AID 1025-1 (7-71) (FACE SHEET) PD-AAA-073

NONCAPITAL PROJECT PAPER (PROP) ISN 1683 | 6180657 | 43 | PAGE 1 of 92 PAGES

I. PROJECT IDENTIFICATION

1. PROJECT TITLE: East African Food Crops Research

APPENDIX ATTACHED: [XX] YES [ ] NO 5

2. PROJECT NO. (M.O. 1025.2): 618-110-10-657

3. RECIPIENT (specify)
[ ] COUNTRY Kenya/Tanzania/Uganda
[X] REGIONAL East Afr [ ] INTERREGIONAL

4. LIFE OF PROJECT
BEGINS FY 1972
ENDS FY 1981

5. SUBMISSION
[ ] ORIGINAL 7-1-72
[XX] REV. NO. 7-1-75 DATE
CONTR./PASA NO. 618

II. FUNDING (000) AND MAN MONTHS (MM) REQUIREMENTS

A. FUNDING BY FISCAL YEAR	B. TOTAL $	C. PERSONNEL (1) $	C. PERSONNEL (2) MM	D. PARTICIPANTS (1) $	D. PARTICIPANTS (2) MM	E. COMMODITIES $	F. OTHER COSTS $	G. PASA/CONTR. (1) $	G. PASA/CONTR. (2) MM	H. LOCAL EXCHANGE CURRENCY RATE: $ US 7.1 (U.S. OWNED) (1) U.S. GRANT LOAN	(2) COOP COUNTRY (A) JOINT	(2) COOP COUNTRY (B) BUDGET
1. PRIOR THRU ACTUAL FY	1546	1235	276	69	75	48	194	599	168		37	651
2. OPRN FY 76	583	305	78	73	66	196	9	305	78		28	434
3. BUDGET FY 77	720	560	144	140	138		20	560	144		36	434
4. BUDGET +1 FY 78	665	500	132	145	153		20	500	132		32	434
5. BUDGET +2 FY 79	529	413	111	96	63		20	413	111		28	434
6. BUDGET +3 FY 80	296	280	75	8	12		8	280	75		20	434
7. ALL SUBQ. FY 81	22	20	6				2	20	6		2	434
8. GRAND TOTAL	4361	3313	822	531 1/	507 2/	244	273	2677	714		183	3255

9. OTHER DONOR CONTRIBUTIONS

(A) NAME OF DONOR	(B) KIND OF GOODS/SERVICES	(C) AMOUNT

III. ORIGINATING OFFICE CLEARANCE

1. DRAFTER	TITLE	DATE
GRamsay/CHuscik	Food-Ag Officer/Area Dev. Ofc	4/23/75
2. CLEARANCE OFFICER	TITLE	DATE
Charles Huscik	Area Development Officer	4/23/75

IV. PROJECT AUTHORIZATION

1. CONDITIONS OF APPROVAL

During project implementation, particular attention will be given to the following A) Assure that results of research are expeditiously made available to the out-reach elements of participating states, B) assure sugar cane research is directed to small producer needs, as well as state operated farms and larger producers, and C) Insure environmental impact/research project is examined. In addition to the other objectives of the project, these items shall be addressed in annual PARs, progress reports and evaluation. (See continuation sheet for footnotes 1/ & 2/.

2. CLEARANCES

BUR/OFF.	SIGNATURE	DATE	BUR/OFF	SIGNATURE	DATE
AFR/ESA	Jerry Knoll	8/19/75	TA/AGR	J. Malcom	8/20/75
AFR/DP	Robert Huesmann	9/2/75	PPC/DPRE	R. Handly	9/9/75
AFR/DS	Princeton Lyman	9/11/75	GC	G. Gladson	

3. APPROVAL AAs OR OFFICE DIRECTORS

SIGNATURE: Assistant Administrator-For Africa
DATE: 9/15/75
TITLE

4. APPROVAL A/AID (See M.O. 1025.1 VI C)

SIGNATURE: Administrator (Acting)
ADMINISTRATOR, AGENCY FOR INTERNATIONAL DEVELOPMENT
DATE: 9/30/75

East African Food Crops Research
618-110-10-657
Cont'd

1/ Total of $462,000 programmed for training includes a "TOPPING OFF" contribution of $100,000 for 900 man months of degree level training at East African Universities and $362,000 for 432 man months of U.S. short and long term training.

