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The Agricultural Research Support Project in Mali:

Institutional Analysis for the Project Identification Document

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Above all, I would like to thank the staff of IER for a spirited reaction to this report. My sincere hope is that it will contribute not only to completion of the PID but also, perhaps more important, to the development of a national agricultural research strategy for Mali, now under way.

The views, opinions, and recommendations contained in this report are mine and should in no way be construed as those of USAID/Mali.

David Gow

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PROGRAM DESCRIPTION

Country Background

Mali is one of the poorest countries in the world, with a per-capita income of approximately $207. The agricultural sector employs between 65 and 70 percent of Mali's adult population and contributes about half of gross domestic product. For Mali to be self-sufficient in food, which it is not, the marketed surplus produced by 100 people in agriculture today would have to feed 35 urban residents. Twenty years ago, farmers needed to feed only eight urban residents. Projecting present demographic trends, 100 farmers will have to feed both themselves and 61 others by the year 2000. However, since the marketed food surplus -- as a percentage of total production -- has remained constant over the years, food imports have risen.

Inadequate agricultural growth has been a principal cause of low incomes in Mali. Malian agriculture is dependent on rainfall, and productivity correlates closely with total annual rainfall and its distribution. Production systems differ according to the three major ecological zones: Sahel, with less than 400 millimeters; Sudan, with 400 to 1,000 millimeters; and Guinean with more than 1,000 millimeters. Over the past decade, however, the total amount of rainfall in each zone has substantially decreased, with the Guinean zone receiving on average 800 millimeters.

The principal rainfed crops, sorghum and millet, account for 75 to 80 percent of food-grain output. In 1986, a year in which rainfall was better than average, production was 50 percent higher than usual. In 1984, one of the worst agricultural years, production was only 60 percent of the average for the previous 10 years. Although Malian food needs are expected to grow at the same rate as its population -- from 2.5 to 3 percent annually -- data for 1961-1983 indicate that the area cultivated increased by 0.23 percent annually, yields increased by 0.39 percent, and per-capita grain production decreased at an annual rate of 1.46 percent. This food deficit was met by commercial imports and food aid.

Livestock production is of major importance throughout Mali. Rainfall is also the principal determinant of pasture and browse conditions and thus livestock productivity. The dominant pattern of livestock production continues to be extensive, free-roaming, transhumant herds -- exploiting the vast grazing lands in the Niger delta from November to April and then moving south to browse on forest lands, fallow land, and harvested fields. Herding and livestock production make up a complex system of ownership, confinement and management, allocation of pasture, and the symbiotic relationships between farmers and the herders to whom they entrust their livestock. This pattern is changing, however, as farmers increasingly manage their own livestock.

Forage production and utilization of crop residues are becoming important concerns in integrating cropping and livestock enterprises on the farm. Increasingly important is the role of small ruminants in the various farming systems found throughout Mali. They outnumber cattle by two to one and are a key component in achieving household self-sufficiency since they can be readily sold to buy grain for domestic consumption.

The need to find a sustainable means of yield improvement and stability has become urgent. Even under normal rainfall conditions with low to moderate input levels, yields from improved cultivars have rarely exceeded 15 percent. Today in Mali there is an immediate and perhaps greater need for technologies that contribute to production stability, by reducing the vulnerability of crops to drought. This can be achieved through the development of varieties that are tolerant to drought and the introduction of soil and moisture management techniques.

For this to happen, the research capability of Malian institutions, particularly the Institut d'Economie Rurale (IER), has to be strengthened and improved to produce viable research results of benefit to Malian farmers and herders. Over the past five years, studies and reports -- the most recent of which is the International Service for National Agricultural Research (ISNAR) diagnostic study of 1988 -- have identified certain key factors that constrain the more rational allocation of the limited resources available for agricultural research in Mali. Among the more serious constraints are the following:

- Lack of a strategic, long-term plan that lays out research objectives, the way they are to be achieved, and the sources of financing. This is being addressed by the IER with assistance from ISNAR and USAID;

- Lack of political commitment and provision of adequate resources by the Malian government (GRM). In 1986, the USAID contribution to IER's capital cost and operating expenses accounted for 34 percent of its total budget, with GRM contribution amounting to 39 percent, mainly for salaries. Of the total donor support to IER, USAID accounted for 55 percent. This donor contribution has complemented that of the GRM by providing the necessary resources and fringe benefits to make research possible;

- Overemphasis on varietal selection, adaptation, and development and underemphasis on the need to better integrate thematic research with systems research, including fodder and livestock. This is being remedied in Mali Sud;

- Lack of a coordinated, systematic process for, first, monitoring and evaluating ongoing research activities and results and, second, planning and budgeting for future activities on an annual basis; and

- Overconcentration of research personnel in and around the capital. In 1988, of 148 IER researchers, 103 -- 70 percent -- were located in Bamako and Sotuba.

Project Goal and Purpose

The goal of the Agricultural Research Support Project (ARSP) is to promote economic growth in Mali through the development of improved agricultural technologies to stimulate productivity. Growth in agriculture is essential for growth in other sectors. Increased productivity in the agricultural sector will increase rural incomes and provide a broad market for the goods and services of other sectors. This will complement the GRM's core goals for agriculture. These are to:

- Achieve food self-sufficiency;
- Decrease and perhaps reverse the rate of environmental degradation; and
- Increase and diversify agricultural production for both internal and export markets.

The purpose of the ARSP is to contribute to the development and implementation of the GRM's agricultural research strategy. This purpose will be achieved in two ways: by assisting the GRM to strengthen the national agricultural research system (NARS) so that it can establish and coordinate research priorities and objectives, and by providing the GRM with the necessary resources -- both financial and human -- to achieve these research goals.

The specific objectives of the ARSP are to:

- Assist the IER in strengthening and improving its planning, budgeting, monitoring, and evaluation activities;
- Assist the IER in the generation and dissemination of improved varieties of cereals, improved agricultural technologies, and better animal husbandry practices;
- Assist the IER in the establishment of a viable network of research stations throughout the country;
- Assist the IER in creating a Donor Coordinating Group for agricultural research in Mali; and
- Persuade the GRM to pay an increasing proportion of the recurrent costs of the agricultural research budget.

Expected Achievements/Accomplishments

By the project assistance completion date (PACD) in 2000 of this 10-year project, the outputs will include the following:

- A coherent national agricultural research strategy;
- XXX improved technologies that incorporate crops, forages, and livestock developed, tested, and extended to farmers;
- XXX improved, drought-resistant varieties of millet and sorghum developed, tested, and extended to farmers;
- XXX regional research stations fully staffed, operational, and producing relevant research results -- by following a commodity team approach;

- The GRM contribution to the total agricultural research budget increased from 39 percent to 50 percent;

- A functioning Donor Coordinating Group, which meets with the GRM and the IER on an annual basis to participate in revising and updating the strategy; and

- A functioning Division de Documentation et Information within the IER, responsible for synthesizing research results, keeping researchers informed of comparable research results from other countries, and publishing a journal on a regular basis for the benefit of IER staff and other researchers.

Project Summary

The proposed ARSP will be a 10-year project with a funding level of approximately $37 million. It will consist of the following five interrelated components.

- **Institutional Strengthening.** There will be three elements: first, technical assistance (TA) will be provided for improving the planning and budgeting cycle within IER; second, TA will also be provided to restructure the accounting and financial accountability within IER; and third, operating funds will be made available to the IER's Division de Documentation et Information (DDI) for the publication and dissemination of IER reports. All told, this component will call for 10 years of long-term TA -- team leader/agronomist, research administrator, and financial and accounting specialist; 20 months of short-term TA; in addition to funds for the purchase of computers. **Total Estimated Cost -- $2.4 million.**

- **Commodity Program Support.** Support in the form of operating funds will be provided to the following programs: sorghum with Sotuba in the lead; millet and fonio at Cinzana; rice -- floating and deep water -- at Mopti; maize at Bougoni; cowpeas and groundnuts at Same; and fruit and vegetables at Bamako. Support will also be provided for multilocational testing and also for on-farm testing. Four years of long-term TA from a breeder will also be provided. **Total Estimated Cost -- $21.5 million.**

- **Farming Systems Research (FSR).** Given the crucial role that FSR has played in adapting improved technologies to local conditions and identifying on-station research needs, the project will provide additional support to FSR-- over and above ongoing activities in Operation Haute Vallee (OHV) and proposed activities in the Mopti region. Support will be provided to Bougoni to enable FSR activities to continue there. In addition, six years of long-term TA -- an agricultural economist and a soil scientist -- will be provided to the Division de la Recherche sur les Systemes de Production Rurale (DRSPR). **Total Estimated Cost -- $5.6 million.**

- **Postgraduate Training.** Support will be provided for upwards of 20 scientists to study abroad for up to three years. Funds will also be made available for short-term training. **Total Estimated Cost -- $4.7 million.**

- **Networking.** Support will be provided to continue and strengthen networking with West African regional organizations and research institutions. Links with Collaborative Research Support Programs (CRSPs) in the United States will also be maintained and supported. Funds will be made available for Malian researchers to travel to neighboring West African countries and the United States. **Total Estimated Cost -- $1.7 million.**

INSTITUTIONAL ANALYSIS

Three research institutes, the IER, the Institut National de Recherche Zootechnique, Forestiere, et Hydrobiologique (INRZFH), and the Division de Machinisme Agricole (DMA), constitute the NARS of Mali. Agronomic research, including the related social and economic research, is conducted by the IER, which is part of the Ministry of Agriculture; livestock and forestry research by the INRZFH, part of the Ministry of Environment and Livestock; and agricultural mechanization by the DMA, also of the Ministry of Agriculture.

