

PD BAG 403

AGENCY FOR INTERNATIONAL DEVELOPMENT PROJECT PAPER FACESHEET		1. TRANSACTION CODE <input type="checkbox"/> A ADD <input type="checkbox"/> C CHANGE <input type="checkbox"/> D DELETE		PP 2. DOCUMENT CODE 3
3. COUNTRY/ENTITY MALI		4. DOCUMENT REVISION NUMBER <input type="checkbox"/>		
5. PROJECT NUMBER (7 digits) <input type="text" value="688-0226"/>	6. BUREAU/OFFICE A. SYMBOL AFR	B. CODE <input type="text" value="06"/>	7. PROJECT TITLE (Maximum 40 characters) <input type="text" value="Semi-Arid Tropics Crops Research-Phase II"/>	
8. ESTIMATED FY OF PROJECT COMPLETION FY <input type="text" value="85"/>		9. ESTIMATED DATE OF OBLIGATION A. INITIAL FY <input type="text" value="81"/> B. QUARTER <input type="text" value="3"/> C. FINAL FY <input type="text" value="85"/> (Enter 1, 2, 3 or 4)		

10. ESTIMATED COSTS (\$000 OR EQUIVALENT \$) -						
A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L/C	D. TOTAL	E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL						
(GRANT)	130	220	350	1300	2450	3750
(L.O.A.H)						
OTHER U.S.						
1.						
2.						
HOST COUNTRY		138	318		318	318
OTHER DONOR(S)						
TOTALS						4068

11. PROPOSED BUDGET APPROPRIATED FUNDS (\$000)									
A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY <u>81</u>		H. 2ND FY <u>82</u>		K. 3RD FY <u>83</u>	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) SH	110			350		710		774	
(2)									
(3)									
(4)									
TOTALS									

A. APPROPRIATION	N. 4TH FY <u>84</u>		O. 5TH FY <u>85</u>		LIFE OF PROJECT		12. IN-DEPTH EVALUATION SCHEDULED <input type="text" value="MM"/> <input type="text" value="DD"/> <input type="text" value="YY"/>
	D. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN	
(1)	885		1031		3750		
(2)							
(3)							
(4)							
TOTALS							

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

1 = NO
 2 = YES

14. ORIGINATING OFFICE CLEARANCE SIGNATURE <i>Robert V. Hoernahr</i> TITLE Design and Evaluation Officer		15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION DATE SIGNED <input type="text" value="06"/> <input type="text" value="05"/> <input type="text" value="81"/>
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ACTION MEMORANDUM FOR THE DIRECTOR USAID/BAMAKO

FROM: Robert V. Shoemaker, DEO

**SUBJECT: Mali Project 688-0226 - Semi Arid Tropics Crops Research
Phase II**

I. Problem:

Your signature is required to authorize a grant of three million seven hundred and fifty thousand dollars (\$3,750,000) from the Sahel Development Program to the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) for the subject project.

II. Discussion:

A. Project Profile:

The project is a \$3,750,000 grant to the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT). ICRISAT, headquartered in Hyderabad, India, began agricultural work in Mali in 1976 through a Ford Foundation grant, began to receive A.I.D. funding in 1977 under the Operation Mills-Mopti Project (688-0202) and finally, following an ICRISAT proposal, received a two-year \$500,000 grant from A.I.D. in 1979.

The major emphasis of ICRISAT/Mali to date has been in the area of varietal improvement of sorghum and millet. ICRISAT/Mali has made significant progress in the identification of sorghum/millet varieties that outyield local varieties* while concurrently exhibiting improved pest and disease resistance. In addition to this crop improvement through the development of improved varieties and hybrids, ICRISAT/Mali had undertaken extensive research in the development of agronomic cropping systems best suited for the semi-arid conditions of Mali's 400-1200 mm rainfall zone. A research station is being established in this rainfall zone in conjunction with a \$360,000 grant from the Ciba-Geigy Foundation of Switzerland.

This project shall continue and improve ICRISAT's research program in the Sudano-Sahelian zone. The purpose of the project, as stated, is to develop a series of technical packages on millet, sorghum and certain grain legumes in the 400-1200 mm rainfall zone and to make them available to small farmers and herders; and to strengthen the research infrastructure of the Government of the Republic of Mali. Varietal improvement work shall include sorghum/millet breeding, introduction of new varieties, disease and pest resistance and social acceptability trials. Agronomic practices research will focus on intercropping, animal traction, forage production, fallow period management, water shed management, phosphorus fertilizer trials and pigeon pea production. Training of ten Malians to the Masters-Degree (M.S.) level shall be financed and phased over the life of the project.

*Under research conditions

B. Beneficiaries:

Eventual beneficiaries of this project shall be the cash-poor rural families that inhabit Mali's semi-arid rainfall zone. While varietal improvement is a long-term process, ICRISAT works closely with the agency dictated by the GRM, SAFGRAD, that conducts tests in farmers fields, and a viable and improving system of disseminating research results to farmers functions under the aegis of the GRM's Ministry of Agriculture.

C. Financial Summary:

Life of project A.I.D. financing totals \$3,750,000 of which \$350,000 shall be obligated in FY 81 according to A.I.D.'s OYB and allotment procedures. Funds are distributed among project components as follows:

1. Technical Assistance	U.S.\$	910,000
2. Training		376,000
3. Construction		125,000
4. Land Development		460,000
5. Research Operations and Supplies		320,000
6. Equipment and Materials		275,000
7. Travel and Transportation		255,000
8. Contingency and Inflation		<u>1,029,000</u>
<u>TOTAL</u> ,		<u>\$3,750,000</u>

GRM contribution to the project will total approximately \$318,000 primarily for salaries and the value of land contributed for project activities.

D. Project Implementation:

Source and origin of goods and services shall be Geographic Code 941 and Mali, unless A.I.D. otherwise agrees in writing.

E. Committee Action:

1. The Semi-Arid Tropics Research PID was approved in A.I.D./Washington on April 9, 1981.

2. The Mission Project Review Committee met on May 19, 1981 and recommended approval of the Project Paper pending the resolution of several outstanding issues. The issues have been resolved and appropriate changes have been incorporated into the attached Project Paper.

F. Conditions Precedent:

The following condition precedent will be required: Prior to disbursement of funds under the project for construction services, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, the Cooperating Country will, except as the party may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D. plans and specifications for the construction activity and an executed contract for construction services for the project with a firm acceptable to A.I.D.

G. Responsible Project Officers:
Maurice Fleming, Project Manager, USAID/Bamako

III. Recommendations:

That you sign the Project Authorization authorizing the Semi-Arid Tropics Research Project with planned obligations up to \$3,750,000 in accordance with procedures described in the Authorization and thereby approve a waiver for the procurement of \$100,000 work of construction commodities included therein.

Attachments

Project Authorization
Project Paper

PROJECT AUTHORIZATION

Name of Country: Mali
Name of Project: Semi-Arid Tropics Crops Research - Phase II
Number of Project: 688-0226

1. Pursuant to Part I, Chapter 121 of the Foreign Assistance Act of 1961, as amended, (the "Act"), I hereby authorize the Semi-Arid Tropics Crops Research - Phase II Project for the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) involving a planned life of project obligation of not to exceed three million seven hundred and fifty thousand dollars (\$3,750,000) in grant funds from the Sahel Development Program of which three hundred and fifty thousand dollars (\$350,000) will be obligated in FY 81, subject to the availability of funds in accordance with the A.I.D. OYB allotment process, to help in financing foreign exchange and local currency costs for the project.

2. The project consists of technical assistance, commodities, construction, training and budgetary support to assist ICRISAT/Mali in identifying successful and adapted technical agricultural packages through research into crop improvement techniques and improved agronomic practices and make these available to farmers in Mali's semi-arid rainfall zone; and to strengthen the research capability within Mali to perform such research.

3. The Grant Agreement, which may be negotiated and executed by the officer to whom such authority is delegated in accordance with A.I.D. regulations and Delegations of Authority, shall be subject to the following essential terms and covenants and major conditions, together with such other terms and conditions as A.I.D. may deem appropriate:

a) Source and Origin of Goods and Services

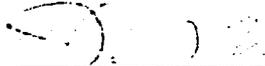
Goods and services, except for ocean shipping, financed by A.I.D. under the project shall have their source and origin in the United States or in the Cooperating Country, except as A.I.D. may otherwise agree in writing. Ocean shipping financed by A.I.D. under the project shall, except as A.I.D. may otherwise agree in writing, be financed only on flag vessels of the United States or the cooperating country.

b) Waivers

Notwithstanding paragraph a) above and based upon the justification set forth in the Procurement Plan of the Project Paper, I hereby approve a procurement source waiver from A.I.D. Code 941 to Geographic Code 899 for the purchase of construction materials and commodities provided that the amount of such a waiver does not exceed \$100,000, and hereby certify that exclusion of procurement from Free World Countries other than the cooperating country and Code 941 would seriously impede attainment of U.S. foreign policy objectives of the foreign assistance program.

c) Condition Precedent:

Prior to disbursement of funds under the project for construction services, or to the issuance by A.I.D. of documentation pursuant to which such disbursement will be made, the cooperating country will, except as the party may otherwise agree in writing, furnish to A.I.D. in form and substance satisfactory to A.I.D. plans and specifications for the construction activity and an executed contract for construction services for the project with a firm acceptable to A.I.D.



David M. Wilson
Mission Director
USAID/Bamako

Date: 4 June 1981

Clearances:

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DD: GEaton *GE*
XCONT: EHardy *EH*
ADO: MSmith (draft)
CROPS: MFleming (draft)
PROG: MDwyre *MD*
MEMT: LGurley (draft)

Drafted by: DEO: LLucke;jm

USAID / MALI

SEMI-ARID TROPICS CROPS RESEARCH

PEASE II

(688-0226)

PROJECT PAPER

USAID/Bamako

May, 1981

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ACRONYMS

ARS	Action Riz-Sorgho
CAR	Centre d'Animation Rurale
CGIAR	Consulting Group of International Agriculture Research
CDOT	Compagnie Malienne pour le Développement de Textiles
CNRZ	Centre National de Recherches Zootechniques
CRSP	Cooperative Research Program
DRA	Direction de Recherche Agronomique
ECIBEV	Establishment for Credit and Investment in the Livestock and Meat Sector
FAO	Food and Agriculture Organization
FCG	Foundation Ciba-Geigy
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IER	Institut d'Economie Rurale
IFDC	International Fertilizer Development Center
ILCA	International Livestock Center for Africa
INTSORMI	Institut de Recherche Agronomique et Tropicale
IRAT	Ingénieur de Sciences Appliquées
ISA	Ingénieur des Travaux Agricoles
ITA	Opération Arachide et Cultures Vivrières
OACV	Opération Haute Vallée
OHV	Opération Haute Vallée
OMBEVI	Office Malien du Bétail et de la Viande (Meat Marketing Board)
OMH	Opération Mils-Nopti
OMVS	Organisation de Mise en Valeur du Fleuve Sénégal
OPSS	Opération de Production des Semences Sélectionnées
PPS	Production Première du Sahel
SAFGRAD	Semi-Arid Food Grain Research And Development
SAT	Semi-Arid Tropics
SECFJ	Section de Recherche sur les Cultures et Fibres Jutières
SECVO	Section de Recherche sur les Cultures Vivrières et Oléagineuses (Food Crops and Oilseed Crops)
UNDP	United Nations Development Program
ZER	Zone d'Expansion Rurale

PROJECT DESCRIPTION

A. Project Goals and Purpose

The project goal is to improve the productivity of small farmers and to increase their incomes. The purpose of the project is two fold:

1. To develop a series of technical packages from adaptive research in sorghum, millet and certain grain legumes in the 400 to 1,200 mm rainfall zone, and to make them available through crop operations and livestock projects to small farmers and herders and;
2. To strengthen the GRM's research capability in the semi-arid rainfall zone.

A 5 year grant^{will} be given to ICRISAT/Mali to continue to conduct research in the Sudano-Sahelian zone (400-1200 mm of annual rainfall) with millet, sorghum and selected grain legumes. This research program consists of multi-local/onal testing of promising open-pollinated varieties and hybrids, agronomic practices and intermediate level farming equipment.

As the outgrowth of the overall ICRISAT program and a longstanding expressed need of the GRM, the Ciba-Geigy Foundation, the GRM, and ICRISAT have undertaken the creation of a new Malian sorghum/millet research facility in the 700-800 mm annual rainfall zone. A 300 ha site, including ecologies relevant to a very substantial part of the zone's agricultural area, has been chosen; appropriate arrangements have been made with local and regional officials for the acquisition of the land; construction of the 2 (two) laboratories/office buildings, a garage, warehouse, drying areas, and other necessary infrastructure is well underway (anticipated completion date: 6/30/1981); land clearing and surveying operations are moving forward; and the first modest experimental program has been executed. An initial proposal for the long-term land use planning is under formulation.

These activities emphasize technologies which have had positive impacts elsewhere in the developing world. Techniques such as hybridization, broad base composite breeding, high pressure disease and insect screening, intercropping, watershed management techniques, and intermediate level farm equipment have shown their merit in the semi-arid tropics. It is a question of adaptation to the Malian context. It is logical to assume that they will bring to Mali benefits that are of a similar kind and magnitude to those which have been achieved elsewhere with intervention by institutes that are now members of the CGIAR international research center network.

B. Project Objectives

On a sectoral and national level the project serves GRM and USAID development objectives. The project's long range objective is to provide assistance to efforts that contribute to the achievement of national self-sufficiency in basic cereals that has direct and specific impact on the total Malian population. The project is part of an ongoing response to the GRM's long-standing desire for an improved agricultural research capacity in the semi-arid rainfall zone. Both the GRM and USAID/Mali assign this project high priority because adaptive research results can find their way into farmer's fields quickly as a result of established linkages and can be obtained at a nominal cost.

This project conforms to and compliments the CILSS/Club du Sahel objectives, addressing the key sectors of agricultural production under limited rainfall (400-1200 mm) and adaptive farming technology.

The positive effects this project will have on the natural resources of the region through improved sorghum and millet varieties and improved production techniques addresses the CILSS/Club du Sahel's strategies for long-term development.

The positive impact of Phase I of this project on the GRM and the local sector has served as a base for formulating and implementing the proposed future action program.

The project is a high priority both to USAID and the GRM because expanding its adaptive research will have direct and immediate supporting benefits for existing USAID cereal and livestock production projects, which utilize the improved technology of this project in the technical packages delivered to small farmers. Moreover, the project is seen as an important step toward an overall integrated system of collaboration with external inputs from the international research system, other donors and the U.S. research institutions. This system would bring the resources and results of international and U.S. research programs in semi-arid tropical cereals and legumes into the Malian situation, and through a strengthened extension program, to the Malian small farmer.

C. Project Background

I. The Project Context: Agricultural Production in Mali

Mali was self-sufficient in cereal grains--millet, sorghum, rice, and corn-- and a net exporter of food until 1965. Since that time, grain deficits have occurred each year due to unfavorable climatic circumstances, growing populations, and changing dietary habits. Deterioration in food production in the Sahelian area of Mali reached a climax during the six years of drought which resulted in soil erosion, reduction in livestock herds, environmental degradation of forest lands, malnutrition and starvation of people, and deterioration of the agro-sector economy in general. Normal rainfall returned in 1974. Since then, agricultural production has improved, stimulated by intensive development operations and financial assistance by many donor agencies. Yet, vulnerability to drought still exists and meagre production is still the rule. These conditions are due in part to low rainfall, impoverished soils, limited production methods, varieties with limited productive potential, the high cost of physical inputs, and the general weakness of the infrastructure in the agro-sector. A high rate of population growth (2.5% per annum) and outmigration from rural communities are reasons why Mali must look to increase its agricultural efficiency and productivity.

In the area of cereal production, sorghum and millet represent more than 70% of Mali's cereal production. These two cereals are grown for the most part in the 400-1200 mm rainfall zones of Mali which are classified as the semi-arid tropics. For significant increases in crop yields, the use of chemical fertilizers would be highly desirable, but with present production parameters and pricing policies, the cost/benefit situation for sorghum and millet is not clear. Other inputs therefore must be sought to increase yields. This project proposes to develop improved varieties of sorghum and millet and to introduce improved agronomic practices by means of adaptive research, training and close collaboration with the organizations concerned with field trials and extension services to farmers.

2. The ICRISAT Program

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), based in Hyderabad, India, was founded in 1971 as an international agricultural research center committed to:

- improving the genetic potential for grain yield, nutritional quality, and consumer acceptability of sorghum, pearl millet, pigeon pea, chick pea, and groundnut.
- developing farming systems which will increase and stabilize agricultural production through more effective use of natural and human resources in the seasonally dry semi-arid tropics.
- identifying socio-economic and other constraints to agricultural development and evaluating technological and institutional changes to overcome them.
- assisting national and regional research programs through cooperation and support by sponsoring training and extension activities.

The Institute is supported by the Consultative Group on International Agricultural Research (CGIAR) which, in addition to the three principal sponsors (Food and Agriculture Organization of the United Nations, World Bank, and the United Nation Development Program) consists of 35 organizations involving various international organizations, foundations, and governments representing approximately 20 countries.

ICRISAT/Mali is closely linked to the other West African regional ICRISAT programs and its headquarters in Hyderabad. Much of the variety source material has been generated from ICRISAT Center in India, and most of these initial results have shown sources of resistance to several of the major problems including grain mold in sorghum and downy mildew in millet.

ICRISAT's regional staff includes millet breeders stationed in Sénégal, Upper Volta, Niger and Nigeria; cereal pathologists in Upper Volta and in Nigeria who are conducting research on millet and sorghum disease problems, as well as an agronomist in Upper Volta, an entomologist in Sénégal, a striga specialist in Upper Volta -- all actively conducting research programs. Consultation and collaboration are frequent and important in several areas for ICRISAT/Mali including pathology, entomology, and watershed management. ICRISAT's regional office in Dakar coordinates the exchange regional network enhances the ICRISAT program in Mali.

3. The Phase I Project

The ICRISAT/Mali program began in 1976 through an initial grant from the Ford Foundation. The following year, following a proposal from ICRISAT, funding was assumed on a one-year renewable basis by USAID/Mali under the Opération-Mils Mopti Project (688-0202) as part of the National Research Program. In June of 1979, as a result of another proposal received from ICRISAT, direct funding for the ICRISAT/Mali program began with the approval of a two-year USAID project.

At the advent of Phase I of this project, the GRM had no agricultural research facility in the 400-1200 mm rainfall zone; all varietal research on short-cycle sorghums (and to some extent, millet) was conducted at the Kogoni station under irrigation or at the Sotuba station where the rainfall pattern differs from the central zone. Further, the soil at the Sotuba station is atypical of the entire zone as they are entirely first bottom or terrace soils of alluvial origin. The GRM recognized the need to develop research facilities in areas more representative of the ecology of the Malian semi-arid zone.

Since that time, six major sites and three special problem sites have been identified. Research facilities have been built, as described in the Phase I project paper, and the agronomist and cereal breeder are continuing their research efforts.

Technical packages developed by ICRISAT/Mali are being disseminated to individual farmers through a formal GEM network involving three steps. In the first step, research results are presented at the annual meetings of the Commission Technique and Comité de Recherche, which serve as the national coordinators for agricultural and livestock research for IIR. These meetings are attended by representatives of crops, livestock, and integrated agriculture development projects. These officials recommend, discuss and decide which techniques developed by research will be disseminated through multilocational farmer field trials conducted by SAFORAD. The second step in the flow of information occurs when an operation or livestock project uses its extension service to transfer what ICRISAT has developed. The extension agent-farmer contacts are the final step in bringing the information to the farmer. This dissemination of information to farmers is discussed later in this chapter in section 4.

The network of research stations comprise many ecological zones and provide research information relative to all of Mali in the rainfall zone of 400-1200 mm. The project is consistent with the GEM's efforts to make improved varieties and agronomic techniques available to farmers in all regions.

Technical packages based on data derived from these research stations should be transferrable and applicable to similar ecological zones across the Sahel.

4. Phase I Evaluation Results

An evaluation of the ICRISAT Phase I project (688-0219) was carried out in November 1980 by the Mission and Dr. Orrin Webster of the University of Arizona. The results of the evaluation were extremely positive as to ICRISAT Mali's progress to date in its adaptive research program, its technical capacity to carry forward its program, and in its determination that ICRISAT is well underway in developing effective institutional capacity of technical packages for the Malian farmer. (See Evaluation Memo, Annex E).

A wide variety of tasks have been completed during the phase I project. Among these are the following:

A) Agronomy Program:

1) Intercropping

The performance of cowpea as an intercrop with sorghum or millet has been looked at in some depth. Cowpea forage production is much more important and dependable than cowpea grain production. Cowpea hay yields can be increased radically by high density seeding in alternate rows with sorghum or millet. In the low density, low fertility local farmer practice sorghum situation, cereal grain yields are not much affected at cowpea densities 4 x's the local practice.

2) Animal Traction Equipment and Techniques

- Bullock pairs have been trained at most experimental sites
- Prototype tool bar equipment has been constructed
- Preliminary data has been taken on seeding and weeding performance of this equipment.

