

PD AAC-176-81 82,

APR 7 1975

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR, AFRICA

THRU: AFR/DP, Robert Huesmann *RH*

FROM: AFR/CWR, David Shear *David Shear*

SUBJECT: Mali Crop Production

Problem: (1) Design of a crop production activity in Mopti initially under the Foreign Disaster Assistance Act of 1974 (\$1.5 million) and (2) programming from FY 1976 regular availabilities to support other crop production activities and water resource development training (\$400,000).

Discussion: Subsequent to Administrator Parker's visit to Mali in the fall of 1974 and the DAP Team in December 1974 it was decided that food production could be increased and skills developed initially through relatively small scale investment in irrigation and better dry land management practices. Similarly since water resources represent a significant yet largely untapped potential for increasing agricultural production, training at various levels of water resource planning and development seems appropriate. Such modest inputs could provide the basis for a broader dialogue with the Government of Mali leading to programs with greater sectoral impact. All this is especially true since, as a result of the severe drought which devastated Mali between 1967 and 1974, self-sufficiency in food production has become the highest development priority for the GOM and the U.S. Foreign Assistance Program in Mali. The technologies of new crops and varieties, better adapted crop cultural calendars, application of organic and inorganic fertilizer, and other technical improvements can lead to an increasing rate of production thereby permitting Malian farmers to assure themselves of adequate food supply even in years when harvests are far less than optimal.

A PRP developed in collaboration with various GOM Ministries was developed which includes food production projects in the Second, Fifth, and Sixth Regions of Mali. In addition a PRP for water resources development and management training was also developed in order to provide training to Malian officials in various aspects of water resource development. Both PRPs are attached.

On March 10, 1975, a Project Committee reviewed the two PRPs and raised a number of issues that require consideration prior to or concurrent with the development of the activities proposed. Minutes

175
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1,500,000
400,000
4,000,000
2,727,000

\$8,627,000

Special Sahel
1975/76

of the Project Committee meeting are attached. In sum, the Committee recommended that project design proceed on the Mopti portion of the proposal. However, the other crop production activities require significantly more data than is presently incorporated in the PRP. In addition the Committee recommended that the water resources development and management training proposal be included in the overall Mali Crop Production Project.

If approved, project design would commence for an expansion of Operation Millet, an existing AID-supported project in Mopti. Its goal is to increase production of millet in the perennially food deficit Fifth Region from a low of about 300 kg/ha in 1972 to about 600 kg/ha by 1978.

To date, AID has contributed to the Operation by providing Malian Francs generated by PL 480 sales from the Regional Grain Stabilization Project. Local salaries are financed from the GOM's own budget. As a result of the phasing out of the Regional Grain Stabilization Project in FY 1974 and thus the end of the flow of counterpart funds this year, the GOM has requested AID to consider a continuation and expansion of the existing program with grant funds. The new elements would be: technical assistance; participant training in the United States or third countries; construction of 400 km of rural access roads and limited housing facilities; the expansion of millet production into two new areas, Niafunke and Djenne; improvement of village water supplies in 14 villages; and the design of an improved credit program for project participants.

Total costs for Operation Millet are estimated at between \$5.5 and \$6.0 million over a three to four year period. Of this amount, the \$1.5 million from Special Sahel funds, if approved, should carry the project through the end of the third quarter of FY 1976.

Recommendation: That you approve the design of a crop production activity in Mopti under the Foreign Disaster Assistance Act of 1974 at a level not to exceed \$1.5 million and that you approve the programming of \$400,000 from FY 1976 regular availabilities to support other crop production activities and water resource development training subject to the resubmission and approval of a revised PRP. If this latter course of action is approved the Committee suggested that the PP Design Team for the Mopti activity also be charged with the revision of the PRP for the proposed FY 1976 production and training activities.

Approved *[Signature]*

Disapproved _____

Date 11 Apr. (1975)

[Signature]
Drafted: AFR/CWR: JAPatterson: jmcs 4/3/75

Clearances:

- AFR/DS: PLyman (subs)
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UNITED STATES GOVERNMENT

Memorandum

TO : SEE DISTRIBUTION

DATE: 4/3/75

FROM : AFR/CWR:John A. Patterson 

SUBJECT: Project Committee Review of PRPs for the Mali
Crop Production Project and Water Resources
Development and Management Project, 3/10/75

PARTICIPANTS: I. Coker, AFR/CWR
P. Lyman, AFR/DS
J. Welty, PPC/DPRE
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J. Patterson, AFR/CWR

The Project Committee reviewed the subject PRPs and raised a number of issues that require consideration prior to or concurrent with the development of the activities proposed.

Background

The Committee reviewed the evolution of AID's support to Mali noting that last spring during the Sahel Cereals and Livestock Seminar it was decided to concentrate our support on livestock activities. However, subsequent to the visit of Administrator Parker in the fall of 1974 and the DAP Team in December 1974 it was decided that food production could be increased and skills developed initially through relatively small scale investments in irrigation and better dry land management practices. Similarly since water resources represent a significant yet largely untapped potential for increasing agricultural production, training at various levels of water resource planning and development seems appropriate. Such modest inputs could provide the basis for a broader dialogue with the Government of Mali leading to programs with greater sectoral impact. The present proposals emanated from these findings.

Issues

1. While the Committee believed that project design could proceed on the Mopti portion of the proposal because of the relatively greater detail and data available and past involvement of AID in the activity there was some doubt expressed as to the viability



5010-106

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

of the other production-components. The Haute Vallee activity appears so small as to raise questions of the value of the effort and its future impact. This suggests additional consideration. It was decided that the Committee should recommend elaboration of that part of the proposal to provide more detail and more of a rationale for proposed AID support. Similarly it was felt that the Riz-Sorgho activity as described in the PRP required additional detail. It was noted that there were conflicting reports on the status of IBRD's support to the Riz-Sorgho activity upon which the AID portion would be based. Finally the Committee felt that there should be some indication as to the Italian role in the final design of any project the Agency may propose.

2. As is the case with most proposed activities in Mali the issue of external factors such as pricing, marketing and logistics, and GOM capacity to provide inputs and budgetary support were discussed. These factors will require special attention in the development of a PP.

3. There will need to be better identification of the actual beneficiaries of the project particularly in the Haute vallee.

4. The PP will need to provide more detail on the plans for a credit program as indicated on page 4 of the Crop Production PRP.

5. There was concern expressed over the magnitude of roads and housing to be constructed as shown in the PRP.

6. The Project Committee emphasized that any PP developed will require an evaluation plan and logical framework. In addition there will need to be an entry in the PP concerning the Percy Amendment and a clear reference to the work of other donors in this area.

Programming Approach

Subject to the provisions and caveats cited above, the Project Committee agreed to recommend the following approaches to an AID-supported crop production project in Mali:

1. That the water resources development and management training proposal be included in the Mali Crop Production Project. This is desirable in order to (a) link training immediately to those specific crop production activities which we may finance and (b) support linkages between those Government entities which are involved in long-range and short-term planning and implementation of crop production and water resources development activities. In addition, because the training proposal is so modest, from a management perspective, it would be convenient to combine the two proposals.

2. That AA/AFR approve the design of a crop production activity in Mopti for \$1.5 million from the Special Sahel appropriation. This could be thought of as Phase I of an overall crop production project as described in the PRP. Subject to the provision in paragraph 3 below, AA/AFR will also be asked to authorize \$400,000 for inclusion in the FY 1976 Congressional Presentation for (a) development of polders in the Riz-Sorgo area near Gao for production of sorghum and rice; (b) financing of irrigated perimeters in the Haute Vallee for integrated and varied agricultural production (rice, millet, sorghum, vegetables, etc.); and (c) provision of seminar-type training in various aspects of water resource development.

3. The Project Committee recommended that the PP could go forward on the Mopti activity, but that the PRP should be revised and re-submitted for the Haute Vallee, Riz Sorgho and training components.

4. In developing the PP the Design Team should justify the payment of per diem out of project funds for officials participating in any in-country training programs.

5. In designing the PP careful attention will need to be paid to the existing research and analysis undertaken in the past by the RDO/Dakar and REDSO.

6. The Project Paper for the Mopti activity will need to be developed as soon as possible for submission and review prior to June 30, 1975. The Committee suggested that perhaps at the same time, the Design Team could revise the PRP for the proposed FY 1976 production and training activities noted in paragraph 3 above so that the latter can be reviewed in Washington. An amended PP submitted for FY 1976 funding would then follow.

DISTRIBUTION

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MALI CROP PRODUCTION

PART I - SUMMARY

- A. Grantee : The Government of Mali
- B. Amount : Grant \$6,198,000 three years; estimated 5 years
Program \$8,875,000
- C. Purpose :

To achieve increased production and internal commercialization of cereals - millet and sorghum - in the 5th administrative region (Mopti Region) and to bring about certain complementary activities which will contribute to achievement of this purpose and contribute to greater overall productivity and better living standards in the area.

D. Project Description :

The project includes two distinct but closely related activities (a) one focusing on the agricultural aspect of increasing production and productivity, the "Operation Mills" activity, and (b) a second focusing on improvement of rural infrastructure and living conditions which will contribute to achievement of the production goal - improvement and maintenance of rural roads and improvement of village water supplies.

Building upon the "Operation Mills⁽¹⁾ Activity" - an activity of the GOM which has been financed by USAID through PL 480 counterpart funds and which has been in operation in certain portions of the proposed project area for the past two years - the project will intensify the production increasing activities in the existing Operation Mills Area and extend the geographical coverage to include essentially all of the area of the 5th Region wherein Millet and Sorghum are the principal crops (see map). The specific actions contemplated are: adaptative research; introduction and extension of use of improved tillage practices - animal powered plowing, cultivation and hauling; increased plant populations; timely weeding; use of improved seeds and seed treatments; use of fertilizer with emphasis on phosphates of local origin; use of animal manures and composts, rotation of cereals with legume crops such as ground nuts and cowpeas; complementary production

(1) Mills in Malian usage is plural and refers to millet, sorghum and fonio (a species of digitalis which is widely consumed as a cereal grain), not only to millet as translated in the FRP.

of vegetables where conditions are particularly favorable; expansion of availability of credit in kind, particularly for procurement of agricultural implements and fertilizers; training of personnel; complementary but related activities such as improvement of village water supplies in the desperately needy areas; improvement of priority rural roads, and improvement of blacksmith shops which exist in most villages.

Being a low cost, broad based and extensive approach, effective implementation of this project will not bring about a dramatic increase in production, nor large improvements in living standards for any one farmer. However, given the existing very low level of productivity and the low levels of living standards, even small marginal improvements will have a significant impact on the population involved - presently approximately 250,000 persons, but expanding through the life of the project to about 500,000, representing approximately 60,000 families or production units. On the economy of the country as a whole the impact will be very significant in that it is expected that increases in production and productivity will yield important amounts of surplus grain (grain production is expected to increase by about 7,000 tons the first year of the expanded program, and 30,000 tons per year by the 5th year) which will be marketed in deficit areas which because of ecologic factors cannot produce grain in sufficient amounts to satisfy the needs of the populations.

The introduction of a rural infrastructure element as a companion effort to the crop production element contributes both directly and indirectly to the achievement of project goals. It makes a direct contribution by facilitating the evacuation of surplus grain and the provision of inputs and releasing large amounts of women's labor now involved in extracting water from meager sources. Furthermore, it provides many indirect benefits by laying a foundation for a broader integrated rural development project within which health and rural education initiatives will be more easily attached.

Although more dramatic results in grain production could be achieved by developing the river deltas for production under controlled or semi-controlled irrigation, such projects will require very heavy capital investment. Because of limitations in managerial capabilities - not to mention the probability of significant gaps in the knowledge of how to deal with the problems of water management in the delta - the rate at which such projects can be effectively pursued will remain low for some time and the numbers of individuals who could profit from such developments will also remain relatively low.

The project is designed as a five-year project with an estimated overall cost of \$8.875 millions. AID funding, however, is proposed

for the first three years at a level of approximately \$6.2 million. Contributions to the two broad activities are separately budgeted since the GOM management and budget allocation for these will be from two separate administrative units.

The U.S. contribution to Operation Mills will be about \$3.2 million during the first three years. Initially the GOM inputs into the Operation Mills activity will consist of only salaries and allowances for GOM personnel and will represent about 15% of the first year costs. Continuation of funding of salaries and allowances supplemented by receipts from revolving funds (described in greater detail in the budget summary) will result in gradual increase in the GOM contribution such that through the fifth year the GOM will have contributed about 60% of the total cost. After the fifth year (the eighth year since the inception of Operation Mills) external financing will no longer be required.

For the rural infrastructure element the U.S. contribution will be approximately \$3.0 millions and will consist of equipment for a rural road improvement and maintenance brigade. The GOM will pay operating cost of the brigade including salaries and allowances of Italian supervisory and operational personnel. The rural roads brigade for improvement and maintenance of rural roads is a new concept which has been successfully employed in a two-year period in Operation Coton and Operation Archice areas with financing from the FAC and the IFRD. The brigade will be under the direction of a special rural roads bureau within the GOM Public works service. The brigade will be used in the cercles of Bankass and Koro - the two more important cercles in Operation Mills in terms of population, area in cultivation and relative isolation from adequate roads. Approximately 470 kms. of roads will be affected during the first three years.

The Director of Operation Mills will establish priorities on roads to be improved in terms of use of roads for evacuation of cereals and transportation of inputs. The initial cost of the brigade equipment (from U.S. sources) will be approximately \$926,000. Operation and maintenance costs during the first three years will be \$756,000.

A village water supply element will be established to improve water supplies in the villages in the Cercles of Bankass and Koro by deepening and improving of existing dug wells and as necessary by construction of new dug wells. Six units, three for each of the cercles, equipped for complementing local labor in an essentially hand-digging operation will be established. The units will include essential

equipment and specialized personnel needed to support hand labor in hand-digging operations - compressors for dealing with rocks, pumps for evacuation of water during digging and deepening operations, pulleys, ropes, etc. for evacuation of dirt, etc. The well openings will be concrete-lined, rimmed and covered as a health measure. These well-digging and improvement units will work under the technical and managerial direction of the Rural Wells Bureau of the Hydraulics Services of the Ministry of Industrial Development and Public Works. Priorities in terms of villages to be served will be established by the Director of Operation Mills in consultation with the Chiefs of Cercles and Chiefs of Arrondissements. The cost of equipping and operating the six units over a three-year period is \$970,000.

An allotment of \$100,000 over a three-year period is proposed for procurement of simple basic blacksmith tools and materials, including round and bar steel stock, for improving the effectiveness of village blacksmiths.

E. Relation to GOM Policies and Strategies :

One of the important consequences of the Sahelian drought of the past several years was to impress upon the GOM the need to give greater attention to basic cereal crops production. Prior to the drought the GOM policies, and certain programs since independence emphasized production of industrial export crops to the almost complete neglect of basic food crops. As a consequence, an economy which traditionally produced a surplus of food for export gradually became a food deficit one. This was brought to a climax by the severe drought which reigned from 1969 through 1973, and which resulted in a serious gap between production and consumption requirements necessitating substantial grain imports at substantial costs. The achievement of self-sufficiency, as a minimum objective, in cereal grain production at acceptable consumer prices has now been established as a key element of GOM policy and strategy. The initiation of Operation Mills in 1972 was the first effort to implement this policy with respect to sorghum and millet, the basic food grains of the majority of the population. Significant changes in the marketing mechanism including two increases in the official buying price of millet and sorghum (from 18 MF/Kg in 1972 to 32 MF/Kg in 1974) by the GOM grain marketing agency (OPAM) has given added impetus to the program.

The project is consistent with the GOM five-year (1974-78) plan for the development of the Seno Plain and the Dogon plateau. These geographic areas constitute the major portion of the project area

F. Relation to AID Policies and Strategies :

In addressing the basic food production need of Mali, this project is directly responsive to AID policies and strategies in that (1) it seeks to reduce the dependence of the country on an ever decreasing world stock of cereal grains, (2) its focus is on one of the poorest countries of the world, and (3) the beneficiaries represent one of the poorest sectors if not the poorest significant sector of the Malian population. For example, whereas the average per capita GDP for the population as a whole is approximately \$70, that for the crop producing sector is on the order of slightly over \$20, while that for the grain producing sector is probably not more than \$15.

The project is also responsive to the incremental modular programming strategy adopted for the Sahel countries in that a primary food production project is complemented by an element for improvement of rural infrastructure which contributes both to achievement of the food production objective and to improving rural well-being.