Mali's NARS is relatively young with a limited, but steadily increasing, number of well-trained national researchers. However, it does not have a well-defined research program and the necessary financial resources to implement it. Only during the last 10 years has the NARS received donor support over and above that provided by the French. In the case of the largest research division within IER, the Division de Recherche Agronomique (DRA), donors in 1988 provided 61 percent of the total budget in 1988. In the case of the second largest, the DRSPR, the donor contribution amounted to 89 percent (CNRA 1989:8).

The problems of focus and coordination of agricultural research and, in particular the relationship between IER and INRZFH, the two major institutions, have been studied and widely acknowledged for years (USAID/Mali 1988). An imposing number of reports by various donors are readily available, including the following: the FAO (Nahal et al. 1985); CILSS (Galan et al. 1985 and Traore et al. 1986); and, more recently, USAID (Simmons 1987 and Reddy 1988), ISNAR (Cassas, Bosso, et Labouesse 1988), and CGIAR (Khan 1989). A review of these studies was complemented by interviews with key personnel in both IER and INRZFH as well as by field visits to research stations, development projects, and FSR activities.

This report is divided into the following sections:

- Structure and function of the research institutions;

- Planning, monitoring, and evaluation;

- Budgeting and financing;
- Results and accomplishments;
- Major internal constraints;
- Major external constraints;
- Recommendations:
  - -- Streamlining and simplifying the organizational structure,
  - -- Integrating planning, budgeting, and financing,
  - -- Synthesizing and disseminating research results,
  - -- Clarifying and institutionalizing the role of the donor community, and
  - -- Strengthening the zonal research networks; and
- Design issues and the composition of the project paper (PP) design team.

THE INSTITUT D'ECONOMIE RURALE

Historical Background

Agricultural research in Mali began in 1925 under the French colonial administration with the establishment of a cotton research station at M'Pessoba. In 1932, the Office of Niger was created to promote production of irrigated cotton, at which time a research program was established at Kayo, in Macina. In 1947, the Institut de Recherche sur le Coton et les Textiles Exotiques (IRCT) established the research station at Kogoni, replacing Kayo, and the research station at N'Tarla. Until independence in 1960, crop research was conducted at these two locations. In 1927, a *ferme d'elevage* was established at Sotuba. By 1950, it had been transformed into an experimental livestock research station for the whole of the Sahel.

In 1962, the GRM assumed administrative control of agricultural research with the creation of IER, attached to the Ministry of Agriculture. As a result, there was an increased emphasis on food crops relative to cash crops. Until 1977, however, crop research was conducted almost entirely under contract by a number of French agricultural research institutes, most notably the Institut de Recherche en Agronomie Tropical (IRAT).

By the mid-1970s, however, the research climate had changed. There was now a growing number of qualified Malian researchers, graduates of the Institut Polytechnique Rurale (IPR) of Katibougou, which opened in 1965. Under a new convention signed in 1976, the French allowed the Malians to develop their own research agenda. At the same time, IER began to participate in regional research

activities and undertook collaborative research with the International Livestock Center for Africa (CIPEA/ILCA) for animal husbandry, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the Semi-Arid Food Grain Research and Development Program (SAFGRAD) for rainfed cereals, and the West Africa Rice Development Association (ADRAO/WARDA) for rice. At the same time, other bilateral donors began to play an important role -- the Canadians in forestry research and the Dutch in soil sciences, ecology, and FSR.

IER is considered among the strongest of the national research institutions in the Sahel and is the second largest in terms of its size -- number of personnel; number of research stations; and its geographical coverage, which includes the whole range of agroecological zones found in Mali.

The Role of the U.S. Agency for International Development

The early 1980s were marked by two important events. In 1981, livestock research, previously undertaken by IER, was placed under the Ministry of Environment and Livestock in the newly created INRZFH. At the same time, USAID began to play an increasingly active role in strengthening the NARS and is presently the principal donor to IER and also probably to INRZFH. In 1986, the most recent year for which data are available, the USAID contribution to IER's capital costs and operating expenses accounted for 34 percent of its total budget, with the GRM contributing 39 percent. USAID accounted for 55 percent of total donor support to IER (See Table 1). These expenditures include capital costs of institutional development, operating costs, and limited technical assistance.

Between 1978 and 1980, USAID funded modest investments in research as a component of several of its major agricultural production projects: Operation Mil Mopti (OMM), Operation Haute Vallee (OHV), Operation Riz Sorgho (ORS), and Action Ble Dire (ABD). Funds were allocated to the appropriate research units to conduct adaptive research in the production zones of the projects. This approach had two major disadvantages: first, funding became snarled in the usual implementation problems; and, second, it was difficult, in the context of these relatively short-duration projects, to establish a critical mass of research expertise engaged in problem-solving research .

Recognizing these problems and the need for more effective technologies in Mali, USAID funded ICRISAT/Mali as a bilateral project in 1979. Thus the independent project approach to funding agricultural research came into being, complemented by additional bilateral projects such as the Livestock Sector Development Project, which also included a research component financed by USAID through ILCA, in the Ministry of Environment and Livestock and the FSR/E project in the OHV; centrally funded projects such as the PSTC grant with the University of Nebraska and the Collaborative Research Support Projects (CRSPs) such as International Sorghum and Millet (INTSORMIL) and Tropical Soils (TROPSOILS); and, finally, by regionally funded projects such as SAFGRAD.

The Mandate of the Institut d'Economie Rurale

According to GRM legislation of 1960 and 1981, IER is responsible for all agricultural research. In collaboration with the respective ministries, it is specifically charged with the following (IER 1985:1):

- The undertaking of technical and socioeconomic studies for agricultural development projects;
- The design, management, and execution of agronomic and FSR programs;
- The planning and evaluation of agricultural development projects; and
- The supervision and coordination of all studies and research concerned with agricultural development in Mali.

TABLE 1

PERCENTAGE BREAKDOWN OF CONTRIBUTIONS TO IER IN 1986 FOR CAPITAL COSTS AND OPERATING EXPENSES[a]

Donor	% Total Budget	Major Research Focus
GRM	38.6	All crops
USAID	33.8	Millet, sorghum, corn, wheat, FSR, pest management
French	-	Cotton, soil/plant/water relationships
Dutch	13.7	Soil/plant/water relationships, rice, FSR
World Bank	7.9	Cotton, phosphate, rice seed production
Canada	3.7	Food legumes, FSR
Ciba-Geigy	1.9	Millet, sorghum, corn, cowpeas
FAO	0.2	Fruit and vegetable seed production
FED	0.2	Millet, sorghum, cowpeas, corn, rice varietal testing

[a] This breakdown is based only on the amount of money that flows through IER for capital costs and operating expenses. It does not include those expenditures paid directly by donors, such as salaries for technical assistance -- the major French contribution.

Source: IER 1987.

Under the Director General and the Assistant Director General are the following six divisions:

- Division Administrative et Financiere (DAF);
- Division de la Documentation et de l'Information (DDI);
- Division de la Planification et de l'Evaluation (DPE);
- Division des Etudes Techniques (DET);
- Division de la Recherche Agronomique (DRA); and
- Division de la Recherche sur les Systemes de Production Rurale (DRSPR)

Each of these will be described briefly below. The IER organization chart is presented on the following page. The distribution of personnel throughout the various divisions is shown in Table 2.

