

Improving the Management of Agricultural Research

Report and Recommendations

for

The Agricultural Research Corporation

of

Sudan

International Service for National Agricultural Research

February 1984

Improving the Management of Agricultural Research
Under Scarce Resource Conditions

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Table of Contents

	<u>Page</u>
Summary of Recommendations	
List of Acronyms	
I Introduction	1
II Terms of Reference and Methodology	3
A Terms of Reference	3
B Methodology	4
III Agricultural Research Corporation (ARC)	5
A History	5
B Facilities and Resources	5
C Organizational Structure and Relationships	6
D Program and Budget Processes	6
E Recent Changes and Their Impact	7
IV Management Frame of Reference	8
V Management with Scarce Resources	9
A Resource Management	9
B Resource Generation	10
VI Key Management Functions Affecting Resource Utilization	11
A Data Collection and Use	11
B Setting Research Priorities	12
C Program Planning	12
D Program Budgeting	13
E Resource Allocation	13
F Program Implementation	14
G Supervision and Monitoring	14
H Fiscal Control and Accounting	14
I Evaluation	14
J Organization - specification of roles and relationships	15
K Organization - delegation of authority	15
L Organization - leadership and motivation	16
M Time Utilization	17
N Communication	17
O Personnel Administration - Manpower Planning	17
P Personnel Administration - Recruitment	18
Q Personnel Administration - Staff Development and Training	18
R Facilities and Equipment Management	18
VII Strengthening of ARC Management of Resources	19

	<u>Page</u>
VIII Recommendations for Management Training	20
A General Strategy	20
B Objectives	22
C Programs	25
1. Phase 1	25
Explanatory Comments	25
2. Phase 2	27
Explanatory Comments	27
D Resource Levels and Funding Requirements	27
E Resource Generation	27
F Implementing Structure	28
IX Conclusions and Follow-up Actions	29
A Agricultural Research Corporation	29
B Corporation Development for Africa	29
X Tables of Recommended Management Actions and Management Training Activities	31
Table 1 Actions related to strengthening ARC's Resource Management	31-36
Table 2 Program to strengthen Management under Scarce Resource Conditions	37-40
Phase 1 - first 18-24 months	37-40
Table 3 Program to strengthen Management under Scarce Resource Conditions	41-45
Phase 2 - the 36 months following Phase 1	41-45
XI Appendices	46
A Itinerary and List of Persons Interviewed	46
B Tentative Outline for a Conference in Executive Management	49
C Tentative Outline for a Training Course in Program Planning and Budgeting	50
D Tentative Agenda for a Training Course in Research Station Management	51
E Sample Training Module	54

SUMMARY OF RECOMMENDATIONS

In response to a request from the Agricultural Research Corporation (ARC) for assistance in improving the management of its research program under scarce resource conditions, and as part of a Cooperative Development for Africa (CDA) special project to strengthen the management of agricultural research in Africa, an International Service for National Agricultural Research (ISNAR) Study Team conducted an on-site review of the ARC's management and operations. The team held extensive interviews with the ARC staff and shared its initial observations with senior ARC staff in the Sudan at the end of the study. The team's recommendations for improving the ARC's management are listed in the report.

The team analyzed the various functions through which the responsibilities of management are exercised in the ARC with a view to identifying those functions which show possibilities for resource economies. The functions reviewed included both resource management and resource generation. The team also considered strategies for improving the ARC's resource management.

The primary recommendations are as follows:

1. That a program to improve resource management be developed and pursued. There is evidence of significant scope for resource economies in the ARC resource management. Functions which show possibilities for resource economies include data collection and use, setting research priorities, program planning, program budgeting, resource allocation, program implementation, supervision and monitoring, fiscal control and accounting, evaluation, specification of roles and relationships, delegation of authority, leadership and motivation, time utilization, communication, manpower planning, recruitment, staff development and training, and facilities and equipment management.
2. That the management improvement program include both management training and complementary management actions. In the case of most, if not all the functions listed, improvements will occur best, and in many cases only, through programs that consist of both management training and related management actions. These actions, depending on the function, consist of system development, technology introduction, development of procedures, role clarification, and so forth.
3. That programs to improve resource management be developed in accord with a strategy which incorporates a number of elements including strengthening the ARC's own capacities as distinct from introducing resident expatriates, building a climate for change, developing a strong leadership team, developing a supportive "critical mass", and utilizing energies in the system which are supportive of change.

4. That the management improvement program be implemented in two phases, PHASE I lasting 18-24 months and PHASE II covering the following 36 months.
5. That PHASE I focus on making a rapid impact on the ARC resource use, and give primary attention to the functions of data collection and use, setting research priorities, program planning and budgeting, leadership and motivation, communications, resource generation and manpower planning. Primary training programs recommended for PHASE I consists of: an Executive Leadership Conference; Program Planning and Budgeting Workshops for Managers and Scientists; a Training Program in Managing Research Stations; and a Training Design and Implementation Workshop. Primary management actions relate to establishing the management improvement program, setting program priorities, resource generation, and improved program planning and budgeting procedures. Time duration for PHASE I is 18-24 months.
6. That PHASE II focus on continuing the strengthening of the ARC resource management, developing increased management and administrative support functions, increased resource generation, increased staff professionalization, and increased training capability. The program to achieve these goals should consist of both training activities and complementary management actions, and should continue for 36 months following PHASE II.
7. That specific activities be set in motion to obtain additional resources through improved program and budget planning, preparation of proposals for donor agencies, increased commercial production, and revised fees and charges for testing and other services.

LIST OF ACRONYMS

ARC	-	The Agricultural Research Corporation (of Sudan)
CDA	-	Cooperative Development for Africa
ICARDA	-	International Center for Agriculture in the Dry Areas
ICRISAT	-	Institute for Semi-Arid Tropics
IDA	-	International Development Association
IDRC	-	International Research Development Centre (Canada)
ISMAR	-	International Service for National Agricultural Research
TOR	-	Terms of Reference
UNDP	-	United Nations Development Programme
USAID	-	United States Agency for International Development

I INTRODUCTION

The purpose of this report is to present to the Agricultural Research Corporation (ARC) the recommendations of the International Service for National Agricultural Research (ISNAR) on management training programs to strengthen the ARC's management of its research program under scarce resource conditions, and to identify from the Sudanese experience, ways in which management training can help improve research management in Africa.

The ARC's effectiveness is crucial to the life of the Sudan. The agricultural sector provides approximately 96% of the country's export earnings, 50% of its government's revenue, and employs 80% of its people.

The necessity of on going research to provide the scientific undergirding to the essential enterprise of food production was recognized in the creation of the ARC. Its mandate states that it is to "Investigate the scientific basis of crop production in the Sudan with a view to producing maximum yields of crops with minimum cost." This central and almost exclusive mandate has been reinforced by recent government reorganizations which have brought other agriculture-related research areas under the ARC's jurisdiction. Chief among these are food processing, forestry, fisheries, rangeland and pasture, and wildlife. It is further reinforced by the legal responsibility to test all chemicals and agricultural innovations before introduction into the Sudan's production schemes.

The ARC's task is facilitated by the fact that most of the Sudan's commercial crop production is concentrated in government sponsored production schemes, a fact which permits direct linkages between research facilities and farmers.

A number of events have generated intense pressure on the ARC to perform its functions and to do so under difficult conditions. The addition of the new research functions referred to, the creation of new stations and facilities, the projected relocation of the ARC headquarters, and the initiation of government decentralization necessitate substantial changes in the ARC's management structure and processes. In addition, dropping production levels, changes in cotton-type demand, the initiation of major donor sponsored projects, and expanded concerns for traditional and non crop agriculture place extra ordinary demands on the ARC.

Overriding other factors is the felt scarcity of funds and the government processes which affect the timing, type and allocation of resources. These have serious impact on the supply, effectiveness and morale of staff at all levels.

The burden of continuing to fulfil the Sudan's agricultural research program falls directly on the ARC management and its interest in obtaining assistance to meet the current challenge through management training is wholly appropriate. Training is a major means whereby the human skills are developed which in interaction with technology, systems and procedures constitute management.

A number of factors have emerged which support the direction and timing of the ARC's interest. Preparations for a major World Bank/AID loan for education, research and training, and national interest in manpower development as represented by President Nimeiri's proclamation of 1984 as a "Year of Training" reflect governmental interest consistent with the ARC's initiative.

The recommendations in this report are directed towards immediate improvement in the ARC's management under resource scarce conditions and towards longer term actions which will reinforce and strengthen that improvement through providing additional management tools and capacities. They comprise recommendations both for training and other management actions consistent with the expanded demands on the ARC. It is felt that they respond to the reality of both the ARC's challenges and opportunities.

This study is part and parcel of a larger management training survey of research systems in Africa conducted under a CDA funding. In a conclusion, the report highlights issues identified in the Sudan which appear to be common to other African research systems.

II TERMS OF REFERENCE AND METHODOLOGY

A. Terms of Reference

The Terms of Reference (TOR) for the study reflected in this report were set by the merging interests of the ARC and ISNAR, the latter as it executes a special project grant from Cooperative Development for Africa (CDA). Correspondence between the Director General of the ARC and the Director General of ISNAR in mid-1983 led to the expression of interest by the ARC in management training for its staff. ISNAR responded by inviting three members of the ARC staff to participate in the ISNAR/ESAMI (Eastern and Southern African Management Institute) workshop "Management of Agricultural Research", 18 to 30 July 1983, Arusha, Tanzania. The three ARC staff were Dr. Hassan Khalifa, Deputy Director General; Dr. A. Dafalla, Director of the Western Sudan Agricultural Research Project (WSARP); and Dr. Babiker B. Mohammed, Director of the Food Research Center. This was followed by a meeting in August 1983, between Dr. Bakheit Said and Mr. H. Hobbs of ISNAR at which the groundwork was laid for an ISNAR mission to identify management training needs within the ARC with particular reference to strengthening the ARC's management under scarce resource conditions.

The ARC's expression of interest coincided with ISNAR's overall mandate to improve national agricultural research systems through management training and with its special interests as a result of the CDA special project grant. Under the auspices of CDA grant with financial support from USAID and ODA (UK), ISNAR has been engaged in a series of country field studies to determine specific "in career" management training needs in African agricultural research systems, and to recommend appropriate training programs. Studies have been completed in Zimbabwe and Cameroon. As a result of the merging interests of ARC and ISNAR the Sudan was selected as the site for the third CDA country study.

The TOR for the study were:

1. For ARC:
 - a. To review the management of ARC under scarce resource conditions;
 - b. to make recommendations on the application of management training to maximize research under resource constraints.
2. For CDA:
 - a. To review the operation of ARC as an African agricultural research system;
 - b. to identify management training needs particularly as they may reflect needs broadly apparent in Africa.

During the course of the study, ARC staff indicated that ARC was to participate in a World Bank loan to strengthen its operations. This knowledge introduced a modification into the TOR in that it opened the possibility of the elimination of some aspects of the constraint occasioned by insufficient funds.