Moreover, the project is responsive to the DAP in that it builds upon an existing "Operation" organization; an institution which has proven itself capable of providing applied research and extension information, credit, marketing, and production inputs services for a given major production program in a given geographic area.

G. Other Donor Coordination :

There is no other major donor activity in the project area which is specifically directed at increasing production of millet and sorghum. Certain other donor activities have some direct or indirect relations to the project: a FED financed seed and grain protection project; a UNDP/FAO proposed seed production project; a rice project financed by IBRD; small dam construction on the Dogon plateau with financial assistance from IBRD, FRG, and FAC; FAC assistance to research through IRAT and improvement of the Bamako-Segou road which is an important link in the road connecting Bamako and the project area with IBRD financing.

H. Budget Summary :

Table and appended footnotes present the proposed budget for the initial three years' financing as well as projections for the five-year life of the project.

From the management standpoint it is proposed that all contributions from both governments, except funding for personnel and

related personnel support, participant training in the U.S., and commodity procurement from the U.S. be contributed to a special project fund to be managed by the GOM Project Director subject to review and approval of plans and budgets by AID and appropriate GOM entities, following the pattern, in intent, established in the Mali Livestock Sector Grant.

H. Budget Summary

	<u>3-year total</u>	<u>FY 76</u>	<u>FY 77</u>	<u>FY 78</u>	<u>5-year total</u>
I. Agricultural production and development (Operation Mills and Culture Maraichere)					
\$1000					
A. U.S. contribution					
U.S. personnel	360	120	120	120	480
Commodities (capital)	480	273	78	129	758
Commodities (expendable operations)	750	221	251	278	834
Buildings & facilities	248	203	45	-	248
Agr. equipment and production inputs (1)	1015	247	341	427	2252
Training	63	18	22	23	113
Contingency	19	-6	6	7	35
Escalation 5%/yr/simple	288	54	86	148	1180
Total U.S. contribution	3223	1142	949	1132	5900

	<u>3-year total</u>	<u>FY 76</u>	<u>FY 77</u>	<u>FY 78</u>	<u>FY 79</u>	<u>FY 80</u>	<u>5-year total</u>
B. GOM contribution							
Salaries & allowances	647	196	216	235	270	323	1240
From revolving fund (1)	500		150	350	825	1280	2605
From molybdenum renewal fund (2)	90	24	31	35	42	48	180
Escalation on salaries & allowances 5%/yr/simple	66	10	21	35	54	81	201
Commission for procurement for OPAM (5 MF/Kg) (3)	295	73	98	125	146	170	612
Total GOM (4)	1598	303	516	780	1337	1902	4838
Protect totals (5) (includes U.S. totals & GOM salaries & allowances + escalation)	3936	1348	1186	1402			7341

	<u>3-year total</u>	<u>FY 76</u>	<u>FY 77</u>	<u>FY 78</u>	<u>FY 79</u>	<u>FY 80</u>	<u>5-year total</u>
% of total project cost from GOM budget (6)	16%	15%	18%	17%			17%
% of total project cost from GOM (7)	40%	22%	44%	55%			61%

II. Rural infrastructure

A. U.S. contributions

1. Rural roads

U.S. personnel

Commodities (capital)	926	438	488	-
Commodities (expendable operations)	570	102	234	234

2. Village wells

U.S. personnel	120	40	40	40
Commodities (capital)	488	195	293	-
Commodities (expendable operations)	266	46	110	110

3. Village blacksmith tools & materials

Contingency	250	80	90	80
Escallation	255	46	130	79
Total U.S. contribution	2975	1047	1385	543

	<u>3-year total</u>	<u>FY 76</u>	<u>FY 77</u>	<u>FY 78</u>	<u>FY 79</u>	<u>FY 80</u>	<u>5-year total</u>
B. GOM contribution							
Roads element							
Personnel salaries & allowances	186	54	66	66			
Village well element							
Personnel salaries & allowances	96	28	34	34			
Village blacksmith element	0	0	0	0			
Total GOM contribution	282	82	100	100			
Rural infrastructure totals	3257	1129	1485	643			
GOM contribution as a % of total	9%	7%	7%	16%			
Total project cost Operation Mills & rural infrastructure	7193	2477	2671	2045			
<hr/>							
GOM contribution from budgetary resources	929	278	316	335			
as a % of total	13%	11%	12%	17%			
GOM contribution from budgetary resources & recycled funds	1880	385	616	880			
as a % of total	26%	16%	23%	43%			

Total budget for 5 years for project Mills and
3 years for Rural Infrastructure 13,995
(it is assumed that the GOM will continue the
Rural Infrastructure activity with its own resources)

Footnotes:

(1) Agriculture equipment and production inputs will be distributed to farmers by Operation Mills on a cash as well as credit basis. Implements are provided on

a 3-year repayment basis while credit for fertilizers, seed treatment and seeds are repayable after 1 year. An interest charge of 4% per year is made in the 3-year credits. The figures reflect repayment of 50% of total credits beginning in the second year. The % of repayments increase each year reaching 90% by the 5th year. Subsequently repayments should approach 100%.

(2) Operation Mills follows a practice of providing mobyettes to agriculture agents and allotting a travel allowance to the users. Approximately 50% of this allowance is retained by the Operation for eventual replacement of worn out vehicles. This in essence provides a revolving fund for replacing mobyettes without recourse to new financing from GOM budgeting resources.

(3) In practice procurement of commercialized grain in Operation Riz (rice) is carried by the respective operation for the account of OPAM, for which service a commission is paid by OPAM. Operation Mills proposes that a similar commission be paid for its procurement operations for the account of OPAM.

(4) Figures represent total GOM contributions from budget allocation to Operation Mills as well as expected receipts. Footnotes 1, 2 and 3.

(5) Project totals represent total GOM contributions (footnote 4) plus the U.S. total contribution.

(6) Figures indicate GOM budgetary contributions as a percentage of total project cost.

(7) Figures indicate total GOM contributions - contribution from GOM budget plus receipts - as a percentage of total project cost.

BUDGET SUMMARY CONT'D
(\$000)

	<u>Total</u>	<u>Foreign Exchange</u>	<u>Local Currency</u>
U.S. Technicians	480	288	192
Commodities (1) (Capital)	1,894	1,704	190
Commodities (2) (Expendible)	1,586	1,271	315
Agriculture Equipment and inputs (3)	1,015	615	400
Buildings	248	62	186
Tools & Materials for Blacksmiths (2)	100	70	30
Training	63	13	50
Contingency (4)	269	179	90
Escalation (4)	543	362	181
GOM Salaries & Allowances	995	- 0 -	995
TOTALS	<u>7,193</u>	<u>4,564</u>	<u>2,629</u>

- (1) Off-shore procurement, local currency cost limited to inland freight.
- (2) Limited local procurement, local currency cost consists mostly of inland freight.
- (3) A substantial amount of local procurement from local fabrication and manufacture.
- (4) Since about two-thirds of total costs, excluding GOM salaries and allowances, represent foreign exchange costs the same percent figure of these items were allocated to foreign exchange costs.

PART II - THE PROJECT

Section 1. Project Background

The agriculture sector including livestock occupies the efforts of roughly 90% of the population of the country and contributed 38% (1) of GDP in 1972. The crop production sector accounted for about 21% of GDP and provides livelihood for approximately 60% of the total population. With an overall GDP of approximately \$70 per capita in 1972 (78 in 1974) it can be seen that the crop production has an average GDP per capita of only about \$21 in 1973 (\$24 in 1974).

The contribution of the crop sector amounting to about \$14 million in 1972 has declined in the past two years because of the effects of the drought resulting in (1) lowered production of export crops as farmers reduced the area planted in order to concentrate on cereal production for their own consumption (2) reduced yields of cereals due to the drought and (3) some decline in market value of export commodities in 1974.

The cereal crops sector contributed 17.1 billion MF at procurement prices to the farmer in 1972 or about \$15 per capita for the estimated grain producing population.

Thus, while Mali is one of the poorest countries in the World in terms of average incomes, the grain producers in Mali represent most certainly one of the poorest groups of population, in other words they are the poorest elements of one of the poorest populations.

These conditions are the consequence of technical/economic factors as described below.

The grain crops except for rice are produced as dry land crops through an extensive system of shifting agriculture with very low yields per unit of production and in which the limits in production are largely established by the following two criteria: (a) the area which a family can prepare and plant during a relatively short critical planting period after the first rains and (b) the area which they can weed properly.

Yields per ha. range from a low average production of between 300-600 kg. per ha. in the rainfall belts below 700 mm (28 inches) to 600-1000 kg. per ha. in the areas with higher rainfall. In the areas of lower rainfall millet is the predominant crop while in higher rainfall areas sorghum and corn assume considerable importance. Moreover, in areas of higher rainfall industrial crops, chiefly cotton and peanuts, are important and contribute to the higher average incomes of the rural population in these areas.

(1) This figure is given by the IMF report, Feb. 1975.
The Dap uses the figure 43%.

In spite of very low productivity Mali was a surplus grain producer during colonial period. Soon after independence, however, grain production in relation to population began to decline such that in about half of the years up to 1970 deficits in production of sufficient magnitude were registered as to require substantial quantities of imports. Several factors accounted for this shift, among which the more important are (1) increase in urban population at a faster rate than that of rural population, (2) expansion of production of industrial crops at the expense of grain crops in the more productive zones, (3) failure to bring about improvements in the rural production system. The first was a consequence of the rapidly expanding service sectors, particularly government services and to a lesser degree industrialization while the second was the result of a deliberate government policy to increase production of export crops for foreign exchange purposes. For this reason technical and material promotional and extension services for these crops were encouraged, production inputs were subsidized and near reasonable prices, (although frequently below corresponding world prices), were guaranteed to the producer. With respect to the grain crops on the other hand very little was done before 1970 to encourage production. On the contrary during most of the period, through control of marketing, prices paid to the producer were kept low, frequently as low as 1/3 of that in neighboring countries. As a consequence cereal production, excepting rice, continued to follow the time honored extensive system of production designed to satisfy family needs rather than for cash sale. Whereas about 70 to 80% of the industrial crop acreage in 1974 was worked with animal power, virtually all the dry land grain crop lands were still tilled with a hoe. Virtually no production inputs are used, few improved practices have been introduced and extension and information services rendered to grain producers have remained minimal.

The drought which began in 1970 created conditions which seriously widened the gap between consumption and production of the basic cereals and even began to have repercussions on the favored industrial crops sector. Heavy imports of grain were necessary in 1972, 1973 and especially in 1974 to cover the needs of the population. It is generally agreed that for the most part the grain producing population continued to be self sufficient with meager production supplemented by the traditional stock in storage. The imported grain therefore served chiefly to feed the urban population and the non-grain producing nomadic and semi-nomadic livestock producing population.

The drought and the considerable effort required by the government, with heavy assistance from numerous donors, to feed large segments of the population brought to the GOM the realization that the basic food grain producing sector could not be left to itself with the expectation that somehow or other it would continue to supply the food needs in the traditional manner. Moreover the need to make adjustments

in the price structure of cereal grains was recognized. In 1972 and again in 1974 increases in the price paid to farmers by OPAM were authorized. In 1972 the first significant "Operation" also was launched for the purpose of increasing production of millet and sorghum.

"Operation Mills" was constituted by governmental decree in May 1972. The structure of Operation Mills follows closely that of previously created "Operations" for promoting the production of cotton, peanuts and rice. In essence an "Operation" is an administrative structure through which extension and information services as well as credit and supply services are provided in a given area for promoting production of a given commodity. The "Operation" also provides a market for the farmer's product at a fixed price. The "Operations" created for promoting cotton and peanut production have been highly successful in introducing changes in the production system and the use of production inputs which up through 1973 had resulted in ever increasing production of these commodities.

"Operation Mills" was launched in 1972 with financial assistance from USAID through PL 480 counterpart funds. Three years financing (about \$1.5 million) was provided in annual installments and sufficient funds are committed to finance the existing program through Oct. 1975.

The "Operation" was started in two cercles (administrative sub-units of a Region) in the Mopti region (Region 5) and has since been extended to three Arrondissements (Administrative sub-units of a cercle) of a third cercle. The first operational effort in Operation Mills, after constituting a staff, (see organization chart), was to make socio-economic base line surveys of the areas to be included. These surveys recorded details on demography and agriculture including population, agricultural area, crops and areas of each, yields, production methodology, use of production tools, implements, animal power, other inputs, the existing research, extension, information, credit and supply and marketing services, etc. Thus a solid base of information was established from which the necessary technical and material inputs could be programmed and from which evaluation of the progress of the program could be measured.

The activities of "Operation Mills" include (1) establishment of a cadre of agricultural agents (see organizational chart) to reach all villages in the chosen area and who, working directly with a group of farmers selected as pilot farmers, carry out a number of improved production practices, including some pre-demonstrational applied research trials of potential but unproved practices or varieties; (2) places production equipment-plows, harnesses, carts; and inputs-seed treating chemicals, improved seeds, fertilizer-at the disposal of farmers on a cash or credit basis (in the first year of operation pilot farmers are provided the inputs

without cost) and; (3) provide a marketing outlet for surplus grain at the official price prescribed by OPAI. Operation Mills acts as the agent of OPAI in buying and stocking grain to be subsequently removed at OPAI's expense to deficit areas.

The improved practices which are being promoted include; (1) plowing, in line seeding, larger plant population, improved seeds, greater attention to weed control, use of fungicides for seed treatment, use of manure and composts, use of chemical fertilizers (especially phosphates) and rotation with other non cereal crops-peanuts and cow peas for which improved varieties are available.

Two years of field operation have been completed in 15 arrondissements of the circles of Bankass and Koro and one years operation has been completed in three arrondissements of Douentza cercle. Subsequent expansion of the project will extend the operation to 5 arrondissements in Nopti cercle, 5 in Douentza cercle, 3 in Bandiagara cercle, and 2 in Djenne cercle, or essentially all of the significant millet and sorghum producing areas of the Nopti region. (See map).

The results to date have been very satisfactory. An effective administrative structure has been established to manage the operation and a staff of agricultural agents has been assigned to the larger villages or groups of villages. A technical staff of 135 is currently assigned in 18 arrondissements. A striking difference was observed in the attitudes of the extension personnel in areas covered by the "Operation" as contrasted to those not yet included. The agents in the former areas were enthusiastic, well informed about conditions in their respective areas and displayed a strong sense of purpose, while the latter were uninformed and apparently drifting with little notion of what their job was, or sense of purpose.

The accomplishments in terms of increased production are not easily evaluated because of changes in the rainfall patterns, however, it should be noted that the projected official commercialization of grain in the crop year 1974-75 in the project area was surpassed by about 35%.

Increasing demand from farmers for agricultural equipment and inputs have been noted and an expansion in number of compost pits has occurred in spite of the problem of water shortages during the dry season. Demand for seeds of rotational crops-peanuts and cow peas - in an area in which the single crop culture of sorghum or millet had been traditional, has exceeded the available seeds supplies.

The present project proposal is based upon these satisfactory experiences with Operation Mills. The proposed USAID funding will make it possible to continue Operation Mills and expand the area of operation to essentially all of the millet and sorghum producing areas of the 5th region.

While the Operation Mills project has focused on increasing productivity and production of millet and sorghum in the project area, attention has also been given and will be increasingly given to more widespread production of other crops in rotation with the grains, especially peanuts and cowpeas.

On the plateau area of Bandiagara cercle intensive market gardening is practiced by segments of the population which have access to small water impoundments. This vegetable gardening operation -- producing principally onions and tomatoes -- is an important supplement to the grain production activity of the population involved (about 26,000). Moreover, shipment of the produce to other areas, including export to Upper Volta represents a significant source of income for the area.

The expansion of Operation Mills to Bandiagara cercle will encompass this area and the services similar to those provided to millet and sorghum growers will be extended to the market garden farmers, who are millet-sorghum producers as well.

To complement the activities designed to increase productivity in the area and to take an initial step towards an integrated rural development approach, the project proposes to bring about some improvements in rural infrastructure -- roads and water supply. Road improvement and maintenance will be of particular significance as the increased production and commercialization of grain will require more effective means for evacuating grain for delivery to deficit regions. Experience with other Operations -- cotton and peanut producing operations in several areas -- leads to the conclusion that improvement of means of transportation is essential to increasing production. In those operations the approach has been to create rural road brigades, which operate under the supervision of the Public Works Service, and are charged with improvement and maintenance of roads in a given area. A similar approach is being proposed as a complement to Operation Mills.