2/ Includes U.S. training only.

1. Conditions of Approval (continued)

This project is approved for FY '76, '77, and '78. Funding estimates for the later years, that is, FY '79, '80 and '81, are illustrative only at this point. The project will not be continued beyond FY '78 without resubmission of the project to the Administrator for his review and approval.

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Revision of
Non-Capital Project Paper

EAST AFRICAN FOOD CROP RESEARCH
618-110-10-657

RDOEA/Arusha
23 April 1975

TABLE OF CONTENTS

Revision of
Non-Capital Project Paper (PP)

Project Title: East African Food Crop Research

Number: 618-110-10-657

Original PROP approved for implementation on July 1, 1972.

Life of Project: Began on July 1972 ends September 1980.

Project Revision: Begins July 1975 ends September 1980.

PART I

Summary and Recommendation

1. Project Development Team

Charles L. Husick, Acting RDO, RDOEA/Arusha
Marcus L. Winter, Agriculture Economist REDSO/EA
George W. Ramsay, Project Manager (Ag.) RDOEA/Arusha

Study Team, East African Food Crop Research
Dr. J. Clark Ballard (team leader). Vice President, Utah State Univ.
Dr. Herbert H. Fullerton, Ag. Economist, Utah State Univ.
Dr. J. Ian Stewart, Agro-meteorologist, Univ. of California, Davis
Dr. Paul L. Cane, Protein Lab Expert, Purdue Univ.
Dr. Donald Wood, Agronomist, Colorado State Univ.
Dr. Deane C. Army, Plant Pathologist, Univ. of Wisconsin
Dr. Norman I. James, Sugar Cane Agronomist, ARS/USDA

Dr. B. N. Majisu, Director of the East African Agriculture and Forestry Research Organization (EAAFRO), Dr. F. J. Wang'ati, Deputy Director of EAAFRO, and their heads of departments made major inputs into the development of the revised East African Food Crop Research Project.

2. Grantee

The grantee for this project is the East African Community. The implementing agency is the East African Agriculture and Forestry Research Organization, a research organization of the East African Community.

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3. Total Project Funding Requirements

II. FUNDING ($000) AND MAN MONTHS (MM) REQUIREMENTS

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8. GRAND TOTAL	4361	3313	822	531 1/	507 2/	244	273	2677	714		183	3255

4. Description and Justification of Project

A. Project Description

The purpose of the revised Food Crop Research Project is to support selected regional research efforts in food crops and cropping systems that are critical to increasing food production and quality throughout East Africa. The project is actually composed of six subprojects and a training element, each of which is focused upon a major constraint to increasing food production in the region. A major target area of the revised project, increasing the production and improving the quality of maize grown throughout the region, encompasses three closely related subprojects, i.e., the continuation of breeding methodology research, breeding for disease resistance in maize, and establishment of a functioning protein quality laboratory.1/ In effect, these three subprojects constitute a concentrated research program on the major food crop of East Africa.

A second priority area within this project is the development of cropping systems for marginal rainfall areas. This project is designed to develop the capability within EAAFRO to serve as an active disseminator of meteorological, soil, and crop information, and of recommendations for field application of research findings in the marginal rainfall areas of East Africa to national level planners, researchers, extension and soil conservation services. Eventually, EAAFRO will serve as the computational and output

1/ Details of each subproject are given in the annexes to this project paper.

center for annual cropping systems recommendations for marginal rainfall areas based on soil water monitoring and long-range weather forecasting.

