no individual land ownership. Land use is allocated to families by traditional authorities. Medium and smaller farm families have about 12 hectares of which about 1/3 is cultivated at any one time. Food crops generally are rice, millet, sorghum and maize and constitute about 75% of production; cash crops consisting of mainly peanuts, but also some cotton and tobacco, account for about 22%; vegetable production is 2-3%.

Between 1946 and 1962 a number of flood plains covering about 3600 ha. were developed for single crop irrigated rice production. These polders were formed by building dikes permitting controlled flooding and providing protection against Niger floods.

Generally speaking, the irrigation and controlled flooding schemes have not been as successful as might have been expected. This is because of

inadequacies in design and construction, fields not level and too large, poor water distribution and unsatisfactory drainage provisions. Additionally, there has been a lack of maintenance and an infestation of yield-reducing wild rice which the small farmer does not have the means to eliminate. The result is that only two polders are presently used for intensive irrigated cultivation-Krina (200 ha.) which produces floating rice and Bancoumana (650 ha.) producing paddy. Not all of Bancoumana is cultivated.

Draft animals are rather extensively used, it being estimated that 20% of farm families take advantage of this kind of energy in doing their work. Total equipment is estimated at 2,500 pairs of draft oxen, 2000 plows, 200 multicultivators, 400 harrows, and 800 wheel carts.

Livestock production is rather widely practiced. There are at present an estimated 74,000 cattle, 24,000 sheep and goats, and 300,000 poultry. The cattle are mainly of the N'Dama breed which is well adapted to the environment and is tolerant to trypanosomiasis. Animal diseases are a major constraint to livestock. They include rinderpest, CBPP, blackleg, pasteurellosis, trypanosomiasis, helminthiasis, and coccidosis. Mortality is about 35% for calves, 10 % for young animals and 30% for adults. Most livestock production is consumed where grown. About 10% is marketed in Bamako.

Human health problems are severe in Haute Vallee, as well as everywhere else along the Niger. Onchocerciasis is possibly the worst of these as it is widespread and leads to blindness. Malaria and schistosomiasis are also endemic and widespread. Trypanosomiasis is present. Guinea worm, intestinal amoeba, and other diseases related to drinking water and lack of sanitation cause serious morbidity.

The existing main all-weather road network has a total of about 230 kms. The most important road is a 120 km section which goes SW from Bamako to Guinea and passes through the towns of Sibi, Narena, and Kouremale. An 89 km section along the edge of the flood plain on the left bank of the Niger connects Bamako to Kongaba. These two left bank N-S roads are linked by a 21 km road between Sibi and Bancoumona. On the right bank of the river, the eastern boundary of the area is marked by the main road leading south from Bamako to Bougouni and on to the Ivory Coast.

The above described network is linked to a number of tracks which provide dry season vehicular access to most of the project area. These tracks are maintained by the rural villagers. They are generally impassable for vehicles in the wet season due to lack of surfacing, poor drainage and difficult stream crossings.

Project Description as Concerns the Environment

ancoumana Polder Rehabilitation

The Bancoumana irrigated polder was developed along with seven other polders in Haute Vallee in the mid-1960's. It incorporates an area of approximately 640 hectares of land, of which about 540 ha could be irrigated by the present system. Its source of water is a non-perennial tributary of the Niger called the Koba. The east side of the polder lies at the edge of the Niger flood plain. The polder is protected from the flood waters of the Niger by a perimeter dike. Water supply to the polder is by gravity feed. The amount of water allowed onto the polder and to the paddy fields is controlled by a system of main canals, control gates, lateral canals, and bunds. Water moving through the system is in part absorbed into the soil and in part circulated to the Niger via drainage canals. The system is characterized by the continued presence of water on the growing crop for much of the growing season.

The polder was from the beginning never properly constructed. Adequate leveling and terracing was not accomplished. In addition, there has been no routine or regular maintenance for a number of years, possibly since construction. The only attention of this kind observed is that of a local nature carried out by some farmers to improve water flows in their own immediate laterals. The most seriously neglected part of the system is the drainage which has now become almost non-functional due to vegetative growth choking the drainage ways. The canals and laterals generally need cleaning and removal of weeds. Some turnout gates are clogged and need attention. The headworks dam on the Koba River needs some masonry work, as does the main canal intake gate and also some of the checks. The earth embankments of the canals, laterals and dikes have been eroded in varying degrees and in some places scarcely exist any longer. A great need exists to remove silt, brush, weed growth, and reshape the channels of the earth canals and laterals to the required size to allow water to flow freely and smoothly.

The rehabilitation of the polder is a major component of the initial years of the Haute Vallee project. In addition, its cultivatable area will be extended by one hundred hectares, and the level of the perimeter dike raised uniformly to 20 cm above the highest estimated 100 year Niger flood level. Deep plowing will be executed to eliminate the in-depth infestation of yeild-reducing wild rice. The project further provides for the installation of an effective operations and maintenance program wherein water user organizations will be formed and lead farmers trained in the management and maintenance of the system. Expatriate expertise will be used to advise OHV and the farmers in efficient methods of water management

and improved irrigated rice cultivation.

Use of the polder land is allocated to families on the basis of one hectare per working family member. There are presently 160 farm families cultivating about 540 hectares, for an average of about 3 1/3 ha. per family. Use rights to the polder land are based upon a written agreement between the farmer and the OHV in which the farmer agrees to certain conditions in order to have the land. One of these, up to now, has been an annual payment of 50 kilos of rice per ha. Others include obligations in respect of the maintenance of the polder.

Environmental Considerations on Bancoumana Polder

Environmental health, salinization of agricultural land resulting irrigation and adverse effects on water quality, either ground or surface, resulting from the use of chemical fertilizers and pesticides, are the three possibilities for environmental impacts that are identified for scrutiny in connection with the rehabilitation of the Bancoumana Polder.

The first thing to note in this analysis is that the project is concerned with an irrigation scheme that has been in existence and in operation for some 14 years. As such, there have been, and there would continue to be in the absence of the project, opportunities for increasing the incidence of such water vector borne diseases as malaria and schistosomiasis. Equally soil salinization and adverse water quality impacts could occur without the project.

A continuation of the operation of the polder in its present condition of disrepair and lack of management, though, could also easily result in increasingly significant adverse impacts of the kind noted, particularly environmental health impacts. Presently the canals and drainage ditches are over grown with weeds, there has been a considerable amount of siltation and water flows are reduced to almost stagnation levels. These conditions provide an ideal habitat for the growth of the malaria mosquito and the schistosomiasis vector, the Bulinus snail. Both of these diseases are endemic and severe in the polder area.

Rehabilitation and efficient management of the polder, as is contemplated by the project, should greatly diminish the attractiveness of the polder waters as a habitat for these vectors. A major focus for the project will be the cleaning of weeds and debris from the canals and the maintenance of this improved condition. If the canals are kept free of weeds and the water allowed to move at a normal pace through them, it is unlikely that any significant populations of either mosquito larvae or snails will occur.

In addition to the foregoing, the project also includes a component of health education and sanitation which can be expected to have some beneficial impacts on the incidence of schistosomiasis. If the farmers and other people in the area could be lead to understand the linkage between using the polder ditches as latrines and the spread of the disease, they might lessen this practice.

In summary, in respect of environmental health and the occurrence of schistosomiasis and malaria, the polder rehabilitation will not result in any degradation of the conditions already present, and can expect to provide some modest benefits.

Concerning possible land salinization impacts, the polder, again, has been in operation for 14 years, and there has been no significant build-up of salt in the soil. Land fertility is good and soil and water samples tests for salt content indicate that salinization has not been and should not be a problem in the future. As a further protection in this respect, better water and irrigated land management techniques to be provided by the project, such as better drainage and ample water for leaching, should diminish even further this consideration.

Concerning chemical fertilizers, especially the nitrogen they contain, these may, either through leaching to ground water or dissolving and draining off into the Niger, affect the nitrogen/and or nutrient levels in the receiving waters. Phosphorous and potassium tend generally, to fix themselves to the soil constituents and stay put. But such fixation can occur also in respect of nitrogen if the material is plowed into the ground prior to flooding and seeding. On the other hand, side dressing of fertilizer after the plant has begun to grow will result in a considerable leaching or movement of nitrogen into both the drain water circulated to the Niger and into ground water. Deleterious effects on the quality of both of these waters can be a possible consequence that should be avoided.