The ISNAR team consisted of Huntington Hobbs (Senior Research Officer, ISNAR), Ghazi Hariri (Senior Research Fellow, ISNAR), and Robert Ayling (Consultant).

ISNAR wishes to thank Dr. M. Bakheit Said, Director General, and the staff of the Agricultural Research Corporation for their cooperation and generosity in the course of this study. An itinerary and list of persons interviewed is included in the appendices.

B. Methodology

The methodology by which the study was conducted included several steps:

First, the ISNAR team reviewed recent reports on the Sudan, Sudanese agriculture, Sudanese agricultural research, and agricultural research management.

Second, interviews were held with ISNAR staff familiar with the Sudan, or experienced in research management in Africa.

Third, on-site individual and group discussions were held at different ARC research stations with the ARC staff including Dr. Bakheit Said, senior administrative staff, national coordinators, directors and heads of a number of stations and centers, Gezira Research Station (GRS) section chiefs, scientists and inspectors of administration and other administrative staff. Very fruitful discussions occurred in these meetings.

Fourth, interviews were held with relevant university personnel, and donor and international agency representatives in Khartoum. A total of fifty persons was interviewed in the Sudan.

Fifth, a meeting was held at the close of the mission with senior members of the ARC and GRS staff at which the team's major observations were shared and discussed, and during which a lengthy and useful discussion occurred.

Sixth, the writing of a draft report, which was forwarded to the Director General of the ARC for reaction and comment.

Seventh, the writing of a final report for transmittal to the Director General of the ARC.

III THE AGRICULTURAL RESEARCH CORPORATION (ARC)

A. History

The ARC is a semi-autonomous national research organization directly responsible to the Minister of Agriculture, Food and Natural Resources. Created in 1967 under the Agricultural Research Corporation Act, it is responsible for almost all agricultural research in the Sudan. Its establishment was the result of a long history of research, initially in cotton but increasingly in other crops, beginning at Shendi and Kamlin (1902), Rumbick and Wau (1903) and Shambat (1904). Other centers followed, with the creation of the Gezira Research Station in 1918 being a major step; and it became the center of the research establishment. Other stations were added dealing with rainfed as well as irrigated agriculture and in 1967 the ARC was created with headquarters at Wad Medani to replace the administration of research by the Ministry of Agriculture which had existed since 1917. Subsequently, other research stations were added, and in 1977 an amendment to the Act of 1967 transferred to the ARC research on food processing, fisheries and marine biology, forestry, range and pastures, and game and wildlife. The importance of the ARC has since grown with the addition of large donor-funded research projects.

B. Facilities and Resources

The ARC's legal and geographical mandate is fulfilled through a network of research stations and centers spread throughout the country associated with regions, ecological zones and production schemes. Among these are 10 regional stations (Gezira, Kenana, Hudeiba, Kadugli, Yambio, Shendi, New Halfa, Sennar, Rahad, Shambat), 2 commodity stations (Guneid, El Obeid), and a number of centers and sections (food processing, fisheries, forestry, range and pasture, and wildlife). A number of sub-stations and testing sites provide outreach to the main stations.

The ARC has approximately 225 scientists including about 155 at the Ph.D. or M.Sc. level. An additional 70 (approximately) are on study leave, mainly abroad at US and UK universities. Many scientists have received additional training by participating in short courses, workshops, and conferences at various universities and international centers.

The financial resources and support for the ARC come from a number of sources. The principal source of funds is the central government. Other important sources are grants from local and international institutions. Other supplementary sources are the sale of crops and produce, grants, fees and income from services and publications, and foreign donors. Most important among the latter are funds from the International Research Development Centre of Canada (IDRC) and the United Nations Development Programme (UNDP). The Western Sudan Research Development Project is jointly funded by USAID and the World Bank (IDA). The ARC participates in cooperative research projects with international research centers, namely the International Center for Agriculture in the Dry Areas (ICARDA) and the Institute for the Semi-Arid Tropics (ICRISAT).

C. Organizational Structure and Relationships

The ARC is administered by a Council responsible to the Minister of Agriculture, Food and Natural Resources, and chaired by the Director General of the ARC. Council members represent the ARC administration, production schemes, government corporations, ministries, universities, official regional administrations and other government bodies.

The Council works through two major committees, the Technical Committee and the Administrative and Finance Committee. The directors and heads of research stations and centers are members of both committees with additional members primarily in technical and scientific areas on the Technical Committee and in the administrative area on the Administrative and Finance Committee.

Establishing priorities among research projects is formally the responsibility of the Technical Committee. To facilitate program coordination, national coordinators have been established in all major crop and some disciplinary areas. Task forces or research teams including both ARC and non-ARC members have been established under the Technical Committee and have field monitoring and review responsibilities. Also, technical committees for crop husbandry, cotton varieties, pests and diseases, rainlands agriculture and propagation have special national responsibilities in relation to innovation, adoption, feedback and research priorities, and relations with production schemes.

An Annual Agricultural Meeting is held to play a central role in discussing achievements, limitations and future remedial actions.

D. Program and Budget Processes

The ARC annual program is developed through interaction between scientists and station directors with input by national coordinators and technical committees, and flows through the Deputy Director for Programs and the Director General to the Technical Committee of the Agricultural Research Council.

The annual budget cycle begins with a directive from the Deputy Director General (Administration and Finance) in January or February to station directors and heads instructing them to prepare and submit budgets. After consideration and input by the ARC administration an overall budget is forwarded to the Ministry of Finance through the Committee on Administration and Finance. Following receipt of the budget in early March, the Ministry of Finance and Economic Planning calls a meeting of the Minister of Agriculture, Minister of Finance, the Director General of the ARC, and other high ranking officials to discuss the budget and to reach a tentative agreement. Final approval is given by the Council of Ministers. After approval, allocations are made on the recommendation of the Director General by the Agricultural Research Council's Committee on Administration and Finance.

E. Recent Changes and Their Impact

As indicated earlier a number of events have occurred in the recent past which impact on the efficiency with which the ARC can fulfill its responsibilities. Many of these events, including the closing, opening and addition of stations and centers, the change of old roles and the establishment of new roles and functions, and the number of staff newly incumbent in senior positions, pose significant difficulties for organizations operating under the best of conditions and with the maximum of support and assistance. To an organization laboring under the resource and other constraints affecting ARC, they create a situation of almost crisis proportions and warranting major action.

IV MANAGEMENT FRAME OF REFERENCE

The review of the ARC management of its program to identify areas in which resource economies might be effected was approached from a management perspective.

Management is the process of organizing and operating a series of activities as a coordinated, productive whole to achieve stated goals. More specifically, it is the process by which human behaviors interact with systems, technologies, resources and internal and external environments to achieve pre-determined ends with maximum efficiency. In this process a number of functions must be performed in a coordinated fashion. The study team, therefore, discussed these management functions with the ARC staff to identify ways in which economies might be obtained.

A basic premise in the study is that the goal of agricultural research is the improvement of agricultural production, i.e., increasing crop yields in the Sudan. The study team discussed with the ARC staff the management functions performed by the ARC to identify their impact on improving agriculture, and to evaluate the efficiency and effectiveness with which the resources at the ARC's disposal are utilized. The term "resources" was interpreted in a broad sense to include funds, equipment, infra-structure, time, staff, etc.

The study is concerned with the management of the ARC as a research institution, as well as with the management of the research process and program within the ARC. Institutional procedures such as administration are considered a part of management, as administrative systems, functions and policies are tools by which management achieves its goals.

A system-wide perspective is used, so that the impact on other parts of the system of the ways in which any given function is performed can be understood. This holistic view of the system permits a better understanding of resource use within the system, and also facilitates the identification of priority areas for training. A system-wide perspective also gives training its appropriate context. As management training is the answer to only some resource-use problems, a system-wide perspective facilitates distinguishing between what training can and cannot be expected to do within reasonable limits.

The team approached the analysis of the ARC's management of its program and the development of recommendations in an open-minded fashion and through a process of discussion with members of its staff. In response to the ARC's initiative, however, it did focus on improving management on a reasonably rapid basis. This predisposed the team towards remedial actions within the current authorities of the Director General and away from reorganizations and similar major actions which may require time-consuming approvals. The study confirmed this predisposition. All the recommendations have been made within the context of a general strategy for change which calls for short- and long-term actions and which is responsive to both short-range needs and broader organizational issues.

V MANAGEMENT WITH SCARCE RESOURCES

At the request of the Director General of the ARC, the study focused on the management of the ARC's agricultural research program under resource scarce conditions. Two primary strategies exist for dealing with the constraint of scarce resources: 1) increasing the efficiency with which available resources are used, i.e. resource management, and 2) increasing the availability of resources, i.e. resource generation. These two strategies are complementary and intimately connected. Essentially, the more efficiently currently available resources are used by an organization, the more likely it is to be able to obtain additional resources. The term resources includes human, physical as well as financial resources.

However, in line with the ARC's request, the study focused very heavily on the management of existing resources, limited attention was given to resource generation.

A. Resource Management

For the ARC, improved resource management is not only an option, but a necessity if it is to continue as an effective research organization. Its budget has been shrinking in real terms, while each year it is called upon to do additional research. At the same time, the Sudanese Government itself is laboring under increasingly scarce resource conditions, and competition for funds among government agencies is increasingly sharp. The demonstration by the ARC that a Sudanese pound invested in agricultural research through the ARC has a greater return to the Sudan than a Sudanese pound invested in some other public agency will enable the ARC to participate in this competition more effectively.

The study team reviewed management practices in the ARC with a view to identifying those functions which have significant impact on resource utilization as currently performed. The functions identified are listed below.

- Data collection and use
- Setting research priorities
- Program planning
- Program budgeting
- Resource allocation
- Program implementation
- Supervision and monitoring
- Fiscal control and accounting
- Evaluation
- Organization - specification of roles and relationships.
- Organization - delegation of authority.
- Organization - leadership and motivation.
- Time utilization
- Communication
- Personnel administration - manpower planning
- Personnel administration - recruitment
- Personnel administration - staff development and training.
- Facilities and equipment management

These functions occur in the ARC as in all research organizations. The question discussed with the ARC staff was how these functions are performed and how can they be performed more economically.

B. Resource Generation

The ARC currently receives resources (human, physical and financial) from a number of sources:

The Sudanese Government through regular appropriations,
International development organizations through grants and loans,
International Agricultural Research Centers through cooperative ventures,
Sudanese production schemes for services provided,
Agro-chemical companies for chemical testing activities,
Government agro-industrial corporations for services provided,
ARC commercial crop production through commercial sales.

Each of these revenue generating activities and sources presents a potential for increased revenues. Agreements can be made, contracts can be signed, projects can be designed, exchanges can be arranged, and mechanisms can be established. Managing these relationships with a view to increasing resources was reviewed and will be dealt with in the recommendations.

VI KEY MANAGEMENT FUNCTIONS AFFECTING RESOURCE UTILIZATION

The management functions performed at ARC were discussed extensively by the team with many groups and individuals within ARC.