Domestic water supplies are one of the more important elements which contribute to the quality of life and eventually to productivity. Because of the limited water supplying infrastructure in most areas in the project area, water supplies are not only frequently inadequate as to quantity but are usually seriously inadequate as to quality.

Moreover the production of water from the meagre sources requires a very substantial expenditure of human effort -- an effort almost entirely carried out by women. In order to take an initial step to remedy these deficiencies the project proposes to improve village water supplies in those villages where the need is most desperate.

A third element in the plan for improving rural infrastructure involves assistance for upgrading village blacksmiths. As more agricultural implements are utilized, village blacksmiths will play an ever increasing role in maintenance and fabrication of equipment and simple tools. An allocation of a modest sum for the purpose of providing tools and round and bar steel stock will provide an important impetus to the program for improving production through use of better farming implements. This will also support the efforts by Operation Mills for upgrading blacksmiths by training programs.

These rural infrastructure improvement activities are included in the project for the significant contribution they can bring to the objectives of the food production element. This approach is also consistent with the concept of the incremental modular program development strategy in that they add to the food production activity initial elements which could lead to a fully integrated rural development approach.

Other U.S. activities which are related to this project are: (1) a Sahel pest control project; (2) a Mali land capability project; and (3) a sociological study in the Dogon area of Mopti Region.

The project was identified as a potential project for AID support by a project team which examined a number of cereal production projects in December 1974. A PRP was prepared at that time which was approved by AID/W with respect to Operation Mills Mopti for more intensive study and preparation of a PP.

Increasing production of cereals in the 5th region is of particular importance in the GOM plans for achieving self sufficiency in cereal production since grain surplusses in this region provide a logical source from which to supply the perennially deficit 6th region. Moreover, since millet and sorghum are the principal crops produced in the 5th region, increasing production and commercialization of these grains offers the chief avenue for improving living conditions of a population of some 500,000 inhabitants.

While some donor assistance has been and will probably continue to be provided in this area, there have been no major donor undertakings

to specifically promote increasing production of sorghum and millet. The FED is financing a 3 year program of seed and harvest protection. This program involved the establishment of a local mixing and packaging plant for seed treatment chemicals which are prepared from bulk imports. The final product is packaged in amounts sufficient to treat ten kilos of seed or enough to plant one hectare. Treatment is carried out by the farmer before planting. The material is distributed through SCAER or directly to seed farms. Materials for treating 10,000 tons of seeds of sorghum, millet and peanuts are expected to be produced and distributed for the 1975-76 crop. Stocks of this material were observed by the PP team in the Operation Mils area.

A UNDP/FAO project, on a national scale, for increasing cereal seed production is under study. This project, however, concentrates most heavily on rice and will probably have little impact on the cereals in this project at least until new varieties become available which are substantially better than the local varieties which are being used. An ongoing project which will terminate in 1976 has provided facilities and training in cereal seed production for the seed farm at Samé (region 1).

Small dam construction being financed by the IBRD, FRG and FAC will increase water availabilities on the Dogon plateau and permit increasing the area and production of vegetables.

An IBRD financed water control project for rice production in the Niger delta near Mopti will have only limited impact on the project.

2. PROJECT ANALYSIS

a. Economic

(1) Macro Overview:

Mali is one of the world's poorest countries with a per capita income of \$60-70 and a national budget of \$63 million. (it is isolated geographically with its nearest port some 1,000 km from Bamako). Economic growth has been slow with an average increase in GDP in real terms of 3.3 percent in the period 1968-1972. During the drought years of 1973 and 1974 the GDP is expected to decline.

The structure of the economy has remained virtually unchanged in recent years with 43% of GDP being accounted for by agriculture, the secondary sector accounting for 14%, the commercial sector accounting for 25% and the public sector accounting for 11%. The main exports of the country are agricultural with cotton (31% of exports) being the leader followed by livestock, groundnuts and fish. Food products form the major import item with 25-35% of total imports being food in 1968-1972. During the period 1968-1972 the value of food exports roughly equaled the value of food imports.

(2) The Agricultural Sector:

The agricultural sector furnished livelihood for 91% of Mali's population and provided 76% of total exports in 1972. About 90% of the cultivated land is devoted to subsistence food grain crops of which millet and sorghum are the greatest importance. In 1973 about 750,000MT of millet and sorghum were harvested of which 25,000 were marketed via official markets.

(3) Cereal Crops:

Traditionally, Mali has been self sufficient in production of cereals, however the past 10 years have shown a steady increase in imported food grains resulting in a doubling of import requirements. Given the fact that the rate of population growth is believed to be increasing as a result of improved health measures, the import requirement is likely to increase substantially in order to maintain an adequate per capita availability. The alternative to increased imports, which would aggravate Mali's deficit balance of payments situation, is increased domestic production.

(h) Prices:

The pricing system is very complex both for the inputs and for the commercialized grain. Inputs are provided to "Operation Mills" by SONARA at heavily subsidized prices with the government paying up to 80% of the cost of production inputs and the farmer paying 20% of the real cost. Equipment is subsidized at a much lower rate. See Annex C for complete details.

The prices for millet and sorghum sold are even more complex with an administered price presently set at 32 MF by the price board, an economic farm gate price of 75 MF and a parallel market (black market) price which varies greatly both seasonally and between years. OPAM (Office Produits Agricoles du Mali) is the official marketing organization. According to the DAP, in the past the parallel market price has been running substantially above the official price, however, officials in the Mopti Region indicate that this year the "parallel market" price is currently below the official price due to a relative local abundance of grain and the closing of the Upper Volta border due to the border conflict which cut the Seno area off from a major market. The private traders price to farmers in May 1975 was about 20-25 MF per kilo and depending upon progress of the 1975-76 season the price is likely to drop further. Further details of marketing and the price situation are given in Annex C.

The official price has been increasing steadily over the past few years due to increasing pressure to maintain producer prices which would offer some incentive and also keep grain in the country.

Official Producer Prices of Millet/Sorghum

Year	1965	66	67	68	69	70	71	72	73	74	75
MF/kg	11	15	16	18	18	18	18	20	26	30	32

source: IBRD and AID/DAP

However this price is still well below the present economic farm gate price as calculated below:

FOB U.S. Gulf Port \$U.S.	110.78
Ocean Freight and insurance	38.00
CIF Dakar	<u>148.78</u>
Portage and shipping to Bamako	65.00
Economic value Bamako	<u>213.78</u>
Transport production areas to consumption areas and margin	
Economic Farm Gate	-30.00
	<u>\$183.78</u>
	75,319 MF/MT
	75 MF/kg

The system of prices for both inputs and marketed millet and sorghum is very difficult to evaluate completely since inputs are heavily subsidized (annual production inputs, fungicides and fertilizers at the rate of 80% subsidy - 20% farmer contribution) and market grain prices seriously depressed. Rough comparisons done to compare subsidized inputs and administered prices versus full price of inputs and the grain priced at the economic farm gate price as derived below showed that the farmer receives approximately the same return under each methodology (See Annex C). The biggest danger to the farmer at the present time is if subsidies were taken off the inputs, in particular fertilizers, while maintaining the low administered price for grain, a return to traditional culture would be required.

(5) Micro Economic Analysis:

If official prices were to rise to the economic farm gate price farmers could afford to pay the full price for recommended inputs only if he were able to harvest 7,000 kg. of millet from his 6 hectares of land area (1166 kg/ha) with no capital expenses to be repaid. A yield of 1500 kg/ha which Operation Vils is projecting will give the farmer a return to capital and labor of 157,350 MF which would give him a 10% return on capital, the ability to repay his equipment loan in 3 years and have 30,000 - 40,000 MF annual residual during the 3 years as a return to labor and management.

If on the other hand the administered prices are kept at 32MF per kilo the input prices must continue to be subsidized to maintain present price levels. Under the current situation of prices a yield of 1500 kg/ha on 6 hectares of land will allow a suitable return on investment, repayment of the equipment loan in 2 years and a return of about 20,000 MF for labor and management. If yields are 1200 kg/ha two years will be sufficient to repay the equipment loan with over 35,000 MF annual residual for a return to capital and labor (See Annex C).

b. Technical Analysis

The principal area in which Operation mills will be concerned is the Plain of Seno and the Wagon Plateau. The latter to a large extent consist of light sandy soil with limited areas of heavier clay soils. The rainfall ranges from about 500 mm to 700 mm, almost the entire amount occurring between June and October. Millet and fonio are virtually the only grain crops produced in the sandy soil area, while in the heavier soil sorghum is produced as well.

Most of the land is cultivated with the hoe and planting follows the traditional pattern of planting on hills from which the soil is removed at each of two weeding and finally the hill for the succeeding crop is formed between hills of growing grain. The hills follow a zig-zag pattern across the field at a spacing of one meter or more. Numerous stalks are allowed to grow on each hill.

Animal manure and compost are widely used, being deposited on the side of the hill before planting, and from which they are worked into the ground during planting and weeding operations.

Mixed planting of varieties of varying vegetative cycles are common and in some areas interplanting of cowpeas or less commonly ground-nuts and pois de terre (*Voandzeia Subterranea*) between hills of millet or sorghum is commonly practiced. These interplanted crops are important sources of food for the farming population just before the grain matures since these have shorter vegetative cycles and are eaten before the seeds are fully mature.

Crop rotations are rarely practiced other than the brush-fallow rotation which is widely practiced, with the frequency of rotation dependent upon population pressure in the land.

The grain is harvested when mature and fully dry by cutting off the heads. Storage is on the head in earthen bins. These are well constructed, raised from the ground, reinforced with timber and provide highly effective storage with negligible losses to insect or other pests. Stored grain can be kept for several years in this manner. Storage of one or more years of the family requirements of grain during good crop years is common, with selling or withholding of grain being determined by the crop outlook, usually shortly before the next harvest.

Research for improvement of millet and sorghum production has been carried out along the usual line of approach - improvement of varieties, study of effect of tillage and cultural methods, pest control, effects of manures and composts and of chemical fertilizers, etc.

Efforts to bring about genetic improvement of millet have centered largely on selection within populations of local varieties with limited efforts to produce new type by intervarietal hybridization and through the use of heterosis. Selection of short types have produced a number of varieties with a higher ratio of grain weight to stalk weight than that found in the local tall varieties. Selection for length of vegetative period has produced varieties of varying vegetative period. Varieties both local or improved are usually photoperiod sensitive. In general improvements which have been made have not brought about dramatic changes in yield potential. Increased yield potential of 15-25% has been the limit. Other changes - shortening of stalks and shortening of vegetative cycle has produced interesting material from the agronomic point of view, but these materials have found little favor so far with producers in the Seno plains or Dozon plateau area. To a large degree this is probably due to failure to carry out field trials on a sufficient scale to establish their utility and to make ample demonstrations in farmer fields for establishing or clearly demonstrating superiority. Field trials which were initiated under Operation Mills with a new early-maturing short-stemmed millet variety have shown much promise and demand for seed is emerging.

Studies on soil preparation, weeding, in line planting, seed treatment, increasing plant populations have provided a good base for defining a package of cultural practices which should produce greater yields. The more important elements of the package are (1) plowing with the first rains to permit in-line seeding, (2) establishment of a good uniform stand with an optimum population of 50-60,000 plants per hectare, and (3) treatment of seed with a fungicide to assure a high percentage of seed germination and healthy seedlings.

Extensive studies of response to manures, composts and chemical fertilizers have been carried out at research stations and to a more limited extent on the Seno plain. These tests have uniformly determined that phosphate is the most limiting nutrient element for millet, while for sorghum, nitrogen rapidly becomes limiting after the phosphate requirements are met. The response curves to phosphate application on millet shows a return of 22kg. of grain for each unit of P_2O_5 added between 0-40kgs. of P_2O_5 per ha. At higher levels the response curve drops off rapidly. With nitrogen the response is 4.5 kg. of grain for each unit of N between 0-100 kg. of N per ha., after the phosphate requirement has been met.

Extensive experimentation has been made with millet and sorghum as well as other crops on the use of ground rock phosphate of local origin. These tests have shown that, while the response to finely ground (200-300 mesh) rock phosphate is delayed, (little response the first year) on a 1-5 year rotation the response overall was essentially the same as that for the more soluble superphosphate when the ground phosphate is used at rates of approximately 3 times that of superphosphate in terms of P_2O_5 content.

With serious consideration being given to commencing a mining and conditioning operation at the phosphate deposits near Tilemsi, this source of phosphate fertilizers could become important in the Mopti area (see economic analysis sector for further treatment of the economics of fertilizer use).

Results with manure and compost depend in large measure on the degree of decomposition of these materials at the time of application and with respect to time of seeding. The effect of compost is neutral to negative during the first year of application depending upon the degree of decomposition.

The research base very briefly reviewed in the foregoing has permitted the development of packages of practice which are capable of increasing productivity by as much as 100% or more for the complete package which includes fertilizer applications equal to 45 kgs. each of P₂O₅ and N per hectare. Less spectacular increases have been demonstrated for less complete and frequently less costly packages with greater marginal returns - see economic analysis.

The practices involved are of such nature as to be applicable by the majority of farmers with little supervision once the practices have been demonstrated. The problems related to application of technology are more economic and logistic in nature than technical.

From the logistic standpoint experience with "Operation" in general and more specifically with Operation Mills suggests that logistics can be satisfactorily handled by the existing structure of Operation Mills if adequate infrastructure and equipment are provided and funds are made available on a timely basis. The project makes provisions for both of the conditioning elements; the rural infrastructure element of the project will facilitate transportation, repair and maintenance of agriculture implements and tools, and the increase in water supplies will release labor for other purposes and facilitate the compost making operation.

Credit-in-kind as practiced by Operation Mills will improve the economic setting by making it possible for farmers to acquire equipment and supplies which heretofore were out of the reach of most of the population.

The technical analysis of the rural infrastructure element is described in more detail in Annex A - Project Description. It suffices to point out here that on the basis of experience with similar activities in other "Operations" it is reasonable to expect that these elements of the project can be successfully executed.

c. Sociological Analysis

The data and thoughts for this analysis have been extracted in large part from an article by Jean Gallais entitled "The Dogon Farmers" and reports done by Dr. Michael Horowitz of REDSO/WA.

The majority of people in the project area are Dogons. The Dogons have shown a unique ability to adapt to a variety of circumstances and to maximize their scarcest resources. When the battles of the Malian Empire, the Ghanaian Empire and nomadic tribes were raging through the area the Dogons managed to survive on the cliffs above the Seno plain by utilizing very intensive agricultural methods. In more recent times intensive vegetable gardening using hand irrigation, soils often carried long distances by head basket to the gardens, and animal manures has become common. The experience of "Operation Mills" over the past three years has been that the farmers are very interested in utilizing the improved technologies and they have been coming with some of their scarce cash in hand to purchase equipment and fertilizers. This clearly illustrates the interest of the Dogon in improving their situation.

The fact that "Operation Mills" is primarily concerned with the production of staple food grains should make the operation attractive to the Dogon who, like most subsistence farmers, have primary concern for the production of food grains.

The farmers in the project area appear to be economically astute with reasonably good knowledge of selling prices both in Ouagadougou and in the Malian markets. They know the seasonal price fluctuations and will often hold grain in their own well constructed granaries until prices rise.

The animal traction components of the "Operation Mills" package appear to be in great demand as farmers are buying both plows and carts readily. Carts appear to be in greatest demand and were seen frequently all through the area by the project team. They were being used to haul water, dirt, firewood, items to and from market and people from place to place. Plows were seen occasionally but the plowing season had not begun as yet. The plow will be valuable to the farmer in terms of allowing an increased area of cultivation only to the extent that it decreases the amount of weeding that must be done since the weeding process is usually considered to have the greatest demand for labor.

The project will have an effect on the women in the project area. Firstly, the "Operation Mills" representatives indicated that most of their millet purchases were made in the amount of a calabash

full and that much of it was purchased from women thus moving women more into the commercial sector. Also the well components of the project will allow easier access to daily water needs for the women thus reducing her workload. Furthermore, since donkey carts were seen being used both for hauling water and firewood, which are traditional women's jobs, her workload will be reduced there also. The net effect will be to reduce the women's daily workload and at the same time provide her an opportunity to contribute to the economic wealth of the family by having more time for her kitchen garden and for marketing produce.

"Operation Mills" has conducted their own socio-economic baseline study in two of their cercles which forms a valuable base of knowledge about the project area and will undertake similar studies on areas into which it will expand.