The present balance of nutrients in the Niger and its capacity to absorb additional quantities, is not very well known. There are, though, many agricultural activities and projects planned for the river system. The use of fertilizer on these projects will undoubtedly grow and it is entirely possible if the issue is inadequately considered, that there will be a point sometime in the future where the ecological balance of the river may be seriously upset. Results, among others, can be significant increases in the growth of weeds (such as the water hyacinth which has become such a problem in East Africa) consequent decreases in photosynthesis and in the supply of oxygen in the water and a diminution in fish and other similar life populations in the river system.

Significant amounts of nitrogen in the form of nitrites in ground water supplies used for drinking can also have a debilitating effect on infants and small children. The condition that can result is called methaemoglovinaemia.

As mentioned earlier, though, appropriate cultivation and fertilizer use practices can reduce the dangers of water quality degradation to low and not significant levels. The project intends to attach a great deal of importance to the matter and consequently, fertilizer use should not constitute a significant environmental problem.

Pesticides will probably be used in the project. Persistent chemical pesticides can have seriously deleterious effects on the ecology of the project area as well as on the ground water and the entire drainage basin of the Niger. AID's present pesticide regulations provide that prior to the funding and/or use of pesticides in a project in which AID is participating, a separate IEE constituting a risk-benefit analysis, will be completed and a separate formal environmental Threshold Decision be taken prior to proceeding to using pesticides. Aspects to be considered in the risk-benefit analysis include, inter alia, the EPA status of the pesticide and whether it is to be for a same or similar use as the EPA approved label, and the extent to which the country has considered and is pursuing policies of integrated or alternative practices for managing pests.

Road and Track Improvements

The vehicular movement of people and things into and out of most of the Haute Vallee is greatly limited or essentially non existent during the wet flood season from around mid-June to the end of October. There are, however, all-weather trunk roads serving the area - one going SW from Bamako to the Guinea border serving the left bank of the valley area and the other going south of Bamako on the right bank of the river towards the Ivory Coast. This latter road marks the east boundary of the project area. There is also a major road south out of Bamako to Kangaba and beyond which is along side the left bank flood plain of the Niger. There are points along this road that become impassable during the wet season. Connecting to these main roads are a system of dry weather tracks that provide dry weather vehicular access to the entire project area.

The project proposes to improve some 398 kms of this system to provide vehicular access to the area throughout the year. Some 200 km. of these improvements will constitute upgrading with laterite surfacing to a class C level. The remainder planned for improvement will consist of reshaping

and elevating to provide for better drainage and culverts to be installed at waterway crossings. None of the roads will be new. They will all follow existing alignments. The choice of the roads selected for improvement was based on existing use patterns. Borrow pits, per se, will not be needed in respect of the improvements to the tracks since these will be subjected only to scraping and shaping. To the extent borrow pits are necessary for the laterite surfaced roads, the project provides that such pits will be leveled and filled so as not to become sites for standing water which might serve for mosquito breeding.

Environmentally viewed, the road improvement activities are not expected to result in any significant impacts. To the extent impacts occur these should be modestly favorable. For instance, grading, shaping, leveling and the placing of culverts in waterways should appreciably decrease erosion. So far as people movement is concerned, none of the project area is in any sense remote. Access in and out in the dry season is not difficult. The effect of improving tracks will be merely to extend this accessibility throughout the year. Economically and socially, extended access to the area will make it possible for goods and services, including health related services, to remain available throughout the year. The improvements will primarily, of course, make marketing of farm products much easier. The overall impact of the project is expected to make the area a more attractive place to live and earn a livelihood, and the road improvements, as a part of this scheme, can be expected to contribute to a lessening of tendencies of young people, particularly, to leave for the city. The impact of the road upgrading, therefore, should be moderately beneficial.

Other Project Components

In addition to the polder rehabilitation and road improvements, other project components to be put in place gradually include improved credit and access to agricultural inputs, animal traction training, institutional strengthening of OHV, improved extension services, blacksmith training for the manufacture and maintenance of animal traction equipment, on farm research, resource and agricultural land use and practices survey, a functional literacy program, and a health services activity. Generally speaking, all of these activities will build on existing programs. None of them are really new. Also, there is no reason to perceive that any of them will have any significant impacts on the environment beyond those discussed earlier for the polder rehabilitation. About the only physical thing they may result is the building of some modest structures which will be environmentally sound.

The health component, though, merits some further discussion. The disease problems in the Haute Vallee are important. There is extensive prevalence of debilitating illnesses such as malaria, onchocerciasis, schistosomiasis, gastro-enteritis, parastic worms, etc. Attention to trying to do something to improve these conditions is considered essential. There are possibilities, for instance, if the project is successful, that it will attract new people to the area, or at least slow the movement of people out of it. This means that people may, as a consequence of the project, be exposed to diseases to which they might not otherwise have been. This is particularly important in respect of onchocerciasis which can result in blindness.

The objective of the health activity is to reduce the disease burden in the valley by making basic prevention and curative health services available. The project will, with relatively modest inputs, and building on existing programs, provide training to health and extension personnel and attempt to improve the distribution system for medication.

The consequences of the health component can be expected to result in moderate gains in the struggle against the disease problems in the area.

Recommendation:

From the foregoing discussion it is reasonable to conclude that OHV will not result in any significant impacts on the environment. No serious if any adverse impacts are perceived and some modest environmental benefits will hopefully occur. Additionally, this is a pilot demonstration undertaking. It will present opportunities for sensitizing people in the OHV and farmers to actions that can preserve and maybe improve the environment. The degradation into which the Bancoumana Polder has been allowed to lapse, is a case in point. A Negative Determination under AID Regulation 16 is, therefore, recommended for the project.

Annex C-5

William H. Settle
Entomologist
Smithsonian - Peace Co
Environmental Program

FIELD DATA AND EVALUATION OF DISEASE VECTORS AND HABITAT IN THE HAUTE VALLEE AREA: BANCOUMANA

I. INTRODUCTION

The village of Bankoumana in the Haute Vallee area of Mali was chosen as the site for a relatively focused look at disease vectors and vector habitats as they relate to proposed agricultural development in the Bancoumana area, and as to some extent being representative of general disease problems in the Haute Vallee as a whole.

In a six day evaluation, quantitative data was not able to be obtained for the reason that adequate estimations of vector population levels require at least one full seasonal cycle to be followed through for the dynamics of the various populations to be fully appreciated. That is to say, to establish one point on a hypothetical curve of population growth and decline shows nothing of the shape of that curve, nor the relative position of the point on that curve. All that can be established with six days in the field is presenc or absence of a particular vector; absence meaning only that the vector was not found, not that it does not exist. (Mosquitoes, for example, were difficult to find at this time of year, December 7-13, since it was the cold-dry season. One must feel certain that many, more species must exist throughout the rest of the year, particularly the rainy season, June - September.

An attempt has been made here to estimate the supposed "Impact" that proposed modification of the environment for agricultural purposes will bring about to the habitat and populations of certain key disease vectors. These proposed changes will take the form of modifiying the physical habitat which would affect the potential for vector development and dispersal. The influx of the human work force is neither a purpose of the project nor a likely result thereof because the problem in the Haute Vallee, as in most rural areas of Mali, is just the opposite— out migration. The most that this project hopes to do is to reduce somewhat that out-flux.

II SUMMARY

Onchocerciasis:

Vector: Blackfly *Simulium damosum*. Vector larvae present in tributaries to the Niger; suspected to exist mostly in the Niger thus complicating control attempts; adults transmit filarial pathogens during blood meals; only reservoir -human.

Present Status: Severe

Future Status: Severe

Action: Educate populace concerning relation of cysts to blindness; supply health efforts directed towards diagnosis and treatment.

Malaria:

Vector: Mosquitoe *Anopheles gambeii*;larvae develop in any available standing water:4 to 7 days.Adults, present in light trapping samples,bite at night in houses.

Present Status: Severe.

Future Status: Severe.

Action: Symptomatic treatment with anti-malarials under supervision of rural health workers.

Trypanosomiasis:

Vector: Primary vector:Tsetse fly *Glossina palpalis* found in great numbers,*G. tachinoides*, and *G. morsitans* suspected in area. In addition,flies of the families.
Tabanidae and Muscidae;Genus *Stomoxys* are present and thought to be possible mechanical vectors.