3) Fallow Period Management

- Wild legume species have been collected and grown with a fairly wide selection of exotic species. Collection teams have looked for, and found, certain wild local species related to pigeon peas, one of ICRISAT's mandated crops.
- Fallow seeding and pasture overseeding techniques have been screened.
- Phosphorus source fertility effect on biomass production has been examined.

4) Forage Production

Sorghum, millet, pigeon peas, and cowpeas have been evaluated for forage production. Broadcast seeding techniques have been examined.

5) Tilemisi Rock Phosphate (TRP)

TRP's effect on crop production has been improved by composting it with cow manure. (200 kgs. of composted TRP has a comparable effect to 100 kgs of diammonium phosphate (DAP) in the first year after application).

6) Pigeon Pea

Respectable 1 to 1.5 ton yields have been seen in several large plot trials.

7) Watershed Management

Crop performance has been tested across several drainage basin slopes so that the production parameters relative to topographic position may be better understood. A team has been trained to survey and lay out "contoured" beds on ridges to control runoff and lower erosion. Prototype appropriate technology equipment has been developed for the ridging or "bedding up".

.) Crop Improvement Program:

- Cataloguing, assured seed storage, and multilocational evaluation of the Malian cereal collections: Sorghum (800 varieties), pearl millet (375 varieties), and fonio (175 varieties).
- Identification of 121 Malian cytoplasmic male sterility maintainer lines (B-lines)
- Identification of 6 photoperiod sensitive, 14 medium cycle, and 6 short cycle Malian sorghums which show promise for wide-scale introduction in Mali.
- Identification of 3 Malian pearl millets within excellent resistance to downy mildew.
- Identification of excellent resistance to striga among both introduced and Malian sorghums.
- Establishment of 2 composite sorghum populations based on genetic male sterility; one based on Guineense sorghums and one based on Hegari sorghums. Both populations are now homogeneous for white seed without a colored test.
- Identification of 7 promising experimental F1 sorghum hybrids, of which the male parent was selected under Malian conditions.
- Development of a small scale laboratory test which accurately predicts the to food quality of candidate breeding materials.

- Development of a nursery scale 2 week test to predict the pre- and post-emergency drought resistance of candidate sorghum and millet varieties.
- Accumulation of 2 years' yield data for Eleusine caracana as a potential cereal to be introduced to Mali. Eleusine grain in Malian conditions has been studied.

Based on the results of the phase I project and project evaluation outlined above, ICRISAT submitted on Phase II project proposal to USAID/Bamako. ICRISAT/Mali and USAID/Bamako have worked closely together in the design of the Phase II project.

The project was designed to meet the needs of the Malian government and the people of Mali. It was designed to be a long-term project, and to be self-sustaining. The project was designed to be a model for other countries in the region.

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D. The Phase II Project

The focus of research in this project is three-fold: crop improvement through the development of improved varieties and hybrids, development of agronomic cropping systems which best exploit the semi-arid conditions of the 400-1200 mm rainfall zones, and strengthening of the GRM's research infrastructure. Training is also an important project component and is described here in.

I. Crop Improvement Program

The technical feasibility of increasing both sorghum and millet yields in semi-arid tropical areas through plant breeding has been demonstrated in India and elsewhere. The world collection of sorghum, millet, minor millets, pigeon pea, chick pea, and peanuts are maintained by ICRISAT/Center, Hyderabad. Their expertise in varietal improvement and in semi-arid tropical research is recognized by the GRM.

The working relationship of ICRISAT/Mali and the GRM has been highly successful in Phase I of this project. Research was focused on areas mutually deemed useful to Malian farmers. In 1977 and 1978 ICRISAT/Mali identified several sorghums from the world collection which are resistant to shootfly, sooty stripe, and grain mold. Similarly, several promising pearl millet sources have been identified which show a high resistance to downy mildew, a severe disease problem in Mali.

In the 1979 and 1980 cropping seasons the collections of Malian sorghums (800 entries) and pearl millets (400 entries) were evaluated under a total of 21 plantings at seven locations. Eight Malian sorghums are being field tested. The sorghums which yield significantly higher than local check varieties will be recommended for SAFGRAD farmer level evaluation. The eight best Malian sorghums have been crossed into the best ICRISAT introduced sorghums. FI hybrids were evaluated for the first time in the 1980 season and were found very promising. Three experimental FI hybrids are being increased for large plot evaluation. An ICRISAT introduced sorghum, IS8686, has shown excellent resistance to the plant parasite Striga hermonthica. Since that sorghum has unacceptable dark red grain, it has been crossed onto local varieties and the progeny is now being evaluated.

Multilocal evaluation of the Malian millet collection revealed a set of millets called "Tiotioni" which are highly resistant to downy mildew (Sclerospora graminicola). ICRISAT/Mali data from 1979 indicate that grain yield can be increased up to 40% if local varieties are protected from downy mildew infection. The best Malian millets, generally well adapted across locations, are being crossed onto Tiotioni sources in view of recovering mildew resistance in the progeny. Selected crosses are also being made between the best Malian millets and promising millets from Niaya (Ankoussa and F15) and from Togo (Intedi).

In 1979 and 1980 the Indian minor millet, Eleusine coracana, showed promising adaptation under Malian conditions. At Sotuba (Bamako) it yielded 1.5 tons/ha in both years, at Kayes it yielded 1.8 tons/ha, and at Diré (Action B1é Diré) it yielded 4.2 tons/ha under irrigation. According to taste acceptability trials, Eleusine grain is acceptable in gruels and fried products. Eleusine will be recommended for SAFGRAD farmer level trials in 1982.

Past breeding efforts by the French in Mali identified a number of very high-yielding, well-adapted sorghum varieties which were unacceptable by Malian farmers on the basis of grain quality. Thus, ICRISAT/Mali screens early in the breeding process to assure that the varieties are acceptable in all aspects of food production, processing and consumer acceptance; i.e., threshing, decortification, reduction to flour, reaction with alkali, and overnight conservation. Experimental and village level interviews in 1980 implicated pericarp thickness in sorghum to be directly related to ease of dehulling by mortar and pestle methods. In 1980 a rapid test was perfected whereby 20g of grain is used to predict Malian food (To) overnight keeping quality. That procedure is now used to screen hundreds of progeny lines and hybrids from the 1980 nursery harvests.

2. Agronomy Program

There are seven major areas of interest under investigation by the agronomy program: intercropping patterns, animal traction equipment and techniques, fallow period management, forage production, rock phosphate utilization, pigeon pea agronomy and watershed management. The emphasis placed on these areas has been the outgrowth of interactions between the ICRISAT regional and Center programs, the desires of the GRM and its personnel, and the ongoing experience of the ICRISAT/Mali team.

a) Intercropping

When ICRISAT was invited by the GRM to bring a program to Mali it was made clear that the GRM wanted a major emphasis to be placed on intercropping. To date experimentation has focused on the major crops of sorghum and millet intercropped with either cowpea or pigeonpea. Plant type, densities, planting arrangements, planting dates, species mix, and ecologies have been varied. "Traditional" and pure plot treatments have been a part of all experiments.

Research results indicate that an increase in intercrop density can improve total yield. However this total gain is only achieved without sacrificing cereal yield at rather low intercrop densities and yields. Cropping schemes based on new plant type mixes or modified harvest scheduling have helped to overcome this problem elsewhere. Several of these strategies are currently being investigated in the program.

Highly productive and stable intercropping patterns and systems have been demonstrated by several of the CGIAR member institutes and elsewhere. Intercropping systems are known to contribute to the long term stability and productivity of traditional farming systems. Making relevant and more productive systems for the Malian context will be an ongoing research challenge for ICRISAT/Mali.

b) Animal Traction Equipment and Techniques

Animal traction is playing an increasingly important role in Malian agriculture. There is probably no other region in West Africa where it is practiced more extensively than in the CMDT zone of southern Mali. Opération Haute Vallée, and Opération Mils-Mopti have important animal traction components.

It has been demonstrated at the Center that there are improved animal traction equipment and management techniques which when used together can reduce the time and tractive power requirements for growing the crop. The contour broad-bed and furrow system (Krantz & Kampen) is very effective on the black vertisols at Hyderabad. Among the demonstrated benefits of the system, which uses Jean Nolle's "Tropiculture" to establish and work contoured 150 cm beds, are increased infiltration, reduced erosion, improved drainage, precision seeding and weeding, improved tilth, and reduced compaction.

The program in Mali has brought an engineer from the Center to build prototype equipment which was subsequently tested and is now undergoing modification. While working, he identified a promising Malian engineer who has finished 8 months training period ^{with} at the Center's staff including guest consultant Jean Nolle. Since his return he has been modifying old prototype tool bar equipment and building some new equipment as well.

A surveying team has been trained and is presently marking contours for the broad bed and furrow system. It is hoped that the new simplified animal traction equipment carrier will make the system practicable in Mali.

c) Fallow Period Management

The fallow period is a critical phase in the traditional farming system. To ignore its potential contribution to a more productive system, especially in a country with four ruminants for every person, would seem to ignore this traditional role. Elsewhere in the semi-arid tropics, most notably Australia, grass and legume mixtures with adequate phosphorus fertility have shown themselves to be good restorers of fertility and tilth as well as excellent forage producers. In light of the theoretical role that slight organic matter and Ph shifts can play in the productivity of these rather fragile semi-arid tropical soils, the potentially beneficial role that improved fallow period can play in the farming system should be developed more intensively.

Under the direction of Dr. Abdoulaye Sow, a collection of exotic, as well as local legumes and grasses, has been carried out. These have been used in a series of simple nurseries and agronomy trials. Selective herbicide control of woody regrowth has also been experimented with. Screening has reduced the range of useful species and the promising material will be planted in grass waterways and selected fields as a part of the ongoing station development programs and in some simple fallow management agronomy trials.

d) Forage Production

The very large livestock herd in Mali, its importance to the farming community, and the almost total lack of livestock feed in the dry season just prior to the most demanding animal traction activities, have led ICRISAT/Mali to work on forage production. Efforts have concentrated on seeding sorghum and millets late in the season, when the farmer work load is low, and growing the crop with a minimum of labor investment. This has been done in collaboration with ILCA and the Peace Corps who have a "pit silo" program and as source of suitable forage is required for silage. Sorghums and millet are important sources of forage elsewhere and could be in Mali.

e) Telesai Rock Phosphates (TRP)

Malian soils are generally deficient in Phosphorus. There are relatively good locally mined tri-calcic rock phosphate materials which could be used to treat this problem. Solubility problems have made this phosphorus source less competitive with imported, acidified, phosphorus fertilizers than would be desirable. In the next year the IFDC will be, in conjunction with the SRCVO (GRM), conducting a series of multilocational trials to look at partially acidified and granulated Telesai rock materials. ICRISAT/Mali has been experimenting with composting the powdered rock as a means of increasing its solubility. Initial results indicate that composted TRP may be as effective a phosphorus-source fertilizer as Di-Ammonium Phosphate (DAP). Trials coordinated with the IFDC will be conducted to contrast simple TRP, YRP partially acidified with sulfuric acid, composted TRP, and Triple-Super P (TSP) and DAP as P fertilizer sources.

f) Pigeon Pea Agronomy

While pigeon peas are not an indigenous crop in Mali, attempts have been made to introduce the crop. One finds farmers, especially in the First Region who cultivate it. In India they play a very important role in the farming system and are one of the major sources of vegetable protein. ICRISAT/Center's breeding program has developed a range of maturity materials which appear relevant to a large part of Mali. At the Center, pigeon peas have played an important role in the intercropping program; sorghum/maize intercrop yields of 100% of pure stand sorghum/maize and pigeon pea yields of 90% of pure stand have been harvested when the crops are intercropped.

x An associated activity has been the collection of wild local species related to pigeon pea, for the Center's germplasm collection.

The agronomy program is in the initial phases of exploring the production parameters of pigeon pea in Mali. The Evapo-Transportation and rainfall patterns here are somewhat different than in India so that experimental work has focused on planting dates, harvesting scheduling and other agronomic techniques. Because of the important role that pigeon peas have played in the intercropping work in India, they have been incorporated in this part of the program as well.

It is already clear that pigeon peas are a far better producer of grain as an intercrop than cowpeas and may, because of its less aggressive growth pattern, be less competitive as well. While there are problems of processing and consumer acceptance which have not been fully addressed, this crop would seem to be a logical candidate for extension to farmers.

g) Watershed Management

Water is the most important limiting factor for crop production in the semi-arid tropics. Its conservation and efficient utilisation is therefore critical to the farming enterprise. Erosion is potentially disastrous to the region. Efforts to manage the natural system and deal with these factors is central to the farming systems effort.

Activities pertinent to this problem are so interwoven with the animal traction equipment and techniques, fallow period management, intercropping, and research site development programs that they are not normally discussed separately. Among the techniques which are relevant are the contoured broad bed and furrow system, grass waterways, contour bands, contoured tree plantings... These activities play an important role in strengthening the research site system in Mali.

The Upper Volta ICRISAT Regional program agronomy group has been active and constructive in the conceptualization of this part of the program. It will certainly be the slowest activity to generate results and the techniques developed will probably be the last to reach the farmer level; but, ultimately, watershed management may be the most important contributor to the long-term stability and productivity of the systems growing out of the present research effort.

3. Development of Research Infrastructure

a) Research Site Network Development

ICRISAT has major research programs at 7 sites: Sotuba (SRCVO, 1000 mm annual ppt.), Cinzana (Semi-Arid Research Station, 800 mm), Baramendougou (SRCFJ, 700 mm), Barbe (CAR, 500 mm), Kopro Kenlepe (PEP, SRCVO, 600 mm), and Samanko (Mechanism Agricole, SRCVO, 1100 mm). In addition there are a series of special problem

sites for downy mildew and striga work. This research site grid is relevant to many important crop production ecologies in the 400 to 1200 mm rainfall zones.

It has become apparent as the project has progressed that there are critical interventions which may be made in these stations that will greatly improve their ability to deliver important and relevant information to the farming community. A good example is the high disease pressure downy mildew screening which is to be begun at Koporo Keniepe and Cinzana. This activity will require that solid set mist irrigation systems be installed. Similarly the surveying and contouring work which will be carried out under the watershed management program has been noted by several visitors to be critical if erosion can be controlled to assure that there is sufficient soil to farm on in the future at a couple of the sites. Given the physical distance and variability between the sites, as well as questions about the speed with which the institutions can absorb research inputs, it is difficult to estimate the exact scheduling and cost of these activities.

As a part of the basic watershed studies a systematic soil survey will be executed in most of the sites for the first time. Studies of the physical and drainage characteristics of the soil will be executed in collaboration with the ICRISAT/Upper Volta soil physicist and watershed management specialists.

As a part of developing the Land Use Plan for the Cinzana site, consultations have been held with William Stoop, Senior agronomist, Dutch Royal Tropical Institute; Koa Van Staveren, ICRISAT/Upper Volta; Tom Dechert, TAMS-Land Use Inventory, Ecologist; Abdoulaye Sow, ICRISAT/Mali, Ecologist, B.K. Sharma, ICRISAT/Center, Land Use Planner; and others. The methodology developed will be applied to the other stations as well.

b) Semi-Arid Tropics Crops Research Center-Cinzana

ICRISAT, USAID and the Ciba Geigy Foundation are making a major investment in research infrastructure in Cinzana. This is the outgrowth of a long standing GRM desire to have a station in the 600-800 mm rainfall zone. Two laboratories and associated out-buildings have been completed. Hydrologic studies are underway to determine the best sites of wells for the facilities and irrigation. An in-depth soil survey is underway. Topographic mapping and surveying are nearly complete. A first series of experiments has been completed. A new series of aerial photographs will be taken soon (IGN). A land use plan is being formulated. Staff housing will be constructed in the next dry season. In 1-2 years there will be 4-6 scientists and 12-24 technicians carrying out the program.

c) Training

There will be five types of training undertaken in this project.

I. ICRISAT/Center training will be provided to individuals with some or no university training. Following a two-month English course they will receive technical training for six months on the design implementation, statistical analysis, and other specialized aspects of agricultural research.

In Phase I of the project ICRISAT and the GRM profited from the training program offered at the Center. The training course has a practical orientation which emphasizes the design, execution, interpretation, and agronomic considerations of field experimentation. Eight Malians participated in the course during Phase I. One of them was a member of ICRISAT's staff. The returned trainees have demonstrated in several capacities that they have learned a great deal during their stay at the Center and the quality of research being carried out is the obvious beneficiary. It is foreseen that six Malian trainees will take the training course in each of the Phase II project years.

2. University training through participant training funds foreseen within the project will provide for the training of ten students to a Master's degree level.

During Phase I it was recognized that university training of promising Malian researchers was essential for developing the full potential of the Malian research program. In Phase II adequate resources have been allocated to fulfill this need. It is hoped that some of the student work may be coordinated with collaborative research efforts foreseen under the INTSORMIL CRSP.

3. 4th year thesis students from the Institute Polytechnic Rurale who wish to do their research work on appropriate subject areas will do so in collaboration with ICRISAT.

This activity has been an important part of the program to date. Subject areas have included grain quality, food quality characteristics, seedling drought resistance, the density and spatial parameters of intercropping patterns, weeding with the prototype tool bar, broadcast seeded forage production and other topics relevant to sorghum/millet production. Several of these students have subsequently either joined ICRISAT or the Cereal Crop Improvement Section of the SRCVO.

4. The ICRISAT field staff will maintain on-going, on-the-job-training for Malian professional staff; work supervisory staff, and field managers.

In Phase I considerable training time has been devoted to plot layout, the management of seeding and other operations during the cropping season. A short course has been given each year prior to the planting season by a returned Center trainee on these subjects. The ICRISAT Malian staff has also participated in training activities at the Regional ICRISAT Sorghum Research Center in Upper Volta on the identification of sorghum and millet diseases.

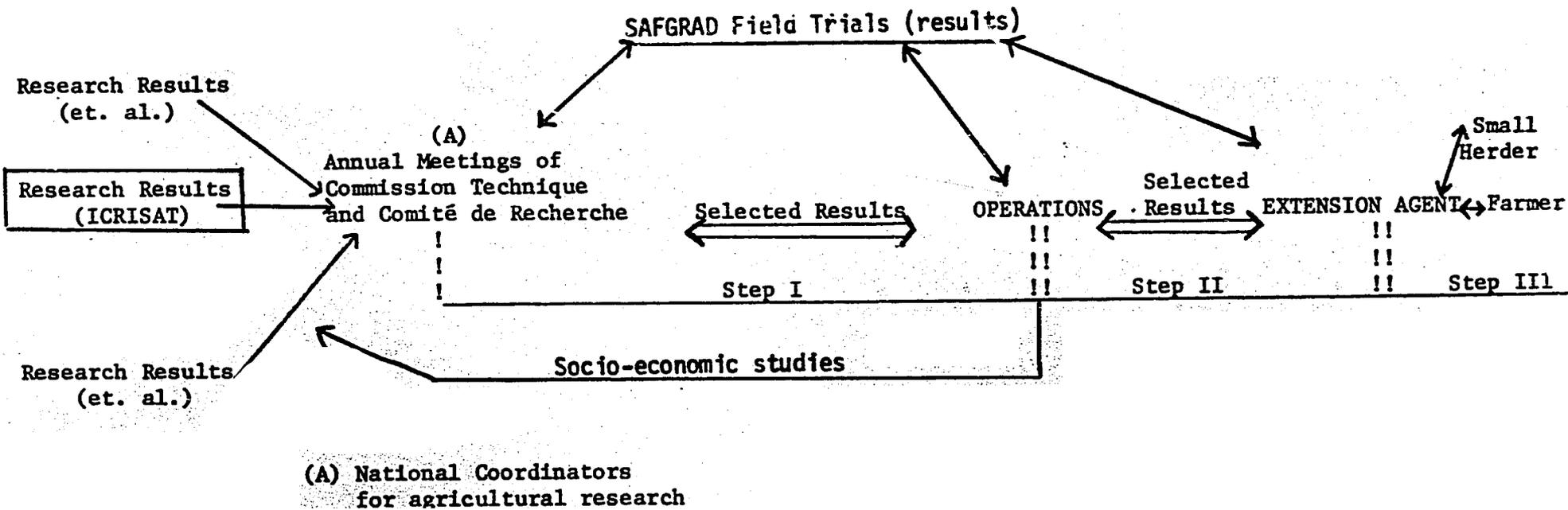
4. Dissemination of Research Results

The system by which research results are reviewed and tested in Mali through researcher peer-group review in the "Commission Technique des Production /ivrières at Oleagineuses," the Comité Technique, through multilocal farmer level testing by the "Cellule des Essais Multilocaux" and by SAFGRAD -- and transmitted to the Operations, extension and development agencies, has been discussed in section three above and presented schematically below.

5. ICRISAT/Mali field and senior staff will offer periodic short courses on field experimentation, seed production, animal traction machinery, and other subjects to special interest groups such as agricultural trainees, pre-sentension agents, and seed production agents.

In Phase I short course were held for the extension personnel, the junior staff of the Seed Production Section and the Cereal Improvement Section of the SRCVO. These focused on the theory and practice of field breeding techniques. ICRISAT/Mali staff also taught courses at the Institute Polytechnic Rural on statistics and plant breeding.