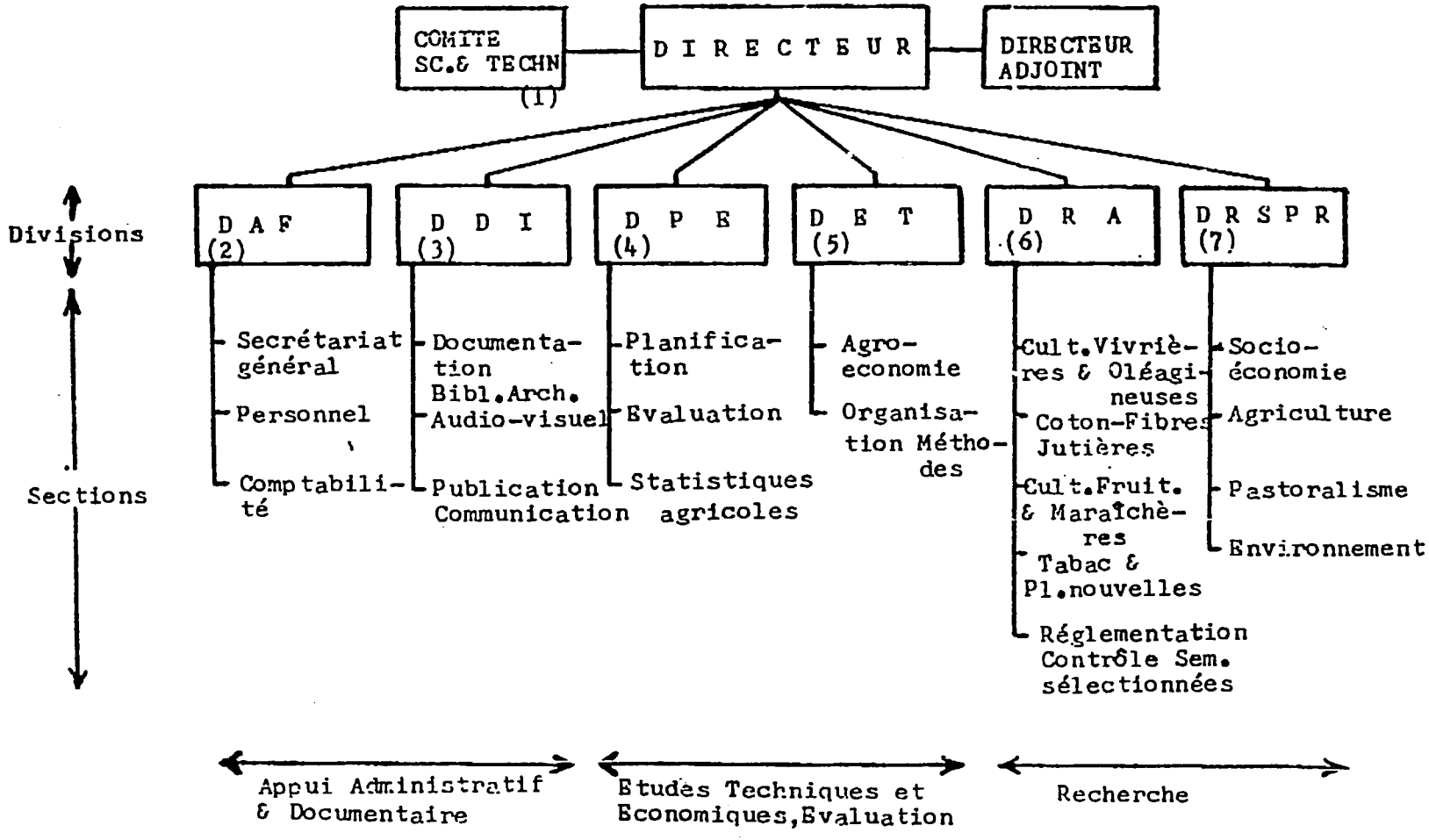
Division Administrative et Financiere

In theory, this division is responsible for general administration, personnel management, accounting, and preparation of the annual budget. It is divided into three sections: personnel, accounting, and secretarial. In practice, DAF has little autonomy and is really a dependency of the Cellule Administrative et Financiere (CAF) of the Ministry of Agriculture. As such, it appears to play a somewhat marginal role in IER since it produces few data or documents that are of use to management for planning, monitoring, or evaluation. The documents its does produce are to satisfy the requirements of the CAF rather than the needs of IER management.

For example, there are two systems of accounting -- one for funds from the national budget (primarily salaries) and one for donor funds. DAF is responsible for accounting for the use of national funds, whereas the heads of the respective divisions receiving donor funds -- specifically DRA and DRSPR -- are directly accountable, with no participation by DAF. In many donor-financed activities, the donors closely supervise how these funds are allocated and utilized. The issue is further complicated by the fact that each donor has its own accounting system.

As a result, DAF does not have readily available information on funding levels and the way the budget -- both national and donor -- is actually utilized. This information is ultimately available in the IER annual reports, the most recent is for 1986, and the biannual reports of the Financial Commission of the Comite National de la Recherche Agronomique (CNRA), the most recent of which is for 1988. But the data provided are very general, no distinction is made between grants and loans, and no information is provided on what the funds were used for or what impact they had (CNRA 1989). For example, it proved impossible to find out how much it costs to run each research station on an annual basis.

IER ORGANIGRAM



(1) Comité Scientifique et Technique (Comité National de la Recherche Agronomique).
(2) Division Administrative et Financière.
(3) Division de la Documentation et de l'Information.
(4) Division de la Planification et de l'Evaluation.
(5) Division des Etudes Techniques.
(6) Division de la Recherche Agronomique.
(7) Division de la Recherche sur les Systèmes de Production Rurale.

Source: IER 1985

TABLE 2

EVOLUTION AND DISTRIBUTION OF IER PERSONNEL, 1976-1987

Division	1976		1981		1986		1987	
	N	E[a]	N	E	N	E	N	E
Management	2	1	1	-	1	-	2	-
DAF	1	-	0	-	1	-	1	-
DDI	1	-	3	-	3	1	3	1
DET	5	2	16	-	17	2	13	0
DPE	3	1	13	-	10	2	9	2
DRA	32	10	72	-	90	10	101	15
DRSPR	-	-	10	-	15	9	14	14
Total Cadre A[b]	44	14	115	14	137	24	153	32
Personnel B[c]	34	-	88	-	126	-	140	-
Personnel C & D	56	-	71	-	105	-	121	-
Laborers	326	-	351	-	324	-	278	-
Grand Total	460	14	625	14	692	24	692	-

a N = National, E = Expatriate.
b Cadre A includes middle- and senior-level staff, with a minimum of four years of professional training after high school.
c Personnel B includes junior-level professionals, and Personnel C and D includes clerical staff.

Source: Casas, Bosso, et Labouesse 1988:25.

A 1986 report identified the principal DAF weaknesses as follows (Traore et al. 1986:7):

- Lack of resources -- DAF has operated with the same level of funding for the past 10 years;
- Very bureaucratic in its operations;
- Minimal role in the budgeting process; and
- Absence of relevant financial reports.

Interviews with DAF personnel and a review of some of the relevant documentation indicate that these constraints still hold today.

Division de la Documentation et de l'Information

In theory, the DDI is supposed to collect the relevant research documentation for the IER library; prepare the annual report; synthesize, summarize, and publish IER research results; and provide IER researchers in the field with up-to-date information and research results. There are three sections: documentation, library, and archives; audiovisual; and publications and communication. In practice, the division appears to be virtually moribund, particularly since its budget has been cut 25 percent over the past decade. As a result, there are no funds to purchase documents and the 1987 annual report has still to appear.

According to a recent USAID report (Simmons 1987:75):

> While it might be expected that the agricultural research projects are already somewhat experienced in generating useful information and diffusing it, it is this area which will probably require the most work over the coming years. While information gathering appears to occur on a regular basis, the analysis and sharing of this information is clearly insufficient. The publication record of virtually all AID-supported research projects is poor, with inadequate rigor in analysis of findings, generally one fairly global presentation of results once a year, and no attempt to translate the material into separate publications for different audiences.

A research institution without a good documentation center and the resources to provide researchers with the information they need is somewhat paradoxical. The situation has been alleviated at some of the IER research stations that have received funding directly from the donors -- for example, in the cases of N'Tarla and Mopti, although with the latter many of the reports and publications are in English. That IER has no established forum for presenting its research results to a wider audience, particularly to fellow researchers doing similar research elsewhere, is regretted by more than just the head of the DDI. The publication of the first issue of the IER's *Bulletin de l'Economie Rurale* in December 1988 is a step in the right direction, with an interesting cross-section of articles on various aspects of ongoing IER research.

The DDI section in the 1986 annual report concludes with the following:

> L'annee 1986 a ete des plus difficiles qu'ait connues la Division quant a l'execution correcte et totale des taches assignees . . . . L'information, denree perissable et chere, a, est et sera toujours consideree comme la cle du savoir, du pouvoir et du developpement mais elle exige des investissements importants. Faut-il s'informer pour savoir, pouvoir et se developper ou ne pas s'informer pour travailler a tatons et sans elements de reference et demeurer dans le sous-developpement aux consequences nombreuses? Un choix est a faire mais aux decideurs d'en decider.

Division de la Planification et de l'Evaluation

In theory, DPE is responsible for preparing development plans and for evaluating programs and projects through its three divisions: planning, evaluation, and agricultural statistics. In practice, it carries out feasibility, monitoring, and evaluation studies at the request of the GRM. Since 1985, it has served as the secretariat for the Comite Executive de la Strategie Alimentaire (CESA) and presently functions as the sponsoring institution for policy reform projects in the area of cereal marketing and price liberalization.

In spite of its title, this division is not actively involved in the planning and evaluation of IER research activities. Interviews with DPE personnel indicated that its concerns are somewhat different from those of IER, and it is difficult to understand its contribution to the institute. In fact, the DPE functions as an arm of the Ministry of Planning within IER. There are rumors, however, that DPE may be separated from IER and become a separate division within the Ministry of Agriculture some time in the foreseeable future.

Division des Etudes Techniques

In principle, DET is responsible for conducting studies and baseline surveys in the areas of agriculture, economics, and sociology. The information produced is used in project design. In-service training for IER researchers interested in agricultural economics and FSR is also part of DET's mandate. To achieve these dual objectives, DET is divided into two sections: agroeconomy and organization and methods. In fact, it functions very much as a *bureau d'etudes*, or consulting company, for the Ministry of Agriculture. The division is responsible for carrying out multidisciplinary feasibility studies for rural development projects, as well as surveys dealing with inputs, prices, and yields, the results of which are regularly used by the ministry in policy formulation. In addition, DET also does contract research -- usually discrete, applied studies -- for other clients.

But, as with DPE, it is difficult to see what this division really contributes to the overall functioning of the institute, particularly since -- as a public entity -- it cannot make a profit on the services it offers. The 1986 annual report lists 11 studies undertaken by DPE, only one of which -- an FSR study in the Mopti region -- was directly related to IER's mandate. The same holds for the studies under way or being negotiated, with the exception of a socioeconomic study in Mali Sud and an evaluation of the research at Cinzana. For some studies, the ministry simply instructs DET to perform them.

Division de la Recherche Agronomique

DRA is the core of IER and commands the majority of its resources, both human and financial. Its 550 employees make up almost 75 percent of the IER work force. Table 3 provides information on the allocation of financial resources within IER for 1986, the last year for which data are readily available.

The division is responsible for the execution and control of agronomic research and trials on all crops grown in Mali. It is also responsible for coordinating and controlling agronomic research undertaken in Mali by regional and international organizations. It is divided into six sections, four of which deal with the following crops: cereals, cotton and fiber, fruit and vegetables, and tobacco. The remaining two are concerned with seed multiplication and multilocational testing of improved varieties and technologies.

The majority of the staff work at Sotuba, the principal research station located just outside of Bamako. In 1988, 67 percent were working there (Casas et al. 1988:37). The rest are located at the regional and sub-regional research stations managed by the division. The six regional stations are:

- Cinzana: rainfed crops, particularly cereals;
- Mopti: deep water rice and floating rice;
- Dire: the focus is on irrigated wheat research;
- Kogoni: irrigated rice;
- N'Tarla: cotton, but increasing attention is also being paid to food crops; and
- Same: cereals and legumes.