Present status: Vectors found in great numbers in several isolated areas.Disease not much of a problem at this time in Bankoumana area.

Future Status:Some

Action: Monitoring of disease incidence;alerting village officials as to location of potentially dangerous sites;teaching health people to diagnose and treat.

Shistosomiasis:

Vector: snail, Genus Bulinus; found in low numbers in principle canal.

Present Status: Endemic at a low level - 3%

Future Status: Difficult to say, factors affecting both increase and decrease of vector population and contact with man.

Action: Monitoring of disease incidence; education of villagers via functional literacy program; supply diagnostic and treatment techniques to health workers; mechanical techniques in respec of irrigation perimeter design and maintenance.

Guinea Worm:

Not thought to be a present problem

III MATERIALS AND METHODS

Two Challier type traps for biting flies were used in five points along the Koba, a small tributary to the Niger. Sites were selected based upon what was know of Tsetse fly habitat requirements: riverine species. Traps were visited once a day.

Light trapping for mosquitoes was done during two nights in two separate locations. A petrol lamp was set up with a white reflecting sheet behind it to attract night flying insects. The mosquitoes and biting midges were manually removed and placed in cyanide vials. Early morning and early evening trips were made attempting to secure mosquitoe specimens.

Marshland parimeters and canal banks were examined to find snails feeding on vegetation. 16 snail "baits" were set on the lower Koba, consisting of green-leafy vegetation secured by twine and sunk in the slowly moving waters. These were examined daily for snails who might attached themselves to feed. The aid of local fisherman was enlisted to provide samples of aquatic snail life.

The Koba was scouted on foot to examine possible blackfly breeding sites. At this same time, "attractive" clothing was worn to entice tsetse fly (dark clothing, leather satchel and leather boots). Approximately 25% of the tsetse taken were captured in this fashion.

Finally, a broader perspective on the question of disease vectors was deduced from service data provided by a retired infirmier d'etat, El Hadj Mamadou Aliou Drame. He is a state trained nurse who now operates the Pharmacie Populaire and still treats patients. He has had 38 years experience in the field of health, 20 of which was spent in the Bankoumana area.

DISEASES/VECTORS/HABITAT

The diseases are being presented in order of importance to future icultural activities. The first two, malaria and onchocerciasis, stand out as being by far the most important for consideration, being of real importance now and undoubtedly in the future. The second two, trypanosomiasis and schistosomiasis do not account for significant percentages of disease at this time, but for reasons that will be discussed, may pose a future threat.

Onchocerciasis

Biology: Onchocerciasis is a disease caused by several races of the filarial worm, Onchocerca volvulus, vectored by several species of the genus Simulium within the fly family of blackfly (SIMULIIDAE)

In humans the slender adults of O. volvulus reach a few centimeters long in the male but up to 70 cm or more as the female, and live in deep seated tissues as well as in superficial fibrous nodules just under the skin. The embryo worms produced by the female, in enormous numbers, are found only in the skin, and are taken up by the fly intermediate host when it rasps the skin in order to take-up blood. Up to (200) worms can be taken up by one blood meal[2]. Metamorphosis of the parasite within the fly involves change of form to a flat 'sausage' stage which is passed on from the mouthpar when the fly feeds. The metamorphic process within the fly takes from within 10-13 days. It is the dispersing microfilarial stage within the human which provokes host reaction[3] the secondary symtoms of pruritis (itching), hernia, elephantiasis and, most importantly, blindness.

Vector & Habitat: Within the blackfly family, (SIMULIIDAE), are included some of the most intolerable and voracious pests that bite man. Some species are such a persistant menace that large areas of land are unpleasant to live and work in[4]. However, there is only one important genus with regard to

---

2. Crosskey, R.W. Insects and Other Arthropods of Medical Importance The Trustees of the British Museum (Naturel History), London 1973. K.G. Smith Editor pp. 134.

3. McClelland, G.A. Medical Entomology. University of California at Davis, 4th Ed., 1974.

Onchocerciasis: Simulius spp. in general Onchocerciasis vectoring species are often not important biting pests as such[5].

Along the small tributary to the Niger, the Koba, larvae of the most widespread vector species of Onchocerciasis in West Africa were found: Simulius Damnosum. The Simuliidae are aquatic in the early larval stages and nearly always require running water for development. Most of them need at least a slowly moving steady current, although a few African species are reported as being capable of development within completely stagnant waters[6]. Simuliidae are found in all manner of water courses, from the merest trickle to the great rivers.

Discussion: The incidence of Onchocerciasis in Bankoumana, based upon the service data estimate of the local infirmier d'Etat, El Hadj Drame, states an average of 7-14 per week treated over a 20 year period. This statistic is confused by the condition that we do not know how many people are returning for additional treatments and do not therefor consitute new cases. I would therefor decline to attempt a percentage figure for disease incidence without further survey work[7]. However, it is apparent that Onchocerciasis places a heavy burden on the population of Bankoumana and the surrounding area. This disease load must necessarily affect greatly the work capabilities of the labor force as well as decreasing, the desireability of the area

---

4. Crosskey. pp. 131

5. ibid.

6. ibid pp. 118

from the viewpoint of the farmer wanting to work in the fields and raising a family in such an area.

The Niger river is most likely the main habitat of blackfly and not the relatively small tributary sources such as the Koba. Although larvae were found in the Koba, the sites were few. Nevertheless these small tributaries should be checked for blackfly larvae during the rainy season. Control programs at this time for blackfly necessarily involve an attack with pesticides on the larval aquatic stage and are therefor ambitious and expensive under-takings. No spraying program is planned by the Onchocerciasis team working under the W.H.O., currently conducting large scale eradication programs in the upper Volta Basin area, as well as some of the eastern region of Mali.

Since it is not considered that blackfly have anything to do with canal habitats the affected hydrologic changes, should have no affect on the vector population. Re humans, if there were a population rise associated with increased agricultural output, this would then have to be paralleled by an increase in health services aimed at treating Onchocerciasis. For the last 20 years El Hadj Drame has proveded services in Bankoumana and the immediately surrounding area for removal of the dermal cysts. Dermal cyst removal is one means for keeping the level of worms at a level below which eyesight is affected.

---

7. Mssr. Drame states that a very real problem with treating this disease is that: a) the paysan does not understand the relationship between skin cists and blindness, and b) the paysan is either embarassed by the presence, or fearfull of treatment for these cysts, therefor much the disease goes untreated until it is at a greatly advanced stage.

Regarding treatment by drugs, both in a preventative and curative fashion, they are used in Mali. and should be investigated further.

It is my opinion that at least for the Bancoumana area, Onchocerciasis at this time is a serious problem, and that there should be a concomitant increase in health services particularly aimed at this problem; otherwise, it may not be realistic to expect that the problem of youth out-migration will be lessened.

Malaria

Malaria, although not in December readily apparent in the Bankoumana area, is stated by local farmers as well as local medical people as being a very serious problem, and one of the major reasons for keeping the farmers out of the fields during planting season (June to September).

Malaria is recognizable by rather regularly occuring paroxysms of chills and fever, and in which the red blood cells are destroyed by the parasite. It is caused by protozoa in the genus Plasmodium and is transmitted by certain species of mosquitoes in the genus Anopheles. Anopheles gambeli was identified from the light trap samples from the Bankoumana area. Three types of Malaria are common in man: benign tertian malaria, caused by P. vivax, which has wide distribution; malignant tertian malaria, caused by P. falciparum, which is principally tropical and is the most dangerous type; and quartanary malaria caused by P. malariae and is the least common of the three. All three types of parasites are reported to exist in the Haute Vallee, but P. falciparum is the major debilitating pathogen.

Biology: The details of the biology of the Malarial parasite will not be discussed in this text in any detail since huge bodies of data exist on this in any college library.

The larvae of the mosquitoe genus Anopheles breed chiefly in ground pools, marshes, and in places where there is considerable vegetation. The area surrounding Bankoumana, therefor, is an ideal site for the development of this mosquitoe. The adult Anopheles has a flight range of up to one mile. A. gambeli has very general breeding site requirements, being able to develop in any areas of standing water; during the rainy season the entire area around Bankoumana will provide such breeding grounds.