The two other subprojects are continued support for the Plant Quarantine Station and assistance to sugar cane research. While these subprojects are not directly related to the major areas of concentration described above, they do represent two priority areas for regional research and cooperation. In fact, due to national efforts to become self-sufficient in sugar production in both Kenya and Tanzania, sugar cane research is one of the most pressing questions facing EAAFRO today. Both Kenya and Tanzania are in the process of expanding sugar cane production and processing. If these efforts are to succeed, it is essential that EAAFRO be able to provide sugar cane growers with the information and varieties required to assure production is increased to the maximum extent possible.

The critical importance of an effective Plant Quarantine Station has been acknowledged by AID's assistance to the station in the original Food Crop Research Project. Achievement of the original goal of AID's assistance to the Station, the development of an effective institution fully staffed by African personnel, requires an additional two years of limited AID assistance.

While the primary goal of the revised project is to assist EAAFRO in responding to requests from the Partner States for help in overcoming specific problems related to food crops production and quality, the project also continues to assist EAAFRO in developing East African scientists to assume full responsibility for agricultural research in the region. The project includes support for 30 undergraduate scholarships in local universities for students bonded to EAAFRO for five years upon graduation and 423 months of advanced participant training in the United States.

Each of the subprojects has been designed to help EAAFRO meet a specific request for assistance from at least two of the three EAC Partner States. Each subproject has a specific goal that an AID-funded study team has described as feasible during the anticipated life of the subproject. This varies from two years for plant quarantine and the conintuation of the ongoing breeding methodology research to five years for the marginal rainfall area cropping systems.

The total project calls for 45 years of technical assistance, training as shown above, and commodity support. The cost of USAID inputs is estimated at $2,815,800 and those of EAAFRO at $2,168,165.

B. Project Justification

The major factor that must be considered when evaluating the need for the revised Food Crop Research Project is the increase in population now irreversibly underway in East Africa. Kenya, with a growth rate estimated at 3.3 to 3.5 percent, has one of the fastest growing populations in the world. Tanzania and Uganda, while not matching Kenya's population increase, have

estimated growth rates of 2.7 to 3 percent. In the 10-year period 1965-75, it is estimated that East Africa's population has risen from 28 to 38 million people and the rate of growth has continued to increase throughout the area. A doubling of the region's population by the end of the century is not considered an impossibility.

The need in the next 25 years to feed, house and employ what may amount to twice the region's present population is the basic justification for the revised Food Crop Research Project.2/ In light of the growing population pressures, it becomes obvious why maize and cropping systems for marginal rainfall areas have been chosen as the two major areas of concentration for the revised project.

Maize:

Maize is the staple food of the East African diet. It has the same importance for the East African as rice does for the Asian. In East Africa more land is planted in maize than in any other food crop. In recent years, successful research efforts have resulted in the introduction and adoption of high yield maize varieties for the higher altitude areas of the region.

A problem related to increased maize production throughout East Africa is the introduction of disease resistance into the maize population. To date, research has focused upon obtaining higher yields with the hope that a disease resistant variety would be developed by the reguing out of diseased plants. This approach has not proved effective and virus diseases continue to limit maize production in low altitude areas by reducing yields and restricting the area in which the crop can be grown.

Breeding a new disease resistant maize variety is considered to offer the best potential for finding a solution to this problem. Sources of resistance to the two major virus diseases are available and resistance screening techniques have already been worked out. Parental material with good agronomic characteristics is also available.

Because of the need to increase maize production and because of the potential breeding offers for developing maize varieties that can be successfully grown throughout East Africa, a program of breeding for disease resistance has been included in the revised Food Crop Research Project.

2/ Population programs can only be expected to have a minimal effect on the population growth rate in East Africa. In addition to the economic, cultural and social factors that have limited the success of these programs in other areas, population programs in East Africa suffer from the fact they are considered by some governments and people in the region to be an imperialist plot designed to weaken or limit the development of the area.

Second only to the need to increase maize production is the need to improve the quality of the maize consumed throughout the region. The protein shortage that affects the developing world is also a problem in East Africa. As the population increases this shortage will become even more critical as the already inadequate traditional sources of protein come under ever increasing pressure. It has already been established that, by incorporating opaque-2 into maize, the availability of useful protein can be increased thus improving it as a major source of protein for human consumption. The revised project will establish, in support of ongoing maize breeding efforts, a protein quality laboratory essential for testing protein quality in maize.