The management functions listed below emerged from these conversations with the ARC staff and were identified by the team as offering possibilities for resource economies. In each case a brief analysis or citing of observations provides an indication of how current performance may cause less than fully efficient resource use.

This list is comprehensive and includes a wide range of the management functions performed by the ARC. There is no implication in this listing that attempts should be undertaken to strengthen all these functions at one time. In a later section of the report, recommendations are made with regard to the relative importance of different functions and to the priority that might be given them in an improvement program, as well as to different funding levels. These recommendations are in Section VIII.

A. Data Collection and Use

The functions involved in data collection and use can be grouped in three categories: input, throughput, output. Important questions can be raised in relation to each category in the ARC in terms of their impact on resource use.

Input: ARC research staff indicated they are isolated from much scientific information generated in other national and international research and available in scientific journals, scientific data bases and professional contacts. There are also information gaps with regard to farmer needs and yields, and production and experimental costs. In particular, the scientists indicated they did not have sufficient information on farmer yields or typical production costs.

Throughput (internal processing and availability): Much internal information relative to costs, budgets and expenditures is inadequately maintained (allowing major expenditure over-runs) or is unavailable for monitoring, comparison or control purposes. Additionally, some cost figures necessary for implementing priorities, e.g. costs associated with different research activities, are not maintained.

Output: Significant questions exist around the ARC's execution of its role in information dissemination and utilization, questions which focus on the form, timing and means of dissemination, particularly with regard to on-farm utilization.

B. Setting Research Priorities

The ARC staff indicated and the team's review confirmed that questions must be raised with regard to the process by which priorities are set and executed. The data base used for setting priorities, the low degree of involvement of farmers in the rain-fed sector and the fact that the number of projects approved for implementation far exceeds available resources, indicate that the priority setting process requires examination.

As the ARC staff indicated policy setting for the ARC is a public, and therefore difficult, political process. There are, nonetheless, certain hard realities which need be faced; first, not all research is equal in importance; second, existing resources will not permit everything to be done that may be desired; and third, unclear or poorly implemented priorities mean less than optimum resource use.

C. Program Planning

Program planning is the coordination and integration of individual lines of activity in accord with stated priorities and budget availabilities. It is ensuring there is no duplication or important gaps in the research program.

Discussions with the ARC staff and earlier studies on the ARC show that program planning has been recognized as a problem area in the ARC and was a cause of the creation of the position of 'National Coordinator'. The establishment of this position reflected a need to coordinate specific research activities taking place at different stations, and to eliminate duplication.

Yet the study team found almost universal concern throughout the ARC about the functioning of the national coordinator position. The coordinators themselves indicated and the team confirmed that, in the context of the ARC, the national coordinators lack the authority, resources and mobility to fulfil their responsibilities. The national coordinator indicated difficulties in obtaining transport, fuel, and permission to travel as parts of the problem. The scarcity of resources affects all staff members of ARC. National coordinators feel more constrained because their commodity mandate indicates they should be able to regularly visit the numerous stations doing research in the commodity for which they are responsible.

Program planning is the indispensable mechanism for translating policy and research priorities into actual research programs, and is a vital link in directing the allocation of resources. As indicated earlier, the large gap between available resources and approved programs indicates that the program planning problem remains unsolved.

D. Program Budgeting

As budgeting is the process by which the ARC's most limited resource (funds) is allocated it deserves the most serious scrutiny. In view of the pressures created by fund shortages, it is inevitable that the ARC staff would express strong and frequently divergent views about fund allocation and use. But on the basis of extensive discussions with the staff, the team's analysis indicates that the ARC's budgeting process offers most promise for significant near term impact on the use of its resources.

Currently, budgets submitted by station directors seem little different from scientists' "list of desirable items" and bear almost no relation to past, current or expected fund allocations. More importantly, budgets are not connected with identifiable projects or units of work, so the consideration of the costs of individual projects cannot become a part of a rational priority setting or planning process. The ability of the ARC management to direct research is severely limited. For this to occur, realistic and enforceable linkages between program planning and budgeting are essential.

The team was told by the ARC staff that the Ministry of Finance had requested budgets organized by program but that the request had been resisted by the ARC out of fear of losing priority setting power. This decision may warrant reconsideration in view of the Ministry's need for information on the ARC contribution to the Sudan's agriculture program. The ARC may need to seek other ways to satisfy its concerns for program control.

E. Resource Allocation

After the ARC has received its funds allocation from the Ministry of Finance, it disburses them through: 1) beginning of year allowance, and 2) covering end-of-year deficits. At the research station level, funds are then disbursed to each discipline on the same basis.

Several aspects of this procedure generate both strong feelings among the ARC staff and legitimate questions: in some instances allowances have remained at the previous year's levels for periods up to seven years, raising questions about the relation of budget to priorities, as well as the relation between disbursements and the budget process. In other instances, disbursements to scientists in each discipline are divided equally on a strict basis - again raising questions about the connection between priorities and allocations.

Discussions with staff revealed that the practice of covering end-of-year deficits, while a necessity in some instances, does not encourage tight fiscal management. The size of some deficits which are covered (up to 25% of the initial allocation in one instance) raises questions on the impact of the retention of so large a reserve fund on the entire fiscal system.

Numerous other aspects of resource allocation warrant consideration, such as leaving in some cases, hundreds of hectares of land idle which could be used to generate income, or the loss of scientists' time whose research is limited by fund shortages, and so forth.

F. Program Implementation

The managing of an institution as complex as the ARC and the directing of research stations with their array of many-faceted problems requires resourceful problem-solving capacities and management skills of a high order. The ARC's managers freely communicated to the team that the current situation requires of them skills for which they have not been trained. Thus, in addition to the powerful sense of professional frustration and role deprivation, there is a sense of unpreparedness and of being untrained which is both immobilizing and undermining of these managers' self-confidence. Management behavior in the ARC indicates that while having learned much "the hard way", i.e. by experience, many managers lack training for their current responsibilities.

G. Supervision and Monitoring

Discussions with staff indicated that the above analysis also applies to supervisory staff, some of whom supervise as many or more persons than some managers. There is, again, an almost complete lack of training.

It is clear, also, in a number of the ARC's research facilities that there are both under-utilized staff, especially at clerical levels, and unfulfilled responsibilities. Disordered libraries, still-crated equipment and a general sense of disrepair are frequently apparent. Additionally, many managers and scientists perform tasks lower level staff could be trained to do, thus freeing the more highly trained staff for more appropriate work.

H. Fiscal Control and Accounting

Input from the ARC staff indicated and was confirmed by the team's review that fiscal control and accounting as exercised in the ARC constitute a problem for the effective management of resources in that they do not ensure that resources are applied in specified amounts, for the purposes intended.

While the team was not able to explore this area in depth, the absence of program budgeting, cost over-runs, cost over-runs which were discovered after the fact, and the general absence of cost and other fiscal information, indicate that both accountability and fiscal control warrant attention. Until the ARC can limit expenditures to the work specified and in the amounts intended, it does not control its resources, and must consider its fiscal control procedures a potential source of resource ineconomies.

I. Evaluation

Discussions with the ARC staff raised questions on each of the major areas of evaluation: program, administration and personnel.

In the area of program evaluation, there does not seem to be a monitoring or evaluation process which checks to see if planned work is completed, on schedule or satisfactory. With regard to projects which are completed and reach formal evaluation, scientists did not seem to be able to identify projects which had been rejected, a circumstance which would raise questions in a research organization operating even in the most favorable circumstances.

In the area of evaluation of administration, there does not seem to be any active evaluation program. The team was unable to find out what personnel appraisal processes are operative, or whether any standardized system exists.

As indicated above, a necessary ingredient in the optimum use of resources is a knowledge base on the effectiveness of the application of those resources which are currently available. The team was not able to identify such a knowledge base.

J. Organization - specification of roles and relationships

The specification of roles, functions and relationships is a necessary part of ensuring that staff are enabled to focus productively on specified tasks and on fulfilling assigned responsibilities. The team found instances where staff were unclear on their responsibilities, where responsibilities were seen to be unrealistic and where staff were performing tasks for which they were greatly overqualified, e.g., station directors acting as clerks and farm managers. The team also found instances of tasks which did not seem to be assigned to anyone, leading to deterioration of property, plant and equipment.

A critical example of under-utilization and waste of resources is found in case of the national coordinators who indicated that, under the current circumstances in the ARC, their assignments cannot be filled. Such observations were not limited to the national coordinators.

K. Organization - delegation of authority

In discussions with staff the team also found evidence of considerable waste of time caused by the retention of authorities at the ARC headquarters which might well be delegated to station directors. The team was told of staff from outlying research stations embarking on multi-day round-trips to headquarters in order to get relatively minor approvals, including that of leave. Nevertheless, the delegation of authority in the granting of leave is complicated by the fact that those requesting leave are not only requesting time, but money as well, in the form of a daily travel allowance. These funds for travel allowance are very limited.

This centralization of authorities on minor matters is inconsistent with the fact that, in research organizations like the ARC, where 90% of the total budget is salaries, people and their time are the key resource.

The survey team was told that a further problem preventing the delegation of authority on leave permits was simply that station directors do not like to be unpopular with subordinates by saying "no" to requests that may be inappropriate, and therefore pass the request to headquarters. Authority and responsibility go hand in hand. Those wishing delegation of authority must also accept delegation of responsibility.

I. Organization - leadership and motivation

The subject of leadership has been addressed under Program Implementation. It may be well to state here that interviews with staff led the Study team to be impressed by the dedication of many of the ARC scientists and their strong desire to do professional scientific work. Although some reports have highlighted the staff turnover and the brain drain to the Gulf states, the fact remains that the substantial majority of ARC staff have chosen to remain with the ARC to do agricultural research in the Sudan. This dedication, however, constitutes a powerful demand of the ARC leadership to provide skillful, problem solving management. While the ARC scientists have persevered under difficult circumstances, there is always the potential of considering that the struggle is not worth the cost.

M. Time Utilization

As has been indicated, staff time is the ARC's greatest asset and examples of less than efficient time utilization have been given in the section on delegation of authority. A second example of less than efficient time utilization may be the time allocated to visitors, as discipline heads and national coordinators are asked to individually meet numerous visitors. The use of time in an effective manner is a resource utilization mechanism of considerable importance. The ARC leadership emphasized that management of visitors was a very serious and daily concern.

N. Communication

The team reviewed the communication problems of ARC - cable, telephonic, land, air, postal, radio in the Sudan - and became aware of their importance and difficulty for an organization with the geographical dispersion of ARC.

Institutionally, the ARC suffers enormously from this problem. Staff told the team that organizing a meeting involving different stations required letters mailed with a minimum lead time of 45 days. Messages between stations often depend on the availability of travelling staff. The physical stress of land travel is considerable.