Discussion: Since Anopheline mosquitoes are generally nocturnal biters the most potent vectors are those that fly into houses to feed; A. gambeli is just such a feeder. After feeding these species usually rest on the walls of the house before leaving at dawn, such species are termed "endophilic". If the walls of the house are sprayed with a residual insecticide there is the chance of killing the mosquito before it has the chance to become infective. Such spray programs have been frustrated by: 1) development of resistance to insecticides; 2) increase in frequency of "exophilic" strains, (i.e. strains that leave the house before resting). Control of breeding places has been helpful but only when complete; this would be impossible with A. gambeli since it is highly non specific in the types of standing waters it chooses for egg laying.

Control efforts against the mosquitoe vector of malaria, given the scope of the health efforts in this development project, are out of the question. Symptomatic treatment of the disease should be considered as a relative simple and inexpensive way of dealing with the problem of farmer time loss in the field. Such treatment should be undertaken only with a responsible program for diagnosis and distribution.

Human Tryponosomiasis

Cases of human trypanosomiasis in the Bankoumana area are reported as very few and irregular. Other areas of the Haute Vallee may very well suffer from a higher incidence rate; this should be studied. There is reason to believe that the disease could be potentially a serious problem, for reasons that will be discussed.

Biology: The species of trypanosome found most often in West Africa is Trypanosoma gambiense[8]. Whereas with Onchocerciasis, the only reservoir for the pathogen was the human population, the vast reservoir for human trypanosomiasis is in the cattle populations, and other large mammals. The cycle of disease begins when the insect vector sucks in infected blood from some vertebrate carrier. Multiplication of the pathogen can take place in several regions of the insect's digestive tract. The important forms that are responsible for sleeping sickness in man and fatal disease of horses have developed a complex cycle which eventually lodges the trypanosomes in the insect's salivary glands, ready for injection into a new host. It takes about two to four weeks for this development to take place in the insect, and during this period it cannot transmit the infection. Once the salivary glands are infected; however, trypanosomes will be injected at each feeding. The tsetse fly remains capable of spreading infection for at least three months

8. Now considered a subspecies of T.brucei

after the trypanosomes first reach the salivary glands[9].

The disease is almost invariably fatal unless treated before the Trypanosomes heavily invade the central nervous system. Endemic infections tend to be chronic with death occuring several months to a few years after infection. Epidemic infections tend to be acute with severe fever and death after about a month. Terminal stages of the disease, particularly the chronic form, are marked by extreme lethargy and drowsiness.

The primary potential vector in the area of Bankoumana is the tsetse fly: Glossina spp. of the family Muscidae of the Diptera. It is found exclusively in Africa. Of the five species associated with outbreakes of human sleeping sickness, one, G. palpalis, has been definitely identified, and it is suspected that G. tachinoides and G. morsitans must surely exist.[10] The former two are "riverine" species, having habitat requirements found only along the banks of rivers and streams and both are potential vectors of human trypanosomiasis. The latter species is a so-called "savannah species" whose habitat is not so easily defined.

Discussion: The small tributary to the Niger, the Koba, was found to be a classic riverine habitat, providing about 4 1 miles of "gallery" type habitat[11]

---

9. Burnet, M. Natural History of Infectious Disease. Fourth edition. Cambridge University Press. 1972 pp. 40

10. J. Goodwin pers. com.

11. A Gallery is defined as an open 'tunnel' formed by overhanging trees just up from, and lining the riverbank. The ground cover is sparse of bare, the soil is permanently shaded and the soil is loose.

121 specimens were caught in 5 locations over the 4 $\frac{1}{2}$ miles. As this entire tributary is a tremendous breeding are for tsetse, the question then remains as to why there is not a higher incidence of sleeping sickness. In my opinion the answer must be that contact with humans is restricted to a few individuals. The riverine tsetse follow the length of the suitable gallery environments, but only extend out from the river or stream 50 to 75 yards, unless provided with open and shaded woodlands such as would be found under a mango grove, but this does not exist in this area[12]. Along the Koba no human habitations exist within this flight range, and contact with human is restricted to a few farmers whose tobacco fields border the stream; and a couple of young men who herd their cattle to feed and water.

The potential threat of human trypanosomiasis in the area of Bankoumana is with regard to the establishment of human habitations within the flight range of the galleries, or the increased usage of the stream for human activities such as washing and bathing. Care must be taken in the choosing of new village sites, and local officials must be made aware of this threat.

Control of tsetse in this area would most easily be affected by destroying the gallery habitat along side the Koba. This should be considered as a possibility if future villages should necessarily be planned to come within the flight range of these flies, or other areas in the Haute Vallee should prove to have infested tributaries in the proximity of human habitation or activity[12].

Other Possible Vectors of Human Trypanosomiasis

Tabanidae: Three genera of the Horsefly and Deerfly family (TABANIDAE)

---

12. For reference to control methods see: Ford, J. 1971. The Role of African Trypanosomiasis in African Ecology. Oxford. 568 p.

were captured in the Challier traps along with tsetse: Tabanus spp., Chrysops spp. and Atylotus spp. Although not ever having been implicated directly as a biological vector of trypanosomes (i.e., one that allows a developmental stage to occur in the body of the animal), mechanical vectoring, (direct transfer), of infectious trypanosomes is definitely suspect[13].

Tabanidae are mostly flies of open woodland and savannah country. In open country they are most numerous near streams, takes and bogs, which provide the muddy edgewaters suitable for breeding.

Stomoxys: six specimen of the genus Stomoxys of the family Muscidae were gathered also in the Challier traps. Stomoxys larvae live in dung and urine-soaked straw, wet straw sacks and earth rich in organic matter. They have been suspected, but not shown, to be a possible mechanical vector of trypanosomes.

Schistosomiasis

Biology: Schistosomiasis is a disease caused by parasitic worms called schistosomes. Three species are of importance to man. Two cause intestinal and hepatic (liver) disease: Schistosoma japonicum and Schistosoma mansoni. The third, Schistosoma haematobium, causes vesical or bladder disease. The Haute Vallee is within the distribution of both S. haemotobium and S. mansoni. Each disease has its associated species of snail that is required for vectoring the disease. For S. mansoni, the snail genus Biomphalaria. For S. haemotobium, the snail genus Bulinus. Three specimens of Bulinus were taken by Bob Lennox, during his 1976 general study of the area. Both his efforts and ours were [illegible] minimal for sampling these snails.

---

3. Details of the life cycle were taken from: Rosenfield, p.L. Schistosomiasis Transmission model. Agency for International Development, 1975.

Successful transmission and completion of the many-staged cycle of Schistosomiasis depends upon the presence of slow moving water areas in which man uses and contaminates. Eggs of the adult worms in the human bladder are passed along with the urine into waters. When the water temperature ranges from 10°C to 32°C, the eggs hatch into the first larval stage. These free swimming larvae must reach the appropriate snail. Thousands of fork-tailed infective "cercariae" emerge from the snail, usually between 10 A.M. and 2 P.M., a time which corresponds with greatest human contact with water. The cercariae are attracted to humans and can penetrate any part of the body. Upon entering the body the cercariae lose their tails, pass through subcutaneous tissues to the veins and move through the complicated migration involving the heart, lungs, liver and bladder. Adults mature in the liver where mating occurs. After mating the females migrate to the bladder and deposit eggs in the blood vessels of the submucosa[13].

Harm to the human host results from incomplete excretion of the eggs. Changes result from accumulations of eggs over years of reinfection; while rarely fatal, the physiological changes produce chronic debilitating changes.

Discussion: Schistosomiasis, also known as Bilharziasis, is a disease that depends upon water for transmission. Increased water availability, due to irrigation or impoundment schemes, could increase the prevalence of the disease.

In the case of the Bankoumana area, the canals, marshes and areas flooded for rice production already exist. The

---

13. Details of the life cycle were taken from: Rosenfield, P.L. Schistosomiasis Transmission Model. Agency for International Development, 1975.

project only proposes to make functional an already existing system. In the process of making functional this system, canals will be cleared of vegetation and inundated areas will be set up for controlled drainage and water control for intensive rice culture. All these measures would seem to have a negative effect on the growth and distribution of the snail-hosts. If for some reason, the project resulted in increased numbers of people having prolonged contact with the water, then this would increase chances of transmission and the chance that humans, already infected with the disease, might come into the labor force, and thus enter the disease cycle.