Support to the ongoing maize breeding methodology research project will be continued for an additional two years. This will allow the evaluation of most of the present trials to be completed. The conclusion of this successful research effort will have a major impact upon breeding programs both in and outside of the region. In addition, the Kitale station will develop and test a project designed to coordinate all regional programs designed to increase the protein quality of the maize grown in East Africa.

The maize portion of the revised Food Crop Research Project is designed to complement programs already underway and critical to the needs of East Africa. The successful development of disease resistant, high yielding and high protein quality maize varieties is critical if East Africa is to be able to support is growing population.

Cropping Systems for Marginal Rainfall Areas:

The increasing East African population is also creating greater pressure upon the land. With approximately 80 percent of the region's population already living on farms, many of the region's most productive areas have already reached their human carrying capacity. While East Africa as a whole has a population density of only 23 people per square kilometer, most of these people are crowded into the relatively limited areas that receive adequate rainfall. Only 15 percent of Kenya and 49 percent of Tanzania receive over 30 inches of rain in four out of five years.3/ As a consequence of the increasing population in the rural areas and the resulting overcrowding of the historically productive (i.e., adequately watered) areas, more and more land that was formerly considered unsuitable for production is now being cultivated. This trend will continue and increase as the pressures created by the region's growing population force more people onto land that is considered marginal for agricultural production.

3/ Even Uganda with only 22 percent of its land mass receiving less than 30 inches of rain per year is reported to be experiencing problems created by too many people on not enough land.

The immediate problem--in some parts of East Africa even problem must be considered urgent--is to develop the methods required to make the most effective long-term use of these marginal lands. The goal of this effort is to provide a home and productive employment for the people being forced out of the traditional areas of agricultural production.

It is necessary, if production is to be maximized on the marginal lands, to develop cropping systems that will take full advantage of existing soil, water, and plant characteristics while actually improving the land that is being cultivated.

The development of such systems will allow individual farmers to maximize their production from marginal rainfall areas and allow national planners to program the use of these lands while avoiding the dangers involved in bringing marginal lands into production. The successful implementation of this portion of the revised Food Crop Research Project will provide the governments and individual farmers with a tool necessary to meet the area's needs for more farm land and food crop production.

Sugar Cane:

Self-sufficiency in sugar cane production is a policy of each of the Partner States. The loss of foreign exchange due to the need to import processed sugar has become intolerable to the three governments. During 1974, Kenya and Tanzania were forced to import over 125,000 tons of sugar to meet their consumption requirements. Uganda, a former sugar exporter, has experienced a significant decrease in sugar production in recent years.

Faced with the prospect of continuing high import costs and growing deficits due to their increasing populations, Kenya and Tanzania have launched major efforts to increase their sugar production and processing to meet their own needs. New factories are being built and additional land is being placed into sugar cane production.

This effort is not being supported by adequate research. The EAAFRO Sugar Cane Research Division, the only research facility working with sugar cane in the Partner States, was established in 1969 and moved to permanent headquarters in 1972. Not enough trained personnel are available to carry out research necessary in variety selection and testing, salinity, soil compaction, percolation or fertilizer usage. All of these are problems affecting sugar cane production in the region and the Partner States are expecting EAAFRO to seek answers to these problems.

The sugar cane research proposal contained in this paper is designed to allow EAAFRO to complete work on the selection of high yielding, disease resistant sugar cane varieties adapted for East Africa. This program is now underway but needs technical assistance if it is to be successfully completed. In addition research will be undertaken to provide sugar producers with better cultural practices and information on salinity, soil compaction and percolation problems.

The successful completion of this research will provide a sound, scientific base for the ongoing national efforts to become self-sufficient in sugar cane production.

Self-sufficiency will free foreign exchange now used for the importation of processed sugar for other development efforts. This is a high priority political and economic goal for the governments of Kenya and Tanzania.