TABLE 3

TOTAL IER BUDGET FOR 1986[a]
(in thousands of FCFAs)

Division	National Budget	Percent	Donors	Total	Percent
Management	10,320	1.8	-	10,320	0.8
DAF	12,806	2.3	-	12,806	0.9
DDI	10,082	1.8	-	10,082	0.7
DET	18,375	3.3	-	18,375	1.4
DPE	10,455	1.9	-	10,455	0.8
DRA	463,571	82.8	559,814	1,023,385	76.1
DRSPR	34,312	6.1	224,777	259,089	19.3
Total	559,921	100.0	784,591	1,344,512	100.0

[a] The reader is advised to treat these numbers with extreme caution and view them as illustrative. The figures for the DRA and the DRSPR are taken from the most recent CNRA report (CNRA 1989:8). The figures for the other divisions are taken from the 1986 Annual Report (IER 1987:5-6). It should be pointed out that there are three different sets of figures available for the DRA national budget. For example, see IER 1987:5-6 and Casas et al. 1988:27.

Each regional station usually has a resident director, four to six professional staff, three to four *moniteurs*, and limited support staff. Since the stations are usually located in or near population centers where housing can be rented, staff are not always provided accommodation on the station. Laboratory and office facilities, however, are part of the station complex. The DRA also manages sub-stations, *points d'appui de recherche* (PARs), which are headed by a resident director, usually a mid-level professional with relatively little experience. He is assisted by one or two junior-level professional staff and two to three *moniteurs*.

The infrastructure at most sub-stations is inadequate. On-station housing is usually not provided. Since the PARs are generally close to villages, but off the main roads, staff find it difficult to obtain adequate housing. When the experimental season is over, PARS look abandoned. At Korporo sub-station, for example, there is no guest house. This means that researchers coming from Cinzana and even Mopti to

work with station staff spend a few hours at most and leave. They may not even have time to visit the fields! There are other problems resulting from the station's isolation. Although there is a school nearby that goes to ninth grade, the dispensary has no medicine (Atwood 1989).

Division de la Recherche sur les Systemes de Production Rurale

DRSPR is responsible for undertaking interdisciplinary studies and research on the various farming systems found in the different ecological zones of Mali. It is divided into three sections: socioeconomic, agricultural, and pastoral. At present there are three FSR/E projects: at Sikasso and Bougoni in the Mali Sud region, and in Bamako with OHV. Created in 1978, it is the second largest division after the DRA and is almost completely financed by donors -- 86.7 percent in 1988 (CNRA 1989:8).

Applied research has been under way in the south since 1976. The results have significantly affected the way the Compagnie Malienne de Developpement de Textiles (CMDT) works with local farmers by encouraging an integrated approach to cotton cultivation, which includes assistance for food crops. The FSR teams there have become the crucial link between the researchers and the farmers -- not only adapting the research results to farmers needs, but also conducting applied research on various techniques for improving soil and water management at the level of the individual farm. In fact, DRSPR has been criticized by DRA for poaching on its territory; however, they are the only people in Mali, apart from some of the non-governmental organizations (NGOs), who undertake this type of research, crucial for understanding and improving the many complex farming systems found in Mali.

There is a growing recognition that any varietal or technological improvements introduced must build on what farmers currently do and why they do it, as well as the agroecological and socioeconomic constraints these farmers face. Also, no one discipline can solve the production problems of small farmers. Any proposed solution must ultimately be tested on farmers' fields, under farmers' conditions, using farmers' criteria of evaluation -- in combination with the standard agronomic and economic analyses of results. This farming systems approach has served to shift the focus from "pushing technology" to responding to farmers' needs (Flora 1988).

INSTITUT DE RECHERCHE ZOOTECHNIQUE, FORESTIERE ET HYDROBIOLOGIQUE

Created in 1981, when a separate Ministry of Livestock was established, the INRZFH is responsible for undertaking and managing all basic and applied research on livestock, forestry, and fish. It is divided into the following three divisions:

- Division Administrative et Financiere (DAF): the same responsibilities as DAF in IER;

- Division de la Recherche Zootechnique (DRZ): responsible for research on genetic improvement, agropastoralism, and nutrition and feeding. The principal research station is located at Sotuba, with others in Niono, Kayes, and Mopti -- the last one presently closed; and

- Division de la Recherche Forestiere et Hydrobiologique (DRFH): responsible for research on wood technology, fish, fauna, ecology, and natural resource conservation. The division manages research stations in Sotuba, Katibougou, N'Debougou, and Mopti.

Considerably smaller than IER, INRZFH has approximately 50 percent of the number of research personnel (Table 4). It suffers from many of the same problems -- except in a more acute form, the most serious of which is lack of resources to conduct research. Compared with IER's 1986 overall budget, INRZFH's budget amounted to 21 percent (Table 5). As a result, very little research was -- and is-- actually undertaken.

INRZFH receives short shrift in the allocation of research resources, as demonstrated during field trips to several of its research stations. In Niono, the major activity is a program to improve local cattle through selective breeding on a small scale. The bulls produced, however, are sold at a subsidized rate to dealers who come up from Bamako, since there are neither funds nor mechanisms to disseminate them, even on credit, in areas of the country where they are most needed. In Mopti, the forage research station has never functioned, partly because it is reputed to be haunted. The hydrobiology station there continues to function with a skeletal, but apparently dedicated, Malian professional staff of two, which receives assistance from ORSTOM. The one bright spot was the forestry research station at N'Debougou, where the staff are producing and extending eucalyptus, leucaena, and merlina to both communities and individuals, thanks partly to Canadian assistance received over the past decade.

TABLE 4

EVOLUTION AND DISTRIBUTION OF INRZFH PERSONNEL, 1976-1987

Division	1976		1981		1986		1987	
	N	E[a]	N	E	N	E	N	E
Management	NA	-	NA	-	4	-	3	-
DAF	NA	-	NA	-	1	-	1	-
DRZ	17	-	NA	-	63	-	66	4
DRFH	5	-	NA	-	24	-	32	-
Total Cadre A[b]	22	-	51	-	92	-	102	4
Personnel B[c]	15	-	40	-	50	-	47	-
Personnel C & D	29	-	27	-	29	-	29	-
Laborers	58	-	157	-	190	-	159	-
Grand Total	124	-	275	-	361	-	337	4

[a] N = National, E = Expatriate.

[b] Cadre A includes middle- and senior-level staff, with a minimum of four years of professional training after high school.

[c] Personnel B includes junior-level professionals, and Personnel C and D includes clerical staff.

Source: Casas, Bosso, et Labouesse 1988:26.

TABLE 5

TOTAL INRZFH BUDGET FOR 1987
(in thousands of FCFAs)

Division	National Budget	Percent	Donors	Total	Percent
Management	14,471	6.5	-	14,471	5.0
DRZ	167,002	74.9	42,577	209,579	72.8
DRFH	41,354	18.6	22,614	63,968	22.2
Total	222,827	100.0	65,191	288,018	100.0

Source: INRZFH 1988:13-19.

INRZFH has attracted a little donor support which has been used to finance some interesting, but rather discrete research activities in a variety of fields, including forestry, poultry, and karite (Table 6). In 1986, donor support to the IER, on the other hand, was 12 times greater.

TABLE 6

PERCENTAGE BREAKDOWN OF DONOR SUPPORT TO INRZFH IN 1987

Donor	% Total Budget	Major Research Focus
GRM	77.5	In theory, everything, but in practice limited, since only 16 percent was allocated for operating costs
USAID	12.5	Animal production -- particularly feed resources and animal husbandry
French analysis	6.7	Natural resource inventory; karite mortality; and pasture
Canadians	3.0	Forestry -- indigenous varieties and fast-growing exotics
EEC	0.3	Poultry

Source: INRZFH 1988:17-18.

With extremely limited funds, INRZFH is unable to do research and produce results. USAID has attempted to break this vicious circle through its Mali Livestock Sector Project, which supports various activities within the ministry, including project management and administrative support, as well as forage and livestock production research. A midterm evaluation in 1987 concluded that (Brett-Smith 1987:1-2):

- In terms of management, efficiency and effectiveness have benefited immensely from the accounting, financial analysis, and work planning/control systems installed by the project, and the ministry has requested that the system be expanded to cover the entire range of operations. The high-level Joint Management Committee is viewed as a positive innovation in donor/recipient collaboration.

- In terms of research, the FSR approach followed by the ILCA contractor has identified the technical and economic problems in developing legume-based forage packages for traction and feeding animals. Some promising legumes have been identified, and a sound basis has been established for understanding the way integrated crop and livestock farming systems--particularly those involving small ruminants -- can be advanced.

PLANNING, MONITORING, AND EVALUATION

The Role of the Commissions Techniques Specialisees

Planning and evaluation of research activities occur at two levels -- that of the Commissions Techniques Specialisees (CTSs), which meet every year, and that of the CNRA, which meets every other year. The CNRA formulates broad research policy--in conformity with the objectives established in the five-year national plan--identifies priority research concerns in conjunction with national research needs, and determines the level of effort and the resources needed.

There are five technical commissions: rainfed agriculture, irrigated agriculture, cotton and fibers, farming systems, and animal production. They are responsible for reviewing research proposals prepared by the various sections of DRA and DRSPR; evaluating research results; and coordinating the overall research program, to avoid duplication of research efforts and to ensure that proposed activities are in line with the priorities established by the CNRA. The reports submitted are principally the work of divisional and sectional heads and do not usually contain much budgetary information.

The commission meetings, held every March and April, are a major event in Mali's developmental planning since they encourage participation by a wide cross-section of interested institutions and individuals, including researchers from within IER, INRZFH, and DMA; regional development organizations; training institutions; and donors that finance agricultural research in Mali. Each commission, chaired by the director of IER, meets for a whole week and discusses, debates, questions, and criticizes the respective results and proposals. Once the commission approves the proposed research program, it is then implemented by the concerned divisions and sections within IER.