Shistosomiasis, at this time, can be considered endemic to the area of Bankoumana. Mssr. Drame estimates a chronic level of the disease to exist at about 3%, and having been this way for about two decades.

It is difficult to postulate what might be the changes due to agricultural development in relation to Schistosomiasis in this area. One can suggest an effort be made to inform the villagers as to the cycle and symptoms of the disease through the functional literacy program, with an emphasis on reporting to the infirmary at the first signs of symptoms. In this way some relative notion of disease incidence can be had. If the prevalence of the disease should be seen to be rising dramatically, a study of the situation should be made and proper control efforts undertaken. In the meantime part of the health effort might be aimed at teaching diagnostic and treatment techniques to the health agents as well as providing medication for treatment.

Annex D 271

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

PART II

COUNTRY : Mali

PROJECT : Operation Haute Vallee

PROJECT No. : 688-0210

Pursuant to Part I, Chapter I, Section 121 of the Foreign Assistance Act of 1961, as amended (the "Act"), I hereby authorize a Grant to the Government of Mali ("Cooperating Country") of not to exceed Two Million United States Dollars ($2,000,000) to assist in financing certain foreign exchange and local currency costs of goods and services required for the project as described in the following paragraph.

The project shall consist of developing the capability of Operation Haute Vallee ("OHV") to assist the farmers in the Haute Vallee area of the Cooperating Country to increase their production and marketing of food crops by providing (a) rehabilitation/construction of an irrigation system for approximately 640 hectares at the Bancoumana Polder, technical assistance in civil engineering, water management and improved rice production, training for participating farmers and personnel of OHV in the management and maintenance of the irrigation system and in rice production, and land development and production credits for participating farmers; (b) construction and equipping of approximately eight small animal traction training and research centers, technical assistance in the research and development of the use of animal traction for crop production, training and demonstration in the use of animal traction and in the production/repair of farm implements; (c) technical assistance, training and capital for an agricultural credit program for production inputs and animal traction; (d) technical assistance, training, equipment and supplies, and operating costs for extending the Cooperating Country's functional literacy program to approximately 200 villages in Haute Vallee; (e) technical assistance, training, operating costs, goods and other services for the development of a health program; (f) technical assistance, equipment and operating costs for the development of a road construction/maintenance brigade that will improve approximately 203 kilometers of link roads and 195 kilometers of improved access trails; and (g) technical assistance, training, equipment and supplies and the construction of a headquarters, six field offices, and approximately four small warehouses for development of the administrative capability of OHV (hereinafter referred to as the "Project").

I approve the total level of A.I.D. appropriated funding planned for the Project of not to exceed Eighteen Million, Three Hundred Ninety

Five Thousand United States Dollars ($18,395,000), Grant, during the period FY 1978 through FY 1982, including the amount authorized above and additional increments of grant funding during that period subject to the availability of funds and in accordance with A.I.D. allotment procedures; provided that, funds may not be obligated for the health program, other than for the purpose of designing such program, until preliminary planning and cost estimates for such program are reviewed and approved by AA/AFR.

I hereby authorize the initiation of negotiations and execution of the Grant Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority, subject to the following terms together with such other terms and conditions as A.I.D. may deem appropriate.

a. Source and Origin of Goods and Services

Except for ocean shipping and motor vehicles, goods and services financed by A.I.D. shall have their source and origin in countries included in Code 941 of the A.I.D. Geographic Code Book or in the Cooperating Country, except as A.I.D. may otherwise agree in writing. Ocean shipping financed under the Grant shall be procured in the United States or the Cooperating Country; motor vehicles procured under the Grant shall be manufactured in the United States.

b. Conditions Precedent.

1. Prior to the first disbursement of funds under the Grant for the services of the technical assistance contractor, other than short-term personal service contracts, or to the issuance of commitment documents with respect thereto, the Cooperating Country shall furnish to A.I.D., in form and substance satisfactory to A.I.D., a request for proposals for such services and an executed contract for such services with a firm acceptable to A.I.D.

2. Prior to the first disbursement of funds under the Grant for the procurement of road building equipment, or to the issuance of commitment documents with respect thereto, the Cooperating Country shall furnish to A.I.D., in form and substance satisfactory to A.I.D., specifications, invitations for bid for such equipment, except the equipment in paragraph d.5, below, and an executed contract(s) for such equipment with a firm(s) acceptable to A.I.D.

3. Prior to the first disbursement of funds under the Grant for the services of a construction contractor for the OHV administrative office building, or to the issuance of commitment documents with respect thereto, the Cooperating Country shall furnish to A.I.D., in form and substance satisfactory to A.I.D., detailed plans, specifications and bid documents and an executed contract with a firm acceptable to A.I.D., for such services.

4. Prior to the first disbursement of funds for the construction/improvement of the irrigation system at the Bancoumana Polder, the Cooperating Country shall furnish to A.I.D. the following in form and substance satisfactory to A.I.D.:

A. Documentary evidence of the establishment of a system of dues and fees to be charged the farmers participating in the irrigation system in an amount adequate to cover, on a continuing basis, the costs of managing and maintaining the irrigation system.

B. A copy of the cahier de charge in the standard form that will be executed by OHV and the farmers participating in the irrigation system.

C. A copy of an executed agreement between OHV and OTER, the construction Division of Genie Rural, under which OTER agrees to provide adequate numbers of technicians, supporting personnel and equipment to undertake the construction and rehabilitation of the Bancoumana Polder on a timely basis.

c. Covenants

The Grant Agreement shall contain covenants providing in substance as follows:

1. Except as A.I.D. may otherwise agree in writing, the Project shall be implemented by OHV on behalf of the Cooperating Country.

2. OHV may procure agricultural implements and supplies whenever, in the judgment of OHV, Societe de Credit Agricole et d'Equipment Rural ("SCAER"), the agency responsible for agricultural credit and rural equipment, is unable to furnish such materials on a timely basis as needed for the effective implementation of the Project.

3. The Cooperating Country agrees that OHV may apply terms of credit and rates of interest as may be required to ensure the financial viability of the credit fund, including loans for the purchase of work animals, and the achievement of Project objectives.

4. The Cooperating Country agrees that, not later than the third year of the project, a study shall be conducted of the existing agricultural credit and input supply program, including the adequacy of interest rates and credit terms, and that necessary modifications or revisions to the credit and input supply program satisfactory to A.I.D. shall be made, based upon the results of the study, prior to obligation of funds by A.I.D. for the credit program in the fourth year of the Project.

5. The Cooperating Country shall increase the number of extension agents assigned to OHV at the average rate of seven per year for the life of the Project.

6. The Cooperating Country shall use its best efforts to ensure that the maximum number possible of alphabetization centers centers ("CAFs") participating in the functional literacy component of this Project shall include, as part of their curriculum classes for women only and that $20,000 from the project credit fund will be used solely by the CAFs for conducting experimental agricultural projects on a credit and group basis.

7. Primes to be paid to eligible persons out of the Grant shall be submitted semi-annually to A.I.D. for review and approval.

8. With respect to the road building components of the Project the Cooperating Country shall agree to the following:

A. A special brigade will be created by Travaux Publics, the Public Works Department of the Cooperating Country ("TP") which will construct, improve and maintain the roads financed under this Grant;

B. TP shall provide to the special brigade a sufficient number of adequately trained technicians and supervisory and support personnel as may be required to construct approximately 203 kilometers of Class B roads and 195 kilometers of trails in the Project area and to maintain such roads and the equipment financed under the Grant;

C. Except as A.I.D. may otherwise agree in writing, road construction and maintenance equipment financed by A.I.D. under the Grant shall be assigned by the Cooperating Country as follows:

(1) road construction equipment, for the life of the project, to OHV which shall make such equipment available to the special brigade for the construction or improvement of roads in the project area;

(2) road maintenance equipment to TP which shall make such equipment available, both during this project and after it is completed, to the special brigade for the purpose of maintaining the roads which are constructed or improved in the Project area under this Grant;

(3) road construction equipment, upon termination of the Project, to TP which shall make such equipment available to the special brigade for the purpose of maintaining and upgrading roads in the Project area.