Plant Quarantine:

This is a continuation of the effort begun under the original food crop research program to develop the East African Plant Quarantine Service as an efficient, fully African staffed organization. Significant progress has been made in the past five years and the Plant Quarantine Station at Muguga is well run and dedicated to assisting the importation of new plant material. The one problem remaining is the selection of an African with sufficient training and experience to assume the responsibilities of Director of the Plant Quarantine Service. The USAID-funded study team, in their recent evaluation of the station, stated that at present no qualified African is available to fill this post. They said that, until such a man is appointed, AID assistance to the station should be continued or the progress of the last five years will be lost; and East Africa rapidly will become vulnerable to the importation of plant diseases and insect pests that are now barred by the Quarantine Service.

Problems in recruitment and training of a qualified African have delayed the Africanization of the Director's position of the Plant Quarantine Service beyond the date anticipated in the original project. Such a man has now been identified and is in training in the United States. To maintain the protection offered by the Plant Quarantine Service at its present high level until this man can return from the U.S., AID assistance to the Quarantine Station has been programmed for two years beyond the date such assistance was originally scheduled for completion.

Training:

The programmed training in the United States (423 months) is directly related to the needs of the six subprojects. The goal of this training is to provide EAAFRO with the skills required to continue and expand upon the research completed during the life of the subprojects. It is anticipated that EAAFRO may have difficulty in releasing enough qualified personnel to take full advantage of the programmed training. This will not limit the success of the individual subprojects as much as it will affect EAAFRO's long-term ability to expand upon the research efforts of the AID-funded scientists. Priorities have been established to assure that the subproject with the most critical need for skilled local personnel will have first choice of qualified participants.

To insure a continuous flow of skilled personnel to EAAFRO, 30 undergraduate scholarships will be offered in fields of study relevant to EAAFRO's long-term personnel needs. A similar AID-supported program has proved successful in helping the EAC overcome difficulties it has experienced in recruiting skilled personnel. Some of the graduates of this earlier program are now working for EAAFRO and have committed themselves to EAAFRO for a minimum of five years after graduation.

It is expected that the 30 scholarships will allow EAAFRO to meet its needs for research and other skilled personnel over the coming 10-year period.

Target Groups and Linkages:

The major areas of concentration contained in the revised project, maize production and cropping systems for marginal rainfall areas, clearly define the ultimate targets of the proposed research projects. These are the farmers now attempting to produce a crop on marginal lands and the maize grower throughout East Africa. These groups will encompass the great majority of East Africa's rural poor.

However, due to EAAFRO's regional nature, the primary target for these projects must be the Partner States' planning, research, and agricultural service personnel. It is through the national organizations that the final target groups are reached. This immediately raises the question of how efficient the linkages are from the regional research organizations to the national governments to the farmers of East Africa. AID's past experience with this system has shown that, while the national extension services need improvement, the benefits from regional research efforts will reach and be adopted by the farmers of East Africa.

In the course of the maize breeding methodology research carried out by AID and EAAFRO at Kitale, Kenya, improved hybrid varieties were developed that now serve as the male parent in 76 percent of the hybrid seed sold in Kenya and as both parental lines of the highland commercial hybrid used in Tanzania. In addition these same populations are being directly utilized commercially in Ethiopia.

Not only have the results of a regional research effort been incorporated into the national production programs, the use of hybrid seed has been extended to and adopted by the farmers of East Africa. The recent increases in maize production in East Africa can be traced directly back from the farmers through the Partner States' agricultural organizations to EAAFRO's USAID-supported, maize breeding research.

The acknowledged weakness of the national agricultural services will limit the speed with which the results of regional research are disseminated to the producers. However, AID's experience during the introduction of hybrid maize proves that this weakness will delay but not prevent the adoption of economically beneficial agricultural practices within East Africa.