FORMAL DISSEMINATION AND FEEDBACK LINKAGES FROM ICRISAT/MALI
TO THE MALIAN FARMER



MINISTRY OF AGRICULTURE

I. E. R

Branches of Research

livestock

Agricultural

SRCVO

ICRISAT

SAFGRAD

COMITE DE RECHERCHE
COMMISSION TECHNIQUE

year's results

years results

selected
results

Yearly meeting to discuss
research results

Operations

OMM

Extension Agents

Small Farmers with work oxen

Livestock Projects

ECIBEV

Extension Agents

Small Herders

The importance of the research results ICRISAT/Mali has generated to date and passed on to the extension services has been discussed earlier. What will actually happen when solid technical proposals are forthcoming from ICRISAT's work, remains to be seen. However, there are encouraging signs that viable dissemination mechanisms are already in place. The discussion of research results at both the "Commission" and the "Comitee" is active and relatively intense. Some of the "Operations", particularly the CMDT, actively participate in the review process. While substantial modifications in actual programs are uncommon, research scientists and technicians are called upon to defend their programs and are indeed, vigorously criticized.

From a technical point of view the Commission is the more important of the two reviews. The invitation list attached as Annex I provides some idea of the diversity, comprehensive nature, and importance of those invited to participate. SAFGRAD and the "Cellule des Essais Multilocaux" are active observers and must present their results and proposed programs.

Linkages with SAFGRAD

SAFGRAD has been given responsibility for the farmer field testing program by the GRM. Farmer field testing of new genetic material and agronomic practices is a new activity for Malian research. Their program is providing an important feedback mechanism for ICRISAT and the GRM.

The SAFGRAD program is executed on a national scale in collaboration with the "Operations" and their extension agents located in the areas. Experimental design, materials, and technical support is provided by SAFGRAD.

Important information has already been generated by SAFGRAD that is relevant to ICRISAT's research program. For example, the best of ICRISAT's exotic sorghum varieties have been shown to be at most only competitive with local varieties in the farmer's field.

As a result ICRISAT is now focussing on the Malian germplasm collection as the source of adaptability for their varietal and hybrid development activities. As a second example, in a series of SAFGRAD experiments the solubility of TRP was shown to limit the effectiveness and economic viability of the product. As a result, ICRISAT's program is focussing on simple methods of acidifying the TRP to increase its usefulness.

It is expected that SAFGRAD will continue to provide a very important feedback mechanism for ICRISAT's program during the Phase II project. At the same time ICRISAT will continue to be an important source of materials and techniques for the SAFGRAD program.

Suggestions are made by ICRISAT as well as many other research organizations and the Operations as to what should be included in the SAFGRAD program. Their programs have been and will continue to be formulated on the basis of this dialogue. It should be noted that the Operations have been one of the primary beneficiaries of the ICRISAT/Center training program. Many of ICRISAT's research sites and all of SAFGRAD's farmer field trials are within one or another of the Operations spheres of influence. ICRISAT personnel note that it is often surprising how well acquainted various members of the

Operations are as to the results of the experimental program in their area. In SAFGRAD's case there are always Operation personnel associated with their trials while this is only sometimes the case for ICRISAT. Staff from the Operations are invited to visit ICRISAT, the SRCVO's and other organizations research programs in the field as a matter of course.

The essence of effective dissemination is showing farmers that improvements can be made in traditional practices. On the bottom line there is the belief that if the product is really better it will sell itself. Farmers are invited to review the work in the field themselves. Farmers days and visits have and will continue to be organized by ICRISAT/Mali.

Word about a really improved sorghum variety, a more efficient fertilizer or cultural practice, gets around. Farmers have often been enthusiastic about what they have seen and staff have learned from farmer comments and criticisms. This process will continue during the Phase II project.

While ICRISAT conducts few tests in individual farmer's fields, Malian government policy dictates that another agency, SAFGRAD, working closely with ICRISAT, will undertake this task once promising results have been achieved at the research station. Farmers who voluntarily participate in the field trial program will be guaranteed an amount of grain equal to their own average harvest to ensure that they will suffer no loss should the test variety prove to yield less than their own under local conditions.

Linkage with CRSP

ICRISAT/Mali handled all of the logistical arrangements for an April 1981 INTSORMIL (CRSP) visit and signing of a Memorandum of Cooperation between INTSORMIL (INTSORMIL is the Title XII group charged with research on sorghum and millet and shares a complimentary mandate to that of ICRISAT), and the Institute of Rural Economy. Under the agreement, there will be bilateral research and training activities established between the DRA and American Sorghum Research Programs in progress at Texas A & M University and The University of Nebraska. ICRISAT/Mali will facilitate the carrying out of these bilateral contacts. Among the first planned activities are: 1) The monitoring of soil moisture status in sorghum breeding nurseries using neutron probes, and 2) the training of a sorghum drought stress physiologist at the University of Nebraska. ICRISAT/Mali will facilitate activity 1) by providing logistical support to an INTSORMIL physiologist who will advise Malians on the use of the neutron probe and by assuring that the neutron probe readings are correctly taken throughout the season. ICRISAT/Mali will facilitate activity; 2) by supplying seed and research ideas for the planning of dissertation research work relevant to the ongoing research in Mali.

As bilateral research becomes defined over time between the IER and INTSORMIL, ICRISAT/Mali will facilitate the fruition of these efforts.

Feedback: The Key to Adaptive Research

As has been noted earlier, the adaptive research carried out under the ICRISAT program is not aimed at prescribing solutions for farmers but rather increasing the range of choices available, so they can find their own solutions. The research activities continued and foreseen in the project will increase the range of available and viable choices. Feedback from farmers, extension agents, the Operations and SAFGRAD is an essential component of the dissemination mechanism (see schema, p. 17) and will be used to shape research as the project progresses.

Socio-Economic Feedback

In addition to the feedback mechanism assured by the Committee/Commission review procedures and the socio-economic studies underway as a part of most of the development "Operations" including the CMDT (Farming Systems Project), OHV, OMM, ODIPAC, ODIK, and others, ICRISAT is planning a socio-economic component for its program in the villages surrounding its experimental sites to fulfill this role in the areas that have the most direct contact with their program. This activity, which will be funded under the Phase II project, is currently in the planning phase and will be executed in years 2 and 3 of the project. Methodology is to be developed collaboratively with the DET (the division of the IER responsible for research of this type) and ICRISAT socio-economic staff members from Upper Volta and its regional sub-center in Niger. The studies will be executed by the DET under contract to ICRISAT.

Baseline data will be gathered in villages around the research sites beginning at Cinzana. These will form the basis of studies to determine the interaction between the research programs and local farmers, testing both the effectiveness of the dissemination/feedback mechanisms and the impact of the technologies developed on the station on farmers in the immediate area. In the project context, these studies will be used to help direct the ICRISAT program of adaptive research. In the broader context of agricultural development in Mali they should provide important insights into the nature and direction of change--insights that may have important ramifications well beyond the project area.

Effectiveness of the Extension Dissemination/Feedback Mechanism

As indicated earlier in the Project Paper a fundamental weakness of the present extension network has been the lack of appropriate technologies/strategies to extend. At the same time, other institutional and personnel weaknesses have had certain impact on the effectiveness of the extension/feedback mechanism. Among these are the following:

- Resources to adequately support the extension agent network have generally lacking. Support activities under USAID-funded projects such as OMM and OHV are beginning to address these problems.
- The dual role of extension agent/official buying agent has hampered agent's effectiveness. Until recently, "Operations" served as official buying agents for the GRM grain marketing parastatal OPAM. As such, the Operation's extension agent has acted as the buying agent at the village level. OPAM policies, including the forced sale of grain at artificially low prices, has had a clearly negative effect on farmer perceptions of the extension agents. Recent changes in GRM structure and policy have removed this activity from the "Operations" and indeed OPAM is becoming a free market buyer purchasing local grain at market level prices. As a result, it is expected that the climate for agricultural extension work will improve.

- In appropriate personnel and training has hampered the effectiveness of the extension system. Agents tend to be young in a society where age is a very important measure of stature/status and the legitimacy of the ideas that one conveys. Perhaps more importantly, most agents are products of an educational system which emphasizes theory and not practice, an elitist tradition which fails to adequately emphasize technical competence and results in a certain disdain for the "ignorant" farmers.

These constraints are currently being addressed in a number of ways. The upgrading of the CAA extension education, (using USAID and other donor funds) coupled with an increased emphasis on establishing linkages between agricultural research and extension education, should, over time, have a positive impact on at least some facets of the problem outlined above.

ICRISAT's role in training both researchers and extension agents under this project will be a positive step serving to increase the effectiveness of the agricultural extension service. Coupled with other USAID-funded and other donor efforts it is hoped, and expected, that the effectiveness of the Extension Dissemination/Feedback mechanism will be improved.

5. Project Beneficiaries

While the project activities will not immediately benefit specific recipients, positive test results and improved techniques will potentially benefit all farm families in the project zone. This linkage from research to the beneficiaries will result from diffusion of test results to producers by the extension personnel. Moreover, such potential benefits will be directed primarily to the poorest of Mali's rural families. Where millet and sorghum are the major crops, the cash income of farm families is often less than that of families in other areas of Mali where, for example, cash crops of peanuts, cotton, tobacco or fiber jute are raised. Hence, the results of the crop research should benefit many of these cash-poor Malian families as soon as they are made available.

However, the negative impact that both an increase in area cultivated and higher yields can have on women must also be considered. Threshing and winnowing the grain crops are the responsibility of the farm family's women. Women normally transport the produce to the granaries. Thus, while an increased harvest may benefit the entire family materially and nutritionally, and efficient animal traction practices may ameliorate the task of hand-weeding, manual labor required of women in handling and processing the larger yield will be even more demanding. Foresight could counter the possible problems that an augmentation of farm production might pose for women. Credit, both to individual families and to women's organizations, for the purchase of appropriate grinding and milling machines and for animal-drawn carts must be provided to mechanize these operations and greatly reduce the increased hours of women's labor required by traditional manual labor.

ICRISAT scientists are aware of the sociological tests to which their results must be subjected. Millet and sorghum varieties that prove their worth in the fields (research station and individual farmer's plots) will be further tested by women for aesthetic attractiveness. Winnowing, milling, cooking, gelling, and conservation properties, as well as appearance, color, aroma, and taste are some of the many characteristics that will be rated by village women. These tests will be conducted in various locations and among different ethnic groups. Varieties that do not satisfactorily meet standards set forth by the female researchers, who ultimately will be occupied with such new or improved varieties in both field and kitchen, will be rejected by the researchers. ICRISAT has already conducted such tests in Mali. In the case of one variety that has been the subject of some ten years of agronomic research in Mali by agencies other than ICRISAT, it was found to lack all the characteristics deemed essential by the women. Earlier aesthetic testing of the variety would likely have saved years of research effort and much money.

The social acceptability of animal traction practices will likewise be subjected to testing by the ICRISAT personnel and government agricultural agents.

6. Project Budget

The project budget is detailed in the Tables that follow. In addition to the USAID and GRM contributions it is estimated that the Ciba-Geigy Foundation will contribute approximately \$360,000 during the first two years of the Phase II project.

7. Recurrent Cost Considerations

At the present time the GRM is paying the basic salaries of ICRISAT's Malian staff, providing land, and has recently awarded a contract for two staff houses on the Cinzana site. While this amounts to a modest part of the total project investment it is indicative of the government's desire to make this and their overall research program work. The IER has a considerable staff and infrastructure in place and has managed to keep it functioning. If there is no deterioration in this situation over the life of the project, it is expected that they will be able to keep the salaries and basic programs functioning.

Eventually the GRM must assume the recurrent operating costs now being financed under this project budget and by Ciba-Geigy, if facilities are to be maintained and the essential research operations continued to update basic agronomic information needed by Mali's farmers. During the course of the first two years of the project, ICRISAT will record expenditures under the project budget and (to the extent feasible) under the Ciba-Geigy budget to generate the financial information to assess the eventual recurrent costs the GRM will assume. During the mid-term evaluation of the project these costs will be analysed and the GRM will be asked to make long term provisions for their financing.

There are some encouraging signs that there may be increased resources available for agricultural research in the future. Many of the state run enterprises are being sold off and/or reduced in operations, thereby removing a drain on the budget. Along with other economic and administrative reforms planned this should result in additional resources in the general budget. Given the general recognition at the cabinet level of the importance of research to the agricultural sector, it is likely that the IER will be one of the organizations to benefit from these funds. Therefore, it is expected that, at the end of the project, with or without ICRISAT, the IER may be in a better position to cover its recurrent costs. At the same time, the training and experience gathered by participants in the present projects should help the IER to utilize their resource more efficiently in the future.

8. Budget Review

A project manager appointed by the USAID Director shall periodically review details of expenditures of project funds to the extent necessary to assess that the pace and nature of expenditures are in accordance with the project implementation plan.

USAID (Q\$)

	1	2	3	4	5	LOP
	FY 81	FY 82	FY 83	FY 84	FY 85	TOTAL
Technical Assistance Long Term	50,000	155,000	160,000	165,000	170,000	700,000
Short Term	20,000	45,000	45,000	50,000	50,000	210,000
Equipment & Materials	40,000	70,000	60,000	55,000	50,000	275,000
Construction	125,000	-	-	-	-	125,000
Land Development	60,000	100,000	100,000	100,000	100,000	460,000
Training	20,000	89,000	89,000	89,000	89,000	376,000
Research Operations and Supplies	20,000	75,000	75,000	75,000	75,000	320,000
Travel and Transpor- tation	15,000	60,000	60,000	60,000	60,000	255,000
(Subtotal)	(350,000)	(594,000)	(589,000)	(594,000)	(594,000)	(2,721,000)
Contingency and Inflation	-	116,000	185,000	291,000	437,000	1,029,000
TOTALS	350,000	710,000	774,000	885,000	1,031,000	3,750,000

GRM

	I	2	3	4	5	LOP
	81-82	82-83	83-84	84-85	85-86	Total
Staff Salaries	45,000	45,000	45,000	45,000	45,000	225,000
180 ha Land \$500/ha)	90,000	-	-	-	-	90,000
Construction Expert	3,000	-	-	-	-	3,000
SUBTOTAL	138,000	45,000	45,000	45,000	45,000	318,000

CHAPTER II

IMPLEMENTATION PLAN

A. Critical Progress Indicators

1. Agronomic practices experiments designed	March-May 81 *
2. Varietal improvement experiments designed	March-May 81 *
3. Project Paper Approved	May 81
4. Project Agreement Signed	June 81
5. Procurement begins; commodities ordered	June 81
6. Experiments/Trials executed and evaluated	June-Dec 81 *
7. Land contouring and leveling begins	July 81 +
8. Watershed development begins	July 81 +
9. Land development begins	July 81 +
10. Well construction begun (Cinzana)	Aug. 81
11. Construction/Installation of irrigation system begun (Cinzana)	Aug. 81
12. University Training for 2 persons per year begins	Sept. 81 *
13. Interpretation of results	Dec. 81-Feb 82 *
14. Annual reports submitted	Feb 82 *
15. Presentation of results to ICRISAT	Feb 82 *
16. Presentation of results to GRM/USAID	March-May 82 *
17. Mist irrigation begins (Cinzana)	March 82
18. Mid-term evaluation	Sept. 83
19. Mist irrigation begins (Same)	March 84
20. Mist irrigation begins (Koporo Keniepe)	March 84
21. Synthesis of project results	Sept. 85
22. Final project evaluation	Sept. 85

- * continues on an annual basis
- + continues through LOP

B. Organizational Roles and Responsibilities

In this project, the GRM, specifically, IER will be responsible for:

a) Providing appropriate national staff for the following research and technical positions:

1. Counterparts as necessary (qualifications to be mutually agreed upon with the GRM and will be dependent upon both experience and training);
2. Researcher/technicians as necessary (with minimum training to the ETA level or equivalent experience);
3. Moniteurs (agriculture extension agents) or equivalent as necessary

- b) Providing salaries and regular benefits for aforementioned employees.
- c) Supervising and supporting the above mentioned employees of the IER, and jointly with ICRISAT, supervising and supporting all ICRISAT employees within the framework of its agreement with ICRISAT.
- d) Developing with the ICRISAT/Center and FCG representative, a system suitable to all parties for the management and administration of all shared facilities, equipment, operational commodities, and funds provided by ICRISAT/Mali under the grant.
- e) Providing all land to be used at the Cinzana station (envisioned at 100 or more ha.)
- f) Providing appropriate personnel during the site development phase for environmental analysis and interpretation within the abilities of the GRM.
- g) Testing each prospective vehicle operator to ensure that the individual is capable of safely operating the intended vehicle(s) before appropriate driving permits are issued. Only when appropriate permits are issued will the Malian and ICRISAT workers be authorized to drive vehicles.
- h) Providing medical examinations for all GRM candidates for project related work at ICRISAT/Mali and training outside Mali. Participation will be limited to those candidates who are medically fit. All responsibility for the health, welfare and actions of such candidates during their work/training at ICRISAT/Mali and ICRISAT/Center will rest with those individuals and/or the GRM within the framework of their mutual understandings (except for insurance provisions for trainees during their actual stay at ICRISAT/Center).
- i) Approving all buildings to be constructed in the project by USAID, IER, and Génie Rural prior to any construction.
- j) Providing construction expert to supervise, assist, and facilitate the construction of the buildings and other installations.
- k) Developing with ICRISAT the role and conduct of ICRISAT/Mali and the relations and obligations between them.

ICRISAT/Mali

ICRISAT/Mali will be responsible for the following:

a) Personnel, Expatriate

1. Under this grant, ICRISAT will provide 2 researchers, 1 agronomist and 1 sorghum/millet breeder -- one of whom will be designated as the official ICRISAT representative and team leader of the ICRISAT program.
2. ICRISAT, under the grant, will provide all support, financial, logistical, and other for the expatriate personnel.
3. This staff will be responsible to ICRISAT for all matters relating to the regional and international ICRISAT program.
4. This staff will be responsible to the national (GRM) program for all matters which are mutually agreed upon.
5. ICRISAT will supervise and direct this staff in all matters relating to these regional and international programs.
6. The GRM will supervise and direct this staff in all matters relating to the national (GRM) program as mutually agreed upon.

b) ICRISAT Representative Mali

1. The ICRISAT Representative in Mali will be designated by ICRISAT/Center with the full accord of USAID, the GRM, and FCG.
2. ICRISAT's Representative in Mali serve as resident liaison on behalf of ICRISAT with all parties and institutions in Mali, and in addition to managing ICRISAT's responsibilities in-country, he will be responsible for arranging ICRISAT/Center inputs, coordinating them with in-country activities, providing as necessary for the logistic support of ICRISAT actions, and reporting on the general and specific programs of ICRISAT in-country.
3. ICRISAT/Center will be responsible for the administration and accounting of all expatriates salaries, benefits, and other matters related to the expatriate staff in this project.
4. The ICRISAT representative will also order and arrange for transport to the site of all materials necessary for the project. He will order and arrange for delivery of those commodities to be purchased in neighboring countries. The Representative and/or his agent will arrange and supervise the construction aspects of the project during this phase of the project. The Representative will be responsible for remitting receipts for all local material and labor costs, that he pays during the term of his contract to ICRISAT/Center and will ensure that all transactions handled by him are conducted within pertinent laws of the Government of the Republic of Mali, particularly with respect to the hire and termination of laborers and skilled workers.

- Initial operational costs at the Research Station will be budgeted in advance on a yearly basis by the ICRISAT Representative in conjunction with representatives of FCG and USAID. A petty cash fund will be established and placed under the control of the ICRISAT Representative for local expenses and a checking account will be opened for local expenses and for the deposit of funds by ICRISAT.
5. With respect to the Millet-Sorghum Research Station, the Representative will maintain a continuing liaison with GRM officials at the national level and with in-country representatives of FCG and USAID, for the continued planning, supply, and all coordination of ICRISAT's inputs. Working with in-country and ICRISAT Center staff, the Representative will recommend suitable communication and logistics systems for the management, support, implementation, and evaluation of the project. The Representative will arrange and manage in-country logistical support in the form of commodities to be procured in Mali and in neighboring countries. The Representative will be responsible for ensuring the complete and accurate maintenance of ICRISAT/Mali accounting records on local currency expenses financed by USAID, and will provide ICRISAT/Center any reports required on those expenses by ICRISAT/Center and USAID. The Representative will receive and analyse periodic narrative reports prepared by the staff at the Research Station, and will compile or condense these into the format suitable for submission to the GRM, ICRISAT/Center, and USAID. Annual progress reports will be submitted by the Representative to USAID.

c) In-Country Personnel (GRM)

1. "Primes and Indemnities" will be paid by ICRISAT/Mali in accordance with GRM policy and the agreement between the GRM and ICRISAT/Mali.
2. Non-GRM work supervisors who are a part of the ICRISAT/Mali program (excluding construction workers to be covered under competitive bids) will be paid for by ICRISAT/Mali.

d) Trainees

1. ICRISAT/Center will be responsible for all costs of persons selected by the GRM and approved for training by ICRISAT/Center including transportation from Mali to India, after they have presented themselves to ICRISAT/Mali.
2. ICRISAT/Mali will be responsible within the normal participant training format for trainees in the U.S.

e) Construction

ICRISAT/Mali will consult closely with Génie Rural, Ciba-Geigy and IER regarding the design of any facility; and their approval of the design of all buildings will be obtained whether or not Génie Rural is selected to do the design work. The selection of the construction contractor will be done by the competitive bidding process. Whether or not Génie Rural/OTER is the winning bidder, the GRM will provide a construction technician to advise and facilitate all construction work.

f) Accounting

ICRISAT/Center will be responsible for the execution and maintenance of all accounting procedures and records thereof for ICRISAT/Mali.

g) Equipment

ICRISAT/Mali will be responsible for the purchase, maintenance and repair of all equipment under this grant. ICRISAT/Mali will be responsible for the procurement, supervision, maintenance provided by ICRISAT for the project.

h) Research

Under this grant, ICRISAT/Mali will be responsible for the conduct, support and interpretation of all research deemed appropriate and entrusted to it by ICRISAT/Center, ICRISAT/Regional, and the ICRISAT/GRM programs and as is agreed to by all parties by mutual consent.

i) Project funds and Reporting Procedures

1. ICRISAT/Center will hold overall responsibility for the receipt and administration of project funds and for reporting on the project in writing to USAID.
2. The procurement and shipment of U.S. source and origin commodities to be sent to Mali for the project will be the responsibility of ICRISAT/Center. All grant funds received will initially pass to ICRISAT/Center and that portion intended for local currency expenses in Mali will then pass to ICRISAT's Representative in Mali to be managed by him there.

j) Consultancy Personnel

1. ICRISAT/Center or ICRISAT/Regional is responsible for consultancy personnel from ICRISAT/Center on visits to Mali.
2. ICRISAT/Mali is responsible for consultancy personnel hired by ICRISAT/Mali.