Participation, Duplication, and Lack of Priorities

This ostensibly democratic system for planning and evaluation can be questioned on several grounds. First, there is simply too much participation: to satisfy as many people as possible, too many research projects, which may or may not be part of IER's overall mandate, are approved. There is really no effective peer review of either results or proposals. Those who participate at the technical commission reviews, sometimes upwards of 80 people, are not necessarily the most qualified to pass judgment. These meetings are intended to ensure that one group does not duplicate the work of others and that all researchers' projects are known to other researchers. Given the constraints of time and the volume of material produced, it is not surprising that researchers at both IER and INRZFH regularly conduct food-grain/legume intercropping trials in isolation from one another (Simmons 1987:46).

The duplication effort that is of more concern, however, is that of year-to-year duplication. A case in point are the virtually identical "rates and dates" efforts on the same crops year after year. The problem is compounded when multiyear analysis is not carried out on the data set and even the slight differences incorporated into the experimental design -- for example, planting one week later or adding 50 more kilograms of urea -- are not examined for significance (LeBeau 1986:54).

Inadequate analysis and reporting are partially responsible for this situation. General practice has been to depend on the annual reports as the sole means of reporting and communicating results. Even in the case of multiyear research conducted under several programs, there has been little attempt to synthesize the results and use them to establish new directions for testing and experimentation. Marginal changes in annual research programs have resulted from individual researchers' knowledge of prior research results, combined with educated guesses and hypotheses, rather than well-documented, critical reviews of multiyear research efforts in Mali and elsewhere (Reddy 1988:34).

According to one commentator, this situation results from a combination of the following (Simmons 1987:47-49):

- Lack of scientific traditions and discipline, particularly the educational requirements for rigorous analysis;

- Lack of training and guidance in the application of analytical techniques, including the use of computers; and

- Lack of creativity in methodological approaches and the dominance, until very recently, of research involving varietal screening, spacing, dates of planting, and rates of fertilizer application.

As a result, there is little premium attached to rigorous analysis, careful reporting, and innovative proposals. Nor is there much motivation to keep abreast of the relevant research literature, except in those cases where there is direct donor involvement.

BUDGETING, FINANCING, AND ACCOUNTABILITY

The Present Chaotic System

In theory, planning, budgeting, and financing should go hand in hand so that realistic plans can be formulated and, once the research results are in, the costs incurred calculated. In practice, there is no such relationship within the IER budgeting system. The same holds for INRZFH. Within IER, there are two budget tracks -- the national and the donor. In the case of the former, the amount allocated has nothing to do with the previous year's performance, or the plans proposed for the following year. Rather it is based on the previous year's allocation, a not uncommon practice in many parts of the world. In essence, the budget covers primarily salaries, with little provision for either operating expenses or capital investments. It is impossible to do agricultural research without such operating expenses. The pittance provided through the national budget invariably arrives two to three months late -- as do salaries -- thereby further diminishing its overall impact on research, where timeliness is of the essence.

In many cases, research has been made possible through only donor financing. This financing is negotiated directly between the donor, the ministry, and the director of IER. Neither the ministry's CAF nor IER's DAF has any control or, for that matter, any information on how much money is involved. To ensure accountability, the donors often have one of their own people control the purse strings. Although such a bypass strategy has the obvious short-term advantage of circumventing the budgeting and disbursement process, it contributes nothing to improving and strengthening it.

Even without this two-track system, the financial management of IER leaves much to be desired, principally because it is very difficult to find out how much is spent on an annual basis and what it is spent on. A case in point was footnoted earlier -- the existence of differing sets of national financial data for the same year. For example, there are three different budgets presently available for DRA in 1986, as indicated in Table 7.

TABLE 7

DIFFERING BUDGETS FOR DRA IN 1986
(in thousands of FCFAs)

Source	National	Donor	Total
CNRA[a]	463,574	559,814	1,023,385
IER[b]	233,403	442,414	675,817
ISNAR[c]	419,000	560,000	979,000

Sources: [a] CNRA 1989:8.
[b] IER 1987:5-6,62.
[c] Casas et al. 1988:27.

The discrepancy in the figures for donor funding is due to the higher figure including both loans and grants. But the discrepancies in the national figures cannot be so easily explained away -- at least on the basis of the available documentation.

Variation at the Station Level

At the level of the individual research stations, the planning and budgeting vary considerably. At one end of the spectrum are N'Tarla and Cinzana. At the former, the CMDT plays an active role in determining the research agenda for the coming year, partly because it is the principal client for the research and partly because it pays for most of the capital costs and operating expenses, financed by a loan from the World Bank. At the Cizana station, which USAID supports through ICRISAT, the budget and broad outlines of the research program are decided each year in December, when the station director, his accountant, and the two donors--USAID/ICRISAT and Ciba-Geigy -- sit down and hammer out a budget together. In the beginning, this was not the case, but now the process is smooth and relatively straightforward. In brief, where donors provide some funding, there is some realistic planning and budgeting -- which may or may not tie in with GRM priorities.

Mopti and Koporo are at the other end of the spectrum, since neither receives any donor funding. The national budget covers salaries. Mopti gets almost no support, except for clients with an interest in contract research and quick results. Mopti also does seed multiplication under contract with several groups, the major one being Operation Riz. Each research agreement is accompanied by a budget, so that any research decisions made are accompanied by the necessary funding. In the case of Koporo, a sub-station, Cinzana or INTSORMIL will send a written research protocol, accompanied by seed, fertilizer, and other inputs. The head of the station then negotiates with the researcher regarding how much of the labor required he is willing to pay for, the major cost over and above inputs (Atwood 1989).

ACCOMPLISHMENTS AND RESULTS TO DATE

Accomplishments

Considering the limited resources allocated to agricultural research, the relatively young research institution with its related administrative and management problems discussed above, and the long time frame required for finding technological solutions to a range of complex problems, the accomplishments and results of the NARS (and particularly the IER) are not inconsequential. First, there now exists high-potential breeding material based on local, Asian, or other African selections, permitting developments in breeding and varietal selection. Second, an infrastructure of on-farm, multilocational trails is now in place, which, although it needs improvement, provides an important complement to on-station research. This complement is further reinforced by a growing body of practical research results produced by the various FSR projects. Third, many of the key interactions and problems involving field crops, pests, soil moisture, soil fertility, and livestock have been identified (Atwood and Elliott 1989: 17-18).

With the exception of cotton, many of the improved varieties and cultural practices were developed by USAID-funded projects. Summarized below is a list of those technologies that have been developed and extended to farmers, especially in the OHV and CMDT zones (Atwood and Elliott 1989: 2-17, 2-18; Reddy 1988:36-37).

Varietal Selection and Improvement

Some of the improved varieties mentioned below produce only marginally improved yields and are in need of further development, but they are superior to local varieties:

- **Cotton.** The most popular variety is B-163, and Mali's relatively stable cotton production is attributable to this. Two promising varieties recently identified are K-170 and B-431-6;

- **Maize.** Tiemantie, Zanguereni, and IRAT-2-81 are among the most popular, widely accepted varieties;

- **Sorghum.** Eighteen varieties have been tested on a large scale and seven have received varying degrees of acceptance. Tiemarifing and CE-90 are the most widely adopted;

- **Millet.** Twelve varieties have been tested on a large scale and four -- M9, NKK, IBV-8001, and NKK 3/4 -- have been adopted in varying degrees;

- **Peanuts.** Of the three varieties promoted by the extension agencies, 47-10 and 28-206 have been widely adopted; and

- **Cowpeas.** Of the four varieties tested, TVx 32/36, KN-1, and Gorom Gorom have been well received by farmers.

Agronomic Practices

Owing to the research undertaken by the three ongoing FSR projects, practical, validated information is available on the following:

- Improved intercropping systems: maize and millet, sorghum and peanuts, and sorghum and cowpeas;
- Improved crop rotation: cotton and cereals;
- Combination of synthetic and organic manures;
- Use of crop residues and compost;
- Forage production for traction animals and other livestock;
- Optimum planting density and sowing dates;
- Shallow plowing on sandy soils;
- Soil erosion control through dicing and tied ridges; and
- Soil covers.

Animal Traction

Technologies developed by the FSR project in Sikasso have become the principal means of improving animal traction productivity in the southern part of Mali. This package includes the following: training of oxen, on-farm management of oxen-housing-feeding, production of fodder and collection of manure, improved harness, and operation and maintenance of animal traction equipment.

Livestock Development

Testing and production of vaccines for livestock disease control are now well established through the Central Veterinary Laboratory. Research on production of fodder, crop-residue management, improved fallows for grazing, improved soil fertility, and on-farm management of livestock is continuing through INRZFH, albeit on a somewhat reduced scale now that USAID no longer provides support to ILCA.

PRINCIPAL CONSTRAINTS

The External Constraints

The principal external constraints affecting the performance of Mali's NARS-- and specifically IER -- are the physical environment and the policy environment. The harsh, unpredictable physical environment does not favor increases in agricultural production nor does it motivate the individual producer to take unnecessary risks and try to intensify production through planting higher-yielding varieties and following improved agronomic practices. Rainfall variation accounts for as much as 80 to 90 percent of variation in agricultural production over the past 10 years, a situation that discourages on-farm investment, the use of purchased inputs, and labor intensification. Soil fertility and structure are poor, exacerbated in some areas by increasing population pressure and shortening of fallow periods (Atwood and Elliott 1989:2-6). In southern Mali, the area receiving the highest -- and most dependable-- rainfall, soil erosion and decreasing soil fertility are identified as the principal constraints to production.

The policy environment directly affects the IER and what it can do in two important ways. Mention has already been made of the importance attached to intensification of the agricultural production system. Yet evidence from southern Mali and elsewhere indicates that the low rate of adoption of new technologies in cereals production -- improved seeds, chemical fertilizers, increased planting densities, and improved cultural practices -- is often due to the extensive nature of the cereal production system. This "extensification" is justified on the following grounds (Reddy 1988:56):

- A risk-management strategy that seeks to minimize losses brought about by rainfall variability;
- The availability of additional land to bring into cultivation;
- High cost of purchased inputs;
- Low prices for food grain cereals; and
- Lack of export markets for increased grain production.