D. The construction and improvement of roads in the Project area by the special brigade shall be supervised by TP but shall be under the direction of OHV.

E. TP and the special brigade shall have the responsibility to maintain each road constructed or improved under this Project as soon as construction or improvement of each road is completed, and maintenance costs shall be financed by the Cooperating Country. Within one year after execution of the project agreement, the Cooperating Country shall identify a satisfactory source of funding from its revenues for such costs.

9. Each contract of the Cooperating Country financed under the Grant, other than those between or among agencies of the Cooperating Country, shall be in accordance with A.I.D. Handbook 11 on Country Contracting.

10. The Cooperating Country agrees that a study will be undertaken, jointly by the Cooperating Country, OHV and A.I.D., regarding alternative ways to increase OHV's revenues from both food and cash crops and, prior to the obligation of funds by A.I.D. for year 3 of the project, that the Cooperating Countries, OHV and A.I.D. shall consult regarding the manner in which the recommendationsresulting from such study may be implemented.

d. Waivers

Notwithstanding paragraph a. above and based upon the justification set forth in Annex A7 of the Project Paper, I hereby

(1) approve a procurement source waiver to Code 935 for the purchase of one pickup truck;

(2) certify that the exclusion of procurement of such truck from the requested country included in Code 935 would seriously impede attainment of U.S. foreign policy objectives and the objectives of the foreign assistance program;

(3) approve a waiver to permit procurement of 162 mobylettes manufactured in countries included in Code 941; and

(4) find that special circumstances exist to waive, and do hereby waive the requirements of Section 636(i) of the Act with respect to such truck and mobylettes;

(5) approve an increase in the per unit cost of shelf items from Code 899 countries (which are not also included in Code 941) that may be financed under the Grant from $2,500 to $6,000 for survey equipment and spare parts for road construction and maintenance equipment;

(6) Approve the procurement from Caterpillar Tractor Company, without competition, of certain items of road construction and maintenance equipment (and spare parts) identified in Annex A7 of the Project Paper based upon the policy of the Cooperating Country to standardize such equipment and the support facilities available in the Cooperating Country.

Administrator

Date

3390
36

Exhibit E

277

FINANCIAL DETAILS

Basis of Cost Estimates (with transport)

1. Technical Assistance, short and long term — $100,000/yr ($8,333/mo)

2. Training in U.S. and 3rd Country — $20,000/yr(a); $28,000 (NA) (includes lang. train. & transport)

3. In-Country training — $250/mo

4. Storage — $200/square meter

5. Mobylettes — $500 each (estimate of local cost)

6. Motorcycles — $1,000 each (estimate of local cost)

7. 4-wheel drive vehicles — $16,000 each (1/3 being transport)

8. Half-ton pick-ups — $10,000 each (1/3 being transport)

9. Ten-ton vehicles — $25,000 each (1/3 being transport)

10. Headquarters — $275/square meter

11. Field office space — $200/square meter

12.. 4 HP Diesel pumps — $2,400 each (taken from Action Blé)

13. All road construction equipment — revised estimates from AID/Bamako civil engineer, George Thompson

14. Project Evaluations — Technicians x 3 weeks at $8,333/mo. ($25,000), plus for PY2 and PY4 an additional $10,000 for intensive sociological/economic survey by IER accompanying evaluations.

15. Welders — $1,500 plus freight, or $2,000 each for 8 Animal Traction Centers ($16,000 total)

16. Blacksmith equipment — $1,500/center (estimate of local SAFGRAD technician experienced in animal traction centers)

17. Animal Traction Supplies — estimates of same technician

18. Third-Country Training (Africa) — $2,000/mo. including travel and per diem.

19. Base line survey by IER — $1,000/mo/professional ($33/day plus 50% overhead x 20 days per month) x 4 professionals x 12 months, or approximately $48,000 for 12 months work — say $50,000

20. Work oxen start-up insurance fund of $10,000 — enough to insure 60 oxen which is more than twice the estimated mortality rate for the number of oxen purchased on credit in PY2 - PY3

371

21. Credit design fund — 1 U.S. Technician x $8,333/month x 5 months, or $42,000 plus $1,000 for 9 socio-economic statistics gathers at $112/mo x 1 month

22. Veterinary supplies — $20,000, or the equivalent of $5,000/yr, starting FY2 (OHV now spends the equivalent of $1,500/yr on such; therefore the recommended supplies would boost program by 333%, which accords with program's focus on animal traction)

23. Study of additional polders in FY4 — $75,000 (this is double the cost of the same type of study done at the Bancoumana polder, to account for larger total area of remaining polders)

24. Foot pedal operated rice threshers — $300/thresher, which is the latest estimated cost of constructing the same in Bamako, using Asian models as a guideline (arrangements for such construction are already being made in conjunction with local U.S. agency sponsoring local small manufacturers)

25. Multiple cultivators, TM Plows, Harrow — existing SCAER prices

26. Tractors (185 HP) — $12,000 plus 50% freight or $18,000/each (estimates of accompanying implements come from U.S. catelogs plus 50% increase to cover transportation of heavy equipment)

27. Machinery depreciation reserve of $40,000/yr (a GRM expenditure) — 20%/yr depreciation on total cost of farm equipment ($192,000), plus 4%, $1,600/yr, to account for above average inflation rate on such

28. "Start-up Fund" at polder — $15,000 to cover completely the polder design study

29. Administrative Advisor — [illegible] (or 50% less than other advisors) to account for fact that planned hiree will be ex-PCV type recruited from West Africa.

30. Remainder of equipment office supplies and training supplies in the functional literacy/health component — estimates of Ministry of Health in conjunction with AID/Bamako health advisor. All health costs based on coverage of 60,000 people during FY 3, 4 & 5.

31. OHV Salaries — $230,000 for FY1 (1978), plus 7% growth rate thereafter for increases in personnel.

32. Garage Equipment ($15,000 — see page____ which lists 13 items costing an estimated $11,340; the remaining $3,660 in equipment will be purchased after the arrival, and advice, of the U.S. technical advisors to OHV's auto garage.

33. Primes ($1000)

	PY1	PY2	PY3	PY4	PY5
1 Director	2				
1 Assistant Director	2				
3 Division Heads	6				
5 Engineers	5				
8 Heads of Sectors	11				
4 Financial Assistants	3				
20 Technical Experts	16				
38 Monitors/Conductors	25				
90 Chauffeurs/encadreurs, guards	26				
170	96				
Total with growth factor of 7%/yr	96	103	110	118	126

34. Maintenance Costs (estimates from Operation Mil)

Gas for 158 mobylettes ($150/mobylette/yr)	12	24	24	24	24
Gas for 24 motorcycles ($300/yr)	4	6	7	7	7
Gas for 20, 4-wheel drive vehicles ($3,000/vehicle)	30	60	60	60	60
1 Pick-up	3	3	3	3	3
3 Tractors ($3,000/tractor/yr)	-	9	9	9	9
Maintenance on above vehicles ($1,000/veh)	12	24	24	24	12
Maintenance on 5 ten-ton trucks ($1,000/yr/vehicle)	-	5	5	5	5
Total	61	131	131	131	131
GRM contribution					
On existing 12 vehicles					
Gas ($3,000/veh)	36	36	36	36	36
Maintenance ($1,000/vehicle)	12	12	12	12	12
On new 10-ton trucks					
Gas ($5,000/veh/yr)	-	25	25	25	25
Total	48	73	73	73	73
Total Vehicle Maintenance Costs					
U.S.	61	131	131	131	81
Mali	48	73	73	73	123

35. Wells — $300/well x 10/yr. = $3,000/yr.

36. Road/OHV Financial Study (PY4) — 3 months of technical assistance or $25,000.

37. Project Evaluations — First year evaluation ($5,000) will cover functional literacy program only; second and fourth year evaluations will include special data collection and therefore increase cost from $25,000 to $35,000 for those two years.