Under these conditions it becomes critical to establish communication links and management practices that take into account the isolation of research stations and the difficulty of normal communication methods. Under these constraints, a number of steps become important, including clear processes, standard procedures and manuals, delegations of authority to appropriate levels, and a radio network.

O. Personnel Administration - Manpower Planning

Manpower planning is the process by which an organization determines the numbers, types and levels of staff it needs in the present and future, and the means by which it will adjust the type, levels and number of existing staff.

The ARC management at several levels expressed its concern over staffing and staff imbalances. The team agreed and felt that along with program planning and budgeting, manpower planning is a priority function for attention. While the number and quality of scientists is impressive, it is seriously out of balance with other categories of staff (technicians, laborers, or assistants, depending on the station). Similarly, it is oversupplied in some disciplines relative to the available operating funds, and seriously undersupplied in other categories, including economics and the social sciences. An equally important feature is the lack of staff with the highly specialized administrative capabilities it needs if it is to gain full control of its program. Included in these are advanced planning, information systems, fiscal analysis, cost/benefit analysis, training and evaluation capabilities.

As a means to optimizing the use of its available staff resources, manpower planning in the ARC ranks as a priority concern.

P. Personnel Administration - Recruitment

Closely related to manpower planning is recruitment. A manpower plan will guide hiring as the most immediate way to begin addressing the problem of staff shortages, surpluses or imbalances. The ARC demonstrates the need for such planning.

Q. Personnel Administration - Staff Development and Training

A further aspect of manpower planning is staff development and training as it constitutes the ways in which existing staff are trained or re-trained to meet the organization's changing needs.

The way in which this function is performed in the ARC leaves significant gaps between resources and needs. There seems to be little evidence of systematic planning for staff development, and many staff, including senior management, readily identify gaps in their training, particularly with regard to management. Little in-house training of a non-technical nature seems to occur and there seem to be no standardized training programs or manuals. Staff did not indicate nor was the team able to identify plans for re-training staff who may be limited by fund shortages from working in their preferred areas.

Staff development and training is a critical function for the ARC as it expresses management's intentions with regard to maximizing the use of its resources.

R. Facilities and Equipment Management

The team observed that the ARC facilities and equipment show significant deterioration. Some of this deterioration is certainly due to shortages of funds, but some is due to neglect. Again, the effects of wear and age can be minimized by maintenance, and the resources required for replacement saved.

The purpose of this section has been to review the performance in the ARC of those functions which comprise management with a view to identifying potential opportunities for resource economies. In the judgment of the team, following extensive conversation with staff at several levels, all the above functions show such opportunities. In the following sections a number of specific recommendations will be made. These recommendations will include some priorities and reference to resource requirements.

VII STRENGTHENING OF ARC MANAGEMENT OF RESOURCES

As the analysis in the preceding section indicates, the functions listed are performed in ways which suggest potential for resource economies. It is the purpose of this section to identify some of the steps to obtaining the fullest use of the ARC's resources. A later section will organize these steps into specific action recommendations and programs.

A premise underlying the following listing of potential steps is the recognition that improvements will occur best, or in some cases only, through a combination of both training and management actions. These actions will usually include staff development in general and management training in particular, but will also include systems design and implementation, new technologies, role clarification, and actions of a similar character. Clearly, staff cannot be trained in procedures that do not exist, do better jobs that are undefined, or follow efficiently policies that are either unknown or known only to persons geographically removed and out of communication. The purpose of this section therefore is to list the scope of actions the team believes necessary to introduce improvements with regard to each of the function analyzed. The activities and actions identified also point in the direction of kinds of responses other African research systems might consider to improve their management effectiveness.

This listing will provide a comprehensive picture of potential actions and will demonstrate the connecting and interactive nature of the management functions themselves and of the programs required to make improvements. It will thus provide a base from which to identify the priority functions to be addressed in the recommendations and from which to plan the appropriate training and management actions so that maximum impact will be obtained with minimum input.

This listing is provided in Table 1. It indicates for each of the management functions, management training programs and the other management actions that would need to be taken to effect improvement on a long and short term basis. In Section VIII an overall strategy is presented for improving the ARC, and proposes specific recommendations for action. These are provided in Tables 2 and 3.

In Tables 1, 2 and 3, the term "Senior Managers" refers to the Director General, 2 Deputy Director Generals, and 1 Assistant Director General (Training and Publication). The term "Managers" refers to Senior Managers, National Coordinators and Station Directors and Heads. "Scientists" refers to scientific program staff not occupying a role included in the Senior Manager or Manager category. Where special groups are referred to they are designated by name.

VIII RECOMMENDATIONS FOR MANAGEMENT TRAININGA. General Strategy

A number of strategies and methodologies can be used to strengthen the management of organizations. Under different circumstances, organization development, employment procedures, system renewal, training and reorganization are possible change methodologies. Similarly, attrition, evolutionary change, critical mass development and so forth are possible strategies. The selection of a strategy is important in that it incorporates assumptions about people and organizations and has long-range repercussions affecting organizational health.

The strategy recommended to improve ARC's management of scarce resources is a multi-faceted one. In summary, it represents a combination of training, organization development, systems development, technology introduction, and resource generation and redirection. It reflects a belief in the abilities of ARC staff to respond to their current situation. It is phased to meet both long- and short-term needs.

The elements of the strategy for this management training program are:

1. A combination of training events with complementary management actions. Management consists of human behaviors interacting with systems, technologies, resources and internal and external environments to achieve stated goals. The human knowledge and skills which comprise human behavior are, therefore, only one element of management and attempts to improve management must include actions directed towards these as well as towards the other relevant elements.
The approach taken in the recommendations is to identify both the management training activities and the supportive management actions that would be necessary to introduce and institutionalize improvement. Recommendations integrate both sets of actions.
2. The creation of a "critical mass" of staff supportive of the desired changes. The introduction of different procedures is facilitated by the understanding and support of large enough proportions of an organization's leadership and staff to outweigh forces retentive of the status quo. The strategy recommended seeks to create this "critical mass" by the number, populations, nature and timing of the training and other actions it proposes.
3. Development of a strong leadership team. The presence of a strong and knowledgeable leadership team, committed to improvement and in agreement on the goals and directions, is a requirement for continued progress, and will provide stability and momentum especially during absences by individual leaders.
4. Limiting actions through phasing and timing, within ARC's acceptable limits. Because organizations have limited capacities for change and for the number of matters they can simultaneously attend to, the recommendations propose activities on a scheduled and phased basis with due regard to the limits and to the degrees and rates of change that can be tolerated.

5. Response to felt urgencies and observable energies in the current situation. The ARC staff currently shows strong desires for improvement at every level, and a strong awareness of the crisis it is facing if it does not increase its research productivity. The recommendations provide the mechanisms to tap these concerns and to draw upon them as sources of energy, initiative and direction.
6. The strengthening of Sudanese management. While the introduction of expatriates on a long-term basis is sometimes a legitimate improvement strategy, the recommendations in this report reflect a belief that the long-term benefits to improving the ARC's indigenous leadership through supportive reinforcement without resident expatriates are overwhelming. The programs which are recommended can be implemented successfully on this basis.
7. The initiation of actions with both short- and long-term impact potential. The actions which have been proposed in the recommendations are directed to meeting the ARC's short- and long-term needs. The initial actions can be undertaken quickly and will have immediate impact. The subsequent actions frequently will take longer to implement and are intended to reinforce early gains and to institutionalize capabilities. Thus both sets of needs and the related skills have been accommodated.
8. The fuller use of currently under-utilized staff. In the midst of its current resource shortage, ARC has many under-utilized staff. These include scientists, technicians, clerical and administrative staff. Existing circumstances indicate little possibility that many of these staff will be fully utilized in their current positions and functions immediately or even in the near future. Recommendations assume the possibility of redirecting or retraining some of these staff to other temporary or even permanent positions so that they can contribute more fully to the ARC.
9. The recognition of the social basis of decision-making. Decision-making in government organizations must reflect the social and economic realities of the organization's internal and external participants and beneficiaries if it is to achieve an operational consensus. This recognition is reflected in the emphasis on staff, government and user (i.e. production schemes and farmers) participation in the recommended planning processes.

B. Objectives

The analysis of management functions in the ARC indicates that there is a considerable potential for resource economies and the prospective World Bank loan provides the opportunity for a significant management improvement program beyond the scope of the financial resources normally available.

It is recommended, therefore, that the ARC undertake a broadly conceived and comprehensive management improvement and management training program in two phases:

PHASE I - lasting 18-24 months - for the purpose of making rapid impact on the ARC's management effectiveness, in selected priority areas and;
PHASE II - lasting for the following 36 months - for the purpose of strengthening the ARC's management effectiveness and administrative support capabilities on a broad and long-term basis

PHASE 1

PHASE 1 would last for 18-24 months and would begin as soon as possible with whatever initial funding from the World Bank, the ARC, USAID or other sources may be available. The activities would be limited and phased consistent with the ARC's internal and programmatic demands.

The management functions which would be addressed primarily in this phase would be:

- . data collection and use
- . setting research priorities
- . program planning
- . program budgeting
- . leadership and motivation
- . communications
- . resource generation
- . manpower planning

In the PHASE I program a number of training programs and management actions are recommended to address the above functions, to develop readiness in the ARC for a management improvement program, and to begin developing capabilities required during PHASE II. The primary recommended steps are listed below. More complete details are provided in Table 2.

Training Programs

Executive leadership
 Program planning and budgeting
 Management of research stations
 Training design and implementation
 Developing readiness for the resource
 management improvement program

Management Actions

Establish management improvement program
 Set program priorities
 Develop planning and budgeting system
 Initiate resource generation activities
 Initiate personnel management, manpower
 planning and staff development actions
 Install radio communications system

The objectives for PHASE I are:

1. Increased effectiveness in utilizing current resources on research activities consistent with national and user priorities.
2. Increased management and leadership skills.
3. Creation of a broadly based commitment and climate for management improvement in ARC.
4. Increased effectiveness in resource generation.
5. Increased intra-organizational communications.

PHASE II

PHASE II would last for the 36 months following PHASE I and would be funded primarily from World Bank loan funds with possible assistance from USAID and ISNAR. The intended purpose would be to institutionalize and stabilize in the ARC management improvements initiated in PHASE I and to develop a self-sustaining management improvement capability.

In this phase, the management functions addressed earlier would continue to receive attention as needed but the primary focus would shift to:

- . resource allocation
- . program implementation
- . supervision and monitoring
- . fiscal control and accounting
- . evaluation
- . organizational functions
- . personnel administration functions
- . time utilization

Under PHASE II a number of training programs and management actions are recommended to address these functions. While it is difficult to project 4-5 years into the future with certainty, a number of new programs and actions would be initiated to strengthen and stabilize the ARC's management. The major programs and actions are listed below. More complete detail is provided in Table 3.

Training Programs

Information systems use	Resource allocation
Proposal writing	Administrative operations
Supervision and monitoring	Budgeting and cost analysis
Evaluation	Organizational functions
Time management	Facilities and equipment management

In addition training programs for selected individuals would be initiated or completed.