The last two factors are policy issues which may well be beyond the GRM's capability to solve -- given the ready availability of food aid and cheap imports from the United States and Europe. Some hope may lie in developing a larger domestic market for food grains -- through economic growth and cost-effective ways of food processing -- whereby domestic grains can partially replace imported grains such as wheat and rice, but only if the price is right.

The second way in which the policy environment affects the NARS is through lack of political commitment on the part of the GRM: first, through the lack of a national strategy for agricultural research; and, second, through the lack of adequate resources to conduct the research actually approved. The last two five-year plans contain no strategy, only a list of research projects proposed by the respective

institutes (Casas et al. 1988:74-75). In 1986, the USAID contribution to IER's capital cost and operating expenses accounted for 34 percent of its total budget, with the GRM contribution amounting to 39 percent, mainly for salaries. As a result, the IER is almost totally dependent on the donors to get most research in the field under way.

However, as the ISNAR study goes to some length to prove, this latter failing is relative. In 1986, the GRM contribution to agricultural research totalled 0.29 percent of agricultural gross domestic product, which compares unfavorably with other countries in the Third World, where the percentage is usually of the order of 0.5 and up. However, it one includes the cost of technical assistance -- valued at Malian prices -- then the percentage increases to 0.64. When this assistance is valued at its real cost, however, the percentage reaches 1.2 (Casas et al. 1988:28-29). From the information available, however, it is unclear whether other countries also include the cost of donor support in their calculations.

A final external constraint affecting the NARS is the fact -- already referred to -- that GRM budgetary allocations, whether for salaries or operating expenses, always arrive two to three months late, an element endemic to government operations in Mali.

Internal Constraints

These have all been described and discussed in some detail above. In brief, the major internal constraints include the following:

- Lack of a strategic, long-term plan which lays out research objectives, how they are to be achieved, and the sources of financing. While this lack is being addressed by IER and ISNAR, there is still a long way to go. The documents produced by the five working groups provide primarily a wish list of what researchers would like to undertake -- if there were no constraints -- and really establish no priorities. The ISNAR synthesis is concerned primarily with laying out all these research possibilities and summarizing the personnel needs to achieve them (ISNAR 1989);

- Lack of a rational way of planning, monitoring, and evaluating research activities in a systematic manner;

- Uneven distribution of resources across the divisions, such that some with an important contribution to make -- such as DDI -- are grossly underfunded;

- The existence of divisions -- such as DET and DPE -- which appear to contribute little directly to IER;

- A system of accounting and financial accountability that makes rational planning and budgeting virtually impossible; and

- Overconcentration of research personnel in and around the capital. In 1988, of a total of 148 IER researchers, both Malian and expatriate, 103 -- 70 percent -- were located in Bamako and Sotuba.

RECOMMENDATIONS

Organizational Structure: Streamlining and Simplification

There is considerable potential for streamlining and simplifying the present organizational structure of IER. Neither DET nor DPE contributes much to the effectiveness of the institute and its research activities, a situation commented upon in earlier reports (Traore et al. 1986:27). DET mostly functions as a *bureau d'etudes* for the Ministry of Agriculture; it should be treated as such and given an institutional home directly within the ministry. The DPE really belongs within the Ministry of Planning and should be transferred there. Such streamlining would presumably call for changes in IER's statutes and general mandate.

DRA is the core of IER and commands the majority of the institute's resources. Given DRA's present personnel level of 550, as well as the fact that one cannot find out how much of the IER budget it actually spends and the cost of running the research stations, the indications are that it may well be unmanageable. It should be restructured and reorganized into smaller, more manageable units. There are several ways in which this could be accomplished. One of the more interesting ideas to emerge from both the IER working group reports and the ISNAR documents is the importance attached to a strategy of regionalization -- in essence, an attempt to assign individual research stations the lead role in research on specific crops.

In practice, this will mean that Cinzana remains the lead station for millet research, lending overall technical direction to the millet program, whereas specific responsibility for research in the Mopti region, including the Korporo station, will be that of the Mopti station, which will be provided with the necessary, additional resources. At present, Korporo falls under Cinzana's jurisdiction -- several hundred kilometers distant. At Cinzana, the field research will all be undertaken within 100 kilometers of the station, since the variation within that radius is characteristic of the region as a whole.

The key assumption underlying regionalization is that each of the eight principal stations will be responsible for research in all of the major crops in its region, under the general leadership of the lead institution for that crop. Mopti, for example, will conduct research on millet, cowpeas, and horticultural crops -- in addition to rice (Atwood 1989). If this strategy is followed, DRA could be restructured by region with a research coordinator for each station located in Bamako to ensure that activities within and between stations are, in fact, coordinated -- a process which will demand time; information; and, most important, resources.

A second way to restructure DRA is by commodity, an approach espoused by AID/Washington and, to a certain extent, by IER (Martin 1989). This approach builds on the historical record of agricultural research in sub-Saharan Africa. In most cases, small groups of scientists, normally not more than four, formed the commodity teams that produced hybrid maize in Zimbabwe and Kenya, rust-resistant wheat in Kenya, improved tea clones in East Africa, cotton in Uganda, and soybean and cotton varieties in Zimbabwe (Eicher 1988:19). In the context of Mali, this "concentrate and

focus" strategy will provide an excellent means of bringing together a number of research disciplines into a balanced and prioritized program. For example, a research team effort on sorghum/millet would include a critical mass of scientists drawn from agronomy, soils, plant breeding, entomology, pathology, agroforestry, forages, and social sciences.

The commodity team will be responsible for reviewing, planning, budgeting, and implementing the national sorghum/millet research effort throughout the country. In addition, it will carefully plan and prioritize the type of research investigations to be conducted at each of the research stations responsible for sorghum/millet work and the role and contribution of each to the country-wide effort. A set of criteria will be established to guide research planners in determining the level of research work to be conducted at each station. Possible criteria include the following (Martin 1989:3):

- Research trials that fit into the objectives of the national sorghum/millet research program;
- Type of trials to be conducted on-station and on-farm;
- Critical mass of scientists; and
- Adequacy of housing, laboratories, other facilities, and equipment.

If IER adopts this approach, then the logical way to restructure DRA will be along commodity lines -- with commodity divisions dealing with the major crops such as sorghum/millet, cotton, rice, and maize.

IER is also interested in pursuing an integrated approach to research, which it would like to combine with a strategy of regionalization. Instead of the current methodology, which focuses on a disciplinary or functional division of labor -- for example, fertility, breeding, agronomy, or economics -- the focus of research will be on a commodity, region, or farming system. For example, the breeder, the entomologist, the physiologist, the agronomist, and possibly the economist will all collaborate on an integrated millet research program based in Cinzana.

While regionalization and a commodity focus are not necessarily incompatible strategies over the long run, they cannot be pursued simultaneously, given the present institutional capability of IER in terms of personnel and resources. The only way to pursue both at the present time would be to drop certain stations completely from the research program and concentrate available resources in certain high-priority areas with known potential. At this stage in IER's institutional development, it makes sense to pursue a commodity focus for key selected crops, building on what is already in place, as discussed in more detail in the accompanying technical report. Trying to do research on all crops in a given region -- irrespective of their importance -- is a luxury that the GRM can ill afford.

This component will require the services of an expatriate technical adviser for a period of three years to work as a research administrator in close collaboration with the assistant director. Upwards of 25 months of short-term technical assistance will also be required.

Integrating Planning, Budgeting, and Financing

Planning

In theory, planning, budgeting, and financing should go hand in hand. In fact, they are all three discrete, independent activities that bear little or no relation to each other. To effectively integrate all three will require significant changes which will take time to implement. Over the next year, IER, ISNAR, and the GRM will produce a national strategy for agricultural research which will establish IER priorities for the next 15 to 20 years. These priorities, which should be revised and updated on a regular basis, will provide the framework with which the IER director will provide guidelines to his divisional heads when preparing their annual plans. At the same time, he will provide them with the necessary budgetary documents so that they will know how much their division is due to receive the coming year from both national and donor budgets. Together they will form a joint planning committee responsible for preparing the IER annual plan in draft and, where relevant, coordinating proposed activities. In the process of preparation, those parties most interested and most likely to benefit from the proposed research activities, will be consulted directly -- as happens with the CMDT.

The planning approval process will be simplified and made more relevant. The technical commissions, as presently constituted, will be scrapped and replaced with a smaller, more manageable entity composed of representatives from: the respective directions within the Ministry of Agriculture and the Ministry of Environment and Livestock; development projects; and farmer groups and associations. The latter are crucial since potentially they constitute IER's most important constituency, virtually nonexistent at present. Evidence from other Third World countries indicates that such bodies can play an important role -- first, by making their production needs known to researchers and, second, by disseminating and adapting improved techniques and cultural practices to local conditions. Possible candidates include *associations villageoisies* (AVs), *tons villageois*, precooperatives, and other producer groups. To a certain extent, the FSR teams can play a broker role.

This body will spend a week reviewing and commenting upon the plan in its entirety. It will not be responsible for evaluating research results -- to be discussed below. By introducing such a process, IER will save a considerable amount of time and resources: at present each division spends upwards of a month preparing for the annual encounters with the technical commissions -- each of which meets for a week and each of which is chaired by the director.

Budgeting

For any realistic budgeting to occur, the bureaucratic stranglenold exercised by the ministry's CAF must be loosened, if not permanently broken, since there is virtually no relationship between planning and budgeting at the present time. The most effective way to do this will be to revise IER's statutes and give it more

autonomy to manage and account for its own finances -- a proposal first made three years ago (Traore et al. 1986:67). With this flexibility, DAF will then be able to concentrate on the budgetary and accounting needs of IER, rather than those of CAF.