Projected Credit Demands (5-yr)
($'000)

	PY1	PY2	PY3	PY4	PY5
1. **Polder**					
Implements ($500/farmer)		26	57	10	5
Land Leveling ($400/ha x 100 ha)		14	23		
Variable Costs ($50/ha on 1 yr terms) (1)		10	32	32	32
2. **Animal Traction Centers**					
Oxen teams ($250/team)		23	54	112	132
Multiple Cultivators ($200 each)		16	46	99	139
Carts, seeders, etc. ($50/trainee)		4	12	25	35
3. **Credit Demands Outside Centers**					
Implements (2)		80	120	180	270
4. **Earmarked for CAF's**	5	15	20	20	20
Total loans	10	178	364	478	663
Reimbursements	-	5	59	176	258
Credit Needs	5	183	305	302	405
$1.2 million					
Loan Fund Budgeted (assumes 20% loans in delayed repayment)	5	185	317	337	456

(1) The number of farmers trained per year starting PY2 is 80,230,495 and 695 (1,500 total). It is assumed all take multiple cultivators on credit, and also buy an oxen team on credit.

(2) For 1979/80 campaign, OHV ordered over $160,000 in implements; it is assumed here that 50% will want to take advantage of the 5 year terms, with growth factor of 50% starting PY3.

OPERATION HAUTE VALLEE

TABLE 3

SUMMARY FOR FIVE YEAR FUNDING ($'000)

	Animal Traction - Research		Administrative Support/OHV		Irrigation/ Bancoumana		Agricultural Credit		Functional Literacy and Health		Link Roads/ Access Trails		TOTALS		
	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	GRAND
Technical Assistance	668	-0-	1,251	-0-	380	-0-	367	-0-	-0-	-0-	434	-0-	3100	0	3100
Commodities	352	35	530	-0-	307	-0-	58	-0-	106	5	1455	-0-	2808	40	2848
Training	171	-0-	165	-0-	199	-0-	118	5	37	9	-0-	-0-	690	14	704
Construction	64	-0-	224	175	566	40	100	-0-	-0-	2,000	3,088	-0-	4,042	2215	6,257
Credit Capital/Research Fund	125	10	-0-	-0-	-0-	-0-	1,310	-0-	-0-	-0-	-0-	-0-	1435	10	1445
Studies/Evaluations	-0-	-0-	175	-0-	75	-0-	43	-0-	-0-	-0-	50	-0-	343	0	343
Maintenance/Salaries/Primes	332	599	357	989	124	328	325	325	-0-	211	-0-	236	1139	2688	3826
Contingencies (15%)	256	127	406	175	248	51	348	80	21	334	754	35	2033	802	2835
Compounded Inflation at 8%	277	158	349	246	244	83	557	131	8	453	871	77	2306	1148	3454
TOTALS	2245	929	3457	1585	2143	502	3226	541	672*	3012	6652	348	18,395	6917	25,312

*includes $500,000 for health component, not broken down into cost categories.

373-241

BUDGET: Animal Traction-Research ($'000)

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	TOTALS AID	TOTALS GRM	TOTALS G
TECHNICAL ASSISTANCE:													
Long-Term													
1 Animal Traction Spec.	35		100		100		65				300		300
1 Crop Specialist			60		100		100		40		300		300
14 PCV's (over 4-yr period)													
Short-Term													
Consultants on call	17		17		17		17				68		68
CONSTRUCTION:													
8 Storage facilities	8		8		24		24				64		64
TRAINING:													
Long-Term													
2 Crop Specialists			7		7						14		14
1 Extension Agent			28								28		28
2 Agronomy (MA)	20		20		20		20				80		80
Third-Country													
3 Animal Traction Spec's	8		8								16		16
1 Blacksmith Trainer	4		4								8		8
In-Country	3		6		6		6		4		25		25
RESEARCH FUND FOR CROPS, ETC.			35	1	35	2	35	3	20	4	125	10	135
COMMODITIES:													
Welders	8		8								16		16
Blacksmith equipment	6		6								12		12
8 Diesel Pumps (4 HP)	5		12								17		17
24 Motorcycles	14		10								24		24
8 Mobylettes	4										4		4
11 4-wheel Drive Vehicles	176										176		176
Field Test Equipment	2		5								7		7
Miscellaneous implements	5	2	10	2		3		3		4	15	14	29
Miscellaneous supplies	5	2	10	2		3		3		4	15	14	29
Spare Parts	35				10						45		45
Animal Traction Supplies			4		8		6	2	3	5	21	7	28

/Continued ..

BUDGET: Animal Traction-Research ($'000)

CATEGORY	FY1 AID	FY1 GRM	FY2 AID	FY2 GRM	FY3 AID	FY3 GRM	FY4 AID	FY4 GRM	FY5 AID	FY5 GRM	TOTALS AID	TOTALS GRM	GRAND
Maintenance/Salaries/Primes													
Salaries (30% of OHV total)		69		74		79		85		90		397	397
Primes (30% of OHV total)	29		37		33		36		38		173		173
Maintenance of project veh.[a]	18	14	39	23	39	23	39	23	24	46	159	129	288
General Maintenance[a]		13		13		14		16		17		73	73
Sub-Total	402	100	434	115	399	124	348	135	129	180	1,712	644	2,356
Contingencies (15%)	60	15	65	17	69	19	52	49	19	27	256	127	383
Inflation (8-17-26-36-47%)			40	11	80	24	104	48	53	75	277	158	435
TOTAL	462	115	539	143	548	167	504	232	201	282	2,245	929	3,174

[a] 30% of total

BUDGET: OHV Administrative Support ($'000)

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	TOTALS AID	TOTALS GRM	GRAND
TECHNICAL ASSISTANCE:													
Long-Term													
1 Admin Sp/Team Leader	50		100		100		100		50		400		400
1 Financial Advisor			60		100		90				250		250
2 PCVs/mechanics													
1 Admin Advisor	25		50		50		50				175		175
Short-Term													
1 Ag. Economist			17		17						34		34
1 Ag. Statistics Advisor			100		75		25				200		200
1 Personnel Advisor					17						17		17
Consultants on call	58		39		39		39				175		175
CONSTRUCTION:													
1 Headquarters	193										193		193
Land		95										95	95
6 Additions to Field Offices	6				15		10				31		31
Land		15				45		20				80	80
TRAINING:													
Long-Term													
1 Management (A)	20		20								40		40
1 Ag. Statistics	10		10								20		20
2 Finance	10		20		10						40		40
1 Ag. Extension			28								28		28
Short-Term													
4 Management	7		7		14						28		28
In-Country	2		2		3		2		1		9		9
STUDIES:													
Base line survey	50										50		50
Evaluations	5		35		25		35		25		125		125

BUDGET: [illegible] Illustrative Support ($'000)

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	TOTALS AID	TOTALS GRM	TOTALS GRAND
COMMODITIES:													
1 Pick-up-truck (1/2 ton)	10										10		10
5 10-ton trucks	125										125		125
122 Mobylettes	61										61		61
7 Short-wave radios & gen'tors	77										77		77
5 4-wheel drive vehicles	80										80		80
Garage Equipment	10		5								15		15
2 Furnishings Guest-House	15										15		15
40 Sets office equipment for OHV headquarters	60	10	10								70		70
16 sets office furniture for the field agents	20		4								24		24
Spare Parts	40	13	13								53		53
Maintenance/Salaries/Prices													
Salaries (30% of OHV total)		69		74		79		85		90		397	397
Prices	29		31		33		36		38		167		167
Admin Assistant											35		35
Maintenance of projected related vehicles	18	14	39	23	39	23	35	23	24	46	155	129	284
Depreciation reserve on 11 new vehicles and short wave radios				60		60		60		60		240	240
General maintenance		30		36		43		52		62		223	223
Sub-Total	987	223	597	193	544	250	429	240	145	258	2,702	1,164	3,866
Contingencies (15%)	148	33	90	29	82	38	64	36	22	39	406	175	581
Inflation (8-17-26-31-48%)	0	0	55	18	106	49	128	72	60	107	349	246	595
	155												
GRAND TOTAL	1,135	256	742	240	732	337	621	348	227	404	3,457	1,585	5,042

BUDGET: Agricultural Credit ($'000)