Ciba-Geigy Foundation (FCG)

The Ciba-Geigy Foundation will be responsible for:

- a) The creation of the buildings and other structures as agreed upon with the GRM and ICRISAT/Mali.
- b) The procurement of the equipment and other inputs as agreed upon with the GRM and ICRISAT/Mali.
- c) The provision of staff and other inputs as agreed upon with the GRM and ICRISAT/Mali.
- d) The utilization, management, and administration of the shared equipment and facilities as mutually agreed upon in relevant accords with the GRM and ICRISAT/Mali.

C. Procurement Plan

I. Responsible Agency

All procurement of project goods and services financed by AID will be the responsibility of ICRISAT. If ICRISAT declines to accept responsibility for procurement implementation, it must do so in writing to the Director, USAID/Mali. The Director of USAID/Mali can then be authorized by ICRISAT to act on its behalf in procurement matters which will range from commodity procurement through contracts for technical assistance. However, in view of the limited procurement anticipated, it is expected that little or no assistance will be requested from the Director, USAID/Mali.

2. Equipment/Commodity List

		<u>Subtotal (LOP)</u>
Fertilizer and Other materials	\$ 35,000/yr	175,000
Animal Traction equipment	\$ 15,000/yr	75,000
Mist irrigation equipment	\$150,000	150,000
Surface irrigation equipment	\$100,000	100,000
Land leveling equipment	\$150,000	150,000
Tractor	\$ 80,000	80,000
Research Supplies	\$ 60,000/yr	300,000
Other	\$ 70,000	70,000
	<u>TOTAL</u>	<u>1,100,000</u>

The items listed above are those that are financed by AID for the life of the project. More exact details will be furnished in the purchasing documents that will be issued to enact procurement.

3. Source of Procurement

The source and origin of commodities being procured for this project will be AID Geographic Code 94I countries, except for construction commodities as authorized under waivers or exempted as shelf items purchased under sanctioned local currency procurement.

4. Waivers

A waiver of source and origin procurement restriction is requested from Code 94I (Selected Free World) and Mali to Code 899 (Free World) to permit this purchase of construction commodities for two staff houses of about 200 m² per house. The USAID/Bamako engineer estimates the cost of this construction at approximately \$100,000.

Justification

The cooperating country has a very limited capacity as a source of construction materials. There is one cement factory that produces only 10% of the country's demands. There is no steel production in the country. Other construction materials (e.g., plumbing, fixtures, tiles, glass, roofing and culing materials, etc.) are mostly from Western European countries. Steel is not produced in West Africa. Procurement of commodities from U.S. source/origin by the Mission has in the past taken a minimum of six months, an average of one year and sometimes as much as two years. Price differences between commodities procured in Europe as compared to the U.S. are exorbitant.

Therefore, in accordance with the criteria set forth in Handbook II, Chapter 3 and due to the reasons mentioned above, a source/origin waiver from AID Geographic Code 94I and Mali to Geographic Code 899 is considered justifiable. It is further held that exclusion of such a waiver would seriously impede attainment of U.S. foreign policy objectives, and objectives of the Foreign Assistance Program.

5. Shelf Item Procurement

As specified in Sections II B3 and II B4 of HB I5 Section I8 A2, I6 A3 and I8 A4 of HBI, Supplement B, items to be purchased as shelf items procurement shall be those imported into Mali and kept in stock in the form in which imported for sale to the general public.

Imported shelf items having their origin in Code 94I countries are eligible for financing if the unit cost doesn't exceed the equivalent of \$2,500 and the total of such financing does not exceed 10% of the total local costs financed by AID or \$10,000 whichever is higher.

Commodities mined, produced, or assembled in Mali are eligible for financing without restriction, except for the limitation on the total amount available for local procurement. However, the statutory restrictions on certain commodities are also applicable to locally-produced commodities, e.g., pharmaceuticals, fertilizers, motor vehicles (including motorcycles) etc. Imported shelf items produced in or imported from countries not included in Geographic Code 899 are not eligible for AID financing. Procurement of shelf items shall conform to good commercial practices, shall be at reasonable prices, and shall be consistent with local laws and practices. A supplier furnishing shelf items for the project must provide a statement attesting to the source and origin of the commodity sold.

Chapter III PROJECT EVALUATION

During the project three categories of evaluation will be performed:

- On-going (formative) evaluation
- Annual Reviews
- A major mid-project evaluation

On-going evaluation so essential to any successful research program has been and will continue to be carried out as a matter of course. This system is described in various sections of the project paper, including Chapter I, Section D. 3,4, and 5. The data collection and analysis system which provides feedback on every stage of the research program from the selection of test varieties, the results of multi-location on station tests; the results of multi-location on-farm trials carried out by SAFGRAD, and the results of multi-location sociological tests. The data collection and analysis system will also provide the information base necessary to carry out periodic assessments, including the mid-project evaluation, scheduled during this second phase of the project.

Annual reviews will continue to be carried out based largely on the detailed annual reports prepared by ICRISAT/Mali and submitted to USAID, the GRM and ICRISAT. These reports include the results of experiments carried out during the preceeding year and the program for the year to come. They will be reviewed by ICRISAT's West African scientists and selected members of the ICRISAT Center's senior staff and the Malian National Research Committee at annual meetings in February-March.

The reports, along with the reactions of the above reviews, will then be presented to USAID/Mali for its detailed review. In addition to assessing progress during the previous year and plans for the future, a major objective of the USAID review will be to inform USAID staff involved with the design, implementation or evaluation of projects involving agriculture components of ICRISAT's research efforts. In addition, these same USAID staff members will observe the ICRISAT program in the field during the growing season.

ICRISAT will present a briefing paper to enable the USAID staff to get maximum benefit from these visits. Furthermore, a synthesis of its work to date will be prepared by ICRISAT for its 5-year review by CGIAR in 1983.

The mid-project evaluation to be conducted during year three will be the most extensive evaluation. It will be undertaken by a combined team representing the IER, USAID, ICRISAT and outside consultants. Based on the results of this evaluation, adjustments in the program will be made as necessary and agreed upon by USAID, the GRM and ICRISAT. This evaluation will cover all aspects of the project, including technical, socio-economic, financial and administrative. Special attention will be focused on the socio-economic feasibility of the ICRISAT strategy, the efficacy of the linkages between ICRISAT and the farmer and the GRM system for getting research results to the farmer and the feasibility of Malian institutions to continue similar research on their own.

The outside experts should include an agronomist from REDSO/WA in addition to a non-AID expert on sorghum/millet breeding and an economic anthropologist or an economist with training in anthropology.

CHAPTER IV

PROJECT FEASIBILITY ANALYSES

A. Technical Analysis

The work to be done under the project will be an elaboration of the program which is already underway in both the crop improvement and agronomy sections.

1. Crop Improvement Program

There will be a continued direct exploitation of the Malian sorghum and millet collections. Local varieties will continue to be tested in view of identifying those varieties with wide general adaptation and resistance to pests.

Sorghum populations based on genetic male sterility will be established for the four major Malian sorghum races. Those population will serve as genetic resource material for future breeding programs in Mali and neighboring countries.

A few (6) cytoplasmic male sterile lines will be obtained from Malian B-line varieties. Those male sterile parent will be selected for the grain quality which is characteristic of Malian sorghums. The establishment of those breeding stocks will facilitate the simultaneous exploitation of hybrid vigor and desirable Malian grain quality.

The millet program will be directed principally toward downy mildew resistance. Once segregating progeny is available from "Tiotioni" crosses an intensive disease screening will be conducted on each progeny line. Following a methodology worked out at ICRISAT/India, seedlings will be submitted to intense disease pressure by infector-spreader rows and nocturnal mist irrigation. Screening nurseries will be installed at Koporo-Keniepe and at Cinzana. Eventually, several thousand progeny lines can be evaluated per year.

Drought screening procedures will be perfected for both sorghum and millet. The present drought tolerance tests used by ICRISAT/Mali will be upgraded to improve reliability. Post-floral drought tolerance will be screened by a line-source irrigation scheme which will be installed at the Samé (OMVS) experiment station.

Eleusine yield trials will be conducted on a range of different soil conditions in order to obtain comprehensive information about its field performance in Mali. Parallel trials will be conducted with pigeon peas (cajana). Once that information has been gathered, Eleusine and pigeon peas will be recommended for pre-extension testing.

2. Agronomy Program

a) Intercropping

To test strategies which minimize interspecific competition and efficiently exploit the limited resources available (especially rainfall),

b) Animal Traction

- To perfect the prototype equipment which has been developed in phase I;

- to introduce new prototype equipment which may be appropriate;
- to use this equipment for surfacing and contouring techniques; relevant to the watershed management strategies;
- to use this equipment for precision seeding and weeding techniques relevant to more productive and efficient cropping systems.

c) Fallow Period Management

- to use the local wild and exotic species collection in the watershed management program;
- to look at the long term fertility status of several crop rotation and fallowing strategies. (These activities will be carried out in collaboration with Dr. Willem Stoop, Tropical Cereal Agronomist, with the Dutch Royal Tropical Institute, (funding government of the Netherlands) and the Soils Department at Texas A & M, under the INTSORMIL CRSP).

d) Forage Production

- To elaborate on the themes explored in Phase I especially the broadcast seeding of local millet and sorghum for forage.

e) Tilemsi Rock Phosphate (TRP)

- To evaluate strategies for improving the efficiency of TRP especially in the first year after application.

f) Pigeon Pea Agronomy

- To evaluate the management-cultivar relationship in pigeon pea cropping for this zone

g) Watershed Management

- To investigate contouring and surfacing techniques relevant to improved water infiltration, storage, run-off management and erosion control.

Equipment and Supplies (indicative list)

- a) Field supplies - crossing bags, staplers, ropes, notebooks, measuring equipment (scales, tapes, calipers...)
- b) Seed Storage Supplies - seed storage boxes, seed envelopes fumigants.
- c) Lab Equipment - petri dishes, balances, dissecting scopes, measurement devices - (moisture meters, grain hardness tester, colorimeter, etc.)

- d) Irrigation equipment for screening nurseries - mist irrigation set-up, including pump, screens, pipe;
 - line source irrigation set-up including pump, screens, pipe;
 - solid set irrigation equipment for approx. 1.5 ha. at Cinzana and Koro Keniepe approx. 3 ha;
 - coated pipe irrigation delivery system: 1,000 m to be irrigated.
- e) Animal Traction equipment - prototype and other to execute basic research program and some of land development strategy.
- f) Farming equipment - tractors and associated equipment
- g) Land developing equipment - for leveling, contouring, etc. to be compatible with items in paragraph f above.
- h) Farming system lab. - specific equipment to be determined as program develops.

4. Implementation Techniques

a) Crop Improvement Program

Although the principal field research will be carried out at the Cinzana station, the critical evaluation of varietal performance will always be based on multi-locational observations. To that end, a supply network of experiment sub-stations will assure multi-locational testing. As in 1979 and 1980 seasons, all nurseries will be personally visited by the ICRISAT cereal breeder at least three times during the season.

Beginning in 1981, the ICRISAT/Mali cereal breeding program will be planned and executed jointly with the sorghum/millet section of the Malian food crop research service and the Ciba-Geigy foundation sorghum/millet improvement program. As the Malian national staff gain experience and efficiency, the ICRISAT breeder will serve as a technical resource rather than as a principal program leader.

b) Agronomy Program

The on-going implementation is an outgrowth of the program to date. In order to facilitate access and control, experiments will be concentrated in areas close to the paved Bamako-Mopti roadway. Other organizations will execute ICRISAT Agronomy trials in the sites not along this paved road. Trips and activities will be coordinated and executed by Malian staff. Various station development activities will be carried out by teams that are being made up of

staff from the SRCVO and ICRISAT.

Human Resource Requirements

c) Experimental Program

Supervisory personnel (4)

Experiments will be conducted relevant to the programs as described in the Technical Analysis from June to December of each of the project year. Data will be analysed and presented to GRM, and USAID from June to April of each project year

Procurement will take place over the life of the project as is dictated by the experimental and research station network development programs.

Land Development Operations will be carried out on the Network first at Cinzana and then the rest of the network. In as much as these activities are an integral part of the watershed management and other parts of the experimental program and that they will be carried out with animal traction equipment, it is foreseen that they will continue for the life of the project.

Research Station Infrastructure Development Cinzana

Estimated completion date

- 1. Hydrologic studies and well drilling January 12, 1981
- 2. Irrigation Water System installed 6, 1983

d) Field Trials, June-October

- 1) Procurement
- 2) Land-farming, preliminaries
- 3) Planting and harvest (intercrop, forage, TRP, etc.)
- 4) Analysis of data/reports Feb-April

e) Research Network Development

1. Cinzana

- a. Hydrologic studies for wells/irrigation
- b. Soil survey 10/81
- c. Topo mapping and surveying 10/81
- d. Land use plan 11/82
- e. Staff housing construction 6/83
- f. Other construction End of project

2. Barbé and Koporo Kéniépé

- a. Installation of set mist irrigation
- b. Part of ongoing project 6/80 (downy mildew screening)
- c. Contour work, etc., tree planting 6/86

f) Training

Completion of one SAFGRAD (6/83) and one IRAT (6/81) training programs in progress to the M.S. and Ph. D. levels respectively; 10 students to M.S. level to be phased over the life of the project.

5. Human Resource Requirements

a) Supervisory personnel

Under this agreement, ICRISAT will provide two researchers: one agronomist and one sorghum/millet breeder, to serve in a supervisory role - One of whom will serve as ICRISAT's representative in Mali.

The GRM and, specifically, IBR will be responsible for providing counterparts and staff as necessary to assist the agronomist and the plant breeder in executing the program.

b) Implementation personnel

The implementation responsibilities will be shared by ICRISAT personnel and GRM employees.

The GRM will provide researcher/technicians (with minimum training to the ETA level or equivalent experience) and moniteurs (agricultural extension agents) or equivalent, as necessary.

c) ICRISAT personnel

The two ICRISAT employees and their project responsibilities follow:

1) ICRISAT Agronomist: Philip Serafini, M.S.

The agronomist is responsible for:

- a. Multiple and intercropping studies. The GRM has formally entrusted ICRISAT with national responsibility for intercropping research.
- b. Research directed at solving specific problems encountered by farmers and extension agents, especially those problems related to the more extensive and efficient use of animal traction.
- c. In collaboration with ILCA (International Livestock Center for Africa) and USAID financed livestock projects - studies of fodder resources for livestock production, especially those relating to sorghum, millet, cowpea and pigeon pea in the Sudano-Sahelian zone.
- d. Research on basic agronomic questions such as crop and soil management techniques adapted to the new sorghum and millet varieties, development of "packages" of recommended practices for semi-arid zone farmers.

- e. Pigeon pea agronomy in Mali
- f. Watershed management studies, in conjunction with the ICRISAT/Upper Volta program and as a part of the new research station network development.
- g. Fallow period exploitation and intensification studies, also as a part of the overall development of the research network.
- h. Striga and downy mildew control studies collaboratively undertaken with participation of the cereal breeder, and other appropriate ICRISAT staff.

ICRISAT Cereal Breeder: John F. Scheuring, Ph. D

The Cereal Breeder will continue the varietal improvement of sorghum and millets for the cereal growing regions of Mali. He will work in coordination with the Malian government cereal improvement effort. The ICRISAT breeder will bring the following complements to the Malian program:

- a. Provision and evaluation of introduced millet and sorghum germplasm showing promise in pest resistance, agronomic value, or culinary preference.
- b. Provision and maintenance of sources of male sterility in both sorghum and pearl millet for genetic male sterile breeding and the production of hybrids based on cytoplasmic male sterility.
- c. Direction and advice in the breeding of new sorghum and millet lines in collaboration with Malian colleagues.
- d. Direction and advice of screening procedures for seedling vigor, yield potential, drought resistance, disease and insect resistance, striga resistance, and culinary preference.
- e. Identification of high yield potential sorghum and millet varietal and hybrids to be passed on for multilocational testing by SRCVO and SAFGRAD.
- f. Introduction and preliminary multilocational evaluation of Eleusine Coracona (finger millet) as a minor millet species and forage grass species.
- g. Introduction and preliminary evaluation of Cajan Cajanis (pigeon pea) as a grain legume crop.

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B. Economic Analysis

Research is only one part of a process which delivers technology to farmers allowing for more optimum use of resources, either to increase output or lower cost. It is assumed that there will be a viable extension service to transfer research results to farmers, especially when the farmers are illiterate and thus do not possess the means of transferring the technology themselves.

Improvement of the extension service through the USAID/CAA project and IBRD support to the CAA's will straighten the technology delivery system from research through extension to the farmer. The success of extension efforts in the CMDT and Operation Mills-Mopti is indicative of the viability of this perspective.

Since project funding does not include a specific component designed to extend results to farmers, there will be no market-measurable benefits generated which could be solely attributable to this project. Any attempt to assess the project's impact on production would have to include an analysis of the costs associated with extending these results to farmers. A further complicating factor is the multi-faceted nature of the research program, which will include trials relating to crops and livestock. In Mali, the extension responsibility within government organizations is divided not only between crops and livestock, but also among crops. There are separate entities to extend cultural practices for the production of millet/sorghum, peanuts, cotton, wheat, and rice. The analysis would have to include that portion of a given increase in production and associated costs attributable to an extension organization using results obtained from this project. An objective separation of these effects would likely be impossible, making inappropriate any cause-effect analysis to justify this program.

Why undertake research? Some 90% of Mali's population derives a livelihood from the agricultural sector. The country has about 11 million hectares suitable for annual crop culture. Less than two million hectares are cultivated in any given year with two-thirds of this area planted to millet/sorghum. The population is estimated to be 6.4 million. Self-sufficiency in cereals is somewhat arbitrarily established at 170 kg/capita or a total of 1.1 million metric tons. In recent years weather has been good and official estimates of total production has been about 1.1 million tons which seems to indicate near self-sufficiency. However, when one considers replenishment of farmers stocks from less productive seasons, inevitable losses, seeding requirements, clandestine exports and, in the case of rice, authorized exports, this figure falls far short of the self-sufficiency goal. This situation need not exist. Given proper technology and remunerative prices, the resources are available for Mali to not only be continually self-sufficient in staple food commodities but also to regain the title of being the "breadbasket" of West Africa.

Farmers are receptive to new production techniques if the benefits involved are sufficiently large to provide visible, clearly quantifiable differences. This is evidenced by the success of CMDT and the Embouche Paysanne project, located in the same general area.

B. Economic Analysis

Research is only one part of a process which delivers technology to farmers allowing for more optimum use of resources, either to increase output or lower cost. There must be a viable extension service to transfer research results to farmers, especially when the farmers are illiterate and thus do not possess the means of transferring the technology themselves.

Improvement of the extension service through the USAID/CAA project and IBRD support to the CAA's will strengthen the technology delivery system from research through extension to the farmer. The success of extension efforts in the CMDT is indicative of the viability of this perspective. The success of Operation Mils Mopti and other operations/actions will depend upon their having the technical packages which will be produced by this project. *P* Since project funding does not include a specific component designed to extend results to farmers, there will be no market-measurable benefits generated which could be solely attributable to this project. Any attempt to assess the project's impact on production would have to include an analysis of the costs associated with extending these results to farmers. A further complicating factor is the multi-faceted nature of the research program, which will include trials relating to crops and livestock. In Mali, the extension responsibility within government organizations is divided not only between crops and livestock, but also among crops. There are separate entities to extend cultural practices for the production of millet/sorghum, peanuts, cotton, wheat, and rice. A quantitative analysis would have to include that portion of a given increase in production and associated costs attributable to an extension organization using results obtained from this project. An objective separation of these effects would likely be impossible, making inappropriate any cause-effect analysis to justify this program.