Some results from this survey in two cercles are as follows:

<u>Element</u>	<u>Bankass Cercle</u>	<u>Koro Cercle</u>
Population	108,000	140,000
Farm units	11,924	16,150
Area in millet, has.	43,000	20,000
Millet area/farm, has.	3.59	4.30
Total cropped area, has.	54,469	81,619
Total cropped area/farm, has.	4.55	5.05
No. work animals	145	134
No. of carts	186	120
No. of animals drawing implements	65	136

More detailed sociological studies will be conducted during the progress of the project by a contract through REDSO/WA.

d. Policy

One of the effects of the Sahelian drought was to bring about a substantial change in attitudes of the GOM towards the grain production segment of the agriculture sector. Since independence and prior to the drought GOM programs in agriculture focused heavily on industrial/export crops both in terms of services provided and incentives through commodity and input prices.

Since 1972 the GOM has recognized the need to encourage cereals production and to provide better services as well as incentives to this sector. Thus in May 1972 by Decree "62/PG-EM "Operation Mills" was established to promote millet and sorghum production in the Monté Region (Region 5). USAID contributed approximately "1.5 millions in PL-480 counterpart towards launching this project. "Operation Mills" was the first significant effort to improve production of millet and sorghum and demonstrated a significant shift in attitude towards the population concerned with these crops. Other "Operations" had been previously established to encourage rice production.

Through "Operation Mills" extension services have been intensified in the project areas and the provision of agricultural inputs to farmers has been made possible. Also between 1972 and 1974 the buying price of sorghum and millet by OFM has been increased twice.

Although the current price of 32MF per kilo for millet and sorghum represents a price increase of about 75% since 1970 and has apparently been sufficiently high to encourage sale by farmers (the marketing goals for the crop year 1974-75 in the Operation Mills were surpassed by about 35%), this price represents about 80% of that for sorghum in the U.S. and less than 50% of that in neighboring countries. It is indispensable to at least maintain the current balance between prices for millet and sorghum and other agriculture commodities, for agricultural inputs, and the wage scales for the lower economic strata of the population. It would be desirable to have prices for millet and sorghum move up in relation to those prices, especially when account is taken of the nearly 120% increase since 1972 of wages paid to the lowest paid workers - those which depend mostly on sorghum and millet, and the substantial increases (about 65%) which have been accorded industrial crops since 1972.

The GOM provides production inputs at fixed prices through SCAER, usually at subsidized prices. At the 1974-75 price levels the terms of trade between inputs and grain were relatively favorable to the producer of grain. Since Feb. 1975, however, prices charged by SCAER have been increased by 35%. With a GOM policy of controlling both input and commodity prices, it will be important to avoid shifts in terms of trade which lowers the producer price for cereals in relation to other prices.

The current marketing practices of OPAM - and consequently reflected in Operation Mills procurement of grain - is to close the official marketing year on March 31. Since farmers frequently hold back reserves of grain until some indications can be had on the prospects of the next harvest - usually the amount and distribution of the rains in May, June and July - a considerable amount of grain may be offered for sale after the official commercialization season is past putting the farmer at the mercy of grain speculators. During periods of grain scarcity the farmer will frequently receive a price above the official price. However, as supplies begin to satisfy or to exceed demand at the local level drastic lowering of prices are likely to occur after close of the official marketing season. Some evidence that this does occur was observed in one area of the Operation Mills project in May 1975. It would therefore seem desirable to maintain the base price throughout the year.

Another aspect of policy which has an important bearing on the project is that of allocation of foreign exchange for procurement of agricultural equipment and inputs. The GOM has traditionally allocated sufficient foreign exchange for agricultural equipment materials and inputs since these were largely used for production of industrial crops which were exported and earned foreign exchange. The increased use of similar imported commodities for cereal production will result in a foreign exchange drain which will not be compensated by export earnings. Particular attention will be needed to assure that foreign exchange allocations are not so limited as to limit the availability of the required imported commodities.

e. Financial

GOM budgetary resources will contribute about 11% of project cost during the first year. This percentage will increase to about 17% by the 3rd year. However, through recycling of funds received from (a) repayment of loans by the farmers, (b) through use of reserves set aside from operating budgets for renewal of motylettes used by agricultural agents, and (c) commissions for procuring grain for the account of OPAM; the GOM contribution will increase each year such that by the third year the total GOM contribution from budgetary resources and recycled funds will be 43% of project cost. After the 5th year no external financing should be required - see budget summary table.

In order to assure timely availability of funds for project operations the creating of a special project fund is proposed similar in intent to that proposed for the Livestock Sector. The fund is intended to receive cash transfers from both Governments as well as receipts from project operations such as repayments of credit extended in kind, commissions for procurement of grain for the account of OPAM eventual commissions for procurement of other commodities e.g. peanuts for the account of SONILEX, deposits of amounts from travel allowances which are set aside for renewal of vehicles, etc. All funds destined

for project use excepting U.S. and GOM funds for paying personnel salaries and personnel related costs, training outside West Africa and commodity procurement from the U.S. will be deposited into the fund. These costs, however, will be included in determining overall project costs and in determining contributions from the two Governments.

The management of the fund will be vested in the director of Operation Mills under policy guidance and direction of the board of directors of Operation Mills. The Mali Development Bank, BDM, will be the depository for the fund in the manner as in the Mali Livestock Sector Activity.

Disbursements from the fund will be made by the director of Operation Mills in accordance with an annual working and budget plan. Semiannual working and budget plans will be established before each period which will become the basis for disbursements from the fund as well for deposits into the fund of contributions from GOM and U.S. grant funds. The semiannual plans and budgets will also reflect expected receipts from internally generated funds - repayment of credit, commissions, deposits against replacement of vehicles - etc.

f. Administration

(1) Agricultural Production Element.

Administration and management of the project from the AID standpoint will be vested in a project manager who will also provide technical guidance to the GOM project director as well as linkages to activities in other institutions including International Research Centers which may be of interest or may contribute to the development of the project. The project manager will be assigned in Mali on a full time basis and may be direct hire or contract. Other technical support will be provided by short term assignments of specialists or through existing programs and institutions supported by AID - TAB, 2IID institutions, International Research Centers, etc. No difficulties are envisioned in providing managerial and technical support for the project by AID.

From the GOM standpoint administration and management will be provided through the "Operation Mills" organization (see chart). This system of managing production oriented activities focusing on specific commodities in specified areas has been the chosen instrument of the GOM for promoting production enterprises and has been remarkably successful. The performance of the Operation Mills organization after two years of operation has been most satisfactory and is a tribute to the leadership and staff of the Operation.

The key figure in the GOM organization is the project director. The project director reports directly to the Director of agriculture and is responsible to the high level board of directors shown in the organizational chart. From the office director there is a naturally flowing chain of command through the chiefs of different administrative units; Chief of Sectors at the Cercle level, Chief of ZERS (Zone D'expansion Rural) at the arrondissement level and Chief of the Secteur de Base at the village or village group level, at which point direct contact is maintained with the farmer. A technical support staff is also provided through the chiefs of extension, of training, of agricultural machinery, and of personnel. Other support staff include the secretarial and accounting staffs.

Experience to date with Operation Mills provides reasonable assurances that the GOM will provide adequate management for the project.

(2) Rural Infrastructure element.

(a) Rural Roads.

The rural roads brigade which will be created for the Operation Mills area will be self-contained and will operate under the direct supervision of its chief engineer. The Chief of the Rural Roads Bureau of the Ministry of Industrial Development and Public Works will provide general supervision of the operations of the brigade. The establishment of priorities in selection of roads and the order in which they receive attention will be determined by the Director of Operation Mills in consultation with the Cercle Chiefs and the Chief of the Rural Roads bureau. This organizational structure has worked satisfactorily for the use of similar brigades in other "Operations".

(b) Water Well Team.

The six water well teams will be organized each with its own chief who will be responsible for the direct supervision of operations. They will work under the general supervision of "Operation Puits" of the Division of Hydrology and Energy of the Ministry of Industrial Development and the Ministry of Public Works. The Director of Operation Mills in consultation with the Cercle Chiefs and with the Chief of Operation Puits will establish priorities in terms of work assignments of the teams.

3. Project Implementation.

A. Implementation plans including flow charts of required actions are given as part of the description of the two project elements in Annex A.

B. Evaluation Plan :

Since in the earlier Operation Mills activity the initial field activity was to conduct a socio-economic survey of the areas involved a good base was established from which to measure progress and accomplishments of the project. As the area of action of the project is expanded similar surveys will be made before undertaking production promotional activities.

The socio-economic survey established base line data on populations, area, cultivated area by principal crops, production by principal crops, agricultural implements and work stock owned by farmers, use of improved production practices, seed treatment, composts and fertilizers. These will provide the basis for evaluating progress towards achieving the project purpose.

Operation Mills has already a well established system for reporting and evaluating performance. Annual work plans are established in terms of quantified targets for the several activities which are to be undertaken during the agricultural year. The work plan is supported by a budget indicating the expenditures which are anticipated in carrying out the work plan.

Annual review meetings at which the results of the preceding years operations are held in April-May to report on field operations (this appears to be a uniform practice in all Operations). The reports from the different field offices record accomplishments in quantitative terms on the various actions taken - experimental trials and demonstrations conducted and results, improved practices employed, improved seeds used, fungicide for seed treatments and fertilizers utilized, composts pits established, agricultural equipment distributed and acquired by farmers, work stock trained and utilized, amounts of grain commercialized, estimates of total production and production of complementary crops or crops in rotation-.

As the program for improvements of the rural infrastructure becomes operational the results from these activities will also be reported in like manner.

Change in staff-additions of agents - and training provided are also recorded.

Accounts of expenditures for equipment and operating expenses, of credit operations and of procurement operations are also rendered.

In essence these annual reviews will cover all aspects of the project and provide all the essential elements for evaluating progress of the program in relations with the projected plan of operation and expenditures. Data from these reviews also become a measure of improvement in the physical well being of the population.

These practices which have already been established by Operation Mills are believed to be adequate to assure a continuing evaluation of performance in the execution of the project.

4. COVENANTS

Agreement will be reached with the GOM for: (a) Assuring budgetary resources for paying salaries and allowances of GOM personnel; (b) providing land and building facilities not otherwise provided from external sources; (c) gradually increasing the allocation of resources either through direct budgetary allocations or from revolving funds so that the entire cost of project operation will be assumed by the GOM at the end of the 5 year period - Operation Mills has proposed a program for auto-financing of the project beginning after 1980; (d) assuring a continuing supply of foreign exchange for importing needed equipment and supplies and the maintenance of adequate stocks through SOGEM to satisfy the requirements of the project; (e) maintaining of equitable prices, within the government policies of fixing prices on essential inputs, at which equipment and materials will be sold to farmers; (f) continuing to provide a marketing outlet for surplus grain at prices which will bear an equitable relation to those paid for other agricultural commodities to wage scales and to equipment and input prices, and; (g) provide for establishing market outlets with protected prices for industrial or other crops which may be produced in rotation with the grain crops; and (h) assuring that the Rural Roads Brigade and the Water Well Teams created by the project will work in the project area for the life of the project.

5. ISSUES

Issues are of two kinds (1) those relating to GOM support for the project and (2) those related to GOM policies.

(1) In general practice in existing "Operations" which are supported by external financial resources - as far as can be ascertained all "Operations" receive financial support from the outside - the cost of the encadrement (Malian staff) including salaries and allowances as well as operating costs are financed by the donor - (FAC, FED, IBRD). It is likely that the GOM will desire that AID provide financing on similar terms.

USAID proposes to apply the same negotiating principles with respect to GOM contributions as were applied in the Mali Livestock Sector Activity.

(2) The incentive for farmers to produce grain for sale and consequently his attitude towards, as well as the economic capabilities for improvement of his productivity within the GOM system of controlling essentially all prices, is largely a function of price relationships. The substantial commercialization of grain in the Operation Mills area from the 1974-75 harvest bears witness to this thesis. A 35% increase in prices of all

agricultural equipment and supplies established by SCAER in February 1975, without any corresponding increase in prices paid to the farmer may sufficiently upset what was perhaps a "reasonable" balance with a resultant disincentive to produce not only grain but other agricultural products. Financiers of other Operations have also expressed this concern.

In the collaborative style, CDO/Ramako plans to maintain a continuing dialogue with the GOI on the subject of this intricate balance of prices between inputs, grain prices and cash crop prices.

PROJECT DESCRIPTION

The project setting is the 5th Region (Mopti Region) and will encompass most of the dryland agriculture area of the Mopti Region.

The project will involve two sets of related activities: (1) an agriculture production activity and (2) a rural infrastructure activity.

1. THE AGRICULTURE PRODUCTION ACTIVITY

The agriculture production activity will be essentially an extension and expansion of the "Operation Mills" project described in the background statement in section II-1 of the paper. It will consist of several types of activities carried out by an initial staff of some 130 technicians working in 3 cercles, 18 arrondissements and 120 villages or groups of villages and supported by a suitable staff of secretaries, chauffeurs, etc. The diagram in Annex (A) presents an outline of the structure of the organization. As the project expands through the period 1976-1980 the technical staff will expand by the addition of approximately 30 agricultural agents each year to reach a total of approximately 280 by the 5th year. The area covered by the project will expand to encompass 24 arrondissements in 6 cercles or essentially all of the sorghum and millet areas in the Mopti Region (Region 5). A population of approximately 500,000 individuals representing 60,000 families or family units and a cultivated area of 300,000 has. will be served.

Several integrated action programs will be undertaken throughout the area served:

(a) Applied research or pre-vulgarization testing of practices to test results and recommendations from local as well as external research organizations in actual farmers' field trials for confirmation of adaptability and utility to the local conditions. In practice 1-5 such tests will be carried out in each cercle. The trials will include testing of : (1) new varieties of millet and sorghum in the areas in which sorghum is adapted -- areas with heavier soils . Particular attention will be given to testing high lysine sorghum varieties which may become available through research programs, and of other crops which fit in a rotation with the grain crops -- cowpeas, peanuts, pois de terre, etc.; (2) recommended fertilizer practices with differing rotation systems and with different fertilizer materials including locally produced ground phosphate rock; (3) effects of different levels of plant populations including interplanting of legume crops with the grain crops on productivity; (4) different rotational patterns; (5) differing soil preparation practices including use of mulches and organic manure and composts; and,

(6) the possibilities of producing sorghum and/or millet as a second crop in floating rice areas in residual moisture after the rice harvest on the pattern which is practiced in the Mekong Delta. It is not the intent of the project to develop new varieties nor to develop new production methodology but rather to test under actual field conditions in the area by local farmers practices which have been developed and recommended by local and foreign institutions.

(b) Demonstrations of proven practices in farmer fields through the pilot farmer system developed in earlier Operation Mils program. Through a number of pilot farmers, usually 10 are chosen in each secteur de base (S.B.) (a unit of area comprising one or more villages covered by a single extension agent) proven practices are applied under close supervision of the agents. Agricultural inputs are provided on a gratis basis on the demonstration areas during the demonstration period. The demonstrations will focus on simple practices which can be applied by most farmers as well as more sophisticated practices which will require off-the-farm inputs. Use of natural manures and compost, seeding in rows, use of optimum plant populations, timely planting and weeding operations, rotations, plowing and cultivation with animal drawn equipment, use of seed treatments, use of improved seeds, use of chemical fertilizers are practices which are demonstrated.

(c) In certain areas of the Dogon Plateau in the Cercle of Bandiagara the applied research and extension demonstration activities will be extended to market gardening because of the significant role of market gardening in the agricultural production pattern of those areas. Special attention will be given to use of improved seeds, use of tools, better water utilization, improved handling and preservation of harvests and better market organization.

(d) Making available to farmers agricultural tools and implements as well as production inputs. These materials will be stocked at each S.B. and made available to farmers on a cash or credit basis. Three year credit terms at 4% interest will be given for implements while for production inputs the term will be one year with no interest. This operation will provide for the first time official credit to producers of the basic grains.

(e) In the project area Operation Mils agents will perform the function of procuring surplus grain at the official price for OPAM. Thus the farmer will be assured the official price for his surplus production. The purchased grain will be temporarily stored at the arrondissement level by Operation Mils until taken over by OPAM for transporting to grain deficit areas, chiefly the 6th Region. As

production of peanuts increases as a rotational crop it is expected that a similar arrangement will be made with SOMIEX for procurement of this crop at the official price.

(f) A training program at the local level will serve to upgrade agents as new practices become available for demonstration. This program will operate on a continuing basis through short courses and seminars at the level of the cercle headquarters for upgrading agents working at the village level. Because of the importance being given to the use of agricultural tools and implements a special section on agricultural mechanics has been established to provide training in the use of tools and implements, including training of draft animals. Training for blacksmiths will also be provided along with material inputs to facilitate local maintenance of equipment as well as local fabrication of simple tools.