Management Actions

Instal information system	Establish planning office
Develop plans	Establish budget and fiscal analysis unit
Establish resource allocation procedures	Develop evaluation unit and plans
Expand staff training capability	Develop training plans

As indicated earlier these constitute the major actions. More detail is provided in Table 3.

The major objectives for PHASE II are:

1. Continued strengthening of ARC's management capability to obtain maximum research results with limited resources.
2. Increased capability of management and administrative support functions to assist management in its resource utilization.
3. Increased funding from GOS and other sources.
4. Increasing professionalization of staff and increased impact on Sudan agricultural productivity.
5. Increased capacity to plan and implement management training programs over the long-term.

C. Programs

In pages 24 thru 27 PHASE I and PHASE II are outlined in tabular form with explanatory notes.

1. PHASE I

Table 2 lists the training activities and management actions recommended for PHASE I over an initial 18 to 24 month period.

Explanatory Comments

The following comments provide brief explanations of specific elements of PHASE I:

- . the appointment of a Coordinator and Advisory Committee is to provide staff support to the Director General and to implement and coordinate the training and other activities decided upon. Preferably, the coordinator would be a member of the senior management group (i.e. a DDG or ADG);
- . the conduct of training sessions for all managerial and scientific staff in such critical functions as program planning and budgeting is intended to develop understanding, support and commitment among a large number of people who contribute to the organization to the effort to improve its management;
- . the conduct of management training at appropriate levels, e.g., executive level management for the senior staff and national coordinators and research station and center management for directors and heads, responds to the felt and expressed needs of these groups and will increase management perspectives in the overall operation of ARC. Specific training in special management functions will add to these strengths and facilitate the development of several necessary documents such as plans and budgets;
- . the provision of training to the degree and depths described recognizes the caliber of ARC staff and of the fact that the changes sought will best result from an educational process in which all managers and scientists fully share. This educative strategy also responds to the current variability of understanding among ARC managers on many key programming, budgeting and political processes affecting ARC;
- . the proposed activities which relate to the generation of new or additional resources respond primarily to the unused scientific talent in the ARC that, given organization and direction, could be harnessed in this effort;

- . the initiation of planning and training in a number of areas - planning (e.g. manpower planning), data gathering (e.g. test and production costs), and skill development (e.g. planning, information, and management) - is in response to the lack of a number of management functions and technologies which are a necessary part of the infra-structure of modern organizations.

Many details remain to be worked out in the design and implementation of the training programs recommended. For instance, the training of scientists in program planning and budgeting could be undertaken as far as possible in groups which keep individual research station staffs intact. In this way, the training sessions could be used also for team building purposes and as a means to doing work related to the development of their station's program and budget. Such matters of training design need to be decided at a later stage, however, when decisions are made on the overall program and more detailed planning occurs.

2. PHASE 2

The training activities and management actions recommended under PHASE II during the 36 months following PHASE 1 are shown in Table 3 in the following pages.

Explanatory Comments

As indicated earlier, the training and management actions proposed for PHASE 2 are provided in limited detail. This applies particularly to the training activities. This reflects the need for specific events to be planned in direct relation to circumstances at the time. However, the general procedure of associating training activities with the development of the policies, procedures, systems and technology with which people interact in the management process has been maintained.

D. Resource Levels and Funding Requirements

Resource levels and funding requirements to implement the management improvement program outlined in PHASES I and II have not been included. As indicated earlier, funding for the strengthening of the ARC management is currently being developed through a World Bank loan. Other funding to assist the ARC may be available through USAID, the ARC itself, or other sources, but in each case the potential amounts need further and detailed study.

Omitting funding estimates at this time is also consistent with the need for the ARC management to respond to this study in terms of indicating the scope of the management improvement program it wishes to undertake.

PHASE I recommendations, however, have taken into account the important actions that need to occur to initiate a management improvement program, but many of them have been formulated with a view to their ease of implementation and low resource requirements. Some initial management training, consultant services on planning and budgeting, and individual training programs for people providing specialized functions could be implemented for relatively small expenditures.

E. Resource Generation

The primary focus of the recommendations in Tables 2 and 3 is strengthening the skills and capacities in the ARC, which will obtain the maximum return from existing resources. A secondary benefit of improving the utilization of these resources is that management efficiency is always a powerful argument in the quest for additional funds.

Included in these skills, however, are a number which have direct reference to increasing the amount of funds from existing sources. Among these are excellence of oral and written presentation, advance discussion and sharing of plans with funding authorities, sharing involvement in the priority-setting process with potential political supporters, and fostering relationships with primary users, both farmers and production schemes.

The matter of resource generation is also addressed directly in several of the recommendations in both PHASE 1 and 2. A number of actions are recommended, among which are

- clarifying the role of donor grant or loan funded projects in the ARC and the extent to which they will be sought, particularly in order to assure that donor grant or loan funded projects are in line with Sudanese objectives;
- reviewing cost and fee schedules. Currently, the ARC charges to chemical companies for chemical tests represents only a fraction of their cost to the ARC;
- reviewing arrangements with the production schemes so that reimbursements to the ARC at least equal the ARC's costs;
- reviewing the possibility of bringing into commercial production the idle hectares of the ARC land;
- reviewing possibilities for research reimbursed by other government and senior government agencies, again, for realistic fees;
- reviewing the technical feasibility of pursuing research requiring fewer resources, such as seeking smaller optimum plot sizes.

Discussions with staff indicated that there are differences of opinion on the generation of additional resources. But the team feels that it is important for the ARC to undertake actions that will lead to both improved resource management and increased resource generation. Recommendations representing both concerns are presented in both PHASE 1 and 2.

F. Implementing Structure

The vitality and effectiveness of efforts to achieve changes of the type the ARC is seeking are frequently determined by the implementing structure. While Senior Managers must be fully involved and supportive, their daily operational responsibilities frequently limit their continuous participation. It is recommended, therefore, that a Coordinator be appointed from the Senior Managers and that an Advisory Committee be established to coordinate the activities involved. A Committee of 5-6 members chosen on the basis of interest and capability and representing major staff levels and functions would be desirable. To facilitate meeting, all members need to be within reasonable reach of the ARC headquarters. The selection of a Coordinator from the Senior Managers to chair the Committee would ensure that the Director General and his key assistants would be fully involved and informed. The Coordinator would serve, operationally, as the primary link to potential funding agencies.

IX CONCLUSIONS AND FOLLOW-UP ACTIONS

A. Agricultural Research Corporation

The study on which this report is based reflects the interests of the ARC in improving the management of its research program under scarce resource conditions. It reflects also ISNAR's interest both in assisting the ARC and in exercising its broad commitment and responsibility in research management.

The recommendations in this report have been presented in the form of two programs which consist of a combination of both management training and other management actions and which are intended to produce both immediate improvement as well as a long-term organizational strength.

The two programs are presented separately to facilitate decision-making by the ARC and have been formulated with the expectation of the availability of funding from international agencies, in particular, the World Bank. In conversations with the ISNAR team, representatives of donor countries and lending organizations have already demonstrated interest in the types of actions and programs recommended in this report.

ISNAR has been happy to cooperate with the ARC in its concern to strengthen its management under resource scarcities. It is willing also to discuss ways in which its resources may be brought to bear both in implementing these recommendations and in collaborating with the ARC and potential funding organizations in planning and implementing projects in which the management of research is an element.

The recommendations in this report reflect the ideas of a number of the ARC staff as expressed in many discussions, together with the ideas and judgments of the ISNAR team. They are now being presented to the Director General of the ARC in the hope they will help provide a basis for the ARC to develop plans to meet its demanding tasks.

B. Cooperative Development for Africa

As identified in the Terms of Reference presented in Section II of this report, a second purpose of the ISNAR study was to review the research management needs of the ARC of the Sudan as an African research system with a view to identifying management training applications which may be of general applicability in other African nations. The partner studies in Zimbabwe and the Cameroons have been completed, and the comprehensive analytical study of the three reports is underway.

Initial analysis, however, indicates a number of important findings for CDA which validate the concern reflected in the grant to ISNAR. While emphasizing the tentative nature of these observations at this time, the following should be noted:

1. Lack of training in management is general among research managers and is a major negative factor affecting agricultural research in Africa.

2. The policy environment is a major difficulty for agricultural research in its search for resources. Frequently, immediate pressures overwhelm the longer-range perspectives necessary for research and create conditions for which many research administrators are not trained.
3. The level of management efficiency in other government agencies is a major impediment to efficiency of management in research organizations.
4. The management functions specified in some detail in this report reflect with considerable accuracy areas of difficulty for other African systems. In particular, information and communications, the policy context and priority setting, planning and budgeting, fiscal control and accountability, manpower planning, and internal staff development represent areas that are broadly problematic.
5. The sense and reality of isolation in many research systems is profound. Distance, communication problems, lack of technology, lack of training and a host of other problems contribute to a sense of isolation. Research managers can be isolated from their peers, substantial parts of their own systems, management sciences and agricultural information. It is an isolation that can become a vacuum of deadening force.
6. There is an almost total absence of research management programs designed especially for Africa. If such programs are being developed, then a major communications problem prevents research managers from knowing of them.

The final report of the CDA study will detail the findings from the three country studies, including the Sudan. ISNAR wishes to indicate its appreciation for the courtesy and generosity of Dr. Bakheit Said of the ARC in making possible an intensive look at the difficulties under which he and his staff, like so many able colleagues in other countries, labor to increase the supply of food for their peoples.

TABLE 1

ACTIONS RELATED TO STRENGTHENING ARC'S RESOURCE MANAGEMENT

MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Data Collection and Use	<ul style="list-style-type: none"> - Train information system manager in relevant technology and systems. - Train managers, scientists and key administrative staff in system and skills to collect and use relevant data. 	<ul style="list-style-type: none"> - Design information system to meet management and program needs for information for planning, budgeting, fiscal analysis and control. - Select/appoint information system manager and establish function. - Acquire and install information systems. Develop information system users manual.
Setting Research Priorities	<ul style="list-style-type: none"> - Train managers and scientists in research priority setting process. 	<ul style="list-style-type: none"> - Establish procedures for setting and implementing priorities; review priorities including relationships with program planning and budgeting process. - Identify research priorities and disseminate to staff. - Establish and foster on-going consultative relationships with key users, ministries, etc.
Program Planning	<ul style="list-style-type: none"> - Train managers and scientists in program planning process to develop program plan reflective of research priorities, resource constraints, long-term nature of research and crop, discipline and regional needs. - Train staff of planning unit. - Train managers in preparing and making oral and written presentations. 	<ul style="list-style-type: none"> - Establish program planning process to develop annual work plan related to research priorities and resource constraints and reflective of crop, discipline and regional needs. - Develop annual program plan related to research priorities, resource constraints long-term nature of research, and crop, discipline and regional needs. - Develop long-range program plan reflective of ARC priorities, long-term nature of research under-taken and regional differences. - Identify staff and establish planning unit to provide technical assistance and to coordinate development of annual and long-range program plans.