Why undertake research? Some 90% of Mali's population derives a livelihood from the agricultural sector. The country has about 11 million hectares suitable for annual crop culture. Less than two million hectares are cultivated in any given year with two-thirds of this area planted to millet/sorghum. The population is estimated to be 6.4 million. Self-sufficiency in cereals is somewhat arbitrarily established at 170 kg/capita or a total of 1.1 million metric tons. In recent years weather has been good and official estimates of total production has been about 1.1 million tons which seems to indicate near self-sufficiency. However, when one considers replenishments of farmers' stocks from less productive seasons, inevitable losses, seeding requirements, clandestine exports and, in the case of rice, authorized exports, this figure falls far short of self-sufficiency goal. This situation need not exist. Given proper technology and remunerate prices, the resources are available for Mali to not only be continually self-sufficient in staple food commodities but also to regain the title of being the "breadbasket" of West Africa.

Farmers are receptive to new production techniques if the benefits involved are sufficiently large to provide visible, clearly quantifiable differences. This is evidenced by the success of CMDT and the Embouche Paysanne project, located in the same general area.

The major source of Mali's foreign exchange earnings are derived from agricultural products. Between 1975 and 1977, cotton, peanuts, and live-stock respectively accounted for 51% of the total value of officially recorded exports. This sector represents by far the largest base for generating tax revenues. Excepting net monetary transfers from other countries, any sustained real increase in government spending must come from an expanding productivity of the agricultural sector. Likewise, any significant increase in real per capita income can only be generated through agriculture.

Therefore, two essential questions must be examined to decide whether agronomic research results in a justifiable economic return. These are: (1) Does the research result in technology which provides economic results to individual farmers when they use it? (2) Do sufficient numbers of farmers continuously use the technology to justify the cost of the research. Initial results under Phase I of this project indicate a positive response to the first question. Both questions will be examined in more detail during the mid-term evaluation.

C. Social Analysis

The emphasis in this project proposal is on agronomic research. In response to a Malian government request, ICRISAT will create a research station at which seed varieties and agronomic practices will be developed and tested. The ICRISAT research itself will not directly involve Malian farmers and will thus have no immediate impact on the Malian people. Many of the social concerns which might be normally examined in a development proposal are, therefore, not relevant to this analysis and will be dealt with only briefly.

When both research and field tests have shown test varieties to provide superior yields, seed will be provided to the governmental agricultural agencies, the "Opérations", which through their village-based agents will disseminate the new varieties to the farmers. Moreover, since the field agents will be trained in improved animal traction or other practices, these improved methods will also diffuse to the farm families.

Appropriate prototype equipment will be demonstrated to farmers around the research sites. Interest will be measured and machines passed on to an appropriate and representative sample of farmers. They will be instructed in the proper use and given a certain amount of experience with the ICRISAT staff. Periodic visits and data gathering will follow. ICRISAT, then will not directly participate in the diffusion of benefits, but the governmental agricultural development operations are structured so as to ensure that positive research results will reach the farm population.

This project is well designed with limited but important goals. It fills a gap in the agronomic research needed in Mali's low rainfall areas. The designated personnel are impressively qualified --in education, knowledge, and first-hand experience in Africa and Mali-- to successfully carry out

the project design. The importance of sociological, as well as agronomic factors affecting production in Mali are known to the ICRISAT personnel. We see no constraints which will prohibit the success of the project.

D. Financial Analysis

A grant shall be made from A.I.D. to the International Crops Research Institute for the Semi-Arid Tropics to assist the GRM in implementing project activities. ICRISAT/Center will be responsible for the financial management of the project and through its designated representative in Mali will be responsible for all grant funds expended on the project. Payments from AID to the grantee will be made by the direct reimbursement method, under which the grantee will submit vouchers with attached documentation (invoices, receipts, etc.) to the AID Project Manager, upon whose approval and certification a check will be requested for reimbursement. Such vouchers must be submitted monthly (See 1. D.8. Budget Review). As no AID money is being channeled to the GRM for this project, the GRM financial responsibilities for the project are limited to the provision of salaries and regular benefits as detailed in Chapter 2B and in the original accord between the GRM and ICRISAT (see annex J).

E. Environmental Analysis

The Initial Environmental Examination undertaken at the PID stage has indicated the project will have no significant impact on the natural and physical environment. On balance, its effect will be positive. No potential negative effects are foreseen which would not be reversible. (See Annex E)

MALI: Semi-Arid Tropics Crops Research-Phase II
(688-0226)

PROJECT PAPER

ANNEX A

TELEGRAM

TO	ACT	INFO
DIR		
ADPR		
PROG		
CEO		
MGMT		
CONT		
ADO		
CROPS		
LVST		
DDO		
EDPT		
AO DIR		
AA/GSO		
JAC/EE		

ACTION: AID-6

UNCLASSIFIED
Classification

CONTROL: 178

INFO
~~AMB~~
DCM
CHRON

8

P R 050927Z MAY 81
FM SECSTATE WASHDC
TO RUTABO/AMEMBASSY BAMAKO PRIORITY
INFO RUEHAB/AMEMBASSY ABIDJAN 7313



RUFHFR/AMEMBASSY PARIS 2271

RUEHRO/AMEMBASSY ROME 3085

BT

UNCLAS SECTION 01 OF 02 STATE 115333

AIDAC - PARIS FOR SCHOONOVER AND OECD (FELLY), ROME FOR FODAG

E.O. 12065: N/A

TAGS:

SUBJECT: PROJECT 688-0226 SEMI-ARID TROPICS RESEARCH PID REVIEW

1. PROJECT COMMITTEE COMPOSED OF REPRESENTATIVES OF AFR/DR, AFR/SWA, AFR/DP, AFR/RA AND PPC MET APRIL 9 TO CONSIDER

SUBJECT PID. MEETING ATTENDED BY MISSION DIRECTOR WILSON. COMMITTEE RECOMMENDED APPROVAL AND AA/AFR (ACTING) HEREBY

APPROVES PID FOR DEVELOPMENT TO PP WHICH MAY BE AUTHORIZED

BY USAID/BAMAKO WITH UNDERSTANDING THAT FOLLOWING POINTS WILL BE ADDRESSED IN THE PROJECT PAPER:

-- A. AID/ICRISAT/GRM RELATIONSHIP:

----- 1. IT APPEARS THAT THIS IS AN ICRISAT PROPOSAL, ALTHOUGH WE ARE NOT CERTAIN BECAUSE OF THE FORMAT IN WHICH THIS WAS CIRCULATED IN AID/W. IN ORDER TO JUSTIFY OUR PROVIDING A GRANT TO ICRISAT, IT IS NECESSARY THAT PP SHOW THE FOLLOWING:

----- A. THAT THE ORIGINAL GRANT TO ICRISAT WAS BASED ON AN ICRISAT PROPOSAL.

----- B. THAT THE GRANT PROPOSED IN SUBJECT PID IS BASED ON AN ICRISAT PROPOSAL.

----- C. THAT USAID INVOLVEMENT WITH THE PROPOSAL WAS ONLY TO EXPEDITE THE PAPERWORK.

ON UNDERSTANDING, BASED ON OUR KNOWLEDGE HERE, THAT YOU CAN PROVIDE INFORMATION SHOWING THAT THIS IS ICRISAT'S PROPOSAL, THE PP SHOULD MAKE CLEAR THAT THIS WILL BE A GRANT FROM A.I.D. TO ICRISAT. IF OUR UNDERSTANDING IS NOT CORRECT, THEN FURTHER ACTION ON THIS PID WOULD BE NECESSARY BEFORE ITS APPROVAL.

---- 2. ICRISAT HEADQUARTERS (INDIA) WILL BE FINANCIALLY

ACCOUNTABLE, THEREFORE ICRISAT'S FINANCIAL MANAGEMENT CAPABILITY SHOULD BE SPELLED OUT. THE RESPONSIBILITY OF THE GRM SHOULD ALSO BE DEFINED.

---- 3. IT WAS RECOMMENDED THAT THE GRM AND ICRISAT

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EXECUTE AN AGREEMENT ACCEPTABLE IN FORM AND SUBSTANCE TO A.I.D. DESCRIBING THEIR RESPECTIVE ROLES AND RESPONSIBILITIES. IT WOULD BE BEST IF SUCH AN AGREEMENT COULD BE REACHED BEFORE A.I.D. EXECUTES THE GRANT BUT THIS CAN ALSO BE A CONDITION PRECEDENT TO THE DISBURSEMENT OF FUNDS IF THE USAID IS CERTAIN THAT A SATISFACTORY AGREEMENT WILL BE EXECUTED. PP SHOULD LAY OUT BROAD POINTS THAT SUCH AN AGREEMENT WOULD INCLUDE.

-- B. RELATIONSHIP TO A.I.D. OBJECTIVES - THIS PROJECT IS IN LINE WITH THE A.I.D. OBJECTIVE IN MALI OF RAISING AGRICULTURAL PRODUCTION AND HELPING MALI ACHIEVE BASIC FOOD CROP SELF-SUFFICIENCY. THE PROBLEM OF PRICING POLICIES IS NOTED IN THE PID ONLY IN PASSING AND THE COMMITTEE ASKED THAT THE PROJECT PAPER REFLECT THE GRM'S GROWING RECOGNITION OF THE PROBLEM AND HOW PROBLEM'S EFFECTS COULD DIMINISH THE PROPER USE OF THE RESULTS OF OUR PROJECT.

-- C. RELATIONSHIP OF THIS PROJECT TO OTHER RESEARCH EFFORTS - RELATIONSHIP TO SAFGRAD SHOULD BE MORE CLEARLY DEFINED. PP SHOULD ALSO NOTE RESEARCH WORK IN MALI UNDER SORGHUM-MILLET CRSP. THE INSTITUTIONAL RELATIONSHIPS TO THE "OPERATIONS" AND "ACTIONS" SHOULD BE DEFINED. MORE EXPLICIT INFORMATION IS NEEDED ON HOW TECHNICAL PACKAGES ARE DISSEMINATED TO FARMERS. IN GENERAL, CLEARER STATEMENTS ARE NEEDED ON THE ROLES AND RESPONSIBILITIES OF THE VARIOUS INVOLVED ORGANIZATIONS.

-- D. INSTITUTIONALIZATION OF RESEARCH CAPABILITY - THE COORDINATION OF RESEARCH IN MALI WAS BELIEVED TO BE A PROBLEM. THE GRM COMITE DE RECHERCHE HAS TENDED TO BE TOO GENERAL A COORDINATING MECHANISM. THE PP DESIGN TEAM SHOULD EXPLORE WHETHER MODIFICATION OF THE COMMITTEE OR EVEN ANOTHER COORDINATING MECHANISM IS NEEDED, SUCH AS A COMMITTEE WHOSE FUNCTION WOULD BE TO ASSURE THE DEVELOPMENT OF THE LINKAGES AND COORDINATION NEEDED FOR THIS SPECIFIC PROJECT. THE PP SHOULD SPELL OUT WHAT TYPE OF RESEARCH COMMITTEE IS ENVISAGED AND WHAT ITS FUNCTIONS ARE TO BE. PP SHOULD NOTE THAT THIS PROJECT IS PART OF A LARGE, MULTI-DONOR EFFORT IN THE RESEARCH FIELD AND SHOULD EXPLORE HOW RESEARCH CAPABILITY CAN BE INSTITUTIONALIZED; E.G., HOW WOULD THIS PROJECT FIT INTO THE PROPOSED INTEGRATED AGRICULTURAL RESEARCH AND EDUCATION (IAER) PROJECT.

-- E. FEEDBACK MECHANISMS - IT IS EXTREMELY IMPORTANT THAT THERE BE A SUITABLE FEEDBACK MECHANISM, PARTICULARLY ON HOW FARMERS ARE REACTING TO THE NEW VARIETIES AND CULTURAL PRACTICES. IF THIS CANNOT BE ADEQUATELY ASSURED THROUGH LINKAGES TO SERVICES OUTSIDE THE PROJECT, E.G., VIA GRM COMITE DE RECHERCHE, CONSIDERATION SHOULD BE GIVEN TO INCLUDING THE FUNCTION IN THE PROJECT ITSELF.

-- F. RECURRENT COSTS - THE PP AND THE ICRISAT/GRM AGREEMENT SHOULD DEAL FORTHRIGHTLY WITH WHAT HAPPENS AFTER TERMINATION DATE OF A.I.D. PROJECT. IT WAS RECOGNIZED THAT THIS SORT OF RESEARCH WOULD NEED OUTSIDE SUPPORT FOR MANY YEARS, AND CONSIDERATION SHOULD BE GIVEN TO QUESTION OF EXTENT TO WHICH GRM WILL BE ABLE TO CONTINUE ANY PART

OF PROJECT WITHOUT OUTSIDE FINANCIAL SUPPORT. PP AND AGREEMENTS SHOULD BE CLEAR ABOUT GRM RESPONSIBILITIES FOR AND TO PEOPLE TRAINED UNDER PROJECT. IN SHORT, PP SHOULD MAKE CLEAR A.I.D.'S CONCERN THAT THE RECURRENT COSTS PROBLEM BE REALISTICALLY ADDRESSED IN DESIGNING THIS PROJECT WITH A VIEW TO MAXIMIZING ITS LONG TERM DEVELOPMENT IMPACT.

-- G. ANIMAL TRACTION - INFORMATION IS NEEDED ON HOW THE PROJECT WILL TEST THE SOCIAL ACCEPTABILITY OF ANIMAL TRACTION PRACTICES.

-- H. BUDGET - FROM GRM (COUNTERPARTS, FACILITIES, ETC.), ICRISAT, CIBA-GEIGY, AND USAID. DESIGN TEAM SHOULD CAREFULLY EXAMINE FINANCIAL MANAGEMENT REQUIREMENTS AND PP SHOULD REFLECT ALL DONOR AND GRM CONTRIBUTIONS ON AN ANNUAL BASIS.

-- I. ENVIRONMENTAL CONSIDERATIONS - FUNDS FOR PROJECT CANNOT BE OBLIGATED WITHOUT AN APPROVED IEE. THE IEE NEEDS A FACESHEET, A PESTICIDE RISK-BENEFIT ANALYSIS, AND ANALYSIS OF EFFECT OF CONSTRUCTION AND LAND CLEARING ELEMENTS OF PROJECT EVEN THOUGH SOME OF THESE ELEMENTS MAY BE FUNDED BY OTHER DONORS TO THE PROJECT.

-- J. AN ENGINEERING ANALYSIS OF CONSTRUCTION ACTIVITY WILL BE NECESSARY. SECTION 3.4.25 INDICATES THAT A GRM INSTITUTION MAY BE COMPETING FOR CONSTRUCTION CONTRACTS. NORMALLY GOVERNMENT ORGANIZATIONS ARE EXCLUDED FROM COMPETITION BECAUSE OF UNFAIRNESS WHICH COULD RESULT IN GOVERNMENT PROCUREMENT. PLEASE CLARIFY INTENTION.

2. ADDITIONAL COMMENTS AND SUGGESTIONS ARE INCLUDED IN AFR/DR MEMOS WHICH ARE BEING POUCHED AS WELL AS HANDCARRIED BY USAID DIRECTOR WILSON.

3. PLEASE ADVISE RE COMPOSITION DESIGN TEAM AND WHETHER ANY AID/W ASSISTANCE NEEDED. WE ASSUME MISSION DESIGN STAFF WILL PREPARE PP IN COLLABORATION WITH ICRISAT STAFF.

CLARK
BT

#5333

AID 1030-28 (7-71)
SUPPLEMENT IPROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK(INSTRUCTION: THIS IS AN OPTIONAL
FORM WHICH CAN BE USED AS AN AID
TO ORGANIZING DATA FOR THE PAR
REPORT. IT NEED NOT BE RETAINED
OR SUBMITTED.)Life of Project: 5 years
From FY 1981 to FY 1986
Total U.S. Funding \$3,750,000
Date Prepared: 11 Apr 1981Project Title & Number: Semi-Arid Tropics Research - Phase II (688-0226)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes: Outputs: (cont.)</p> <p>e. More efficient use of fallow period for soil fertility, regeneration and livestock fodder production.</p> <p>f. More efficient use of crop and soil management techniques.</p> <p>g. More efficient use of sorghum/millet and selected legumes.</p> <p>2. Research results relevant to plant breeding; selection of more efficient sorghum/millet cultivars which better resist the major diseases and insect pests.</p> <p>3. Trained Malian research, technical and administrative staff to assure continuity and suitability of research program.</p>	<p>Measures of Goal Achievement:</p> <p>Magnitude of Outputs: (cont.)</p> <p>7. Do 5-10/yr yield trials.</p> <p>8. Do 5-10/yr disease and insect resistance trials.</p> <p>9. Do a bulk crossing program.</p> <p>10. Do a selected crossing program.</p> <p>11. Develop selected segregated nurseries.</p> <p>12. Staff in SRCVO and ICRISAT capable of conceptualizing and executing a program of this type.</p>		<p>Assumptions for achieving goal targets:</p> <p>Assumptions for achieving outputs: (cont.)</p> <p>5. The planned research program and the training of Malian counterparts will produce an institutional capacity to carry on useful work in this field.</p> <p>6. GRM will keep trained staff at post sufficiently long to realize benefits and pass knowledge to others.</p> <p>Assumptions for achieving inputs:</p> <p>4. Vehicles, equipment and commodities can be procured and will arrive on time.</p>

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project: 5 years
 From FY 1981 to FY 1986
 Total U. S. Funding \$3,750,000
 Date Prepared: 11 Apr. 1981

Project Title & Number: Semi-Arid Tropics Research - Phase II (688-0226)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program or Sector Goal: The broader objective to which this project contributes: To improve small farmer productivity and increase their incomes.</p>	<p>Measures of Goal Achievement:</p> <ol style="list-style-type: none"> Improved varieties and farming systems for increased production. Farmer field testing of improved varieties and farming systems. 	<ol style="list-style-type: none"> Government records/statistics and independent studies. Station results. 	<p>Assumptions for achieving goal targets:</p> <ol style="list-style-type: none"> Adaptive research will lead to demonstrable methods for increased production. Farmers need to increase sorghum/millet production. Rainfall patterns will be relatively normal. Price policy is not disincentive to increased sorghum/millet production.
<p>Project Purpose: To develop a series of technical packages with sorghum/millet and certain grain legumes in the 400-1000 mm rainfall zone and to make them available through the crop operations and livestock projects to small farmers and small herders. To strengthen the GRM's research capability in the semi-arid rainfall zone.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status.</p> <ol style="list-style-type: none"> Operational station and 6-8 site locations carrying out research of varietal improvements and farming systems for sorghum/millet and selected legumes. Continuous linkages between research station, field trials and crop production projects. Body of literature on sorghum/millet and selected legumes. 	<ol style="list-style-type: none"> Site visits Station research literature Yearly reports Evaluation 	<p>Assumptions for achieving purpose:</p> <ol style="list-style-type: none"> That the traditional varieties may be improved upon in this environment. That some improved varieties from IRAT and ICRISAT can be usefully adapted to the Malian environment. That the traditional cultural practices and environmental exploitation can be improved upon in this environment.
<p>Outputs:</p> <ol style="list-style-type: none"> Research results relevant to Agronomic practices: More efficient use of cropping environment through association of one or more crops with sorghum/millet intercropping. More efficient use of animal traction and associated equipment. More efficient use of rainfall. More efficient use of locally available organic and natural fertilizers. (see continuation sheet) 	<p>Magnitude of Outputs:</p> <ol style="list-style-type: none"> Do 5-10/yr trials of relevant sorghum and millet intercropping. Develop 2-3 relevant watersheds for study. Do 2-5/yr trials with use of nature and organic fertilizers. Do 2-5/yr trials in fallow-period exploitation. Do 2-5/yr trials in crop and soil management. Do 2-3/yr trials for forage production. (see continuation sheet) 	<ol style="list-style-type: none"> Site visits Station records Literature checks 	<p>Assumptions for achieving outputs:</p> <ol style="list-style-type: none"> There will be no natural catastrophe, major outbreak of disease or serious insect problem. There will be continued GRM support to these activities. ICRISAT central will continue its support. Promising techniques developed elsewhere can be adapted to Malian environment. (see continuation sheet)
<p>Inputs:</p> <ol style="list-style-type: none"> Technical assistance Commodities Construction Maintenance/salaries/primes Contingencies (15 percent). 	<p>Implementation Target (Type and Quantity)</p> <ol style="list-style-type: none"> Technical assistance of 150 person months. Commodities: <ol style="list-style-type: none"> Earth moving equipment Laboratory and field equipment Animal traction equip. and tools. Mist irrigation equipment Research supplies. 	<ol style="list-style-type: none"> PIO/Ts PIO/Cs, receiving reports Site visits ICRISAT records USAID records 	<p>Assumptions for providing inputs:</p> <ol style="list-style-type: none"> That the Ciba Geigy Foundation will continue its support of the project. That GRM will provide qualified personnel for the project. ICRISAT is capable of transferring technology to local counterparts. (see continuation sheet)

Annex C: 611(a) Certification

1. Engineering Analysis

Contemplated construction in this project is minimal and consists of the following:

2 staff houses approximately 200m²/house

All construction will be designed by a local engineer hired under contract by ICRISAT and based upon typical plans and advice of ICRISAT/Ciba Geigy/GRM. Plans will be approved by USAID/Engineering and construction will proceed by force account or local construction contractor with the local engineer supervising construction using local qualified tradespersons approved by USAID/Engineering. ICRISAT/Ciba Geigy/GRM and USAID/Engineering will monitor this construction.