Training for more specialized personnel, especially in the area of market gardening, will be provided by short term observation and training visits to specialized institutions and production enterprises in Mali or in other African countries.

Limited opportunities for training in the U.S., subject to solution of the language problem, will be provided for higher levels of personnel.

The U.S. will provide the services of one full time project manager. The project manager will be an individual with broad background in agronomy and in extension. He will serve in a technical capacity as advisor to the GOM project director assisting in; establishing and maintaining liaison with research and training institutions within Mali as well as in other countries, assisting in designing field trials and demonstrations, designing on-the-job training programs for local agents, determining the needs for special short term advisory services and recommending sources for obtaining these services, identifying needs for training outside of Mali and recommending means for achieving this training.

Approximately 10 man months of technical advisory services per year will be provided by AID through short term assignments of direct hire or contractor personnel. These will include chiefly agronomists, horticulturalists, soil scientists and entomologists. The project manager will also to the extent possible utilize consultants which may be available from International Research Centers and through TAB research contracts or 211D grant programs.

Field activities will be under the direction of the Director of Operation Mills. Working through a direct line of command to the

agricultural agent at the village level and supported by a headquarters staff, the Director will be responsible for carrying out the purposes of the project (see organization chart). The initial staff of 146 of which 130 represent technical personnel will increase to 280 plus additional support personnel to handle logistics, etc. The additional technical agents will be recruited and provided training within the "Operation".

Procurement of materials, establishment of stocks of production inputs and agricultural implements at points accessible to the farmer and other logistics will be carried out by the "Operation".

The technical support staff at Project Headquarters (Mopti) will work with the field staff and with advice from the U.S. project director and short term specialists in selecting pilot farmers, designing of demonstrations to be carried out on pilot farms, designing of simple experimental trials to be established in a few representative areas in the project area, follow through on experimental and demonstration plots including holding village meetings and field days to permit farmers to observe results.

Recycling training of all agents at the village level will be carried out each year.

Annual meetings at the cercle level will be held for reporting on the year's activities, evaluating results and for planning the next year's program.

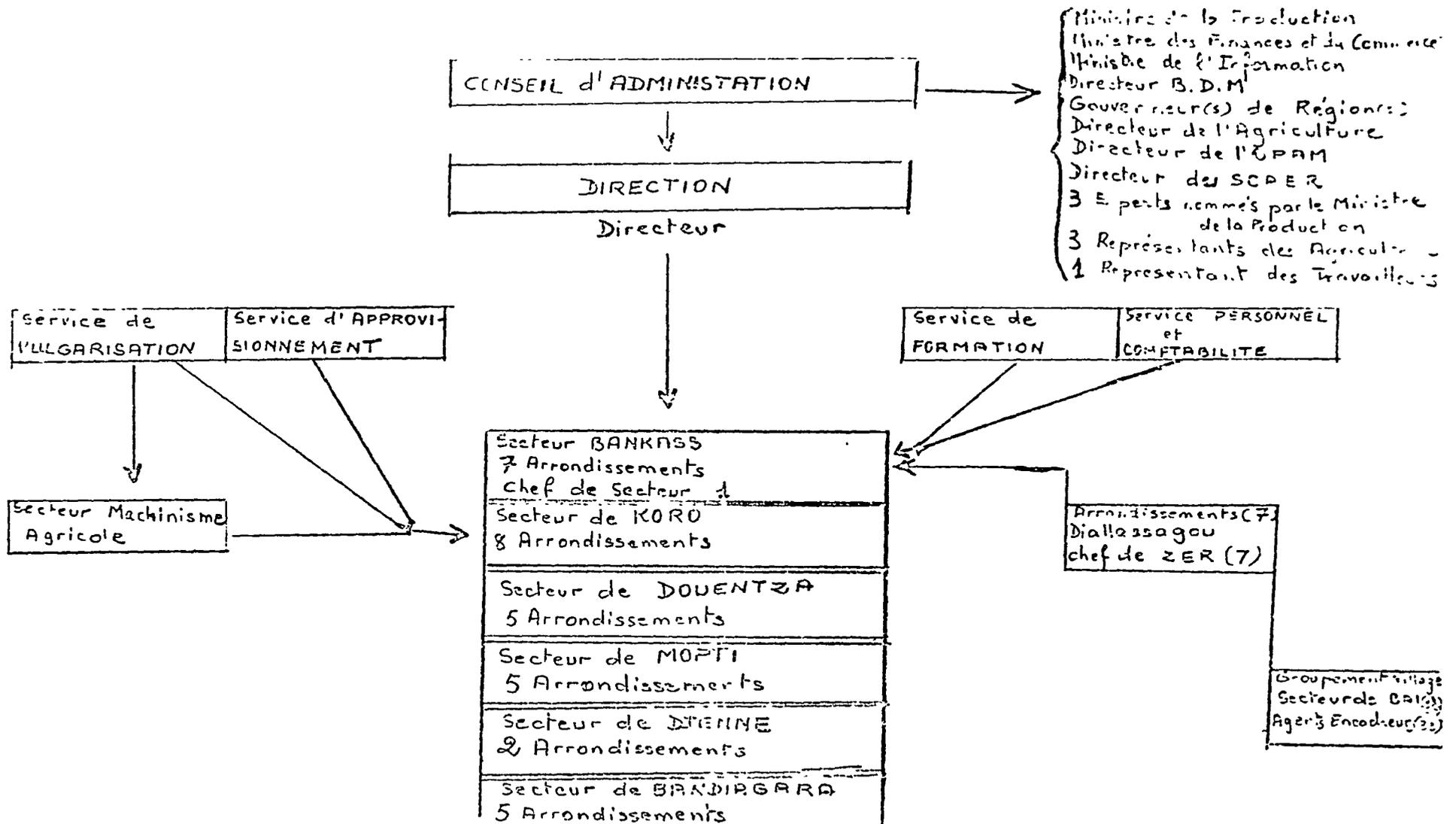
Flow charts of required actions are appended.

IMPLEMENTATION PLAN/COURSE OF ACTION
GOM ACTIONS 1st YEAR

	1975						1976												
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
Project Director on board with staff (146) Prior Operation Mills	X																		
Interim operations and financial plan prepared (Oct. - Dec. 1975)	X																		
Project fund established			X																
Recruitment of 30 new agricultural agents				X	X	X													
Training of new agents									X										
Socio-economic survey new project areas						X	X	X											
First year's operations and financial plan prepared					X	X													
First six months use of funds projected						X													
Re cycle training old agents										X									
Procurement vehicles and other capital items (1) (1)				X	X	X	X	X	X										
Procurement expendable and operations materials				X															
List and amounts of inputs and equipment needs provided to SCAER (1)					X														X 2nd yr.
Procurement vehicles and other capital items for 2nd year																			X -----
Inputs and equipment received from SCAER (1) delivered									X	X									
Inputs and equipment/to S.B. stores (1)										X	X								
Improved seeds obtained from IRAT (1)						X(vegetables)				X (grains)									
Field action program established (1)									X	X	X								
Experimental testing program established with IRAT (1)									X										
Pilot farmers selected and trained (1)											X								
Experimental field work with selected farmers(1)													X						-----
Intensive field work with pilot farmers	X												X						-----
Field work with other farmers	X																		-----
Sacks obtained from JPAM and delivered to S.B. stores				X	X	X	X									X	X	X	X
Financial projections for 2nd 6 months												X							
Grain procurement operations					X							X							X----->
Collation of results from trials and demonstrations							X				X								X->
Review and evaluation of results of prior crop cycle										X									
Operational and financial plan for 2nd year prepared																			X X X

(1) Refers to CY 1976 program, subsequent years will follow similar pattern.

ORGANIGRAMME OPERATIF DES SERVICES DE DEVELOPPEMENT RURAL



2. RURAL INFRASTRUCTURE ACTIVITY

1.0 - The technical feasibility of "Operation Mils" is related closely to certain infrastructure (logistical) activities - specifically, transportation and water supply. Transportation is limited to rural roads and pistes, while water supply includes dug and drilled wells.

2.0 - Rural Roads

The Road Planning Section of the Mali Department of Public Works (DPW) defines three classes of roads, as follows:

<u>Class</u>	<u>Capacity</u>	<u>Surface</u>
A	Over 4,000 T/year	Bitumen or gravel
B	1,000 - 4,000 T/year	Gravel
C	Less than 1,000 T/year	Earth

Except for the main axis Bamako-Mopti (612 km. of asphalt pavement), all roads in the project area are class B or C, with the preponderance in class C.

Type B: Limited wet season (June-Oct.) use; water courses crossed by low-level paved fords; 12 m cleared width 4.5 m surfaced with 15 cm compacted laterite. Construction carried out by New-Works Section DPW, with maintenance by regional centers (Mopti, in this case).

Type C: Dry season (Nov-May) only. Existing tracks improved by realignment, clearing and stumping as required. Laterite surfacing where necessary (i.e. sandy or silty patches). Low-lying sections and water courses packed with rock or gravel. Rock points and high spots removed. These roads are repaired and maintained by the Travaux Publics, in accordance with priorities established by the "Operation".

2.1 - The Chief of Operation Mils-Mopti has requested that the improvement of 467 km of Type C roads as shown below and on Map (page) be included on the Project.

<u>Priority</u>	<u>Route</u>	<u>Km</u>
1	Segue-Dialassougou-Sokoura-Wankoro	65
2	Bankass-Koundougou-Bai	55
3	Koro-Diougani-Douentza	160
4	Diougani-Dinangourou	60
5	Somadougou-Ouo-Bankass-Koporo-Koro	<u>127</u>
	TOTAL	467

The AID team submitting this paper has reconnoitred most of the roads involved. The repair and improvement of these agricultural roads is considered vital to the successful accomplishment of project purposes, and can reasonably be expected to be achieved within the time frame and funds contemplated for this project. They were selected on the basis of minimum cost and length to achieve maximum agricultural benefit, by improving transport conditions - both import and export - in the most critical areas of need. They will not only improve communications between farms and market centers, but will also reduce truck operating costs.

2.3 - The Directorate of Public Works (DPW) has the responsibility for administration, planning and maintenance of primary and secondary roads, and in 1973, created a special New Works Section to carry out rural road works financed by IDA and FAC for the cotton and ground nut "Operations" in other regions of Mali. Two special Agricultural Road Repair Brigades were created, each having the personnel and equipment to repair and improve about 200 km of rural roads annually. A recent report by DPW "Organisation de l'Entretien Routier et Amélioration de Pistes Agricoles - Plan de Campagne 1974-1975" dated March 1975 cites progress, accomplishments and costs to date in creating, training and equipping these Brigades. A study of that report, along with discussions with the Director General of Travaux Publics, lead to the conclusion that a somewhat similar special additional Agricultural Road Repair Brigade, with a minimum of heavy machinery, would be an acceptable strategy for accomplishing the rural roads program requested by Operation Mills, over a three-year period. On-the-job training will be the policy in the Brigade.

From an analysis of the above report, and after the field reconnaissance of the roads to be repaired and maintained, it is recommended that a special Agricultural Road Repair Brigade be created, manned and equipped especially for the type and amount of road work required for Operation Mills. Such a Brigade need not be as heavily equipped nor manned as were the IDA and FAC Brigades, since it will be working in easier terrain, and the repairs to existing pistes need not be to as high standards as achieved by the other two Brigades.

The personnel, equipment and estimated costs for such a road Brigade are as follows:

2.4.1 Personnel:

- 1 Engineer - Chief of Brigade
- 1 Technician - Unite (Drainage and Culverts)
- 1 " - Debroussement (clearing)
- 1 " - Rechargement (embankment)
- 1 " - Compaction (rolling)
- 1 " - Reprofilage (grading)
- 1 " - Mechanic

8 Equipment Operators
 14 Truck Drivers
 8 Mechanics and Assistant Drivers - Operators
 10 Drainage & Culvert Crew
 10 Clearing Crew
 9 Embankment Crew
 9 Grading Crew

75 Total

Total monthly cost for salaries of entire brigade estimated as MF 2,250,000.

2.4.2 Equipment:

	1975 Unit Est. Cost Hors tax	Total Est. 10 ⁶ MF
	<u>MF 10⁶ Ca.</u>	
1 Bulldozer (D-7)	50.0	50
1 Loader (or power shovel)	27.0	27
2 Graders	24.0	48
5 Dump Trucks (6 m ³)	10.0	60
1 Repair Truck	27.0	27
2 Tank Trucks ($\frac{1}{1}$ water) 10,000 l.	13.0	26
4 Liaison Vehicles	4.0	16
1 Heavy Trailer	10.0	10
1 Concrete Mixer	2.0	2
1 Lubrication Truck	8.0	8
1 Rubber Tired Tractor	3.0	<u>3</u>
	10 ⁶ MF total	277
15% spare parts		<u>43</u>
1975 Est. Cost (hors tax)	Total	320 x 10 ⁶ MF
(at 410 MF = \$ 1 US = \$ 780,000)		

Other Equipment:

Heavy Jack	1
Chain Hoist	1
Tents (10 man)	10
(4 man)	5
Motor Gen. Set 15 KVA	1
Mobile Compressor	1
Welding Set	1

Other Equipment (continued)

Water Pump	1
Tools, cables & hardware	lot
Pick up Trucks (404)	3

1975 Est. Cost (hors taxe)	=	60 x 10 ⁶ MF
(at 410 MF = \$ 1 US)	=	\$146,000

Total equipment	=	380 x 10 ⁶ MF
(at 410 MF = \$ 1 US)	=	(\$ 926,000±)

2.4.3 Based on experience with the similar brigades in other parts of Mali, it is estimated that once the brigade is on site and properly trained and equipped, it can repair an average of about 1 km of rural road daily. Allowing for holidays, equipment maintenance, rainy periods, equipment repair, and other factors, a rough planning factor of about 200 km annually is a fair assumption. Periods for moving from one site to the next must be allowed, also.

2.4.4 Materials and supplies

Once the Brigade starts operating, experience has shown that the following materials and supplies will be required monthly by local procurement, in order to work satisfactorily:

Monthly Material and Supplies Needs

Gasoline and Diesel Fuel	3,000,000 FM
Lubricants	100,000 "
Repair parts	1,000,000 "
Tools	1,000,000 "
Tires	200,000 "
Batteries	200,000 "
Expendable supplies	1,000,000 "
Communications and other	1,500,000 "

Total Monthly	8,000,000 FM
at 410 MF = \$ 1	(\$ 19,500) Equivalent

2.5 Implementation Plan

Using the planning factors determined above, a three-year schedule for organizing and equipping the Ag Road Brigade for Operation Mills, and repairing the most urgently needed roads in the area, follows. It will be noted that the Brigade will have accomplished about 40% of the 5th road during the three-year time frame of USAID funding.

12

	1975	1976	1977	1978	Roads-Schedule Operation Mile Schedule
Proj. Auth	S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	J F M A M J J A S O N D	
Equip Ordered	▽				
Personnel :	▽				
Recrutment & Eng Survey & Planning		=====			
Equip Arrives Mali		=====			
Move equipment to site n°1		=====			
Brigade Est. in Région V on road N° 1, ready to work			▽		
Repair road N° 1, 65 km		=====			
Move to N° 2			=====		
Repair Road N° 2, 55 km			=====		
Move to N° 3			=====		
Repair road N° 3, 160 km			=====		
Move to N° 4				=====	
Repair n° 4, 60 km				=====	
Move to n° 5				=====	
Repair n° 5, 127 km				=====	
Term. of AID Project				▽	

It is anticipated that, if necessary, other sources of funding can be provided to complete the fifth road repair project.

2.6 Budget

The funding required for the road repairs in Operation Mills area is summarized in the Budget Summary sheet. All costs were estimated in Mali Francs, as of January 1975, based on recent experience of the Public Works Department. Costs for equipment, supplies, materials, tools, etc. are less taxes, and are convertible to U.S. dollars, where appropriate, at the rate of 410 MF = \$ 1 U.S.

It is assumed that the heavy construction equipment would be procured in the U.S. using standard specifications already available in the Mali Highway Department. No procurement services contractor would be required, as the Highway Department has its own procurement division, which recently procured similar equipment, in a larger amount, under an IBRD-funded program.

The time phasing or cash flow as shown in the accompanying chart is derived from estimations of the periods during which actual expenditures will occur, in accordance with the Road Repair Schedule on Page 11.