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	TOTALS AID	TOTALS GRM	GRAND
TECHNICAL ASSISTANCE:													
1 Credit Advisor	10		100		100		100		40		350		350
1 Credit Trainer					17						17		17
CONSTRUCTION:													
4 Warehouses (125 sq m ea)	25				75						100		100
TRAINING:													
Long-Term													
1 Agricultural Credit (A)			20		20						40		40
Short-Term													
5 Supervised Credit (MA)			28		42						70		70
In-Country (30 m)		1	2	1	2	1	2	1	2	1	8	5	13
REVOLVING CREDIT LOAN FUND:	5		185		317		337		456		1,300		1,300
Animal Insurance Fund			10								10		10
STUDIES/CREDIT DESIGN			43								43		43
COMMODITIES:													
2 4-wheel drive vehicles	32										32		32
Veterinary supplies	3		4		5		5		3		20		20
Spare Parts	4				2						6		6
Maintenance/Salaries/Prime													
Salaries (30%)		69(1)		74		79		85		90		397	397
Prime (30%)	28		31		33		36		38		166		166
Maintenance costs of vehicles transporting agricultural implements (30%)	18	14	39	23	39	23	39	23	24	46	159	129	288
Sub-Total	125	84	462	98	652	103	519	109	563	137	2321	531	2852
Contingencies (15%)	19	13	69	15	98	15	78	16	84	21	348	80	428
Inflation (8-17-26-34-47%)	–	–	42	9	127	32	155	33	233	57	557	131	688
GRAND TOTAL	144	97	573	122	877	150	752	158	880	215	3226	742	3968

(1) 30% of DIP total with 7% growth factor

BUDGET: ROADS AND TRAILS ($'000)

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	TOTALS AID	TOTALS GRM	TOTALS GRAND
TECHNICAL ASSISTANCE:													
Short-Term													
1 Civil Engineer			42		42						84		84
1 Engineer, REDSO, TDY (2 PM ea. in PY's 1,2,3													
1 Heavy Equipment Main. Spec.			100		100						200		200
1 Construction Manager			100		50						150		150
CONSTRUCTION:													
203 km roads			550		650		725		714		2,639		2,639
195 km trails			100		150		125		74		449		449
COMMODITIES:													
2 Bulldozers	200										200		200
2 Motorgraders	170										170		170
1 Wheeled Loader	65										65		65
2 Wheeled Scrapers	170										170		170
1 Disc plow	16										16		16
1 Compactor	30										30		30
5 Dump Trucks	150										150		150
3 Water Trucks	90										90		90
3 Water Tanks	3										3		3
1 Mechanic's pickup truck	20										20		20
2 One-ton Payload Pickup	18										18		18
1 Concrete Mixer	5										5		5
10 Wheelbarrows	1										1		1
2 Water Pumps	2										2		2
1 Lot Survey Equipment	6										6		6
1 Fuel/Lab Truck, Diesel	30										30		30
2 Fuel Tanks	5										5		5
1 Tanker (1500 Gal) Truck	30										30		30
1 Lowbed (30T) Tractor/Trailer	45										45		45
2 6T Trailer Vans	8										8		8
5 Ten-Man Tents	5										5		5
1 15-Kw Generators (Diesel)	10										10		10
Spare Parts	325										325		325

379 20-1/

BUDGET: ROADS AND TRAILS ($'000) CONT'D

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	TOTALS AID	TOTALS GRM	TOTALS GRAND
Pickup Truck for Survey	10										10		10
Shop Equipment	40										40		40
MAINTENANCE EQUIPMENT													
2 Motor Graders	150										150		150
2 Two type water tanks	8										8		8
2 Water Pumps	2										2		2
2 Dump Trucks	60										60		60
2 Tractor (Industrial)	35										35		35
2 Wobble Wheel Tyred Rollers	20										20		20
2 1-T payload 4-wheel Drive Diesel Pickup	18										18		18
Spare parts, insurance & freight	59										59		59
STUDIES — ROADS/OHV FINANCES (3 mo.)							50				50		50
MAINTENANCE/SALARIES/ PRIMES													
Road Maintenance		—		—		30		60		100		190	190
Administration/Overhead Costs		—		7		13		13		13		46	46
Sub-Total	1,455	—	892	7	992	43	900	73	788	113	5,027	236	5,263
Contingencies	218	—	134	1	149	6	135	11	118	17	754	35	789
Inflation 15 Percent	—	—	82	-	194	8	269	22	326	47	871	77	948
GRAND TOTAL	1,673	—	1,108	8	1,335	57	1,304	106	1232	177	6,652	348	7,000

BUDGET: FUNCTIONAL LITERACY ($'000)

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	TOTALS AID	TOTALS GRM	GRAND
TRAINING:													
Third-Country	12										12		12
In-Country	5		5		15	1		3		5	25	9	34
CONSTRUCTION													
200 CAFs		250		500		500		500		250		2,000	2,000
COMMODITIES													
1 4-wheel drive vehicles	16										16		16
12 Mobylettes	2		1		2		1				6		6
Spare Parts 20%	3										3		3
Mimeographs, Audio-Visual aids, limographs, educational supplies for CAFs	48		20		11		2			5	81	5	86
MAINTENANCE/SALARIES/PRIMES (1)		8		10		39		42		42		141	141
200 CAF Centers set-up costs		5		10		10		5				30	30
Office Rentals-Equipment		5		5		10		10		10		40	40
SUB-TOTAL	86	268	26	525	28	560	3	560	0	312	143	2,225	2,368

1) The AID contribution to vehicle maintenance is incorporated into the Administrative support component.

BUDGET: FUNCTIONAL LITERACY & HEALTH ($'000)

/Continued . . .

CATEGROY	PY1		PY2		PY3		PY4		PY5		TOTALS		
	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	AID	GRM	GRAND
15% Contingencies	13	40	4	79	4	84	-	84	0	47	21	334	355
Inflation (8-17-26-36)			2	48	5	109	1	167	0	129	8	453	461
GRAND TOTAL	99	308	32	652	37	753	4	811	0	488	172	3012	3184

BUDGET: Irrigation/Bancoumana ($'000)

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	TOTALS AID	TOTALS GRM	GRAND
TECHNICAL ASSISTANCE:													
Long-Term													
1 Irrigated Rice Spec	10		100		100		90				300		300
Short-Term													
1 Water Managment Spec			4		4		4				12		12
Consultants on call	9		17		17		17		8		68		68
CONSTRUCTION:													
Construction			150	10	359	30					509	40	589
Engineering			57								57		57
TRAINING:													
Long-Term													
1 Engineer (A)			20		20						40		40
3 Rice Production Spec's	14		14		14						42		42
Short-Term													
2 Technical Specialists			6								6		6
4 Others			6		5						11		11
In-Country (100 m)			15		35		35		15		100		100
STUDIES:													
(Additional Folders)							75				75		75
COMMODITIES:													
Assorted Tools			5								5		5
Materials			5								5		5
5 Diesel pumps (4 HP)	12										12		12
3 Tractors (HP 185)	54										54		54
3 Scrapers (Reydold 4m3)	18										18		18
3 Plows (MF 1.24)	36										36		36
3 Disc Harrows (MF 95)	36										36		36
3 Trailers (MF 2.16)	36										36		36
1 Land Plane (Marium tri-plane)	12										12		12

/Continued ...

BUDGET: Irrigation/Bancoumana ($'000)

CATEGORY	PY1 AID	PY1 GRM	PY2 AID	PY2 GRM	PY3 AID	PY3 GRM	PY4 AID	PY4 GRM	PY5 AID	PY5 GRM	TOTALS AID	TOTALS GRM	GRAND
40 Foot Pedal Threshers	12										12		12
40 Weeders	4										4		4
64 Line Seeders	9										9		9
1 Rice Mill, complete	15										15		15
1 Hammer Mill	1										1		1
50 Sprayers, portable	3										3		3
20 Multiple cultivators	4										4		4
20 TM Plows	2										2		2
20 Harrows	2										2		2
Spare Parts	41										41		41
Maintenance/Salaries/Primes													
Vehicle Maintenance	6	5	13	5	13	5	13	6	8	15	53	36	89
Machinery Depreciation Reserve				40		40		40		40		160	160
Salaries (1)		23		25		26		28		30		132	132
Primes (1)	10		10		11		12		13		56		56
Other/Start-up fund	15										15		15
Sub-Total	361	28	422	80	578	101	246	74	44	85	1,651	368	2,019
Contingencies (15%)	54	4	63	12	87	11	37	11	7	13	248	51	299
Inflation (8-12-26-36-47%)	–	–	39	7	113	19	74	22	18	35	244	83	327
GRAND TOTAL	415	32	524	99	778	131	357	107	69	133	2143	502	2745

(1) 10% of OHV total