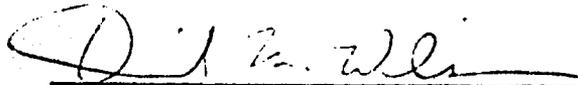
Cost Estimate:

The cost of construction is based upon recent unit cost and lump sum costs for similar type construction performed in a like manner. Cost of construction is estimated at \$100,000.

Certification Pursuant to Sec. 611 (a) of the Foreign Assistance Act of 1961, as amended.

The project analyses demonstrate to the extent practical planning and design incorporated into all components of the ICRISAT project. Furthermore, the USAID engineer has reviewed and approved the planning and financial analyses for all engineering components in this project and recommends 611 (a) certification.

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



Mission Director

4 VII 81

Date

File - ICRISAT
evaluation JGR

ANNEX D

November 12, 1980

Dr. Earl Leng
INTSORMIL, Plant Sciences
University of Nebr.
Lincoln, Nebraska 68583

Dear Earl:

Enclosed is my report of the trip to Mali as well as my list of expenses. The report may not be in the form AID/Mali would like but it does comply with the request made by Roger Simmons - Concur in favorable reports of ICRISAT/Mali and make recommendations for future work.

I was pleased to see the progress being made in Mali and am certain the ICRISAT boys can help move the agricultural development in this country.

I had two agencies ask for more information on the Title III Sorghum-millet program particularly the training phase so please prepare such a document for me to send to Mali. They would like to be able to send boys to this country to complete their B.Sc. degrees. They have about the equivalent of 2 years college and are at a dead end in Mali. Information on who can be accepted for training plus the mechanics of applying is needed.

Sincerely, _____
Orrin J. Webster, Adjunct Prof.

OJW:lw
cc: Roger Simmons

*Supplement to my report.
May go to Kenya the early part of Feb.
John S. should be here next week.
OJW*

ANNEX E

INITIAL ENVIRONMENTAL EXAMINATION

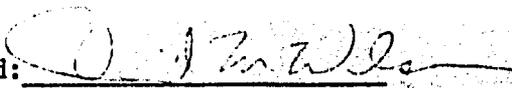
PROJECT LOCATION: Cinzana, Mali
PROJECT TITLE: Semi-Arid Tropics Crops Research (688-0226)
FUNDING: \$ 3,750,000
LIFE OF PROJECT (Funding): 5 Years
IEE prepared by: L. Lucke, P. Serafini
Date: 16 February 1981
ENVIRONMENTAL ACTION RECOMMENDED: Negative Determination

Concurrence

AW
David Wilson
Mission Director

Date:

Approval

Approved: 

Date: 4 IV 81

Disapproved: _____

Date: _____

As pertains to AID Regulation I6, as a research activity this project is subject to no further examination as regards use of pesticides.

Note: For full IEE see Approved PID

ANNEX E (con't)

Land Clearing and Construction Analyses
per State 115333

Land clearing. To date, all land clearing has been done utilizing local workers and traditional methods. Thus the potential environmental impact will be no greater than in the adjacent farmers' fields. Contour ridging and other techniques developed at the ICRISAT Center in India and elsewhere are to be systematically used to reduce, minimize or avoid soil erosion. Fields are to be placed so as to avoid slopes of greater than 0.5% wherever possible and appropriate contouring and bunding techniques as well as plantings will be used in the limited areas where slopes exceed this amount. Stump removal will not be practiced and trees normally a part of the cropping ecology will not be removed. It is likely that there will be fewer brushy species present the longer the fields are put under cultivation; however, because this is also the case in traditionally cropped fields, the environmental impact will be comparable to that in adjacent farmers' fields.

It is clearly the intention of the ICRISAT/Mali research staff to preserve an environment which is as consistent and relevant as possible to the local farmers' situation. The research station site was selected because of the presence of large units of uniform and contrasting soil types with non-erosive slopes relevant to the local agro-ecologies. Field layout has and is being undertaken with a view to supporting the ecological balance as it presently exists. Hand, animal traction, and small tractor cropping and land management techniques which are the same as those available to Malian farmers are being and will be used.

In those limited areas which are to be irrigated, land clearing will be more systematic. Woody species and trees will be removed. These fields are to be located on minimal slope areas (less than .15%). Most will be sprinkler or mist irrigated with the systems being designed for compatibility with the infiltration rate and water-holding capacities of the soils (presently under study) on which they will be placed. Where surface irrigation is to be used on some of the heavier, vertic type soils, the length of furrows and the drainage system will be designed and installed to minimize water loss and to avoid stagnant bodies of water being formed which would be the source of mosquitoes, etc. Impact rating - None to beneficial.

Construction. (Analysis of the effects of constructional land-clearing element of the project even though most will not be funded by AID). The following buildings have been or will be constructed by the Project: five staff houses, one rest house, two laboratories, one stove house, one work shed, one drying floor, one gardien house, and one generator house. Buildings have been and will be constructed on a laterite cap on the highest part of the station. Inasmuch as the buildings are poised on this rocky outcropping with very little natural cover, no negative environmental impact is foreseen. Indeed, planting and irrigating trees and shrubs at this location should provide cover, reduce temperatures, and generally improve the barren ecology which presently exists.

Furthermore, the laterite cap is thick, three to four meters, and is underlain by very fine kaolinitic clays of low permeability. Therefore, waste water passing into the deep (about 60 m) and low-permeability superficial aquifer will be minimal or nonexistent and could pose no threat to existing village water supplies in the area.

Water for the station itself is to come from a deep aquifer (about 150 m) approximately 1.5 km from the station. This aquifer is apparently stable, fed from the Bani River. Villages in the area obtain their water from a superficial aquifer (about 20 m) which will be unaffected by water drawn from the deeper aquifer. Impact rating - None to beneficial.

ICRISAT Staff, Trial Locations, and Operational Linkages

1. Staff Functions - ICRISAT

Agronomist: Philip Serafini, M.S. Agronomy

Administrative Responsibilities: Cinzanna, Baramendougou, Barbe,
Northern and Eastern Sites: Koporo Keniepe

Cereal Breeder: Dr. John Scheuring, Ph.D. , Cereal Breeding

Administrative Responsibilities: Breeding Program

Implementation Responsibilities: Dalabali, Sotuba, Samé, and the special
Southern and Western Sites: problem sites

Staff Functions - Malian

Administrative Assistant: Seydou Toure, ITA

Administrative Responsibilities: Administrative Assistant to the
Representative

Technical Staff: Mamadou Doumbia, ITA

Technical Responsibilities: Agronomy Program

Implementation Responsibilities: Coordination of northern and eastern sites

Technical Staff: Balagi Kieta, ISA

Technical Responsibilities: Breeding Program

Implementation Responsibilities: Coordination of southern and western sites

Technical Staff: Boucara Touré

Implementation Responsibilities: Dalabani and Samé programs

Technical Staff: Makono Coulibaly

Implementation Responsibilities: Sotuba program

2. Trial Locations

Trials dealing with (the several) aspects of the breeding and agronomy programs have been carried out to date on seven main sites and three special problem sites considered representative of the 400 to 1,200 mm rainfall zones. Emphasis to date has been on the less than 800 mm rainfall zone (5 of 7 sites).

Protection végétale

Nature of the relationship: -Collaborative work on downey mildew control
is carried out by ICRISAT and PV.

SAMÉ, OMVS (Kayes)

rainfall 738.9 mm (41-75)
latitude 14° 27N - 11° 30W
accessible year round

Other research organizations participating in the program:
OMVS

External Financing:
Multi-donor

BARBE, CAR (Mopti)

rainfall 533.8 mm (41-75)
latitude 14° 31N - 4° 6W
accessible year round

Other research organizations participating in the program:
SRCVO

External Financing:
Karl Freidrich Foundation

KOPORO KENIÉPÉ, PAR (Bankass)

rainfall 645.0 mm (52-78)
latitude 14° 4N - 3° 31W
accessible year round

Other research organizations participating in the program:
SRCVO

External Financing:
OMM-USAID

BABOUGOU SEED PRODUCTION FARM, OPSS (Markala)

rainfall 640.2 mm (1941 to 1975)
latitude 13° 41N - 6° 5W
accessible year round

Other research organizations participating in the program:
Production semences

External Financing:
FAO

SPECIAL PROBLEM SITES:

Accessible year round
Minitimbougou, village cooperative field ZER and OACV - Striga research
Ouelessébougou, CAR - downy mildew research
Sirakarola, CAR - downy mildew research

3. Physical situation:

Six major research facilities and three special problem sites are currently operational under Semi-Arid Tropics Research, Phase I. They traverse Mali including various ecological zones in the 400-1200 rainfall zone; major emphasis is being focused on the less than 800 mm rainfall zone (5 of 6 sites).

SOTUBA NATIONAL RESEARCH STATION

rainfall 1042.9 mm (51-75)
latitude 12°39N - 7°5W
accessible year round

Other research organizations participating in the program:

SRCVO

IRAT

PPS

CNRZ

Administrative headquarters on: DRA, SPCM, CRNZ, SAFGRAD, IRAT, ICRISAT

External Financing:

IRAT

Dutch government

CINZANA, CAR

rainfall 838.6 mm (63-77)
latitude 12°15N - 5-8W
a accessible year round

Other research organizations participating in the program:

SRSFJ

SRCVO

External Financing:

Multi-donor

BARAMENDOUYOU, PAR

rainfall 577.9 mm (36-75)
latitude 14° 01N - 14° 04W
accessible year round

Other research organizations participating in the program:

SRCFJ

External Financing:

FAO

EED

JUL 30 1979
-77-

INSTITUT
D'ECONOMIE RURALE
RECHERCHE AGRICOLE

Komoko le **13 JUIL. 1979**

0999 /MDR.IER

Le Ministre du Développement Rural

à Monsieur le Représentant de l'U.S.-A.I.D.
à BAMBO

S/O de Monsieur le Ministre des Affaires Etrangères
et de la Coopération Internationale à KOULOUBA

OBJET: Financement poursuite
programme recherche et parti-
cipation à l'installation d'une
Station en Zone Semi-aride.-

Monsieur le Représentant,

Dans le cadre du Projet ICRISAT/MALI financé par l'USAID et arrivant à terme le 30 Juin 1979, j'ai l'honneur de vous demander de bien vouloir prendre les dispositions nécessaires en vue d'une continuation de ce Projet dont l'intérêt pour le développement de la production céréalière en zone semi-aride du Mali n'est plus à démontrer.

Les résultats déjà acquis étant partiels, une poursuite des diverses expérimentations entreprises me paraît indispensable.

Je vous serais par ailleurs obligé d'une participation financière de l'USAID à l'installation de la nouvelle Station de recherche sur mils et sorgho prévue en zone semi-aride (Ségou), pour laquelle un accord va être signé entre la Fondation CIRA-SEIGY et le Gouvernement du Mali et sur laquelle l'ICRISAT mènera ses prochains programmes de recherches.

En vous remerciant d'avance pour cette très précieuse aide, je vous prie d'agréer, Monsieur le Représentant, l'assurance de ma considération distinguée.

PAR LE MINISTRE DU DEVELOPPEMENT RURAL,
DIRECTEUR DE CABINET,



Dr. Soudougar Sada SY.-

MINISTERE DE L'AGRICULTURE
 --:--:--:--:--
 INSTITUT D'ECONOMIE RURALE
 ..:--:--:--:--
 COMITE NATIONAL DE LA RECHERCHE
 AGRONOMIQUE
 -:--:--:--:--

REPUBLIQUE DU MALI
 UN PEUPLE -- UN BUT -- UNE FOI

COMPOSITION DE LA COMMISSION TECHNIQUE DES
 PRODUCTIONS VIVRIERES ET OLEAGINEUSES

DIRECTION NATIONALE DE L'AGRICULTURE

- Directeur Général à BAMAKO
- Directeur de l'Opération Arachide et Cultures Vivrières à BAMAKO
- Directeur de l'Opération Développement Intégré du Kaarta à NIORO
- Directeur de l'Opération-Mils à MOPTI
- Directeur de l'Opération-Riz à MOPTI
- Directeur de l'Opération-Riz à SEGOU
- Directeur de l'Opération Haute Vallée à BAMAKO
- Directeur de l'Opération Zone Laxustre à TONKA
- Directeur Opération Production Semences à SEGOU
- Directeur Opération Protection des Semences et Conservations des Récoltes à BAMAKO
- Directeur Action-Riz-Sorghos de décrue à GAO
- Directeur Action Périmètres Irrigués à KAYES
- Directeur Action-Blé à DIRE

DIRECTEUR GENERAL DE L'OFFICE DU NIGER à SEGOU

COMPAGNIE MALIENNE POUR LE DEVELOPPEMENT DES TEXTILES(C.M.D.T.)

- Directeur Général à BAMAKO
 - Directeur Action-Riz à SIKASSO
- DIRECTEUR GENERAL DE L'INSTITUT DU SAHEL à BAMAKO

GERDAT -- PARIS

DIRECTION NATIONALE DE L'ELEVAGE

- Chef Division de la Recherche Zootechnique à SOTUBA

INSTITUT D'ECONOMIE RURALE

- Directeur Général à BAMAKO
- Chef de la Division de la Recherche Agronomique à BAMAKO
- Chef de la Division Administrative et Financière à BAMAKO
- Chef de la Division des Etudes Techniques à BAMAKO
- Chef de la Division Documentation et Information à BAMAKO
- Chef de la Division de Recherches sur les Systèmes de Production Rurale à SIKASSO
- Chef Unité de Planification et d'Evaluation à BAMAKO
- Chef Secrétariat Technique à BAMAKO
- Conseiller Technique/DRA à BAMAKO
- Chef de la Section de Recherche sur les Cultures Vivrières et Oléagineuses à SOTUBA
- Chef de la Section Recherches Ocotomières et Fibres Jutières à SOTUBA
- Chef Projet SAFGRAD/Mali à SOTUBA
- Chef Projet ICRISAT/Mali à SOTUBA
- Représentant du GERDAT auprès de l'I.E.R. à BAMAKO
- Secrétaire Permanent du C.N.R.A. à BAMAKO

DIRECTEUR CENTRE DE RECHERCHE AGRONOMIQUE -- OMVS à SAHE

DIRECTEUR STATION REGIONALE ADRAO à MOPTI

ACCORD ENTRE LE GOUVERNEMENT DU MALI
ET L'INSTITUT INTERNATIONAL DE RECHERCHE AGRONOMIQUE
DANS LES ZONES TROPICALES SEMI-ARIDES

PREAMBULE :

Les populations vivant dans les régions sahéliennes et sahélo-soudaniennes sont très fortement dépendantes pour leur subsistance des cultures de mil, de sorgho et de légumineuses alimentaires. Les conditions de cultures dans ces régions sont difficiles en raison de l'irrégularité et l'intensité des pluies, de la fertilité souvent médiocre des sols et enfin des faibles possibilités d'investissements des paysans.

Le Gouvernement de la République du Mali et l'Institut International de Recherches Agronomiques dans les zones Tropicales Semi-Arides (ci-dessous désigné ICRISAT) sont mutuellement concernés et préoccupés par les problèmes de production végétale du monde rural.

Les parties contractantes de cet accord s'engagent à travailler (d'accord parties) sur des problèmes d'études, de recherches et leurs applications en vue de l'amélioration de la production agricole dans les zones concernées et ce, dans le cadre de programmes présentant un intérêt commun pour le Gouvernement de la République du Mali et pour l'ICRISAT.

A cette fin, les projets associés devront être approuvés par les représentants appropriés du Gouvernement de la République du Mali et de l'ICRISAT. Ces projets devront être suffisamment détaillés et spécifiques de manière à prendre aux buts principaux énoncés dans le programme général annexé au présent accord et dont il fait partie intégrante.

Le Gouvernement de la République du Mali et l'Institut International de Recherches Agronomiques dans les Zones Tropicales Semi-Arides désireux de coopérer dans le but de rechercher des solutions aux problèmes de la production agricole présentant un intérêt commun pour les deux parties:

Sont convenus de ce qui suit:

Article I:

1. L'ICRISAT se conformera, pour les conditions d'emploi pour les membres du personnel de l'ICRISAT au Mali, aux bases internationales, sans aucune discrimination de nationalité ou d'origine ou de toute autres considérations que celles basées sur les qualifications et l'expérience, ainsi qu'il est nécessaire pour embaucher du personnel très qualifié et obtenir un travail de très haute qualité.

Le choix du personnel scientifique dans le cadre de la collaboration avec la République du Mali se fera selon les recommandations de l'ICRISAT qui prendra particulièrement en considération les candidatures d'experts de nationalité malienne, étant entendu que toute proposition d'affectation de personnel expatrié sera soumise à l'approbation du Gouvernement de la République du Mali.

Pour le personnel d'exécution et à qualification égale, la priorité sera donnée au recrutement du personnel malien.

2) Les procédures d'entrée ou de sortie du Mali pour le personnel du projet et d'encadrement, pour les stagiaires, les étudiants et les visiteurs concernés par les programmes se feront conformément aux lois d'immigration et d'émigration au Mali.

3) Le Gouvernement de la République du Mali accordera l'autorisation de mouvement pour des matériels végétaux à l'entrée et à la sortie du Mali, matériels pouvant être nécessaires à l'ICRISAT soit pour ses programmes au Mali, soit pour ses programmes associés dans d'autres parties du monde.

Ces mouvements seront assujettis aux lois et réglementations du Gouvernement de la République du Mali sur l'inspection, la quarantaine et la circulation de tels matériels, notamment de manière à éviter l'introduction ou l'exportation de maladie.

Le Gouvernement de la République du Mali convient d'assurer l'inspection la plus rapide possible pour tous des matériels et d'en réduire au maximum les délais de livraison.

4) La publication et la dissémination par l'ICRISAT des résultats de ses recherches se feront de commun accord avec les institutions maliennes compétentes.

DISPOSITIONS PARTICULIERES

Article II:

Pour faciliter la conduite des projets associés tels que actuellement agréés par les parties contractantes de cet accord, le Gouvernement de la République du Mali accordera à l'ICRISAT et à son personnel les facilités, privilèges et immunités suivants, analogues à ceux des institutions spécialisées des Nations Unies :

1) L'ICRISAT jouit de l'immunité de juridiction pour la protection légale de ses biens, fonds et avoirs.

2) L'ICRISAT, ses biens, fonds et avoirs seront exonérés de toute imposition directe à l'exception des charges émises en fonction des services publics rendus.

3) L'ICRISAT sera exonéré des droits et taxes sur les importations et réexportations de ses publications.

4) Les revenus éventuels provenant de la vente de matériel (y compris matériel végétal) acquis dans le cadre du projet conjoint seront réutilisés par l'ICRISAT pour son programme au Mali.

5) Le Gouvernement de la République du Mali accordera à l'ICRISAT toutes les facilités de communications nécessaires à l'accomplissement de sa mission.

6) Le matériel scientifique et de laboratoire ainsi que les moyens de transport et tout autre équipement importés destinés à l'usage officiel de l'ICRISAT, sont exempts de tous droits de douane, étant entendu qu'en cas de vente du matériel ou de véhicules à un tiers ne bénéficiant pas des mêmes privilèges, ils seront soumis au paiement des droits et taxes dans les conditions prévues par la réglementation en vigueur au Mali.

7) La contre-partie du Gouvernement de la République du Mali consistera:

a) à la mise à la disposition de l'ICRISAT de terrains convenables destinés :

- aux recherches sur le mil, le sorgho, l'arachide, le pois d'angol et d'autres légumineuses nécessaires à l'augmentation de la ration en protéines des populations.

- L'édification des bâtiments (bureaux, laboratoires, logements, locaux de travail) nécessaires pour mener à bien les travaux de l'ICRISAT. Il reste entendu que l'ICRISAT avancera les fonds - pour ces investissements dans la mesure de son budget.

b) à l'assistance pour les arrangements nécessaires pour le logement du personnel expatrié, chargé du programme de coopération et affecté au Mali. Il reste entendu que l'ICRISAT prendra à sa charge les loyers et pourra financer la construction de maisons d'habitation dans la mesure où son budget le lui permet.

Après accord préalable, les maisons et bâtiments construits par l'ICRISAT reviendront au Gouvernement de la République du Mali lorsque le programme de coopération ou ses prolongements seront totalement terminés.

c) au détachement à l'ICRISAT du personnel nécessaire à la réalisation du programme conjoint et à la participation aux dépenses y afférentes.

d) à l'exonération de droits de douane et taxes pour les matériaux, équipements et fournitures importés au Mali, et utilisés uniquement pour la construction des installations de l'ICRISAT.

8) Tous les agents de l'ICRISAT (chercheurs-assistants de recherches, experts consultants adjoints administratifs) :

a) jouiront de l'immunité de juridiction pour les notes accomplies en leur qualité officielle, y compris leurs paroles et leurs écrits.

b) seront exempts ainsi que leur conjoint, et les membres de leur famille qui sont à leur charge, de l'application des dispositions limitant l'immigration et des formalités d'immatriculation des étrangers.