2.7 Implementation - Personnel

The Mali Highway Department can furnish the 7 key personnel, plus necessary operators, truck drivers and mechanics, as shown in paragraph 2.4.1 above, in accordance with the Road Repair Schedule. The labor crews will be hired locally.

2.8 Supervision

It is contemplated that periodic visits by USAID direct hire or contract engineers can provide the necessary technical supervision, under the overall control of the AID Project Manager, and the Country Development Officer.

3. RURAL WATER SUPPLY

3.1 Rainfall in the region of Operation Mills (Mopti) averages between 500 and 700 mm annually, with all rainfall normally occurring during a 25 to 60-day period between June and September. Rainfall during the months October-May is practically unknown. Since 1955 maximum annual rainfall at Bankass occurred in 1956, and amounted to 860 mm, when rain occurred on about 61 days. Lowest recorded annual rainfall at Bankass occurred in 1970, and amounted to 443 mm, when rain occurred on less than 20 days.

3.2 The cercles of Mopti and Djenne contain large areas subject to inundation by the Niger and Bani Rivers. At Mopti, where the Bani and Niger converge, flow has varied from 85 m³/sec (elev. 261.1 M) at lowest stage, to 2800 m³/sec (elev 267.8 M) at highest stage. Except for a diversion dam at Markala on the Niger River some 300 km upstream from Mopti, both the Niger and Bani are uncontrolled, with the result that variations in river stages can be great from one year to the next. While not occurring in successive years, it is significant that the river at Mopti over a period of record of some 60 years has recorded a maximum range of 6.6 M (21.5 feet).

3.3 The cercles of Douentra, Bandiagara, Bankass and Koro depend practically entirely upon the sparse rainfall and groundwater for their supplies. Taking in consideration the limited funds available, the urgency of need, and priorities of "Operation Mills", the water supply activities in this three-year project will be limited to the cercles of Bankass and Koro.

3.4 During the period of extreme drought (1970-1973), villages and towns located away from the Niger and Bani Rivers (and even some of those in the flood plain) suffered severely from water shortage. Such villages and towns obtained their water from dug wells, many of which went dry. As a result of increased activity by the Government of Mali, and external donors, water development activities have been stepped up throughout the affected areas and in all aspects of water resources development.

The Direction de l'Hydraulique et de l'Energie in the Ministry of Public Works stepped up studies and planning in the two major river basins -- the Senegal and the Niger -- including the final design of two large dams, one in each basin, plus preliminary investigations for a large dam on the Niger between Tombuctu and Gao. OP - the water well office (Operation Puits) - was strengthened and expanded.

Foreign technical assistance in terms of both money and personnel was increased, particularly in the bureaus of surface waters, hydrogeology, water wells and dams.

With the limited resources available and the difficulties of transportation and field investigations, the Government of Mali is making commendable progress in research, field surveys, observations, development and management of its groundwater resources. A shortage of drilling rigs, with necessary ancillary equipment, and trained operators, exists in Mali but both the COM and foreign donors have recently provided several such rigs for research and exploration.

Before digging wells at a new location, it is wise to drill an exploratory small hole and run a test to determine whether water is present, its

level, quantity and its quality. Since most of the proposed new dug wells in the OM area will be at locations near existing wells, where the depth to water, quantity and quality are already known, it is considered that a drill rig will not be necessary for the well development contemplated in this project.

3.4.1 Situation in Mopti Region V

Mopti has the only municipal water system in the region. Its supply is obtained from the Beni River, and includes simple treatment facilities. All other towns and villages in Region V derive their water supplies from wells - mostly dug wells of about 1.5 to 1.8 M - diameter and depths from 8 meters to 70 meters, and usually concrete lined. Except for the three larger towns (Bandiagara, Bankass and Koro), where submerged mechanized pumps have been installed in driven wells, the villagers obtain their water - for themselves and their cattle, horses and other livestock - from the open well by means of a leather or rubber bucket of about 4 to 10 litre capacity on the end of a rope. Except for municipal systems, such as Mopti, there is generally no charge for water in Mali. Nor is there much attention or interest in water rights.

3.4.2 Some basic data obtained by the AID Project Paper team during its fields reconnaissance (ID - 25 May 1975) are tabulated below:

<u>Village</u>	<u>M³/hr Est. Capacity</u>	<u>Meters Depth of Well</u>	<u>Meters Depth to Water</u>
Sevare (UNDP) Forage	20	31	14
Gani do Puit	0.5	50	49 [±]
Bankass (Hydr) Forage	15	130	?
Dialassagou	1.0	27	26,5
Bai	0.4	65	65 (1)
Doule (2 wells) ea.	1.0	42	41
Toroli	.8	42	41
Koro Forage	5	195	187 (2)
Barapire (non operation windmill)	2.5	60	56 (3)
Madougou		41	40
Youdiou (2 wells)	3.0	41	40
Bandiagara (Forage)	40	?	?
Djenne (many wells)	1.0	14	13
Mounia (two good wells)	1.0	10	9

(1) Directory Hydraulic constructed a driven well at Bai which was never completed. Drill rig went to 60 m depth and then broke down. In 1973, villagers deepened their dug well to 65 m and found sufficient water for meager existence. (5 lit/day/capita). Bad water.

(2) Koro well has electric submerged turbine pump driven off a Leroy-Somer gasoline engine-generator set. Alternator provides 3.75 KVA, 3 phase, 180 volt (5.7 amp) power (3,000 rpm engine). Completed 4 July 1973. Operates 2-3 hours per day, providing $\pm 20 \text{ m}^3/\text{day}$. Very good water.

(3) At Catholic Mission - Barapire - windmill was not mechanically connected to pump. Three-man type lift pump (2 installed, 1 operating) was producing about 1 m^3 per hour, from 56 m depth.

3.4.3 In the project area, the Direction Hydraulique (DH) has recently completed two electrically driven pumped water wells (at Bankass and Koro) and attempted one unsuccessfully at Bai. Using the only available truck mounted "FATLING" rotary drilling rig in the area, DH is about to test a 31-meter deep $8\frac{1}{2}$ inch diameter borehole, in which the static water table is 14 meters below the surface, near the rice mill 12 km east of Mopti. It is expected that this well will produce 15 to $20 \text{ m}^3/\text{hr}$ with acceptable draw-down, using a submerged electric deep well turbine pump. The Malian hydrogeologic engineer on this well, will devote his efforts in the next few months to continued studies in the Dogon Plateau and Gondo plain, of needs and possibilities for additional groundwater development in the Operation Mills area of interest.

3.4.4 Planning factors for village water supply may be roughly estimated as follows:

Humans	30-40 liters/day/person
Cattle & horses	30 " " /animal
Goats and sheep	10 " " "

3.4.5 There appears to be no clear-cut set of criteria by which a decision can be made on the type of well to be constructed, even though the choice is between only the two types - dug wells and driven wells. The former are usually much lower in capacity than the latter and are much slower to build, especially in rock. Rough construction rates for dug wells of 1.8 meter diameter, lined with sectional concrete cylinders are 15-18 meters/month, with maximum practicable depth of 80-90 meters. Difficulty of obtaining and using explosives is also a significant factor.

The Water Well Office (Operation Puits - OP) of Direction de l'Hydraulique et de l'Energie, in the Ministry of Industrial Development and Public Works is responsible for investigations, planning and implementation of water wells throughout Mali. The OP is conducting field investigations, drilling and well development - on a limited scale - in the Operation Mills area now. Needs

have been evaluated in the area, and can be categorized as follows:

- Field investigations, including drilling
- New dug wells
- Deepening existing wells
- Drilling and developing high capacity wells
- Dams and reservoirs

It is not contemplated that the Operation Mills project will be involved in the development of any high capacity wells. However, in order to expedite field investigations in the area, and upon recommendation of OP, it appears that the procurement of a combination rotary-percussion type drill might be justified, but it has not been included in this project.

The Project Paper Team inspected a completed dam and reservoir, plus two under construction, on the Dogon Plateau, and discussed the program in the office of the Directeur de l'Hydraulique, and found that the dam and reservoir program is adequately planned, staffed and funded for several years into the future.

In view of the on-going OP field investigations now underway in the area and planning already done, it is believed that, for the limited requirements of Operation Mills, a ground water study and investigation need not be funded under this project.

New Dug Wells

Operation Puits has determined that the most urgent needs for new dug wells in the Bankass Cercle of Operation Mills area exist at the following sites:

<u>Site</u>	<u>Diam.</u>	<u>Est. Depth</u>
Kani Bonzon	1.8 m	50 m
Segue	1.8 m	60 m
Diallasagou-Djimindo	1.8 m	60 m
Bankass-Gendarmerie	1.8 m	60 m
Sokoura	1.8 m	60 m
Worj	1.8 m	60 m
Bai	1.8 m	60 m

For constructing such new wells (and also deepening existing wells) OP has procured a percussion type bucket especially designed for such work, but lacks a truck mounted derrick and compressor on which to mount the bucket. It is proposed to finance the procurement of such a truck mounted derrick, with compressor, in order to provide a more effective tool for building and deepening water wells in the Operation Mills area. Estimated cost is 16,400,000 MF.

Deepening Existing Water Wells

Operation Puits has determined that the most urgent needs for deepening existing dug wells exist at the following sites:

<u>Site</u>	<u>No. of wells</u>	<u>Diam.</u>	<u>Average deepening</u>	<u>Total M.</u>	<u>Ave. exist. depth</u>
Bankass	4	1.8 m	5 m	20	33 m
Kari-Bonzon	2	"	"	10	20 m
Diallassagou	2	"	"	10	20 m
Segue	1	"	10 m	10	32 m
Total	10			55	

Implementation

As a result of long experience, OP-GOM uses the following planning factors in the area under consideration:

A team of 10 men, including Chief Well Mason, plus Assistant Mason with 8 trained workers, assisted by unpaid unskilled local villagers, can excavate about 225 meters of hole, at an average finished diameter of at least 1.8 meters, in one year. This length of well hole can be either new well, or the deepening of an existing well. For the area under consideration, it is assumed that 150 meters will be in rock or formations requiring blasting, and 75 meters will be softer material.

Such teams are usually organized in groups of three to work in an area the size of the cercles of Bankass and Koro. Certain trucks, equipment and personnel can be used to support three teams, with resulting savings in cost. In this case there would be two mechanics, provided by the GOM at no cost, plus two truck drivers in support of each three teams. The water well digging team personnel, and their costs are presented in the following table:

Water Well Digging - Personnel & Salaries

Each Well Digging Team:

1 mason	32,500 MF/month	x 12	=	390,000 MF
1 mason assistant	25,500 " "	x 12	=	306,000 "
8 well workers	13,500/mo	x 12 x 8	=	1,296,000 "

+ villagers at no cost

TOTAL	1,992,000 "
USE	2,000,000 MF/y.

For each Cercle there will be three teams, as above,

Hence: $3 \times 2,000,000 = 6,000,000 \text{ MF/y.}$

PLUS:

2 mechanics - at no cost

2 chauffeurs C $32,500/\text{mo} \times 12 = 780,000 \text{ MF/y.}$

Total annual cost/cercle = 6,780,000 MF/y.

Personnel/cercle/yr USE - 7,000,000 MF/year/cercle

2 cercles - 14,000,000 MF annual personnel costs

Using the above planning factors, it is estimated that each Cercle (Bankass and Koro) can be provided with new dug wells and deepening of wells, annually, as follows:

	<u>New Wells</u>		<u>Deepening</u>		<u>Meters Total</u>
	<u>No. of Sites</u>	<u>Meters Depth</u>	<u>No. of Sites</u>	<u>Meters Depth</u>	
Team No. 1	3	55	6	10	225
Team No. 2	3	55	6	10	225
Team No. 3	3	55	6	10	225
					675

Thus assuming about 2.5 years of effective work (allowing for mobilization and for moves, etc) about 1700 meters of new or deepened dug wells could be produced in each Cercle, during the AID funding for this project. This assumption is justified when the period required to order and deliver equipment to Bamako and thence to the field sites is considered. Also, the period required to recruit, train and move the personnel to the field sites will result in no more than 29 to 30 months -- at most -- of productive field work during the 36-month duration of the AID-funded project.

The equipment required for a group of three teams, as described above, i.e. the equipment required for each cercle (Bankass and Koro), is shown on the following Table, along with estimated costs. These costs are 1975 prices, delivered Bamako, Mali, without tax, as determined from actual bids received recently, for identical equipment.

Operation Mills - Water Wells
Equipment for 1 Cercle Well Digging Group
 (Each group consists of 3 digging teams - 8 men/team)

	<u>Quantity</u>	<u>Unit Price</u> <u>M.F.</u>	<u>Total Cost</u> <u>M.F.</u>
Land Rover Long Wheel Base	1	4,500,000	4,500,000
Truck 5 Ton 4x4 w/winch	1	14,500,000	14,500,000
Truck 2 ton 4x4 w/winch	2	12,000,000	24,000,000
Compressor - 4,000 litre 7 kg/cm ²	2	11,000,000	22,000,000
Compressor - Piping and Fittings	Lot	2,000,000	2,000,000
Air Hammers w/attachments	3	400,000	1,200,000
Connectors and controls	Lot	2,000,000	2,000,000
Air Drills w/attachments	6	200,000	1,200,000
Bits, spades, hoses and fittings	Lot	6,000,000	6,000,000
Grinders and sharpeners	Lot	1,000,000	1,000,000
Pneumatic winch, w/wire rope	2	900,000	1,800,000
Well lining sets 1.8 M ϕ	2	1,100,000	2,200,000
Shaper and Trimmer 1.8 M ϕ	1	350,000	350,000
Perforated Bottom Ring form 1.2	2	600,000	1,200,000
Cylinder 1.5 M ϕ - 3M long	2	450,000	900,000
Guide Hooks and Chain Fall w/pul	1	200,000	200,000
Telescoping Shear legs (Derrick)	3	200,000	600,000
Self empty Exc. Bucket	3	60,000	180,000
Tank Trailer, 2,000 litre	1	1,200,000	1,200,000
Grip Hoist - complete	3	150,000	450,000
Blasting Machine, w/wire	5	200,000	1,000,000
Ohm meter	1	100,000	100,000
Safety Belts and Hats	15	22,000	330,000
Face Masks	10	1,000	10,000
Rope, Sisal meters	200	2,500	500,000
Pump, Drainage, w/hose & access.	3	700,000	2,100,000
Additional hose and fittings	Lot	1,000,000	1,000,000
Tools and Extras for Heavy Trucks	Lot	800,000	800,000
" " " Light "	Lot	800,000	800,000
Spare Parts	Lot	3,000,000	3,000,000
Tents and Explosive Storage	Lot	1,000,000	1,000,000
Elevating Platform	6	50,000	300,000
		Total	98,420,000
Contingency			<u>1,580,000</u>
			100,000,000 MF

Note: All costs exclude taxes and duties.

410 MF = \$ 1 U.S.

Materials and Supplies

For each Cercle - the GOM estimates annual costs for Materials and Supplies annually:

(For all 3 working well digging teams)

Fuel and lube	8,500,000 MF
Well materials (cement, lumber, etc.)	6,000,000 MF
Explosives	6,000,000 MF
Expendable tools and misc.	2,000,000 MF
	<hr/>
	22,500,000 MF/year

Procurement

The Bureau in "Operation Puits" of the Direction de l'Hydraulique in Bamako has the responsibility, and the capability, to procure quickly, the equipment necessary for the water supply activities contemplated in this project. As a matter of fact, bids had just been received in that Bureau for almost identical items, in similar quantities, a few days prior to visit of the Project Paper Team.

Except for a few minor items all equipment, materials, supplies and tools will be procured outside Mali, as practically nothing of this type is produced locally.

It should be noted that procurement, transport and supply of commodities, especially to remote areas in Mali, is an expensive and time consuming operation. Shortages in such commodities as gasoline, diesel fuel, cement and explosives could seriously delay progress of this water supply program. However, the Project Paper Team is cognizant of this situation and allowed for it in the cost estimates and progress schedules.

Schedule

There is a tradition in Mali that road and field work outside town slows practically to a stop for about two months during the height of the rainy season. Assuming this project were approved about 1 September 1975, and the equipment ordered shortly thereafter, it is possible that the equipment could arrive in Bamako and be forwarded to the field working sites near the start of the rainy season. While the rains do sporadically interrupt good working conditions for short periods, and cause transportation difficulties, they also reduce the intense heat. It is suggested that it behooves the GOM to investigate the possibility of continuing field work throughout the short, so-called "rainy" season.