TABLE

MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Program Budgeting	<ul style="list-style-type: none"> - Train managers, scientists and other relevant staff in budgeting system. - Train managers and scientists in program budgeting related to specific projects and work units. - Train budget analysis staff in budget and fiscal analysis. 	<ul style="list-style-type: none"> - Design and implement program budgeting system relating budget to work units or projects to permit coordination of budget allocations with research priorities and accounting requirements. - Establish timetable annual for budget preparation and review consistent with realistic time demands. - Develop senior management policy review procedures for annual program plan and budget. - Develop written procedures for development and review of annual budget. - Develop annual budget associating budget allocations with program activities. - Appoint or strengthen budget and fiscal analysis staff.
Resource Allocation	<ul style="list-style-type: none"> - Train senior managers, and research station directors and heads in procedures for allocation of resources. 	<ul style="list-style-type: none"> - Review current allocation of resources at national and research station levels. - Develop policies and procedures for resource allocation. - Issue guidelines for resource allocation at research station levels. - Establish plan to allocate and adjust allocations to meet program requirements.
Program Implementation	<ul style="list-style-type: none"> - Provide training in executive level management to DG, 2 DDC, ADG, National Coordinators. 	<ul style="list-style-type: none"> - Develop research station directors and heads operations manual to provide uniform policy and operational guidance for current and future directors.

TABLE

MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Supervision and Monitoring	<ul style="list-style-type: none"> - Train Research Station Directors and Heads in research station management. - Train senior administrative staff (establishment, finance, administration) and inspectors of administration in key administrative support functions as redefined. - Implement training programs for individuals and special groups to increase skills in special need areas as identified. - Train scientists and other staff in supervisory positions in supervision and monitoring as needed. 	<ul style="list-style-type: none"> - Develop Inspector of Administration operations Manual to provide uniform policy and operational guidance for current and future incumbents. - Develop and disseminate written procedures for key administrative functions, including administration, finance, personnel, etc. - Establish definition of supervisory functions and identify supervisory positions. - Develop or adapt supervisors' training manual for scientists and for other staff in supervisory roles.
Fiscal Control and Accounting	<ul style="list-style-type: none"> - Train or expand skills of budget and fiscal analysis staff in fiscal accounting. - Train managers and scientists in fiscal control and administrative procedures. - Train relevant headquarters and research staff administrative staff in fiscal accounting procedures. 	<ul style="list-style-type: none"> - Develop and implement fiscal control and administrative procedures relating budget allocations, expenditures and accounting to specific work units in approved program plans. - Develop fiscal manuals and operational manuals to guide appropriate staff in fiscal procedures. - Expand or develop budget and fiscal analysis staff to provide assistance in budgeting and fiscal management. - Develop or expand cost accounting and economic analysis capability to provide basic cost data on costs of production, testing, experimentation and research on a project, program or functional basis as required.

TABLE 1

MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Evaluation	<ul style="list-style-type: none"> - Train managers and scientists in evaluation system. - Train evaluation staff in evaluation systems and methodology. 	<ul style="list-style-type: none"> - Establish policies and procedures for evaluation of program and administrative areas. - Develop annual and long-term evaluation plans related to program plans and special projects. - Select or appoint evaluation staff and establish evaluation unit.
Organization - Specification of Roles, and Relationships	<ul style="list-style-type: none"> - Train staff in functions, roles and responsibilities, with particular emphasis on national coordinators. 	<ul style="list-style-type: none"> - Develop statement of ARC organizational purpose and functions, relations between headquarters and research entities, roles and responsibilities. - Develop functional statements for all professional and administrative units, position descriptions for senior managers, national coordinators, station directors and key administrative staff, with particular regard to role of national coordinators. - Distribute written descriptions of functions, roles and responsibilities.
Organization - Delegation of Authority	<ul style="list-style-type: none"> - Train managers in responsibilities associated with delegations of authority. - Train managers in the meaning and use of delegated authority as a key management tool. 	<ul style="list-style-type: none"> - Establish and document types and levels of authority for all staff but particularly senior managers, national coordinators, and research station directors and heads, to locate authority functionally in terms of poor communications and transportation, local and regional realities, and general principles of management and efficiency.
Organization - Leadership and Motivation	<ul style="list-style-type: none"> - Provide training for senior managers in Executive Leadership. - Provide training for managers in leadership and motivation. - Provide training for Gezira R.S. section chiefs and other supervisors in supervision. 	<ul style="list-style-type: none"> - Establish senior group reflecting major levels and types of responsibility and function in ARC to provide recommendations for director general's consideration on management training and other management issues including major disincentives and demotivators.

TABLE I

MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Time Utilization	- Train managers in time management.	- Identify major causes of time wastage and take remedial action.
Communication	<ul style="list-style-type: none"> - Institute conferences of managers periodically (twice yearly) to review and resolve management issues. - Institute scientists conferences periodically on appropriate lines to discuss and resolve issues of scientific importance. - Train managers in oral and written reporting. - Train managers and supervisors in techniques and skills in listening to subordinates and personnel problems. 	<ul style="list-style-type: none"> - Identify communication needs, issues and problems relating to scientific, administrative and managerial goals, and develop and institute appropriate administrative, system and procedural changes. - Institute radio linkage between ARC headquarters, research stations and centers.
Personnel Administration - Manpower Planning	- Train managers in understanding and implementing manpower plan.	<ul style="list-style-type: none"> - Develop manpower plan related to current and future research priorities and program plans, projecting staff needs at scientist, technician and administrator levels, including plans for additions, deletions, retraining and staff reallocation. - Establish and disseminate policies and procedures relating to manpower plan.
Personnel Administration - Recruitment		<ul style="list-style-type: none"> - Review and adjust policies and procedures relating to recruitment and training of scientists especially to strengthen social science, economics and administrative areas. - Inform Gezira University of skills and qualifications required by the ARC but unavailable in recent graduates.

TABLE 1

MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Personnel Administration - Staff Development and Training	<ul style="list-style-type: none"> - Provide training for staff development and training staff in needs analysis and training organization, methodology, management, and implementation. - Train managers and scientists in staff development and training policies and procedures. - Train library staff in library science specializing in information system access and scientific information, dissemination and utilization. - Train managers and scientists in use of library and information systems. 	<ul style="list-style-type: none"> - Establish or expand internal training or staff development capability to plan and implement internal staff development and training policies with particular relation to current staff imbalances. - Develop and implement annual staff development and training plan covering all current staff. - Expand central and research station libraries and access at research station level to scientific information systems. - Provide memberships in scientific and professional organizations. - Facilitate attendance at professional meetings and internal utilization of individual scientist's attendance at professional meetings (i.e. by internal seminars, etc.) - Establish training policy requiring specific management training of all graduate degree candidates. - Establish policy requiring supervisory or management training of all new incumbents in supervisory and management positions.
Facilities and Equipment Management	<ul style="list-style-type: none"> - Train managers in equipment and facilities management. - Train appropriate staff in equipment and facilities management policies and procedures. - Train instrument technicians in instrument repair and servicing. 	<ul style="list-style-type: none"> - Identify equipment and facility maintenance, repair and restoration needs and prepare plan for implementation. - Develop and implement equipment and facility maintenance repair and restoration policies and procedures. - Establish instrument repair and servicing unit.

TABLE 2

PROGRAM TO STRENGTHEN MANAGEMENT UNDER SCARCE RESOURCE CONDITIONS

PHASE 1
 OBJECTIVES: 1. Increased effectiveness in utilizing current resources on research activities consistent with national and user priorities; 2. Increased management and leadership skills; 3. Creation of a broadly based commitment and climate for management improvement in ARC; 4. Increased effectiveness in resource generation; 5. Increased intra-organizational communication.

DURATION: 18 - 24 MONTHS

Id. No.	TRAINING ACTIVITY	Id. No.	MANAGEMENT ACTION
1a	<p><u>Executive Leadership Conference</u></p> <p><u>Population:</u> Senior Managers (DG, 2DDG's ADG) and National Coordinators.</p> <p><u>Type:</u> Conference in Executive Management and Organizational Development; 10 days in duration conducted outside Sudan.</p> <p><u>Objectives:</u> Increased skills in executive management; increased policy and program planning skills; improved team management skills.</p> <p><u>Content:</u> Policy and priority setting, program planning and budgeting, resource allocation and generation, organization development, oral presentation.</p>	2a ²	<p><u>Actions Related to Establishing Resource Management Improvement Program</u></p> <p>Review and finalize initial activities aimed at improving ARC management under scarce resource conditions. Present and discuss plans with staff.</p> <p>2b Appoint Coordinator and Committee on Training for Scarce Resource Management and development Terms of Reference. Notify ARC staff. Provide training. (Related to Training Program i.e.).</p>

1. The same definitions are used as in Section VII: "Senior Managers" applies to DG, 2DDG's and ADG (T & P); "Managers" refers to the Senior (DG, 2DDG's and ADG for T & P) Managers plus National Coordinators and Research Station & Centre Directors and Heads.
2. "Management Actions" are not correlated with "Training Activities" in all cases. In some instances relationships of timing and sequencing do exist. Also many of the actions proposed will have impact on more than one of the management functions listed in Section VII. In this Table the proposed action is related to the most relevant function only.

TABLE 2

Id. No.	TRAINING ACTIVITY	Id. No.	MANAGEMENT ACTION
1b	<u>Program Planning and Budgeting Workshop for Managers</u> Population: National Coordinators, Research Station and Centre Directors and Heads, with involvement of Senior Managers as available. Type: Workshop in Program Planning and Budgeting; two weeks in Sudan. Objectives: Increased skills in establishing priorities and program planning and budgeting; increased skills in management and leadership. Content: Priority-setting processes, program planning and budgeting, resource allocation, leadership and motivation, time management and utilization.	2c	<u>Actions Related to Priority Setting and Program Planning and Budgeting</u> Determine research priorities in conjunction with managers and scientists and issue policy and planning guidelines for the development of program plans and budgets in accord with approved research priorities. (Related to Training Programs 1a, 1b, and 1d).
		2d	Develop for review by ARC leadership program plan and budget in which work units are identified in relation to approved priorities, and budget amounts are tied to specific projects. Work plans are related to different funding levels. (Related to Training Programs 1a, 1b and 1d.)
		2e	Establish and implement program and budget review procedure to ensure consistency of projects and budgets with approved research priorities. (Related to Training Programs 1a, 1b, and 1d).
1c	<u>Training Program in Managing Research Stations</u> Population: Research Station and Center Directors and Heads. Type: Workshop and Observation Tour on Management of Research Facilities 6-8 weeks in the United States. Objectives: Increased knowledge and skills in management of research facilities, station organization, scheduling and resource use. Content: Planning, scheduling, procurement and input supply, maintenance, stock and inventory control, resolution of technical and scientific issues, management of production, financial and personnel administration, labor relations, contingency planning.	2f	<u>Actions Related to Resource Generation</u> Determine policies and priorities related to generation of additional resources and assign responsibilities to Task Forces or individuals as appropriate. (Related to Training Program 1a.)
		2g	Develop plans and procedures for presenting ARC's case for additional funds in a timely manner to the Ministry of Agriculture and Ministry of Finance. (Related to Training Program 1a).
		2h	Initiate review of costs of service rendered to users including production schemes, chemical companies, government corporations, commercial companies and bring charges into alignment with costs. (Related to Training Program 1a).