To plan realistically, the proposed planning committee must know what finances will be available in the coming year, information which should be provided by DAF. Such a potentially radical change in the present system can only be introduced gradually. Experience with the Mali Livestock Sector Project clearly indicates that changes of this nature must be tied in closely with specific activities. In this case, USAID could propose that one of the commodity programs it wished to finance-- say in millet or sorghum -- would serve as a model for implementing the system on an experimental basis. This experience could have an important demonstration effect and, to be effective, would have to be phased in over a period of years.

If the GRM takes the national agricultural research strategy and its priorities seriously, then hopefully pressure can be brought to bear for it to increase its financial commitments on a regular basis, instead of the present somewhat piecemeal process which makes a mockery of serious planning. Likewise with the donor community. If they are to take the strategy and its priorities seriously, then they should be prepared to make long-term commitments that respond to these priorities, provided, of course, that certain standards are maintained and concrete results achieved.

The objective is to have a budgeting and accounting system which integrates the two sources of funding -- both national and donor -- and produces monthly updates on all expenditures. As a consequence, when funds are late, monies can be reprogrammed from one division to another, or from one program to another, or from one activity to another, in order to make the most effective use of limited resources. At the present time this is impossible because of lack of information, lack of authority, and lack of trust.

Financing

The present system of financing is uncoordinated, piecemeal, and often appears to respond more to donor interests than Malian needs. To be effective, the donors must respond to the priorities identified in the forthcoming national strategy and agree to finance certain parts of it over the medium and the long term. This commitment is crucial if Mali's institutional capability to undertake effective research is to be strengthened. A case in point is the Dutch support of FSR in Sikasso which began in 1976 and is scheduled to continue until 1993. Development activities there, particularly the effective integration of research and extension, are regarded as the most successful in Mali (Eicher 1988).

In fact, one of the rationales for developing the national strategy in the first place is to use it as the framework for soliciting and coordinating donor assistance -- both public and private -- for agricultural research (USAID/Mali, Annex 3:6). The possible mechanism for achieving this will be discussed below. At this stage what is important is that donors agree to make this commitment so that the director and his

planning committee can plan accordingly and make modifications in the donor proposals, if circumstances so warrant.

The second aspect that requires donor concurrence is the agreement to let DAF manage and be accountable for all IER funding. This will require strengthening and modernizing DAF, through the provision of technical assistance, retraining -- and motivating -- the present staff in the use of computers and more cost-effective accounting procedures, the development of standardized accounting procedures acceptable to the donor community, and the establishment of financial accountability through a system of checks and balances.

This will be a major undertaking, but much can be learned from the USAID-financed Mali Livestock Sector Project which has tackled similar problems in the Ministry of Environment and Livestock. One of the management objectives in this project is to refine the existing financial monitoring system and provide a more effective and timely assessment of the progress and financial status of each program activity. While progress to date has been slow, the leadership has welcomed the innovations introduced. To date only the national budget has been affected.

This component will require the services of an expatriate technical adviser for three years to work as a financial and accounting specialist in close collaboration with the head of DAF and the assistant director. Upwards of 25 months of short-term technical assistance will be required. Funds will be made available for computerizing DAF.

An Increased Role for Economic Analysis

Economic analysis of new varieties, new technologies, production constraints, market demand, and related themes properly belongs to the two divisions -- DET and DPE -- which are recommended for transfer elsewhere. By default, some economic analysis is now undertaken by the FSR teams, particularly at the level of the individual family farm. But economic analysis is also needed at the station level in order to calculate the costs and returns from on-station research. This becomes more of a realistic possibility if a commodity team approach is followed, not only for calculating the research economics, but also for investigating the larger economic questions related to the costs and benefits of extending improved seeds and/or improved technologies on a larger scale. The provision and availability of such data could also improve the annual planning cycle.

The ARSP will provide the services of an agricultural economist for a period of three years who will serve as an adviser to both the head of DRSPR and the head(s) of the commodity programs(s) to be supported by USAID.

Synthesis and Dissemination of Research Results

At present there is no synthesis of research results. The process of report preparation for the annual encounters of the technical commission produces standard, turgid documents which, with one or two notable exceptions, make for heavy reading.

The week-long defense of research results before a crowd of up to 80 partisans, while it may have certain ritual and symbolic importance, appears to contribute little to the research endeavor. All development activities, in theory at least, are evaluated in terms of the outputs obtained and the results achieved: number of bridges built and the difference they made; metric tons of corn produced and their contribution to improved nutrition and higher income; and number of extension agents trained and their impact on farming practices.

The case of agricultural research is somewhat different: first, it has certain scientific standards to meet in terms of reliability and validity; second, its potential audience is not restricted to Mali, rather it is world-wide; and, finally and perhaps most importantly, the acid test is whether the research results respond to local needs. When the research results are disseminated to farmers, do they modify and adapt them to their own needs? In brief, IER, like any other worthwhile institution engaged in serious research, is -- in the final essence -- in the business of information generation and dissemination. In this domain, there is much room for improvement.

Mention was made earlier of the moribund state in which DDI -- in theory the division responsible for such activities -- finds itself, a situation commented upon in earlier reports (Traore et al. 1986:26). Mention was also made of the present, rather chaotic process of evaluation conducted during the annual technical commission meetings. Under the proposed project, individuals will have their research evaluated by their peers in a two-stage process, first at the level of the division, and then at the level of the IER. That which is judged acceptable will then be edited, polished, and published by DDI -- for distribution both within and outside Mali. Earlier this year, DRSPR produced the first number of a journal of this type, which, while a step in the right direction, leaves considerable room for improvement -- both in the quality and the type of articles published.

In addition, the best material will be summarized and published in abbreviated form on a regular basis, also by DDI, and distributed to interested researchers. In the early 1980s, the FAO financed a newsletter/bulletin of this type and it was, according to reports, very popular.

A third type of publication or report provides practical information -- based on proven research results -- for extension agents and farmers. What happens to the research results has not been of great concern to IER until relatively recently, with the advent of FSR. When questioned about who is responsible for disseminating the research results, investigators based at the various stations gave a standard response about how the process is supposed to work -- on-station, multilocational, on-farm, pre-extension, and extension. But when questioned more closely about who is actually responsible for preparing the "message" at the pre-extension phase, their responses varied considerably. The most effective system is that implemented by IER and CMDT in Mali Sud where the FSR component plays a crucial role in testing the proposed packages on farmers' fields under their conditions. FSR personnel are also responsible for training the CMDT extension agents who will extend the "message". The CMDT has its own training division, responsible for preparing the extension materials in conjunction with both the station and the on-farm researchers.

Ideally, IER -- through DDI -- will be responsible for "packaging" the research results for dissemination and use by extension agents. It will also be responsible-- and this is already happening to a certain extent with FSR activities in OHV -- for evaluating the impact of its research results. Under the proposed project this will become standard practice and funds will be made available for DRSPR to do this on a regular basis, in close collaboration with DDI.

This component will require upwards of six months of short-term technical assistance in desk-top publishing and general computer and publication skills. Funds will made available for computerizing the division and for producing and distributing IER reports and publications on a regular basis.

The Role of the Donor Community

One of the objectives in preparing a national agricultural research strategy is to use it to solicit and coordinate donor assistance. Donors always pay lip service to better collaboration, in spite of the fact that it may not always be in their own best interests or those of the host government. A case in point is FSR -- currently funded by both the US and the Dutch. In spite of the fact that the Dutch project, which has been functioning since 1976, is regarded as highly effective and a model of what can be achieved in Mali, there has been only limited contact at the institutional level of the respective donors, although there are regular monthly meetings at the operational level. This should surprise no one.

As indicated earlier in Table 1, the donors are already financing a variety of agricultural research activities: the French in cotton and soil/water/plant relationships; the Dutch primarily in irrigated rice and FSR; the World Bank in cotton, phosphate, and rice seed production. Until this year, the Canadians have financed FSR and also some agroforestry research -- particularly under the irrigated conditions prevailing in the Office du Niger. One major change in the near future will be the potential role of the World Bank, which is funding Training and Visit (T and V) extension activities in various parts of the country and proposes to also invest in agricultural research here. Preliminary reports indicate that T and V is not viewed very favorably by the Malians since they see little advantage in it. Concern has been expressed, however, that World Bank funding of research may be closely tied to GRM acceptance of the T and V system (Atwood 1989). The Dutch will continue to finance FSR in Sikasso and irrigated rice research at Kogoni.

The Canadians will soon have an agronomist based permanently in Bamako who will be preparing their agricultural portfolio, at which time they will be interested in participating in a Donor Coordinating Group. At present, the Canadians do not finance any research activities undertaken by the research institutions. However, they are very interested in seeing the research results implemented in their various ongoing agricultural/rural development projects.

The words "coordination" and "collaboration" have been used virtually synonymously for some time in project design documents and evaluations. Chambers (1974) has noted that the use of the word "coordination" often indicates a shallow understanding of local incentive systems, cultural perspectives, and bureaucratic

dynamics. He went so far as to suggest that the value of a consultant's report is in reverse relation to the number of times the word appears in the report! According to a forthcoming article (Honadle and Cooper 1989):

> the word ["coordination"] remains one of the most common ones found in donor evaluations and consulting studies. But imprecision and allusion continue to characterize the word. It is sometimes a euphemism for poor management behavior and it often is used to gloss over organizational enmities, personal antagonisms, or political conflict. A call for more coordination may be a thinly disguised plea to act 'better.'