A tentative schedule for implementing the water supply aspects of the project can be estimated as follows:

1 August 1975	Project Authorized
1 October 1975	Equipment Ordered
1 November 1975	Recruitment of personnel begins
1 March 1976	" and training completed
1 March 1976	Approximate arrival Bamako of equipment
1 April 1976	Personnel and equipment arrive field sites
1 April-30 May 1976	Technical Advisors' visits
15 April 1975	Well digging commences
1 Oct-30 Nov 1976	Technical Advisors' visits
1 March-30 Apr 1976	" " "
1 Sept-31 Oct 1976	" " "
1 Feb-31 March 1977	" " "
1 Jul-31 Aug 1977	Final Technical Advisors' visits
31 August 1977	End of USAID participation

The schedule is shown in graphic form on the following page.

WATER SUPPLY
 OPERATION MILS
 SCHEDULE

1975 1976 1977 1978
 J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N

Project Authorization -

Equipment ordered -

Personnel:

Recruitment & Training -----

Movement to field --

Well construction - Bankass -----

 " " Koro -----

Equipment Arrival Bamako --

 " " Field Sites --

Bankass Tech Advice & Assistance ---- ---- ---- ---- ---- ----

Koro " " " ---- ---- ---- ---- ---- ----

Water Supply Summary

For the equivalent of about \$800,000 US a three-year program of village dug water well development, improvement and augmentation can be accomplished in the Cercles of Bankass and Koro, within the "Operation Mills" project.

Using three 10-man teams of well diggers in each cercle with common labor support from the villages, plus equipment and supervision provided by the Direction de l'Hydraulique et de l'Energie of the GOM, it is estimated that about 27 new wells can be completed, and about 54 existing wells improved, during the three-year program. For both cercles, the totals would be 54 new wells and 108 improved.

While it is difficult to predict the additional quantity of water this effort will produce, it could be of the order of 300,000 to 400,000 liters daily.

Operation Mills - Rural Infrastructure - Financial Plan

A summary tabulation of the estimated costs, in both Mali Francs and \$ US (at the assumed - May 1975 - exchange rate of 415 MF = \$ 1 US) is attached. While the unit prices, salaries and quantity estimates are fairly precise, the allocations to project years, and between off-shore and on-shore expenditures are arbitrary.

As can be seen from the table, there is a contingency of about 10% available, over the three-year program. This contingency was not distributed by years, types of currency, nor considered in estimating escalation.

The escalation was arbitrarily estimated as 5% on first year costs, 10% on second year and 15% on the third year costs. Several of the calculations are only to slide rule accuracy.

It will be noted that an estimated amount of \$100,000 for blacksmith tools, hand tools, hardware, etc. has been included in the Financial Plan for Rural Infrastructure. A suggested list of types of tools and materials required is included in this project paper.

As such tools and materials are literally non-existent in the Bankass and Koro Cercles, the Team feels strongly that this item is vital to the success of the Project. It was assumed that about half such commodities could be procured locally.

Illustrative List of Materials, Tools, Supplies and General Hardware
for Improvement of Village Blacksmiths

Blacksmith Type:

Round and bar stock
Anvils
Hammers
Tongs
Punches
Chisels

Other Tools:

Hammers
Pliers
Screw drivers
Wrenches
Saws (wood and metal)
Cutters (tin snips)
Drills (wood and metal)
Drill presses
Bars, gooseneck
Pick mattocks
Shovels
Tap and die sets

Materials:

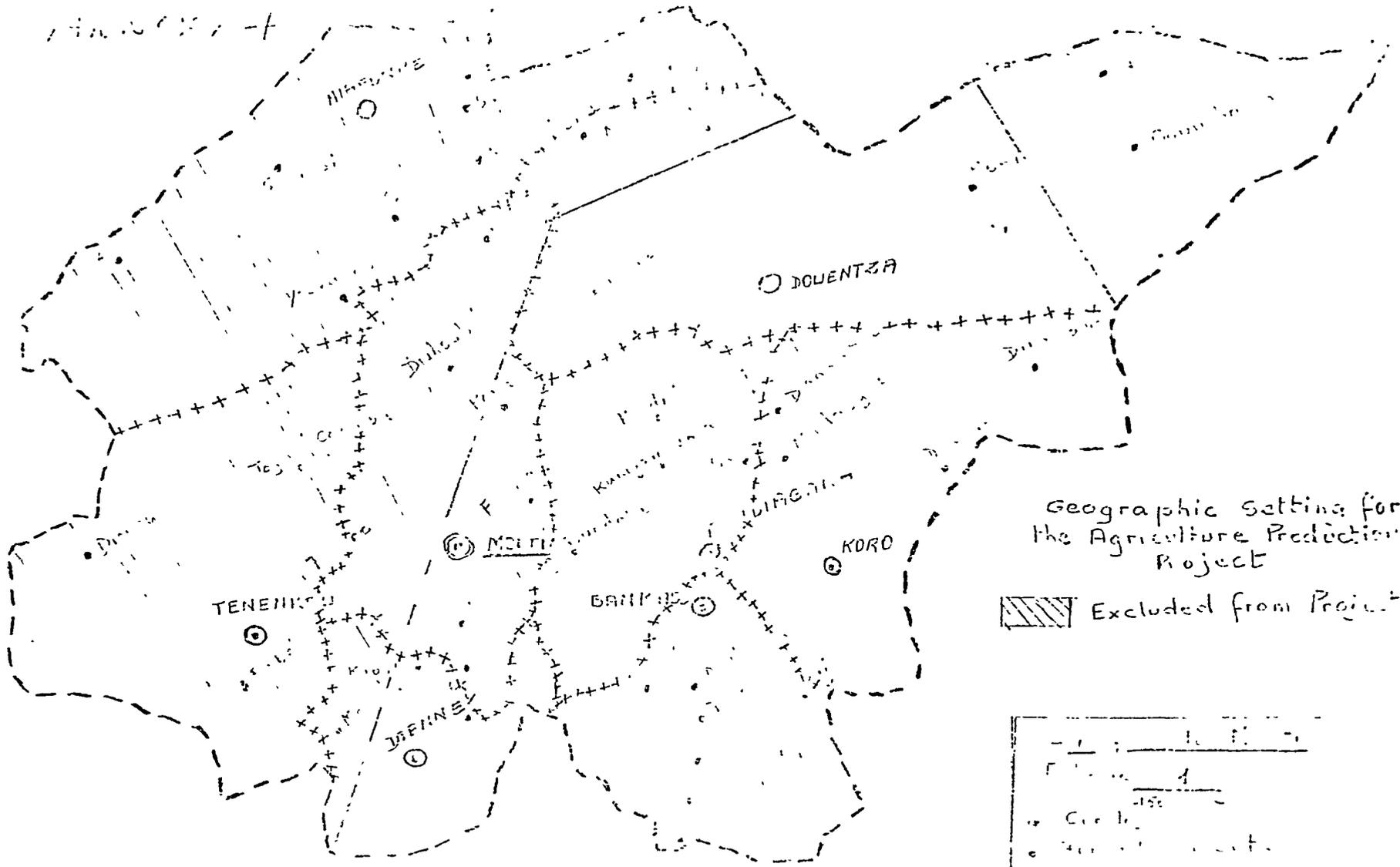
Nails
Screws, screw eyes, shackles
Bolts and washers and nuts
Buckets, including sprinkler
Rope (fiber and wire)
Chain
Wire
Cement
Pipe
Hose

MALI - OPERATION MILLS - RURAL INFRASTRUCTURE - FINANCIAL PLAN
 All currency conversions made at rate of 410 MF = \$US 1 (May 1975)

	1 ^o YEAR		2 ^o YEAR		3 ^o YEAR		TOTAL PROJECT		\$US Equiv of Offshore Component	\$US Equiv of Total Project	Mali Franc Equiv of Total Project
	MF Local	MF Offshore	MF Local	MF Offshore	MF Local	MF Offshore	MF Local	MF Offshore			
ROADS - (467 Km Repair)											
Construction Equipment	-	179,660,000	-	200,000,000	-	-	-	379,660,000	(926,000)	926,000	379,660,000
Personnel - Salaries	22,260,000	-	27,000,000	-	27,000,000	-	76,260,000	-	-	186,000	76,260,000
Materials & Supplies - Expendables	24,260,000	-	58,800,000	-	58,800,000	-	141,860,000	-	-	346,000	141,860,000
Fuel & Lubes	16,620,000	-	37,200,000	-	37,200,000	-	91,020,000	-	-	222,000	91,020,000
Roads - sub-totals	63,140,000	179,660,000	123,000,000	200,000,000	123,000,000	-	302,140,000	379,660,000	(926,000)	1,630,000	635,500,000
WATER RESOURCES -											
Operation Pumps - Bankass & Koro											
Vehicle, Equipment & Tools	-	80,000,000	-	120,000,000	-	-	-	200,000,000	(487,800)	487,800	200,000,000
Personnel - Salaries ^{/1}	11,700,000	-	14,000,000	-	14,000,000	-	39,700,000	-	-	96,800	39,700,000
Materials & Supplies - Expendables ^{/2}	11,700,000	-	28,000,000	-	28,000,000	-	67,700,000	-	-	165,100	67,700,000
Fuel & Lubes ^{/3}	7,100,000	-	17,000,000	-	17,000,000	-	41,100,000	-	-	100,000	41,100,000
Water - sub-totals	30,500,000	80,000,000	59,000,000	120,000,000	59,000,000	-	148,300,000	200,000,000	(487,800)	849,700	345,500,000
Blacksmith Tools, Hand Tools, etc.	4,000,000	4,000,000	8,000,000	8,500,000	8,000,000	8,500,000	20,000,000	21,000,000	(57,220)	100,000	41,000,000
Supervision ^{/4}	-	16,400,000	-	16,400,000	-	16,400,000	-	49,200,000	(120,000)	120,000	49,200,000
Sub-totals	97,640,000	280,060,000	190,000,000	344,900,000	190,000,000	24,900,000	377,640,000	649,860,000	(1,585,000)	2,749,730	1,127,500,000
Contingency ^{/5}									use	2,750,000	
Annual Totals - in MF	377,700,000		534,900,000		214,900,000		1,127,500,000				
\$US equiv.	925,000		1,300,000		525,000		2,750,000				
Estimated Escalation ^{/6} MF	18,835,000		53,490,000		2,250,000		104,610,000				
\$US Equiv.	46,300		130,000		70,700		255,000				

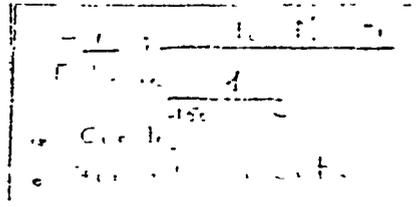
- ^{/1} 10 months only, in 1^o year
^{/2} 5 months " " " "
^{/3} 5 months " " " "
^{/4} 24 man routine; allocated by year according to schedule. All offshore costs assumed.
^{/5} Not considered in Estimating Escalation
^{/6} 5% on 1^o year expenditures; 10% on second; 15% on third.

1/10/57



Geographic Setting for the Agriculture Production Project

Excluded from Project



LOGICAL FRAMEWORK
FOR
SUMMARIZING PROJECT DESIGN

Est. Project Completion Date Feb 78
Date of this Summary Nov 26, 1975

Project Title MALI CROP PRODUCTION

DEVELOPMENT HYPOTHESES
if Purpose, Then Goal
if Purpose, Then Purpose
if Outputs, Then Outputs
if Inputs, Then Outputs

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Program Goal: The broader objective to which this project contributes</p> <p>Self sufficiency in staple cereal grain crops for Mali</p>	<p>Measures of Goal Achievement</p> <ol style="list-style-type: none"> 1. Import requirement for staple cereals in 1979 equal to 85% of import requirements in 1975. 2. Annual production increase equal to or exceeding rate of population growth after 1979. 	<ol style="list-style-type: none"> 1. National accounts 2. National statistics 	<p>Concerning long term value of program/project</p>
<p>Project Purpose</p> <p>Increase the productivity and commercialization of cereal crops in the Kopti area.</p>	<p>Conditions that will indicate purpose has been achieved (end of project year)</p> <ol style="list-style-type: none"> 1. Increasing of cereal grains in the project area increasing 15% per year over 10P. 2. Per ha yields of 1200 kg/ha on farms of pilot farmers by year 3 of their participation in the program. 3. Per ha yields of 1500 participating farmers to increase 15% per year to 900 kg/ha at a minimum. 4. Pilot farmers continue to use recommended after end of free inputs. 5. Per km/l costs at 1975 prices of private transport to 10000000 by road approved in project area by 1979. 	<ol style="list-style-type: none"> 1. Operation Mils records 2. " " " 3. Survey by Project Manager 4. Operation Mils records 5. Survey by Project Manager 	<p>Affecting purpose to goal link</p> <ol style="list-style-type: none"> 1. Production programs will be initiated in other areas of Mali. 2. The GOM will continue to support food production as a valuable goal. 3. Severe droughts of long duration will not occur. 4. Grains flows across borders will not become too severe. 5. National program for security stock of grain is instituted.
<p>Outputs</p> <ol style="list-style-type: none"> 1. Agricultural input supply system well focused. 2. Extension system expanded. 3. Marketing capabilities of Operation Mils expanded. 4. Agricultural credit system established in Operation Mils. 5. Increased availability of labor. 6. Roads improved in project area. 7. Wells dug or improved. 	<p>Measures of Output necessary and sufficient to achieve purpose</p> <ol style="list-style-type: none"> 1. 3000 tillage tools in hands of farmers by 1979. 2. 280 Agr. agents working with farmers by 1979. 3. 1000 T. of agr. inputs used by 1979. 4. 12000 T. of grain commercialized by 1979. 5. 450 km. roads capable of handling 6 T. trucks during critical transport periods. 6. Revolving credit fund of 200 million CFA francs established by 1979. 7. Repayment of 50% achieved by 1979. 8. Women time spent in obtaining water and wood decreased by 15%. 	<ol style="list-style-type: none"> 1. Operation Mils records. 2. " " " 3. " " " 4. GOM records and survey statistics. 5. Engineering report. 6. Operation Mils records. 7. " " " 8. Survey by social scientist contractor. 	<p>Affecting output to purpose link</p> <ol style="list-style-type: none"> 1. Adequate rainfall conditions will exist for normal production. 2. GOM will maintain a balance between prices of agr. inputs, grain, peanuts and cotton which allows a marginal incentive for food production. 3. Research results are applicable to the area of the project. 4. The private trader market will expand to handle some of the additional grain produced. 5. The farmers in the area will accept the package.
<p>Inputs: Activities and Types of Resources</p> <ol style="list-style-type: none"> 1. Commodities: a) Farm equipment; b) Farm inputs; c) Road equipment. 2. Trainers. 3. Technical assistance. 4. Local staff (CFA). 5. Well construction equipment 	<p>Level of Effort/Expenditure for each activity</p> <p>See Budget</p>	<p>Disbursements</p>	<p>Affecting input to output link</p> <ol style="list-style-type: none"> 1. Commodities will be available in adequate quantities at the offered prices. 2. GOM will provide sufficient budgetary support to fully staff the operation.