TABLE 2

Id. No.	TRAINING ACTIVITY	Id. No.	MANAGEMENT ACTION
1d	<p><u>Training Program in Managing Research Stations</u></p> <p><u>Population:</u> Scientists from all research stations and centers (excepting those also designated as Managers or Senior Managers); ADG's for Finance, Establishment and Administration.</p> <p><u>Type:</u> Workshop in Program Planning and Budgeting; 2 weeks in Sudan; 3 sessions of approximately 40 persons each.</p> <p><u>Objectives:</u> Increased skills in establishing priorities and program planning and budgeting; increased skills in resource generation.</p> <p><u>Content:</u> Priority setting processes, program planning and budgeting, time management and utilization; resource generation.</p>	2j	<p><u>Actions Related to Program Implementation</u></p> <p>Draft operations manual for guidance of current and future Research Station and Center Directors and Heads. (Related to Training Program 1c.)</p>
		2j	<p><u>Actions Related to Organization and Personnel Administration</u></p> <p>Initiate review of allocation of functions and responsibilities in light of needs to conserve time, fuel, vehicles and other resources, and write functional statements, position descriptions and delegations of authority accordingly.</p>
		2k	<p>Initiate development of manpower plan projecting current and future needs for different disciplinary and functional categories to provide guidance for recruitment, allocation and reallocation, and retraining.</p>
1e	<p><u>Training Design and Implementation Workshop</u></p> <p><u>Population:</u> Advisory Committee on Training for Scarce Resource Management.</p> <p><u>Type:</u> Conference on Training Design, Methodology and Implementation; 10 days, in Sudan.</p> <p><u>Objectives:</u> Increased skills in training need identification, planning and implementation, monitoring and follow-up.</p> <p><u>Content:</u> Organizational behavior; group development; need assessment; training methodology, implementation, evaluation and follow-up.</p>	2l	<p>Review and amend training policies to meet requirements as reflected in Manpower Plan, especially affecting management training for graduate degree candidates.</p>
		2m	<p><u>Actions Related to Implementing Resource Management Improvement Program</u></p> <p>Compose and initiate task forces or work groups to undertake activities planned under effort to improve resource management.</p>

TABLE 2

Id. No.	TRAINING ACTIVITY	Id. No.	MANAGEMENT ACTION
1f	<p><u>Staff Conference on Resource Management Program</u></p> <p><u>Population:</u> All ARC professional staff.</p> <p><u>Type:</u> Information sharing session and general discussion on plans to improve management of resources; 1 day in Sudan (to be held at a time when scientists are at Headquarters).</p> <p><u>Objective:</u> Increased and uniform awareness of plans to improve resource management; commitment and involvement in the effort.</p> <p><u>Content:</u> Plans for increasing effectiveness of resource management, structure and organization, roles staff will play, objectives and intended outcomes.</p>	2n	<p><u>Actions Related to Building long-Term Capability.</u> Select/appoint/reassign staff as appropriate and plan and initiate individual or group training programs in:</p> <ul style="list-style-type: none"> - planning - information management - budget and fiscal analysis - cost and cost/benefit accounting - training design and management - management analysis - evaluation - library technology and information science.
		2o	<p><u>Actions Related to Communication</u> Instal radio network.</p>

TABLE 3

PROGRAM TO STRENGTHEN MANAGEMENT UNDER SCARCE RESOURCE CONDITIONS

PHASE 2

DURATION: 16 MONTHS

PREFATORY NOTE: As PHASE 2 would follow the initial 18 - 24 months of PHASE 1, training activities and management actions would be determined by circumstances at that time. Therefore, the following recommendations are tentative and are provided in less detail than those in PHASE 1.

OBJECTIVES:	<ol style="list-style-type: none"> 1. Continued strengthening of ARC's management capability to obtain maximum research results with limited resources; 2. Increased capability of management and administrative support functions to assist management in its resource utilization; 3. Increased funding from GOS and other sources; 4. Increasing professionalization of staff and increased impact on Sudan agricultural productivity. 5. Increased capacity to plan and implement management training programs of the long-term.
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MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Data Collection and Use	<ul style="list-style-type: none"> - Complete training of information services manager in systems and technology. - Train managers, scientists and other staff in information systems use. 	<ul style="list-style-type: none"> - Select/appoint information system manager and establish function. - Design and implement information system to meet management needs.
Setting Research Priorities	<ul style="list-style-type: none"> - Continue to train staff in setting research priorities as needed. 	<ul style="list-style-type: none"> - Develop and implement information systems users manual. - Refine and institutionalize procedures for review and setting of research priorities. - Structure on-going relationships with key sources of information affecting priorities, including production schemes relevant ministries, etc.
Program Planning	<ul style="list-style-type: none"> - Complete training of planning officer in short- and long-range program planning. - Continue training of staff in program planning as needed. 	<ul style="list-style-type: none"> - Refine program planning process reflective of national priorities, resource constraints, crops and regional differences and institutionalize through documented guidelines. - Establish planning office or function. - Develop long range and strategic plans related to national priorities, ARC's role and the nature of research.

TABLE 3

MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Program Budgeting	<ul style="list-style-type: none"> - Complete training of Budget and Fiscal Analysis Officer or Staff. - Continue to train managers, scientists and administrative staff in budget preparation. - Provide instruction for selected staff in writing proposals for donor funding. 	<ul style="list-style-type: none"> - Establish or expand Budget and Fiscal Analysis Unit. - Refine and institutionalize budget preparation and review process relating budget to research projects and national research priorities. - Initiate budget conversations on on-going basis with relevant ministries. - Propose alternate proposals to Ministry of Finance with a view to changing current method of fund development. - Develop policies and objectives and pursue other funding sources as suitable. - Develop and distribute to staff written guidelines on budget procedures.
Resource Allocation	<ul style="list-style-type: none"> - Train staff as needed in resource allocation policies and procedures. 	<ul style="list-style-type: none"> - Review and establish procedures for resource allocation of national and research station level.
Program Implementation	<ul style="list-style-type: none"> - Complete management training commenced in PHASE 1. - Train Inspectors of Administration in Operations Manual. - Provide training for relevant staff in administrative procedures. - Provide individual and group training programs for specialized functions as needed. 	<ul style="list-style-type: none"> - Complete Research Station Directors Operations Manual. - Develop Inspectors of Administration Operations Manual. - Develop and disseminate written procedures for key administrative function including administration, personnel, finance, etc.
Supervision and Monitoring	<ul style="list-style-type: none"> - Provide training to supervisors in supervision and monitoring. 	<ul style="list-style-type: none"> - Adapt or develop supervisors' manual.

TABLE 3

MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Fiscal Control and Accounting	<ul style="list-style-type: none"> - Complete training of fiscal accounting staff. - Complete training of cost analysis staff. - Update and train managers and other staff on fiscal procedures. - Train staff in use of cost and economic data in budgeting and cost analysis. 	<ul style="list-style-type: none"> - Expand or establish fiscal analysis unit. - Identify or establish cost analysis officer or unit. - Develop fiscal and operations manuals in fiscal area for appropriate staff. - Develop cost accounting and economic analysis capability to provide ARC costs of production, testing, experimentation and research in general on a project or work unit basis.
Evaluation	<ul style="list-style-type: none"> - Complete training of evaluation officer or staff. - Train managers and scientists in evaluation policies, procedures and plans. 	<ul style="list-style-type: none"> - Establish program evaluation unit. - Establish policies and procedures for evaluation of program and administrative areas. - Develop and implement annual and long-term evaluation plans.
Organization - Specification of Roles, Functions and Relationships	<ul style="list-style-type: none"> - Provide training to develop broad staff understanding of functions, roles and relationships in ARC and research entities. 	<ul style="list-style-type: none"> - Refine and develop written statements of organizational purpose, relations between headquarters and research entities, functional statements and position descriptions for key positions - with special reference to role and relationships of National Coordinators.
Organization - Delegation of Authority	<ul style="list-style-type: none"> - Train managers and other staff in delegations and in related monitoring and reporting systems. 	<ul style="list-style-type: none"> - Refine and issue delegations of authority in light of needs to conserve time, vehicles, fuel and other resources, and to permit maximum managerial responsibility at regional and station level. Define means of monitoring and reporting.
Organization - Leadership and Motivation	<ul style="list-style-type: none"> - Complete leadership and managerial training. 	<ul style="list-style-type: none"> - Establish mechanism (committee or meeting of Directors and Heads) to identify and propose resolution of primary demotivators.

TABLE 3

MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Time Utilization	- Train additional levels of staff in time management as needed.	- Monitor time utilization and identify ways of maximum time usage.
Communication	<ul style="list-style-type: none"> - Train staff to service radio communication system. - Provide training in communication skills as needed. - Initiate twice yearly (at least) management conferences for key Headquarters staff and Research Station and Center Directors and Heads to discuss management issues. - Initiate periodic scientist conferences on appropriate lines to discuss issues of scientific importance. 	<ul style="list-style-type: none"> - Institute radio link between ARC Headquarters and Research Stations and Centers. - Identify further communication needs in ARC and initiate remedial action.
Personnel Administration - Manpower Planning	- Provide training as required.	- Complete and update as necessary manpower plan projecting current and future needs for different disciplinary and functional categories and to provide guidance for recruitment, staff allocation and reallocation and training.
Personnel Administration - Recruitment	- Provide training as required.	- Review and update recruitment policies and procedures to relate recruitment and training of staff to manpower needs, especially with regards to social science, economics and administrative areas.
Personnel Administration - Staff Development and Training	<ul style="list-style-type: none"> - Complete training of Staff Training Officer in staff development, training needs assessment, organization, methodology, management and implementation. - Train managers and scientific staff in staff development and training policies and procedures. 	<ul style="list-style-type: none"> - Establish or expand functions of Staff Training Unit. - Develop and implement annual staff development and training plan covering all current staff. - Develop and expand library system and expand access at research station and centre level to library resources and scientific information systems.

TABLE 1

MANAGEMENT FUNCTION	TRAINING ACTIVITY	MANAGEMENT ACTION
Facilities and Equipment Management	- Train managers and scientists in use of library and information systems.	<ul style="list-style-type: none"> - Provide memberships in scientific and professional organizations. - Facilitate attendance at professional meetings and develop procedures for internal use of attendance of such meetings. - Continue review of and revise training policies to ensure training is consistent with organizational priorities.
	<ul style="list-style-type: none"> - Train managers and staff in equipment and facilities policies and procedures. - Train instrument technicians in instrument repair and servicing. 	<ul style="list-style-type: none"> - Identify equipment and facility care, repair and maintenance policies and procedures. - Establish equipment repair and servicing unit.