Le personnel de l'ICRISAT visé au paragraphe (b) de l'article précédent bénéficie de toutes les facilités d'entrée et de sortie en République du Mali.

c) seront exempts de toute obligation relative au service national.

d) jouiront des facilités monétaires et des facilités d'échange.

e) bénéficieront ainsi que leur conjoint et les membres de leur famille à leur charge des facilités au rapatriement en période de crise internationale.

f) seront exonérés de tous impôts et taxes sur les salaires et émoluments qui leur seront versés par l'ICRISAT.

g) jouiront du droit d'exporter sous le régime douanier de l'importation temporaire leur mobilier et objet personnel incluant un véhicule automobile lors de leur prise de poste en République du Mali ou dans les six mois après leur installation.

Le délai de validité de l'importation temporaire des véhicules appartenant aux agents de l'ICRISAT est de trois ans, renouvelables jusqu'à la ré-exportation ou à la mise en consommation desdits véhicules.

Le mobilier, les objets personnels et véhicules des agents en cas de vente à un tiers ne bénéficiant pas des mêmes privilèges, seront soumis au paiement des droits et taxes dans les conditions prévues par la réglementation en vigueur en République du Mali.

Article III:

1) les agents de nationalité malienne ou toute autre personne recrutée localement par l'ICRISAT, ne bénéficieront pas de facilités et privilèges tels qu'indiqués dans les sous-paragraphe b) à g) du paragraphe 8 de l'article précédent.

2) Le personnel d'exonération de nationalité malienne ou toute autre personne recrutée localement sera régi par la législation malienne du travail.

ARTICLE IV :

1) Le présent accord pourra être modifié ou complété à la demande de l'une ou l'autre des parties et d'un commun accord.

2) Tout différend relatif à l'interprétation ou à l'application du présent accord sera réglé par voie de négociations.

3) Le présent accord entrera en vigueur à la date de sa signature. Il demeurera en vigueur tant qu'il ne sera pas dénoncé par l'une des parties.

La dénonciation ne peut intervenir qu'après un préavis d'un an.

Additif

Une autorisation d'achat de carburant en exonération des droits de douane et des taxes d'entrée sera accordée à l'Institut International de Recherches Agronomique dans les Zones Tropicales Semi-Arides (ICRISAT).

Fait à Bamako, le 22 Mars 1976

POUR L'INSTITUT INTERNATIONAL DE
RECHERCHES AGRONOMIQUES DANS LES ZONES
TROPICALES SEMI-ARIDES

POUR LE GOUVERNEMENT DE LA REPUBLIQUE
DU MALI
LE MINISTRE DES AFFAIRES ETRANGERES
ET DE LA COOPERATION INTERNATIONALE

ACCORD FONDATION CIBA-GEIGY - GOUVERNEMENT DU MALI

JUILLET 1979

Entre la

Fondation Ciba-Geigy

pour la coopération avec les pays en voie de
développement, d'une part

et le

Gouvernement de la République du Mali, d'autre part

Concernant

Le Projet d'implantation d'un centre de recherches sur l'amélioration
et la multiplication de semences de base de Mil au Mali (ce projet ainsi que
l'implantation réalisée sont désignés ci-après "Projet").

Il a été convenu ce qui suit :

Préambule :

La Fondation Ciba-Geigy pour la coopération avec les pays en voie de développement, Fondation sans aucun but commercial (ci-après désigné "Fondation") et le Gouvernement de la République du Mali (ci-après désigné "Gouvernement du Mali"), dans le cadre de l'Accord de coopération technique entre la Confédération Suisse et la République du Mali, s'engagent à réaliser conjointement le Projet présent et conviennent à cet effet de ce qui suit :

Article I : Objectif général du projet

Le Gouvernement du Mali, ainsi que les organisations internationales comme le FAO et l'ICRISAT, ont signalé depuis des années le problème de l'insuffisance chronique de productions vivrières en zone de savane. L'urgence des efforts à entreprendre pour élever la productivité et finalement atteindre un approvisionnement autonome qualitatif et quantitatif a été soulignée après la série de sécheresses généralisées qui ont frappé le Sahel et les régions voisines. Dans le cadre de ces efforts le but du Projet consiste dans l'amélioration de la productivité en premier lieu du mil et éventuellement du sorgho. Puisqu'il s'agit des céréales de base dans les zones les plus défavorisées, ces cultures couvrent des centaines de milliers d'hectares au Mali; en outre, le rendement est bas et la teneur en protéine est faible, cet objectif prend une place de premier choix dans le plan malien de développement. Le mil et le sorgho étant cultivés sur de petits champs, les petites exploitations devraient être les premiers bénéficiaires du Projet par la mise à leur disposition des variétés améliorées et de techniques culturales adaptées.

Article II : Objectifs spécifiques du Projet

Le projet vise, dans le cadre d'un programme national de Recherche et de développement :

- à promouvoir différentes méthodes de sélection destinées à la création de variétés de mil (et subsidiairement d'autres espèces, p. ex. du sorgho) hybrides synthétiques ou composites avec les qualités suivantes:
 - . meilleure adaptation à la zone semi-aride,
 - . rendement plus élevé que les variétés locales,
 - . haut pourcentage en protéine,
 - . résistance ou tolérance aux maladies et parasites,
 - . bon comportement à la sécheresse,
 - . cycle de végétation adapté,
 - . goût acceptable.
- à élaborer des techniques pour la production de semences de base à partir de ces cultivars. La multiplication semencière au-delà des semences de base est cependant exclue du Projet.
- à développer les techniques agricoles pour un meilleur usage des variétés ainsi créées et à consulter les cultivateurs sur ces technologies.

Article 3 : Gestion du Projet

Pendant la phase de recherche et de production (2ème phase) le Projet est géré conformément aux règles de gestion des structures de recherche du Mali.

Un comité de surveillance et de contrôle sera créé pour coordonner et contrôler les activités du projet.

La composition de ce comité est définie dans l'annexe 1.

Article 4 : Engagements des parties contractantes

1. La Fondation s'engage,

- 1.1. à participer, sauf obstacles de force majeure, à la réalisation du Projet et de ses objectifs,
- 1.2. à construire les installations conformément à l'Annexe I
- 1.3. à fournir l'équipement requis pour l'exécution du Projet conformément à l'Annexe I,
- 1.4. à mettre à la disposition du Gouvernement du Mali un Ingénieur Agronome qui assurera la gestion du fonds pendant la 1ère phase et siégera en tant que représentant de la Fondation au sein du comité de surveillance et de contrôle pendant la 2ème phase.
- 1.5. à mettre à la disposition du Gouvernement du Mali les services, l'expertise et les conseils des chercheurs de la section amélioration semences de CIBA-GEIGY S.A., Bâle, conformément au programme approuvé du Projet et et autant que disponible,
- 1.6. à faire visiter le Projet une (ev. deux) fois par an par un spécialiste en génétique pour évaluer les résultats et pour aider à établir le projet de programme de recherche,
- 1.7. à former un sélectionneur malien dans une des stations de recherche et de développement de semences de CIBA-GEIGY S.A., ou dans une autre station choisie par les deux parties contractantes,
- 1.8. à effectuer des analyses de protéines pendant la durée du projet,
- 1.9. à prendre à sa charge les frais de fonctionnement énumérés dans l'Annexe I.
- 1.10. Les engagements de la Fondation pour les prestations énumérés sous article 4, 1.2. et 1.3. sont limités à un maximum de 153 millions de francs maliens (FM).

- Les engagements devraient être terminés 24 mois après l'approbation du Projet. Une fois terminés, la propriété des installations sera transférée au Gouvernement Malien.
1. Les engagements de la Fondation pour les prestations énumérées sous article 4, 1.4, 1.5, 1.6, 1.7, 1.8, sont limités à un maximum de 37 millions de FM par an.
 - 1.11. Les engagements de la Fondation pour les prestations énumérées sous article 4, 1.9. sont limités à un maximum de 44,5 millions de FM par an pour les premiers six ans du fonctionnement du Projet.
 - 1.12. Après 6 ans de fonctionnement, le Projet entier sera transféré au Gouvernement du Mali.
 2. Le Gouvernement du Mali s'engage
 - 2.1. à mettre à la disposition du Projet le personnel malien nécessaire énuméré dans l'annexe I,
 - 2.2. à fournir au Projet tous les autres agents requis pour la bonne exécution,
 - 2.3. à reprendre les frais de fonctionnement du Projet à partir de de la fin de l'Accord,
 - 2.4. à concourir à la bonne marche du Projet en lui assurant la jouissance des infrastructures générales ainsi que la collaboration du personnel des services compétents.
 - 2.5. à mettre à la disposition du Projet le terrain nécessaire (100 ha environ), ainsi que deux villas pour le logement du personnel.
 - 2.6. à exonérer le matériel importé dans le cadre du Projet des taxes fiscales et douanières selon le règlement en vigueur en République du Mali,

Article 5

1. L'Etat du Mali, représenté par le Ministère du Développement Rural du Mali sera employeur du personnel malien.

La Station sera implantée dans la zone semi-aride et fera partie des structures de Recherche du Ministère du Développement Rural.

2. Le Ministre du Développement Rural confie la gestion du Projet pendant la première phase d'environ 2 ans à la Fondation qui nomme un Chef de Projet.

Pour la 2ème phase, le représentant de la Fondation siégera au sein du comité de surveillance et de contrôle en qualité d'expert agronome.

Article 6 :

1. Les biens matériels, matériaux et équipements qui devront être importés pour la réalisation du Projet seront soumis au régime de l'admission en franchise des droits et taxes conformément à la réglementation en vigueur en République du Mali.
2. Les coopérants expatriés qui seront mis à la disposition du Projet par la Fondation ainsi que les membres de leur famille seront exonérés de tous les impôts directs et taxes assimilées.
3. Les effets et objets personnels des coopérants expatriés et de leurs familles bénéficient de l'exemption fiscale et de la franchise douanière à l'implantation et à l'exportation conformément à la réglementation en vigueur en République du Mali. Ce privilège ne s'applique pas aux boissons, cigarettes et denrées alimentaires.
4. Les coopérants expatriés qui importeront ou achèteront sur place un véhicule privé bénéficieront du régime de l'importation temporaire conformément à la réglementation en vigueur en République du Mali.
5. Les contrats et marchés passés dans le cadre de l'exécution du présent accord sont exonérés de tous droits de timbres et d'enregistrement.

Article 7 :

1. La gestion de la totalité des fonds mis à la disposition du Projet (phase II) sera faite sous le contrôle du Comité de surveillance et de contrôle désigné par le Ministre du Développement Rural.
2. La Fondation est responsable de la gestion des fonds du matériel et des équipements pendant toute la 1ère phase du projet.
3. Les crédits correspondant aux frais de fonctionnement (2ème phase) seront virés par tranches dans un compte ouvert par le Ministère du Développement Rural auprès de la Banque de Développement du Mali. Ce compte fonctionnera sous la signature conjointe d'un représentant désigné par le Ministre du Développement Rural et du représentant de la Fondation.
4. Les détails de l'exécution et de l'opération du Projet sont définis dans l'Annexe I, qui fait partie intégrante du présent accord.

Article 8 : Déroulement du Projet

Le Projet est conçu en deux phases :

1ère phase : phase de construction - 2 ans environ

2ème phase : phase de recherche et de production de semences de base - six ans à partir du commencement de la recherche; c'est-à-dire dès que les conditions matérielles le permettront.

Après la 2ème phase, le Projet entier sera transféré au Gouvernement du Mali.

Article 9 : Modification de l'Accord et règlement de différends

Toute modification du présent accord devra faire l'objet d'un échange de lettres entre les parties contractantes.

Article 10: Entrée en vigueur et Durée de l'Accord

Le présent accord entre en vigueur dès sa signature pour une durée de deux (2) ans. Il sera reconduit jusqu'à la fin de la 2ème jusqu'à la fin de la 2ème phase, sous réserve d'une dénonciation par écrit de l'une ou l'autre des deux parties contractantes avec un préavis de trois mois.

Fait à Bamako, le

Pour la Fondation

Pour le Gouvernement du Mali

Le Directeur

Le Directeur Général de la
Coopération Internationale

Dr. H.P. HOECHLI

[Ousmane] Diallo

V. Hoctan

ANNEXE 1 DE L'ACCORD

FONDATION CIBA-GEIGY - GOUVERNEMENT DU MALI

Entre la Fondation CIBA-GEIGY pour la coopération avec les Pays en voie de développement (ci-après désigné "Fondation"),

Et le Gouvernement de la République du Mali (ci-après désigné "Gouvernement du Mali")

Concernant le Projet d'implantation d'un centre de recherche sur l'amélioration et la multiplication de semence de base de mil et éventuellement du Sorgho au Mali (ci-après désigné "Projet").

Partie I : Matériel et Investissement

1. Définitions

Le matériel, l'équipement et les investissements du Projet visé par le présent article sont ceux, sur lesquels la Fondation et le Gouvernement du Mali se sont mis d'accord et dont les listes sont jointes à la présente (pièce jointe 1).

D'un commun accord des modifications éventuelles pourraient être apportées à ces listes.

2. Commande du Matériel

La Fondation a la responsabilité de la commande du matériel retenu en consultant le Gouvernement du Mali.

3. Paiement du Matériel

Le coût du matériel rendu Bamako sera réglé par la Fondation à partir de la Suisse.

4. Assurance durant le Transport

Durant son transport, le matériel est assuré par la Fondation.

5. Réception du Matériel

Avant l'expédition du matériel faisant l'objet des contrats de fourniture, il sera procédé à une réception technique par la Fondation.

A son arrivée à Bamako, le matériel sera réceptionné par le représentant du Gouvernement du Mali qui adressera à la Fondation un accusé de réception détaillé faisant, le cas échéant, état des dommages et des pertes survenus en cours de transport.

Statut du Matériel

Le Projet reste propriétaire du matériel jusqu'à ce qu'un accord de transfert soit conclu entre la Fondation et le Gouvernement du Mali.

Partie IV : Personnel

7. Personnel expatrié et comptable responsable

- 1) Le recrutement du personnel expatrié engagé nouvellement incombe à la Fondation. Pour pouvoir être engagés, les candidats devront avoir été agréés par le Gouvernement du Mali.
- 2) La rétribution du personnel expatrié, toutes charges et frais de voyage compris, incombe à la Fondation.
- 3) Le personnel expatrié comprendra un ingénieur agronome, (chef du Projet pendant la 1ère phase).
- 4) L'Agent cité ci-dessus recevra un cahier des charges décrivant ses tâches et ses compétences de façon détaillée. Ces documents seront préparés par le Gouvernement du Mali conjointement avec la Fondation et devront être agréés et contre-signés par les intéressés.
- 5) Les règles de cet article 7 s'appliquent aussi au comptable responsable malien.

8. Personnel Malien

- 1) Le Gouvernement met à la disposition du Projet le personnel malien nécessaire à sa réalisation. La liste du personnel malien du Projet est jointe à la présente (pièce jointe no. 3).
- 2) L'ensemble de tout le personnel malien est à la charge du Gouvernement du Mali en ce qui concerne les salaires. Les indemnités et primes sont à la charge de la Fondation.
- 3) Les homologues des coopérants devront tous posséder, chacun dans leur domaine une formation de base suffisante pour pouvoir assumer seuls les responsabilités des coopérants expatriés au terme du Projet.

Le personnel devrait être rûdé.

Partie III : Frais de Construction et de Fonctionnement

9. Le financement des frais de construction et du matériel acheté sur place se fera à partir d'un compte spécial que le Ministère du Développement Rural ouvrira auprès de la Banque de Développement du Mali à Bamako.
10. Tous les frais de fonctionnement du projet, comme ils sont énumérés dans la pièce jointe 2 sont, pendant la durée du Projet, conformément aux articles 8 et 10 du présent accord, entièrement à la charge de la Fondation.

Toute modification importante, dans l'exécution du budget devra être auparavant approuvée par le Comité de Surveillance et de Contrôle

Le contrôle de la gestion comptable incombera au Comité de Surveillance et de Contrôle. Il sera assuré conformément à la réglementation en vigueur du Mali.

A la fin de chaque année, cette comptabilité, accompagnée des pièces justificatives correspondantes, sera envoyée à la Fondation par le Ministère du Développement Rural.

La Fondation a le droit d'exiger toutes les informations sur la comptabilité et de procéder à des expertises comptables du Projet.

Partie IV : Principes Généraux d'organisation et de Fonctionnement

11. La Station sera soumise aux règles générales de fonctionnement des Centres et Stations de Recherches Agricoles du Mali. Elle sera dirigée par un Ingénieur Agronome malien.

Le Comité de surveillance et de Contrôle sera constitué comme suit :

- **Président** : Le Chef de la Section de Recherche sur les Cultures Vivrières et Oléagineuses (SRCVO).
- **Membres** : Le Directeur de la Station
Le Représentant de la Fondation
Le Comptable de la Station

Ce comité a les tâches suivantes :

- Etablissement de la proposition de programme de recherche,
- Proposition du budget des frais de fonctionnement,
- Evaluation des activités et contrôle financier.

Partie V : Projet de programme technique et budget

12.

- 1) - La proposition de Programme sera préparée par le Directeur du Centre de recherche et soumis au Comité technique du CNRA, Comité de Surveillance et de Contrôle, à la Fondation.
- Adopté par le C.N.R.A.
- 2) - De même la proposition de budget sera préparé par le Directeur du Centre, approuvé par le Comité de Surveillance et de Contrôle. Il sera ensuite soumis à la Fondation avant d'être examiné et adopté par le Comité National de la Recherche Agronomique (Commission Financière).

13. Les frais de construction (1ère phase) sont à contrôler par le représentant de la Fondation conformément au Code de frais de construction de CIBA-GEIGY adapté aux conditions maliennes.

Partie VI : Calendrier d'exécution

14. Les différentes étapes de la mise en route du Projet à partir de la signature de l'accord sont énumérées dans la liste "Calendrier" qui est jointe au présent accord (pièce jointe no. 4).

Le représentant de la Fondation devra se conformer aux directives générales du Gouvernement du Mali et agir en collaboration étroite avec lui et plus particulièrement avec l'Institut d'Economie Rurale (IER).

Bamako, le

Pour le Gouvernement du Mali

Pour la Fondation

MATERIELS ET INVESTISSEMENTS

<u>1. Installation et édifices</u>	<u>Millions FM</u>
- Laboratoire et bureaux	20
- Bâtiments de stockage et préparation des engrais et pesticides & chambre froide	20
- Hangar et garage	9.5
- Aire de séchage et de battage (200 m2)	6
- 1 case gardien	2
- Clôture 50 ha.	10
- Puits citerne	3
- Groupe électrogène (40 KVA & local)	<u>10,5</u>
Total installations et édifices	81
<u>2. Equipements</u>	
- 2 Toyota	10
- Camionnettes 404	6.5
- 1 Tracteur IF 650	8
- 1 Gyrobroyeur	2
- 1 Matériel de culture attelée	2
- Mobilier du bureau	3
- Equipement pour chambre froide	6
- Equipement pour irrigation par aspersion	10
- Matériel de pesée	2.5
- Equipement pour le laboratoire de génétique	3
- Outillage mécanicien	<u>2</u>
Total Equipement	55
Imprévu	<u>17</u>
<u>Total Matériel et Investissement</u>	<u>153</u>

Deuxième étape

Millions FM

- Clôture 50 ha.	10
- Campement	25
- Car transport de personnel	7,5
- 2 maisons d'habitation	<u>40</u>
Total	32,5

Frais de Fonctionnement (Annexe article 9)

Millions FM

1. Personnel

- Main d'oeuvre saisonnière (50 % x 7 mois)	5.5	
- Primes de recherche et indemnités de déplacement	7.0	
- Charges sociales	1.0	
- Pharmacie - Vêtement de travail	1.0	<u>14.5</u>

2. Matières consommables

- Engrais - Pesticides - Herbicides	1.0	
- Sécherie	1.0	
- Carburant - Lubrifiants	8.0	
- Pièces de rechange et matériaux	2.0	<u>12.0</u>

3. Travaux fourniture et service extérieur

- Entretien et réparation	3.0	
- Travaux effectués par des tiers	1.0	
- Documentation	1.0	<u>5.0</u>

4. Frais divers de gestion

- Fourniture de bureau et frais postaux	3.0	<u>3.0</u>
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- Imprévu		10.0
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Total Frais de Fonctionnement

44.5

Personnel malien (Article 8.1.)

- 1 Agronome Sélectionneur : Directeur de la Station
- 1 Agronome
- 1 Comptable
- 4 Techniciens
- 5 Moniteurs

- 1 Secrétaire & Planton
- 1 Magasinier
- 1 Mécanicien
- Chauffeurs
- Gardiens
- 1 Tractorista

Calendrier d'Exécution

(article 14)

Les différentes phases de la mise en route du projet à partir de la signature de l'accord seront les suivantes :

Signature de l'Accord : Juillet 1979

1ère phase :

Phase de construction 1979 - 1981 (jusqu'à deux ans environ)

Juillet 1979 - détermination d'un terrain adéquat pour la station
 - recrutement du personnel nécessaire pour la 1ère phase
 - élaboration des plans et des devis pour les constructions
 - élaboration d'un plan d'étape pour les constructions avec budget d'investissements.