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(B) SUBJECT TO PROVISIONS CITED PARA 3, AA/AFR ALSO APPROVES INCLUSION DOLS 400,000 IN FY 1976 CP AS FOLLOWS: (1) DEVELOPMENT OF POLDERS IN RIZ-SORGHO AREA NEAR GAO FOR PRODUCTION OF SORGHUM AND RICE; (2) FINANCING OF IRRIGATED PERIMETERS IN HAUTE VALLEE FOR INTEGRATED AND VARIED AGRICULTURAL PRODUCTION (RICE, MILLET, SORGHUM, VEGETABLES, ETC.); AND (3) PROVISION OF SEMINAR-TYPE TRAINING IN VARIOUS ASPECTS OF WATER RESOURCE DEVELOPMENT. FYI: LATTER POINT COVERS TRAINING ACTIVITIES INCLUDED IN SEPARATE PRP WATER RESOURCES DEVELOPMENT AND MANAGEMENT WHICH WOULD NOW BE INCLUDED IN THIS OVERALL PROJECT. SUCH AMALGAMATION BELIEVED DESIRABLE BECAUSE OF IMMEDIATE TRAINING NEEDS OF PROPOSED PRODUCTION ACTIVITIES, EFFICACY OF LINKING GOM ENTITIES INVOLVED IN SHORT-TERM AND LONG-TERM PLANNING AND IMPLEMENTATION, AND MANAGEMENT CONVENIENCE VIS-A-VIS MODEST TRAINING PROGRAM PROPOSED. END FYI. COSTS BROKEN DOWN FOR CP AS FOLLOWS: (1) PART-TIME CONTRACT SERVICES FOR TRAINING PROGRAM (DOLS 107,000); (2) PARTICIPANT TRAINING (DOLS 19,000); (3) COMMODITIES INCLUDING ANIMAL TRACTION EQUIPMENT, VEHICLES, AGRICULTURAL INPUTS AND TRAINING MATERIALS (DOLS 100,000); AND (4) OTHER COSTS INCLUDING POL, AND OPERATIONAL AND CONSTRUCTION COSTS (DOLS 174,000). SINCE THIS FUNDING WOULD ONLY PERMIT START OF CONTEMPLATED ACTIVITIES IN FY 1976, SUBSEQUENT YEARS FUNDING REQUIREMENTS SHOULD BE INCLUDED IN FY 1977 FBS

3. PROJECT COMMITTEE RAISED SEVERAL ISSUES WHICH REQUIRE REVISION OF PRP FOR ACTIVITIES PROPOSED IN FY 1976. THESE ISSUES, INCLUDED IN PAPER SUBMITTED TO AA/AFR IN APPROVAL PACKAGE, BEING POUCHED TO CDO AND REDSO. FYI: MAJOR ISSUES INVOLVED VIABILITY OF SMALL HAUTE VALLEE ACTIVITY, PRICING AND LOGISTIC CONSIDERATIONS, GOM SUPPORT CAPACITY AND NEED TO BETTER IDENTIFY ACTUAL BENEFICIARIES OF PROPOSED ACTIVITIES. END FYI.

4. PP FOR MOPTI ACTIVITY TO BE FUNDED UNDER SPECIAL SAHEL APPROPRIATION WILL NEED TO BE DEVELOPED FOR OBLIGATION PRIOR 6/30/75. SUGGEST CDO REQUEST REDSO FIELD TEAM PERHAPS MORE MODEST THAN ALONG LINES CITED PAGES 10 AND 11 OF PRP AND, INSOFAR AS POSSIBLE, INCLUDING SAME PERSONNEL UTILIZED IN DEVELOPING EXISTING CROP (FOOD) PRODUCTION PRP, UTILIZING RESOURCES AVAILABLE NEARBY; E.G., REDSO; RDO/ DAKAR, USAID MISSIONS; ETC. REDSO SHOULD ADVISE IF ADDITIONAL TDY EXPERTISE NEEDED FROM U.S. ALSO SUGGEST THAT PP TEAM REVISE PRP FOR PROPOSED FY 1976 PRODUCTION AND TRAINING ACTIVITIES WHICH IN TURN AFTER REVIEW AND AP-

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PROVAL WOULD BECOME BASIS FOR PP AMENDMENT IN FY 1976. KISSINGER

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APR 7 1975

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR, AFRICA

THRU: AFR/DP, Robert Huevann *RH*

FROM: AFR/CWR, David Shear *David Shear*

SUBJECT: Mali Crop Production

Problem: (1) design of a crop production activity in Mopti initially under the Foreign Disaster Assistance Act of 1974 (\$1.5 million) and (2) programing for FY 1976 regular availabilities to support other crop production activities and water resource development training (\$400,000).

Discussion: Subsequent to Administrator Parker's visit to Mali in the fall of 1974 and the DWP Team in December 1974 it was decided that food production could be increased and skills developed initially through relatively small scale investment in irrigation and better dry land management practices. Similarly since water resources represent a significant yet largely untapped potential for increasing agricultural production, training at various levels of water resource planning and development seems appropriate. Such modest inputs could provide the basis for a broader dialogue with the Government of Mali leading to programs with greater sectoral impact. All this is especially true since, as a result of the severe drought which devastated Mali between 1967 and 1974, self-sufficiency in food production has become the highest development priority for the GOM and the U.S. Foreign Assistance Program in Mali. The technologies of new crops and varieties, better adapted crop cultural calendars, application of organic and inorganic fertilizer, and other technical improvements can lead to an increasing rate of production thereby permitting Malian farmers to assure themselves of adequate food supply even in years when harvests are far less than optimal.

A PRP developed in collaboration with various GOM Ministries was developed which includes food production projects in the Second, Fifth, and Sixth Regions of Mali. In addition a PRP for water resources development and management training was also developed in order to provide training to Malian officials in various aspects of water resource development. Both PRPs are attached.

On March 10, 1975, a Project Committee reviewed the two PRPs and raised a number of issues that require consideration prior to or concurrent with the development of the activities proposed. Minutes

of the Project Committee meeting are attached. In sum, the Committee recommended that project design proceed on the Nopti portion of the proposal. However, the other crop production activities require significantly more data than is presently incorporated in the PRP. In addition the Committee recommended that the water resources development and management training proposal be included in the overall Mali Crop Production Project.

If approved, project design would commence for an expansion of Operation Millet, an existing AID-supported project in Nopti. Its goal is to increase production of millet in the perennially food deficient Fifth Region from a low of about 300 kg/ha in 1972 to about 600 kg/ha by 1978.

To date, AID has contributed to the Operation by providing Malian Francs generated by PL 480 sales from the Regional Grain Stabilization Project. Local salaries are financed from the GOM's own budget. As a result of the phasing out of the Regional Grain Stabilization Project in FY 1974 and thus the end of the flow of counterpart funds this year, the GOM has requested AID to consider a continuation and expansion of the existing program with grant funds. The new elements would be: technical assistance; participant training in the United States or third countries; construction of 400 km of rural access roads and limited housing facilities; the expansion of millet production into two new areas, Niakouba and Djénne; improvement of village water supplies in 14 villages; and the design of an improved credit program for project participants.

Total costs for Operation Millet are estimated at between \$5.5 and \$6.0 million over a three to four year period. Of this amount, the \$1.5 million from Special Sahel funds, if approved, should carry the project through the end of the third quarter of FY 1976.

Recommendation: That you approve the design of a crop production activity in Nopti under the Foreign Disaster Assistance Act of 1974 at a level not to exceed \$1.5 million and that you approve the programming of \$400,000 from FY 1976 regular availabilities to support other crop production activities and water resource development training subject to the resubmission and approval of a revised PRP. If this latter course of action is approved the Committee suggested that the PRP Design Team for the Nopti activity also be charged with the revision of the PRP for the proposed FY 1976 production and training activities.

Approved [Signature]

Disapproved _____

Date 11 Nov 1975

Drafted: AFR/CWR: JAP [Signature] rson: jacs 4/3/75

Clearances:

- AFR/DG: Plyman (subs)
- AFR/DP: Farnecke (draft)
- AFR/CWR: J Coker (Subs) ✓
- AFR/CWR: LGlyburn (subs)
- AFR/CWR: CDCapoterri (subs)
- PPC/DP: JWelty (subs)
- AA/AFR: DBrown _____

FARM BUDGETS/FINANCIAL ANALYSIS FOR 7 PRODUCTION PACKAGES

ANNEX C

Calculations assume a 6 has. farm unit and use official (subsidized) prices for inputs and official procurement price for grain.

ITEM	1 (1)	2	3	4	5	6	7
Costs - Capital							
Seeder	24,975	24,975		24,975		24,975	
Plow	44,280	44,280	44,280	44,280	44,280	44,280	
Assembly	11,000	11,000	11,000	11,000	11,000	11,000	
Oxen/donkey	75,000	15,000	15,000	75,000	15,000	75,000	
Total capital	155,255	95,255	70,280	155,255	70,280	155,255	
Costs - Recurrent							
Fungicide	50	50		50	50	50	
Ammonium Phosphate	5,500	5,500		5,500	5,500	5,500	
Urea				4,250	4,250	4,250	
Total Production cost/ha.	5,550	5,550		9,800	9,800	9,800	
No. of has.	6	6		6	6	6	
Production cost/farm	33,300	33,300	33,300	58,800	58,800	58,800	
Revenues							
Yield/ha.	900	900		1,200	1,000	1,000	600
No. of has.	6	6		6	6	6	4.5
Total production	5,400	5,400		7,200	6,000	6,000	2,700
Price / Kg.	32	32		32	32	32	32
Total value of crop	172,800	172,800		230,400	192,000	192,000	86,400
Value of auto consumption (2,800 Kg/Fam)	89,600	89,600		89,600	89,600	89,600	86,400
Cash income	83,200	83,200	83,200	140,800	102,400	102,400	--
Summary							
Cash income	83,200	83,200	83,200	140,800	102,400	102,400	
Annual production costs	33,300	33,300	33,300	58,800	58,800	58,800	
Return to capital and labor	49,900	49,900	49,900	82,000	43,600	43,600	
Return to capital	15,525	9,525	7,025	15,525	7,025	15,525	
Cash labor income	34,575	40,375	42,875	66,475	36,575	28,075	
Per capita cash labor income	4,321	5,047	5,359	8,309	4,571	3,509	
Per capita value of consumption	11,200	11,200	11,200	11,200	11,200	11,200	10,800
Per capita real income	15,521	16,247	16,559	19,509	15,771	14,709	10,800

- (1) The seven different production packages assumed are as follows:
1. 100 Kgs. ammonium phosphate and complete oxen traction package.
 2. 100 Kgs. ammonium phosphate and complete donkey traction package.
 3. 100 Kgs. ammonium phosphate and minimum traction package.
 4. Same as #1 plus 50 Kgs. urea/ha. at yields of 1200 kgs./ha.
 5. Same as #3 plus 50 Kgs. urea/ha. at yields of 1000 kgs./ha.
 6. Same as #1 plus 50 Kgs. urea/ha. at yields of 1000 kgs./ha.
 7. Traditional culture.

SIAM RICE BOARD
as of September 3, 1974 (1)

M.S.D.E.

Season 74/75
Malaya France

ITEM	FOB Price	Transport to Bangkok	CIF Bangkok	Transport to Interior	Wholesale Charges	Financial	Sellers Commission	Total Cost	Sale Price (Net of Cost)	Outsides *	Total Cost (Net of Cost)	Market Price
Tool bar°	49775	-	49775	1000	3003	4023	1500	57601	30000	2761	100,73	110,00
Plow°	26776	-	26776	600	2583	3185	1190	34054	20000	10,564	145,14	120,16
Sawder°	32000	1770	34000	500	2024	2401	925	40730	17000	22730	210,16	210,00
Cart 500 Kgs.°	41500	2000	43500	500	3152	3002	1110	50054	20800	23654	107,13	156,39
Cart 1000 Kgs.°	41500	2000	43500	500	3589	4398	1640	53027	32800	20827	163,49	120,22
Tractor	20000	1700	21700	-	1674	2052	765	26151	15300	10891	171,19	100,00
Cotton Mixture	160	60	220	10	6,0	7,37	2,75	246,14	55	191,14	427,52	100,74
Urea Fertilisers	54	17	71	12	4,3	5,36	2	94,74	40	54,74	236,05	175,14
Ammonium Phosphate°	166,80	60	226,80	12	4,3	5,36	2	250,54	40	210,54	626,35	150,22
Urea°	200	17	217	12	6,0	3,45	3,15	246,49	63	183,49	377,25	123,24
Super Triple Phos.°	114	60	204	-	3,7	2,02	3,70	225,72	74	151,72	305,02	136,75
Endrin/DDT Fertiliser	1070	-	1070	-	43,7	53,65	20	1187,42	400	787,42	256,05	116,07
Endrin/DDT "	1460	-	1460	-	43,7	53,65	20	1577,42	400	1177,42	394,35	103,04
Insecticides locally made	1350	-	1350	-	43,7	53,65	20	1467,42	400	1067,42	366,85	103,70

	% of Farm Cost	% of Total Cost
Admin. Charge	10,54	4,23
Financial Charge	13,41	5,18
Commissions	5,60	2,10

* Indicates items to be used in "Operation Mills".
(1) Farm prices escalated 35% as of February.

EXPLANATION OF ACRONYMS

- | | | | |
|-----|-----------------------|---|---|
| 1. | FAC | - | Fonds d'Aide et de Coopération |
| 2. | FED | - | Fonds Européen de Développement |
| 3. | FRG | - | Federal Republic of Germany |
| 4. | IBRD | - | Banque Internationale pour la Reconstruction et le Développement. |
| 5. | IDA | - | International Development Association |
| 6. | OPAL | - | Office des Produits Agricoles du Mali |
| 7. | Operation
Mils | - | Program for increasing production of millet and sorghum. |
| 8. | Operation
Arachide | - | Program for increasing production of groundnuts. |
| 9. | Operation
Coton | - | Program for increasing production of cotton. |
| 10. | Operation
Riz | - | Program for increasing production of rice. |
| 11. | SCAR | - | Service du Crédit Agricole et de l'Équipement Rural. |
| 12. | SEDEX | - | Société Malienne d'Importation et d'Exportation |
| 13. | CR | - | Secteur de Développement Rural |
| 14. | ZER | - | Zone d'Extension Rural |
| 15. | SR | - | Secteur de Base |

Items 13, 14 and 15 represent organizational units in Operation Mils - SR is at the Cercle level, CR is at the Arrondissement level while the SR is at the village or village group level. This organization is parallel to the rural development organization which is virtually non-functional except in "Operation" areas.

ANNEX G

PROJECT PAPER TEAM

Francis J. LeBeau; Consultant under contract; Team Leader

Quincy Benbow; Agronomist; AID/W TDY

Wright Hyatt; Engineer; REDSO/WA

Gary Nelson; Project Officer/Agricultural Economist; REDSO/WA

Roger Montgomery; Agricultural Economist; REDSO/WA contract

Annex F

Environmental Impact

Situated between 12° and 14° N of the Equator (and 3° to 4° W of Greenwich), the Operation (Mopti) Mills can generally be described as hot, dry, undeveloped and sparsely populated. Human activity is devoted principally to agricultural and domestic activities, obtaining water for domestic and animal use and wood for fuel, with practically no industrial nor commercial activities.

All roads are dirt, and traffic is very light.

Except during the short and very meagre "rainy" season - June to September - the heat is intense, both day and night, humidity is low, with fairly regular strong winds from the East commencing about 10 to 11 a.m. and continuing till mid-afternoon - the "Haramidi". Daytime temperatures are seldom below 90° to 100° F, with the result that human activity is curtailed normally around 11:30 until 4 p.m. The project will have no adverse effects on this already severe and relatively hostile environment, since its principal purposes are to increase agricultural production with little to no expansion in acreage under cultivation and to improve transportation, and water supplies. No industrial nor commercial activities are planned. There are no endangered species in the region, and very little wild life. The abundant fish in the rivers and birds along the rivers and flood plains will not be affected. No irrigation works are contemplated. Increased use of plows will not increase erosion, and the increased uses of fungicides and fertilizers will be carefully controlled, so as to minimize adverse environmental effects. Nor will road improvement and building construction have any significant adverse effects on the environment.

PART 5 - SUMMARY AND ISSUES

A - Summary

Based upon the findings of the PP team and the SATEC study "Etude de Reconnaissance de la Vallée du Niger dans la Région de Gao" completed in April 1975, the project appears to be feasible in every respect.

As a low cost, labor intensive, low technology approach to development it appears to be free of many of the problems related to more technically advanced projects, particularly the high costs which lead to low rates of return and the reluctance of the farmers to adapt to such great changes in their traditional methods.

The technology which is being introduced represents two stages. The basic minimum package is very similar to the present technology except that the dikes are slightly higher and control of the fish is improved. In addition, emergency pumping will be made available to allow planting of additional hectares prior to the arrival of the flood. The second stage of technology which will be introduced and encouraged but is not critical to the project is the introduction of chemical fertilizers, etc. in a complete package. This package appears to be quite profitable for individual farmers but requires greater cultural change. However, it is important as an intermediate step to the large scale irrigation schemes envisaged for the area. It is hoped that approximately 10% of the farmers under the project may try the advanced project.

The major question regarding the feasibility of the project relates to recurrent expenses after AID involvement. As discussed at length in the financial soundness section, it will be possible to fund these expenses with no increases in the GOM budget for the project if some reforms are instituted in the final years of the project.

The PP team found the project to be a very exciting prospect for rural development. The expansion of the project will permit farmers to raise themselves above the subsistence level, thereby improving community standards. Action Riz-Sorgho fits well into the GOM 5 Year Plan of development and creates a real mechanism for the participation of the 6th region in its own development. In a continuous effort to reduce Mali's dependence on grain imports, we strongly endorse the project.

B - Issues

The issue is limited to one since the Mali Crop Production PP covers all other related issues:

1. A continuous fee is to be levied on farmers for the use of the water pumps.