XI APPENDICES

A. Itinerary and List of Persons Interviewed

26/10/1983 Arrival in Khartoum		
27/10	Dr. Gerald Owen, Western Sudan Agricultural Research Project (WSARP)	Khartoum
	Dr. Fred Winch, United States Agency for International Development (USAID)	"
Arrival in Wad Medani		
	Dr. M. Bakheit Said, Director General, Agricultural Research Corporation (ARC)	Wad Medani
28/10	Lunch with Dr. Bakheit Said, ARC Guesthouse	"
29/10	Dr. M. Bakheit Said, ARC	"
	Dr. O.I. Gameel, Deputy Director General, ARC	"
	Mr. A.M. Abdelal, Assistant to Director General (Finance)	"
	Mr. M.A. Mohammed, Audit	"
	Mr. M.Y. Elhilo, Assistant to Director General (Establishment)	"
	Mr. M.S. Ahmed, Assistant to Director General (Administration)	"
30/10	Dr. E.M. Elamin, Director, Gezira Research Station (GRS)	Wad Medani
	Mr. F.A. Metwali, Assistant Director, GRS	"
	Mr. O.H. Abdel Magid, Farm Manager, GRS	"
	Dr. I.E. Mursal, Head, Cotton Breeding Section, GRS	"
	Dr. M.K. Ahmed, Head, Horticulture Section, GRS	"
	Dr. S.A. El Hussein, Medicinal Plants, GRS	"
	Dr. M.S. Hassan, National Coordinator, Horticulture Research	"
	Dr. A.T. Ayoub, Head, Soil Section, GRS	"
31/10	National Coordinators:	
	Dr. H.M. Ishaq, Groundnut Research, GRS	"
	Dr. I.A. Babiker, Soil Science Research, GRS	"
	Dr. M.B.A. Saleem, Cotton Research, GRS	"
	Dr. M.S. Hassan, Horticultural Research, GRS	"
	Dr. F.M. Ali, Wheat Research, GRS	"
	Dr. A.A. Abdel Rahman, Entomology Counterpart, FAO/UNEP Project	"
	Dr. A.M. Yassin, Head, Plant Pathology, GRS	"
	Dr. A.M.B. Elahmadi, Head, Plant Breeding, GRS	"

01/11	Dr. F.M. Khalifa, Director, Rahad Research Station, Fau Dr. M.B. Mohamed, Horticulturist (Vegetables)	Rahad "
	Mr. Timothy Conolly, Uniroyal Chemicals Co.	Wad Medani
02/11	Dr. E.M. Elamin, Director, Sennar Research Station	Sennar
	Dr. M.A. Yassin, Leader of Sugarcane Task Force	"
	Dr. A.A. Geneif, Vegetable Breeder	"
	Dr. A.E. Khashmelous, Horticulturist	"
	Mr. M.E. Elnaeem, Inspector of Administration	"
	Lunch at Sennar Research Station	"
	Mr. B. Kateb, FAO Fertilizer Project	Wad Medani
03/11	Dr. M.G. Mansi, Head, Statistics and Agricultural Economics, ARC	"
	Dr. H.H.M. Faki, Economist, ARC	"
	H.E. Dr. O. Khalifa, Regional Minister of Agriculture and National Resources	"
	Director General of Gezira scheme	Barakat
	Travel to Khartoum	
04/11	Mr. M.I. Mahmoud, Ex-minister of State for Commerce	Khartoum
05/11	Dr. M.H. El Jak, Head of Poultry Sciences, Arab Organization for Agricultural Development (AOAD)	"
	Dr. A.E.A.E. Alrawi, Head of Animal Production, AOAD	"
	Dr. A.H. Osman, Director, Institute of Animal Production, Shambat, University of Khartoum	"
06/11	Dr. E. Elkhidir, Professor of Entomology, Faculty of Agriculture, University of Khartoum	"
	Dr. Farah, Head of Agricultural Economics, Faculty of Agriculture, University of Khartoum	"
	Dr. A.R. Tayeb, Dean, Faculty of Agriculture, University of Khartoum	"
	Dr. A.H. Raslan, Head, FAO Fertilizer Project, (Extension Services)	"
	Dr. S. Abbady, Secretary General, National Council for Research,	"
	Dr. Dafalla A. Dafalla, Project Manager, WSARP	"
07/11	Dr. Keith Sherpa, Deputy Director, USAID	"
	Ms. Ingrid Poik, World Bank, Sudan, Representative Officer	"
	Dinner, AOAD invitation (Drs. El Jak, Alrawi, Mourani, and Khamis)	"
08/11	Dr. E. Elkhidir, Professor of Entomology, University of Khartoum	"

09/11	Dr. S. Zaki, Acting Deputy Minister of Finance and Economic Planning Dr. A. Elfares, Head, Technical Cooperation, AOAD	Khartoum "
10/11	Travel to Wad Medani Presentation of findings, attended by DDG (Administration), National Coordinators, Heads of Sections and other Scientists (about 20 persons) Back to Khartoum	Wad Medani
11/11	Arrival at The Hague.	

- B. Tentative Outline for a Conference in Executive Management
1. Research and the Role of the Researcher in Agricultural Development
 2. The Leader and the Leadership Role in Management and Organizational Change
 3. The Change Process in Organizations - Political and Social Realities
 4. The Role of the Management team
 5. Policy, Policy Setting and Policy Execution
 6. Program Planning and Budgeting
 7. Program Implementation Mechanisms
 - . Fiscal Control and Administration
 - . Program Coordination
 - . Resource Allocation
 8. Resource Generation - Mechanisms and Presentations

- C. Tentative Outline for a Training Course
in Program Planning and Budgeting
1. Research and the Role of the Researcher in National Agricultural Development
 2. The Context for Research and the Research Environment - Political, Social, Organizational and Economic Factors
 3. Information Sources for Research Planning - Political, Organizational, Research Users
 4. Data Collection and Use - Methods and Processes
 5. Setting Priorities - What Comes First and How Much of It
 6. Project Analysis and Selection
 - Specifying Project Activities
 - Classifying Costs
 - Estimating Project Costs
 - Forecasting Project Benefits
 - Benefit/Cost Comparisons
 7. Project Scheduling
 - Bar Charting
 - Pert Chart: Critical Path Analysis
 - Pert Chart: Time-Cost Trade-Off Analysis
 - Resource Smoothing
 - Contingency Planning
 8. Project Budgeting
 - Line-Item (input) Budgets
 - Project (process) Budgets
 - Program (output) Budgets
 - National Budget Cycles
 - Flexible Budgets
 - Contingency Budgeting
 - Planning-Budgeting Linkages
 9. Management Accounting and Project Control
 - The Concept of Management by Exception
 - Determining Project Status
 - Identifying and Producing Project Problems
 - Financial Analysis and Management Decision-Making
 10. Evaluation and Reporting
 - Results Identification
 - Records and Publication
 - Presenting Results and Future Plans

D. Tentative Agenda for a Training Course in Research Station Management

The list of topics below is a tentative agenda for a training course in research station management. The training course would include field visits.

A. Information and Data Sources

1. Policy Information and Relationships.
2. Farmer and Research User Inputs.
3. Scientific Data and Information Input and Utilization.
4. Administrative Information Flow.
Budget, resources, etc. - internal and external.

B. Planning and Programming

1. Planning and Programming Research Activities. Defining the nature, level and scope of the research activities as the basic for other planning.
 - a. policy determination;
 - b. priority setting;
 - c. research program definition and planning;
 - d. budgeting; e. program implementation;
 - e. program implementation;
 - f. data analysis;
 - g. results review and publication;
 - h. monitoring and evaluation.
2. Physical Facilities

Relating physical facilities to program nature, level and scope; relating to current and future activities.
3. Selection and Procurement.
4. Equipment and Transport Use

Including field and laboratory equipment.
5. Scheduling of Input Supply

Input supply on the basis of biological needs.
Relating cash flow to program implementation.
6. Maintenance of Equipment and Transport.

C. Managing Operations

1. Organization and Research Execution.
2. Mechanisms for Resolution of Technical Issues

Allocation of machinery and labor

3. Land and Water Use

Rainfed and/or irrigated agriculture research - relationships with field research methods

4. Experimental Design and Plot Layout
5. On-farm and Station Research Management
Defining and developing an integrating process
6. Station Production and Station Research
Relationships and priorities
7. Outreach Activities
Visitors, user and other related relationships
8. Records Control

- a. experimental data-base records in biological, social and economic areas
- b. field execution records
- c. results records

9. Inventory Control - Stocks and Records

D. Financial Administration

1. Budgeting

- a. research station level
- b. program research level (commodity, discipline, farming system, etc.)
- c. functional level (administration, training, etc.)

2. Financial Accounting

3. Expenditure Control

Methods and applications

4. Contingency Planning in Financial Management

E. Personnel Management

1. Experiment Station Personnel Structure

- a. personnel classification, responsibilities and functions
- b. selection of personnel
- c. performance appraisal
- d. internal staff development and training-short and long-term
- e. supervision
- f. education, health and housing
- g. labor relations (intra-and interinstitutional)

F. Outreach and Research Delivery

1. Research Delivery Relationships

- a. user linkages - farmers, extension, corporations, mechanisms and instruments
- b. political relationships
- c. scientific contacts - internal and external

E. Sample Training Module

Many modules in management training programs are built around providing the opportunity to learn to understand and apply specific management tools. These tools relate directly to some skill areas required in management functions such as planning, scheduling or contingency budgeting.

Typically, modules cover from 1 to 2 days and consist of four sessions -

1. an introductory lecture or conceptual presentation
2. practice to ensure understanding the tool
3. a comprehensive application exercise, and
4. analytical discussion.

In more detail, the sessions function as indicated below.

1. Session 1. Short Lecture or Presentation.

This lesson concentrates on definitions of the management tool and its purpose. It includes a short pre-test designed to illustrate to the trainees the kinds of problems for which the tool is suitable and to motivate them to want to learn more about its use.

Time: 1/2 to 3/4 hours.

2. Session 2. Practice.

This lesson concentrates on practice on how to use the tool under various situations. This part will consist of a tutorial culminating in a step-by-step procedure for the practice of the tool. Included in this section is group decision exercises with simple objectives, well-defined alternatives, and unambiguous data.

Time: 2 hours (approximately).

3. Session 3. Application Exercise.

This lesson consists of a comprehensive application exercise for the purpose of teaching the trainees to exercise judgment in the application of management tools to situations involving conflicting objectives, confusing data and unspecified alternatives.

Time: 3 hours (approximately).

4. Session 4. Analytical Discussion.

This session consists of deriving and analyzing information from the earlier sessions with a view to understanding the applicability of the tool to the actual work situation of the participants.

Time: 1 to 1 1/2 hours (approximately).