On closer inspection, however, there are three overlapping dimensions of coordination: information sharing, resource sharing, and joint action -- all of which have been touched upon above in discussing how certain aspects of IER's organizational dynamics can be improved and strengthened. These coordination functions make more sense when viewed within the larger institutional context within which agricultural research occurs. Within a small circle is the area a program can control, in this case all agricultural research undertaken in Mali. Beyond is a larger area where the program may influence what is going on, but is unable to control it because others have access to their own resources. This would include many agricultural activities implemented by the two ministries and the semi-autonomous development authorities, such as CMDT and OHV. And beyond that is a still larger area which the program cannot influence, but where what occurs may influence the program -- as discussed above in the section dealing with external constraints.

USAID experience with donor collaboration in Mali has been mixed -- ranging from the unsuccessful efforts to rally both donors and the GRM around the issue of reforming the regional development organizations to the successful experience with other donors on grain market policy reforms, under its Cereals Market Restructuring Project (PRMC), managed as an integral part of a larger multidonor/GRM effort (Simmons 1987:21-22). While the PRMC contributed in a concrete way to food security in the 1983 and 1984 drought years, it is the joint programming of the reflows from food aid sales which has provided the GRM/multidonor forum for a joint analysis and discussion of agricultural sector and grain marketing/pricing policies, expected to lead to long-term food security in Mali.

The donors set up a technical committee, consisting of staff members -- generally economists -- of their Bamako offices, and a management committee, consisting of the heads of their Mali missions, to participate in the policy dialogue process and the management of the counterpart fund. The donors agreed on a common framework of objectives which are relatively consistent and for which they are prepared to provide implementation support in the form of food aid or cash assistance directly to the counterpart funds. The minister responsible for execution of the project chairs the joint management committee which consists of the heads of donor missions, together with other ministers and agency heads.

A participant in this process outlined the following conditions that have to be met, if similar collaborative efforts are to have any chance of success (Simmons 1987:32):

- A high degree of initial consensus on mutual objectives;
- A clearly outlined program of action at the outset;
- Some jointly managed financial resources; and
- The provision of technical assistance to the GRM.

Two important caveats were also included: first, resources cannot be programmed too tightly and some flexibility is mandatory; and, second, the donors cannot expect to control the process and must be prepared to share the decision-making responsibility.

For the national agricultural research strategy, it has been suggested that USAID take the initiative and encourage the minister of agriculture and the director of IER to work through the Special Program for African Agricultural Research (SPAAR) and organize a formal Donor Coordinating Group. SPAAR has already instituted one such group in Tanzania and could draw upon this experience in organizing a similar group in Mali (Martin 1989). The leadership must come from the ministry, which will approve both its composition and its mandate.

The proposed responsibilities of this Donor Coordinating Group will include, but not necessarily be restricted to, the following:

- **Information Sharing:** keeping each other and the GRM informed of ongoing agricultural research activities. Reviewing the national agricultural research strategy and reaching agreement on who will fund what and at which level. Reviewing and commenting upon the IER's annual work plans and annual research results;
- **Resource Sharing:** agreeing to provide complementary resources to address some clearly defined problem, for example, in accounting, computerization, or information dissemination; and
- **Joint Action:** the most crucial area is accounting and financial accountability and agreement must be reached among the donors and between them and the GRM to do the following -- program and manage national and donor funds together and institute a standardized system of financial accountability. Such a system is supposedly being introduced into the agricultural research system of Niger.

The Role of External Research Institutions and Networks

The involvement of donor and international research institutions can best be achieved through a well-planned collaborative research effort (Martin 1989). One possible strategy would be to have scientists from the CRSPs, such as those working on sorghum and millet, tropical soils, cowpeas, and peanuts, and the International Agricultural Research Centers collaborate with IER scientists in planning the national commodity research programs, if the commodity program approach is the one the GRM decides to follow. The CRSP scientists will visit twice a year: first, for the

annual planning and budgeting exercise; and, second, during the later stages of the growing season to collaborate with IER researchers in observing, monitoring, and evaluating trials at the on-station and on-farm levels. The visiting CRSP scientists will be encouraged to serve as collaborators on a continuing basis. Moreover, the networks supported by USAID and SAFGRAD should also be invited to participate in these visits, thereby ensuring broader collaboration. Such collaboration will provide commodity research under the IER with a significant degree of scientific legitimacy.

The IER currently collaborates with the West African Sorghum Network, the West African Cowpea Research Network, the West African Maize Research Network, the West African Peanut Network, and the West African FSR/E Network, all supported by USAID and SAFGRAD. The proposed project will be designed to provide resources for the networks to conduct research trials in Mali and for Malian researchers to participate actively in these networks in a variety of ways, including the following:

- To visit ongoing research activities in neighboring countries;
- To participate in planning workshops and monitoring tours;
- To participate and present papers at regional workshops, seminars, and conferences;
- To obtain varieties for testing through the various networks; and
- To collaborate on specialized problem areas with researchers who have similar interests.

The networking activities provide an excellent opportunity for Malian researchers to observe and exchange information with other scientists in the region. The IER also collaborates with the CORAF networks, which focus on groundnuts, maize, cotton, and cassava. The sum of $25,000 a year will be provided for CRSP activities and $100,000 per year for networking activities.

The Project Paper Design

Key Design Issues

During the process of PID preparation and many discussions with both IER and USAID, the following issues continue to appear:

- What should USAID support in terms of the priorities laid out in the accompanying budget?
- Commodity team approach versus regionalization: polar opposites, complementary, red herring?

- What precisely should be the priority research areas within the commodities to be supported -- if that is the approach to be followed?

  -- Varietal improvement

  -- Soil fertility

  -- Economic analysis of technologies at both on-station and on-farm levels

  -- Food technology

  -- Production constraints

  -- Forage production

  -- Training of human capital

- What is the proper role of USAID in the Donor Coordinating Group?

- How should USAID deal with the World Bank and their avowed interest in financing agricultural research in Mali, particularly if tied to the T and V blueprint?

- How important a role should FSR play vis-a-vis varietal improvement and what are the respective contributions of thematic and systems research to increases in productivity, overall production, and ultimately, economic growth -- minor, complementary, primordial?

- The numbers game: how many trained researchers does Mali need and how many can it afford?

- Sustainability: what percentage of the overall research budget should be borne by the GRM -- after five years, after ten years?

- What contractual mechanism should be used for designing the PP: Title XII; IQC; some combination thereof?

- What should be the proper role of USAID/Washington in the PP design?

- What contractual mechanism should be used for implementing this project: Title XII, open bidding, some combination thereof?

- How can preparation of the PP assist IER in the preparation of its national agricultural research strategy?

Composition of the Design Team

The PP design should take place in the fall of this year -- during the months of October and November -- and the team should consist of the following:

- Team leader/design specialist (8 weeks);
- Sorghum breeder (6 weeks);
- Specialist in deep water/floating rice (6 weeks);
- Farming systems agronomist (6 weeks);
- Small ruminants/forage specialist (6 weeks);
- Agricultural economist (7 weeks); and
- Specialist in finance and accounting (6 weeks).

In addition, the AID agricultural research coordinator for the African Bureau should also participate -- as a senior policy adviser -- for the first two weeks and the last two weeks of the design effort.

Initial Comments from the Institut de Recherche Economique

Prior to their departure from Bamako, the PID design team gave a presentation at IER to the Assistant Director and the division chiefs, summarizing the major recommendations made in this report and the accompanying report by the agronomist. The response was generally favorable and a spirited dialogue ensued, in which the principal points made included the following.

- **Contribution to the National Strategy:** According to the Assistant Director, to date neither IER nor ISNAR has addressed the institutional aspects of the upcoming national agricultural research strategy. This report will serve as basic point of reference and discussion, particularly once it is translated into French.

- **Financing the Proposed Institutional Changes:** Many of the criticisms and recommendations of IER as an institution have been made in earlier reports, but have never been implemented because there were never any funds available. In what way is the ARSP any different from its predecessors? The ARSP will be realistic and pragmatic by: first, working towards integrating planning, budgeting, and financing; and, second, by insisting on better collaboration among the donors and their agreement to establish one planning process to include both national and donor funds. The CILSS-supported AGROMET in Burkina Faso is a potential model for how this type of donor collaboration can be established.

- **Strengthening IER Capacity in Economic Analysis:** Why was no mention made of possible assistance to DET which, in theory, is responsible for doing economic analysis at the station level, as well as networking for the other divisions? In practice, the division operates more as a *bureau d'etudes* for the ministry than as the economic research arm for IER. The point was strongly made that there are some good economists in DET who do not get the chance to do the sort of research that would benefit the agricultural research -- particularly its impact at the farm level -- because there are no funds available. Better to use the funds destined for hiring a long-term expatriate economist to pay the operating costs of the division, thereby providing IER economists with the necessary resources to conduct research, especially on impact.

- **No Need for an Expatriate Chief-of-Party:** Why does the proposed technical assistance team need a full-time chief-of-party? The team should follow the example of the other expatriates working in IER, who are completely integrated into the divisions, and respond to their respective divisional heads. With its own team leader, the team might well march to its own drummer, rather than IER's. The proposed expatriate research coordinator could handle the necessary administrative matters for the team.

- **Hiring a Scientific Editor:** Given the potential importance of IER reports and publications, DDI needs the services of a scientific editor for a period of two years, especially if USAID and IER are serious about producing professional publications.

- **Commodity Research a Priority:** In the agronomist's report, FSR is identified as the first priority for IER and USAID because of its importance in identifying applied research needs and also in adapting research findings to the local circumstances. The major portion of the proposed budget, however, is potentially allocated to supporting commodity research programs in millet, sorghum, rice, cowpeas, and maize. In contrast, the ISNAR reports -- together with the reports of the IER strategy working groups -- appear to favor a strategy of regionalization. In fact, the commodity approach is already under way and the IER people present had no problem in accepting it.

- **A Word of Caution:** The Assistant Director emphasized that these were all preliminary, unofficial comments and that IER looked forward to receiving the French translation so that, on his return to Bamako, the Director General and his staff could have the opportunity to reflect on the recommendations proposed.

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