Juillet 1979

1ère étape de construction

Mai 1980

- Juin 1981
2ème étape de construction

2ème phase

Phase de recherches et de production

Dès la fin de la première étape de construction, environ Juin 1980, commencement de la phase de recherche (suivant les possibilités).

Dès la fin de la deuxième étape de construction, environ mai 1981, phase de recherche et de production. Durée 6 ans à partir de la fin de construction (environ 1986/87).

B U D G E T (Phase I Project)

USAID financing is as follows:

I. Technical Assistance:

(a) Long-Term (48 pm).....	\$ 180,000	
(b) Short-Term (3 pm).....	10,000	
Total.....		<u>\$190,000</u>

II. Commodities:

1. Vehicles.....	\$ 15,000	
2. Lab equipment and field equipment.....	10,000	
3. Workshop tools and equipment.....	5,000	
Total.....		<u>\$ 30,000</u>

III. Construction and Land Development:

1. Laboratory and Agronomic Office (170 m2).\$	75,000	
2. Meteorological station.....	5,000	
3. Stable, holding pens, feed store.....	10,000	
4. Site prospection.....	12,000	
5. Land development.....	20,000	
Total.....		<u>\$122,000</u>

IV. Other Costs:

1. Research Operations and Supplies.....\$	105,000	
Total.....		<u>\$105,000</u>

V. Contingency and Inflation:

53,000 \$ 53,000

Grand total \$500,000

Foundation Ciba-Geigy will provide the following:

I. Construction:

Genetic laboratory and offices (x 6).....	\$ 46,512	
1. Supply building.....	46,512	
2. Garage/workshop/hayloft.....	22,093	
3. Threshing/drying floor.....	13,953	
4. Guard quarters.....	4,651	
5. Fencing (50 ha.).....	23,256	
6. Well cistern.....	6,977	
7. Generator (40 KVA).....	24,419	
Total.....		<u>\$188,373</u>

II. Commodities:

1. 2 four-wheel drive vehicle.....	23,216	
2. 2 pick-up trucks.....	15,116	
3. Tractor.....	18,605	
4. Rotary mower.....	4,651	
5. Animal traction equipment.....	4,651	
6. Office furnishings.....	6,977	
7. Cold room equipment.....	13,953	
8. Irrigation equipment.....	23,259	
9. Scales.....	5,814	
10. Genetic lab equipment.....	6,977	
11. Mechanics tools.....	4,651	
Sub-total.....		<u>\$127,910</u>

Contingencies: 39,535 39,535

Total..... \$167,445

III. Operating Expenses:

1. Personnel

- Seasonal workers (50 x 7 months).....	12,791	
- "Primes et indemnités".....	16,279	
- Social Security payments.....	2,326	
- Medical.....	2,326	
Sub-total.....		<u>\$ 33,822</u>

2. Consumables

- Fertilizers, pesticides, herbicides.....	\$ 2,326	
- Sacks.....	2,326	
- Fuel.....	18,605	
- Spare parts and equipment.....	4,651	\$ 27,908
Sub-total.....		\$ 27,908

3. Supplies and Service

- Maintenance and repair.....	\$ 6,977	
- Third party work.....	2,326	
- Printing services.....	2,326	
Sub-total.....		\$ 11,629

4. Miscellaneous

- Office supplies.....	\$ 6,977	
<u>Contingencies.....</u>	\$ 23,256	

Total..... \$103,492

Grand total..... \$459,300

5.4 Environmental Effects

5.4.1 Land Use

1. Changing the character of the land through:

a. the development of improved agronomic practices; these practices which deal with crop and residue management, fallow period management and exploitation, tillage and weeding practices, etc., would provide for the more efficient and conservative utilization of agricultural lands.

Impact rating negative.

b. Increasing the population of people and animals; the demographics will not be shifted in the 100 hectares for the station. There will be no direct impact on any significantly large population of people or animals.

Impact rating negative.

c. Extracting natural resources: the practice of mining in modern agriculture (i.e., the taking off of more than one puts on) has long been known as an acceptable practice with time. The cultural systems to be studied at the station will demonstrate their viability and their conservative nature with time.

Impact rating negative.

d. Land Clearing: To date all land clearing has been done utilizing local workers and traditional methods. Thus, the potential environmental impact will be no greater than in the adjacent farmers' fields. Contour ridging and other techniques developed at the ICRISAT Center in India and elsewhere are to be systematically used to reduce, minimize or avoid soil erosion. Fields are to be placed so as to avoid slopes of greater than 0.5% wherever possible and appropriate contouring and bunding techniques as well as plantings will be used in the limited areas where slopes exceed this amount. Stump removal will not be practiced and trees normally a part of the cropping ecology will not be removed. It is likely that there will be fewer brushy species present the longer the fields are put under cultivation; however, because this is also the case in traditionally cropped fields, the environmental impact will be comparable to that in adjacent farmers' fields.

It is clearly the intention of the ICRISAT/Mali research staff to preserve an environment which is as consistent and relevant as possible to the local farmers' situation. The research station site was selected because of the presence of large units of uniform and contrasting soil types with non-erosive slopes relevant to the local agro-ecologies. Field layout has and is being undertaken with a view to supporting the ecological balance as it presently exists. Hand, animal traction, and small tractor cropping and land management techniques which are the same as those available to Malian farmers are being and will be used.

In those limited areas which are to be irrigated, land clearing will be more systematic. Woody species and trees will be removed. These fields are to be located on minimal slope areas (less than .15%). Most will be sprinkler or mist irrigated with the systems being designed for compatibility with the infiltration rate and water holding capacities of the soils (presently under study) on which they will be placed.

Where surface irrigation is to be used on some of the heavier, vertic type soils, the length of furrows and the drainage system will be designed and installed to minimize water loss and to avoid stagnant bodies of water being formed which would be the source of mosquitoes, etc.

Impact rating - None to beneficial.

e. Changing the soil character: changes in soil structure, texture, nutrients status, aeration, water infiltration, drainage, salinity, and other relevant factors will be monitored as a part of the stations ongoing research program. An important objective of the program is to find ways to conserve the soil and its qualities while efficiently exploiting it for crop production.

Impact rating: none.

2. Altering natural defenses:

The site is too small to have any direct impact on natural eco-system defense systems.

Impact rating: none.

3. Foreclosing important use:

Land pressure is low enough in the areas under consideration (long fallow periods are common) that the station can be created without being a real competition. The station would be placed on land which has been in fallow for some time.

Impact rating: none to little.

4. Jeopardizing man or his works:

The project is designed to improve, through the generation of relevant information, the works of man and reduce his insecurity within his environment.

Impact rating: none.

5. Construction (Analysis of the effects of constructional land-clearing element of the project even though most will not be funded by AID)

The following buildings have been or will be constructed by the Project: five staff houses, one rest house, two laboratories, one stove house, one work shed, one drying floor, one garden house, and one generator house. Buildings have been and will be constructed on a laterite cap on the highest part of the station. Inasmuch as the buildings are poised on this rocky outcropping with very little natural cover, no negative environmental impact is foreseen. Indeed, planting and irrigating trees and shrubs at this location should provide cover, reduce temperatures, and generally improve the barren ecology which presently exists.

Furthermore, the laterite cap is thick, three to four meters, and is underlain by very fine kaolinitic clays of low permeability. Therefore, waste water passing into the deep (about 60m) and low-permeability superficial aquifer will be minimal or nonexistent and could pose no threat to existing village water supplies in the area.

Water for this station itself is to come from a deep aquifer (about 150m) approximately 1.5 km from the station. This aquifer is apparently stable, fed from the Bani River. Villages in the area obtain their water from a superficial aquifer (about 20m) which will be unaffected by water drawn from the deeper aquifer.

Impact rating: None to beneficial.

ANNEX E

INITIAL ENVIRONMENTAL EXAMINATION

PROJECT LOCATION: Cinzana, Mali
PROJECT TITLE: Semi-Arid Tropics Crops Research (688-0226)
FUNDING: \$ 3,750,000
LIFE OF PROJECT (Funding): 5 Years
IEE prepared by: L. Lucke, P. Serafini
Date: 16 February 1981
ENVIRONMENTAL ACTION RECOMMENDED: Negative Determination

Concurrence

David Wilson/ff
David Wilson
Mission Director

Date: 6/30/81
per Attached face sheet
of 6/4/81

Approval

Approved: James S. Hester Date: 7/8/81

Disapproved: _____ Date: _____

Clearance; GC/AFR LA 7/8/81

ANNEX E

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IEE prepared by: L. Lucke, P. Serafini
Date: 16 February 1981
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Concurrence

David Wilson
Mission Director

Date:

Approval

Approved: [Signature]

Date: 4 II 81

Disapproved: _____

Date: _____

As pertains to AID Regulation 16, as a research activity this project is subject to no further examination as regards use of pesticides.

Note: For full IEE see Approved PID

5.4 Environmental Effects

5.4.1 Land Use

1. Changing the character of the land through:

a. the development of improved agronomic practices; these practices which deal with crop and residue management, fallow period management and exploitation, tillage and weeding practices, etc., would provide for the more efficient and conservative utilization of agricultural lands.

Impact rating negative.

b. Increasing the population of people and animals; the demographics will not be shifted in the 100 hectares for the station. There will be no direct impact on any significantly large population of people or animals.

Impact rating negative.

c. Extracting natural resources: the practice of mining in modern agriculture (i.e., the taking off of more than one cuts on) has long been known as an acceptable practice with time. The cultural systems to be studied at the station will demonstrate their viability and their conservative nature with time.

Impact rating negative.

d. Land Clearing: To date all land clearing has been done utilizing local workers and traditional methods. Thus, the potential environmental impact will be no greater than in the adjacent farmers' fields. Contour ridging and other techniques developed at the ICRISAT Center in India and elsewhere are to be systematically used to reduce, minimize or avoid soil erosion. Fields are to be placed so as to avoid slopes of greater than 0.5% wherever possible and appropriate contouring and bunding techniques as well as plantings will be used in the limited areas where slopes exceed this amount. Stump removal will not be practiced and trees normally a part of the cropping ecology will not be removed. It is likely that there will be fewer brushy species present the longer the fields are put under cultivation; however, because this is also the case in traditionally cropped fields, the environmental impact will be comparable to that in adjacent farmers' fields.

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Where surface irrigation is to be used on some of the heavier, vertic type soils, the length of furrows and the drainage system will be designed and installed to minimize water loss and to avoid stagnant bodies of water being formed which would be the source of mosquitoes, etc.

Impact rating - None to beneficial.

e. Changing the soil character: changes in soil structure, texture, nutrients status, aeration, water infiltration, drainage, salinity, and other relevant factors will be monitored as a part of the stations ongoing research program. An important objective of the program is to find ways to conserve the soil and its qualities while efficiently exploiting it for crop production.

Impact rating: none.

2. Altering natural defenses:

The site is too small to have any direct impact on natural eco-system defense systems.

Impact rating: none.

3. Foreclosing important use:

Land pressure is low enough in the areas under consideration (long fallow periods are common) that the station can be created without being a real competition. The station would be placed on land which has been in fallow for some time.

Impact rating: none to little.

4. Jeopardizing man or his works:

The project is designed to improve, through the generation of relevant information, the works of man and reduce his insecurity within his environment.

Impact rating: none.

5. Construction (Analysis of the effects of constructional land-clearing element of the project even though most will not be funded by AID)

The following buildings have been or will be constructed by the Project: five staff houses, one rest house, two laboratories, one stove house, one work shed, one drying floor, one garden house, and one generator house. Buildings have been and will be constructed on a laterite cap on the highest part of the station. Inasmuch as the buildings are poised on this rocky outcropping with very little natural cover, no negative environmental impact is foreseen. Indeed, planting and irrigating trees and shrubs at this location should provide cover, reduce temperatures, and generally improve the barren ecology which presently exists.

Furthermore, the laterite cap is thick, three to four meters, and is underlain by very fine kaolinitic clays of low permeability. Therefore, waste water passing into the deep (about 60m) and low-permeability superficial aquifer will be minimal or nonexistent and could pose no threat to existing village water supplies in the area.

Water for this station itself is to come from a deep aquifer (about 150m) approximately 1.5 km from the station. This aquifer is apparently stable, fed from the Bani River. Villages in the area obtain their water from a superficial aquifer (about 20m) which will be unaffected by water drawn from the deeper aquifer.

Impact rating: None to beneficial.

5.4.2. Water quality

1. Physical state of water:

the improved use of rainfall is clearly part of the goal of the project. Improved agronomic techniques would facilitate the infiltration, retention, and use of the naturally available water.

Impact rating: none.

2. Chemical and biological status of water:

these factors will be monitored as a regular part of the conduct of research on the station. EPA approved pesticides will be used in small amounts during the life of the project. Before the project begins a risk/benefit analysis will be done. In as much as this research should bring about improved agricultural systems which are stable over time the chemical and biological status of water available to these systems will be of some concern.

Impact rating little.

3. Ecological balance:

because seasonal rainfall is of interest, its more efficient utilization should improve the ecological productivity and balance.

Impact rating: none.

5.4.3. Atmosphere

1. Air additives:

the unimportant part insecticides and herbicides will play in the program will make their impact insignificant on the station. In the broader perspective the station is small enough that the use of any materials would have a negligible impact on the environment as a whole.

Impact rating little.

2. Air pollution:

insignificant amounts will be generated by the project.

Impact rating: none.

3. Noise pollution:

Noise levels generated will be insignificant especially when one considers the rural setting of the project.

Impact rating none.

5.4.4. Natural resources

1. Water use:

the improved use of available water resources will be a subject of research on the station. See 5.4.2. - 1., 2., and 3.

Impact rating: none.

2. Soil: 5.4.1. - 1. a), c) and e).

Impact rating negative.

3. Natural cover:

the natural cover is systematically destroyed and then allowed to regenerate as the farming system is presently practiced. One of the goals of the research to be undertaken is to more efficiently and conservatively manage this pattern. See also 5.4.1. - 1. d).

Impact rating little.

4. Local genetic material:

local genetic resources will be included in the breeding program.

Impact rating: none.

5. Local livestock resources:

livestock resources will be studied as a part of the farming systems, animal traction, and forage production activities on the station.

Impact rating: none.

6. Human resources:

farming systems which allow man to more efficiently and conservatively exploit his environment improve the exploitation of man himself.

Impact rating: none.

7. Irreversible, inefficient commitments:

the area itself is insignificant when compared to the total of the same type which is available. All foreseeable alternative applications would probably be much less profitable, particularly over the long run.

Impact rating negative.

5.4.5. Cultural

1. Altering physical symbols:

Impact rating negative.

2. Dilution of cultural traditions:

the station would have no direct effect on cultural traditions. While one might argue that research results on the station may considerably affect cultural traditions, indirectly, over time, it is also clear that the changes brought about as a result would improve the productive capacity of the land and thus the well being of the culture as it presently exists.

Impact rating: none.

5.4.6. Socio-economic

1. Changes in economic/employment patterns:

because of the small numbers of people involved on the station, many of whom are already functioning in the roles they would fulfill on the station, economic/employment patterns will not be directly affected. Research results which allowed a more efficient and stable agricultural production will increase the productivity per farmer and tend to reduce the number of farmers over time.

Impact rating: none.

2. Change in population: see f.1.

Impact rating: none.

3. Cultural patterns: see e.2.

Impact rating: none.

5.4.7. Health

1. Changing the environment:

because of the very small zone of intervention represented by the station itself there will be no direct impact. Indirectly over time, research results could point the way to considerably improving the environment from a health and nutritional point of view.

Impact rating negative.

2. Eliminating an element of the ecosystem:

understood in the goals of the station is the endeavor to better understand and exploit the ecosystem. Thus any elements eliminated, after research and reflection, would be eliminated to the benefit of man.

Impact rating negative.

3. Other factors:

more efficient agriculture emans more to eat per unit invested. More conservative agriculture gives consistency to this formula. Both provide for more to eat, and thus, in a part of the world where basic nutrition is one of the great limiting factors in human health, better health for the population as a whole.

Impact rating negative.

5.4.8. General

1. International impacts:

In as much as ICRISAT is a part of a larger international organization, promising techniques and varieties will be tested elsewhere to the possible benefit of these other areas.

Impact rating negative.

2. Controversial impacts: no controversial impacts.

Impact rating negative.

3. Larger program impacts:

Experimental results and materials from this project will provide a basis for extension and other activities for larger programs.

Impact rating: none.

4. Other factors: no other factors are foreseen at this time.

Impact rating: none.

5.4.9. Other possible impacts

When one places the corn production curve in the U.S. from the turn of the century on, next to the expenditure curve for research on corn production during the same period, one finds the two curves are roughly

parallel with the rise in research expenditures proceeding rises in yields. While one may argue that this has not taken place without certain sacrifices or changes in the agricultural environment in the U.S., it is clear that the global environmental effect of the increased production has been positive. One may assume that the potential for similar benefits to this part of the world from research are of a similar type and perhaps magnitude as well.

5.5. Recommendation for environmental action

The preceding discussion has indicated that the effects of the project will have no significant impact on the natural and physical environment. On the balance, its effect will be positive. No potential negative effects are foreseen which would not be reversible.

Chapter 6 - Modalities For Financing

As the mode of financing for the previous two-year ICRISAT project has proved efficient, expeditious and has operated with the concurrence of all concerned parties—ICRISAT, USAID/Bamako and the GRM, this mode shall be continued in the present project. That is, a grant shall be made to the International Crops Research Institute for the Semi-Arid Tropics to assist the GRM in implementing project activities. ICRISAT/Mali will be responsible for the financial management of the project and through its designated representative will act as controller for all grant funds expended on the project. Payments from AID to the grantee will be made by the direct reimbursement method, under which the grantee will submit vouchers with attached documentation (invoices, receipts, etc.) to the AID Project Manager, upon whose approval and certification a check will be requested for reimbursement. Such vouchers must be submitted monthly.

Chapter 7 - Project Management and Organization

7.1 Description of the structure of the project organization

ICRISAT Agronomist: Philip Serafini, M.S.

Responsibilities : Agronomy program and ICRISAT representative to the GRM.

ICRISAT Cereal Breeder: John Scheuring, Ph. D.

Responsibilities : Breeding Program

Administrative Assistant: Seydou Touré, ITA

Responsibilities : Administrative Assistant for the ICRISAT team.

ANNEX E (con't)

Land Clearing and Construction Analyses per State 115333

Land clearing. To date, all land clearing has been done utilizing local workers and traditional methods. Thus the potential environmental impact will be no greater than in the adjacent farmers' fields. Contour ridging and other techniques developed at the ICRISAT Center in India and elsewhere are to be systematically used to reduce, minimize or avoid soil erosion. Fields are to be placed so as to avoid slopes of greater than 0.5% wherever possible and appropriate contouring and bunding techniques as well as plantings will be used in the limited areas where slopes exceed this amount. Stump removal will not be practiced and trees normally a part of the cropping ecology will not be removed. It is likely that there will be fewer brushy species present the longer the fields are put under cultivation; however, because this is also the case in traditionally cropped fields, the environmental impact will be comparable to that in adjacent farmers' fields.

It is clearly the intention of the ICRISAT/Mali research staff to preserve an environment which is as consistent and relevant as possible to the local farmers' situation. The research station site was selected because of the presence of large units of uniform and contrasting soil types with non-erosive slopes relevant to the local agro-ecologies. Field layout has and is being undertaken with a view to supporting the ecological balance as it presently exists. Hand, animal traction, and small tractor cropping and land management techniques which are the same as those available to Malian farmers are being and will be used.

In those limited areas which are to be irrigated, land clearing will be more systematic. Woody species and trees will be removed. These fields are to be located on minimal slope areas (less than .15%). Most will be sprinkler or mist irrigated with the systems being designed for compatibility with the infiltration rate and water-holding capacities of the soils (presently under study) on which they will be placed. Where surface irrigation is to be used on some of the heavier, vertic type soils, the length of furrows and the drainage system will be designed and installed to minimize water loss and to avoid stagnant bodies of water being formed which would be the source of mosquitoes, etc. Impact rating - None to beneficial.

Construction. (Analysis of the effects of constructional land-clearing element of the project even though most will not be funded by AID). The following buildings have been or will be constructed by the Project: five staff houses, one rest house, two laboratories, one stove house, one work shed, one drying floor, one gardien house, and one generator house. Buildings have been and will be constructed on a laterite cap on the highest part of the station. Inasmuch as the buildings are poised on this rocky outcropping with very little natural cover, no negative environmental impact is foreseen. Indeed, planting and irrigating trees and shrubs at this location should provide cover, reduce temperatures, and generally improve the barren ecology which presently exists.

Furthermore, the laterite cap is thick, three to four meters, and is underlain by very fine kaolinitic clays of low permeability. Therefore, waste water passing into the deep (about 60 m) and low-permeability superficial aquifer will be minimal or nonexistent and could pose no threat to existing village water supplies in the area.

Water for the station itself is to come from a deep aquifer (about 150 m) approximately 1.5 km from the station. This aquifer is apparently stable, fed from the Bani River. Villages in the area obtain their water from a superficial aquifer (about 20 m) which will be unaffected by water drawn from the deeper aquifer. Impact rating - None to beneficial.