The linkages between a regional research effort and the East African farmers exist and function, the next question is if they will be used to extend the results of the projects to be carried out under the revised food crop research program. This will depend upon the value of the research results to the individual Partner States. Each of the research projects contained in this paper is being undertaken by EAAFRO at the request of at least two of the three Partner States. The AID-funded study team confirmed this and also confirmed that the problems these research projects are attempting to solve are of critical importance to the Partner States. Therefore, it is considered a safe assumption that the existing linkages between the regional research effort and the East African farmers will be used to extend any meaningful research information that is developed in the course of the revised project.

The Revised Food Crop Research Proposal and the Development Assistance Plan:

During January 1975, AID/W approved RDOEA's DAP for future programming with the East African Community. This DAP contained a new approach and guidelines for AID assistance to Community-supported projects. This new approach is to focus AID assistance upon problems critical to two or more of the Partner States. The Community is to serve as a means of identifying regional problems and as a channel for focusing the resources required to overcome these problems. This revised food crop research proposal falls well within the parameters of RDOEA's new guidelines and represents a switch from the priority given to institution building in the original project to the problem specific approach contained in the present proposal.

PART II

Section B: Project Description

A. Background Information Leading to Revision of the Project

The present Food Crop Research Project became outmoded soon after its beginning in June 1972 due, primarily, to the situation in Uganda and the subsequent withdrawal of all American aid to that country. During the period October 1972 to June 1973, the major thrust of the original project, sorghum and millet research, was curtailed. What was retained from the original project was the continuation of high-altitude maize breeding methodology, food technology, plant quarantine, and the field trials officer activities in Tanzania. Remnants of the project totaled four men, one in each of the above activities. This presented a disjointed and unrelated set of agricultural research activities with no definite direction and with goals and targets of achievement which were very difficult to identify. The existing PROP also provided for research activities in rice, low-altitude maize, and food legumes. These three research areas would have been new activities for EAAFRO and required the approval of the East African Community Authority (the three heads of state). The Authority has not met since 1972 and their approval for the new research activities could not be obtained.

In addition to the difficulties encountered in the implementing of the original project design, changes in the political environment in East Africa forced REDSA to reevaluate the goals of all AID's assistance to the East African Community. In the course of this evaluation, it was proposed and approved by AID/W, that REDSA's former efforts on institution building within the EAC be refocused to solving problems from the regional level that were common to at least two of the three Partner States.

B. Prior AID Assistance to Food Crop Research in East Africa

In 1964, AID, in agreement with the Scientific and Research Committee of the Organization of African Unity, initiated an African-wide research program to improve the varieties of the major cereals. Research teams for this effort were furnished by the U.S. Department of Agriculture under a PASA agreement with USAID. These teams were instructed to work on maize, millet and sorghum. The maize work was conducted in West Africa at the Institute of Agriculture Research, Samaru, Nigeria. East African efforts were concentrated on research for sorghum and millet at the Uganda Agriculture Research Station, Serere, where an EAAFRO breeding program was already underway, largely supported by a Rockefeller grant. Under the same major cereals research program for East Africa, work was also begun in 1964 on maize research methodology. This work was conducted at the Kenya Research Station located in Kitale where the Rockefeller Foundation also made a grant for maize development. During the period 1964 to 1970, AID accepted the total cost for all expenditures connected with these programs. This was done on a reimbursement basis to EAAFRO. In 1968, a food technologist was added to the AID/USDA team to test nutritive values of sorghum and millet varieties being developed. In 1971, two field trials officers were also added to the team stationed with the Ministries of Agriculture in Tanzania and Uganda. These men were to facilitate the utilization of research information emanating from the sorghum, millet and maize work being conducted.

Over the years, the responsibility within AID for funding and management of the major cereals project was changed. Originally conceived and implemented as a part of a world-wide research activity, the project was not designed in response to any specific expressed need of any African government. Rather its purpose was to produce better varieties and agronomic practices which would then be available for application through the bi-lateral aid program in those countries receiving assistance. As such, the project was fully funded as to both local and foreign exchange costs by AID. EAAFRO's role was a passive one permitting the use of its facilities. In FY69, the major cereals research project ceased to be a part of the world-wide project and a definite effort was made to incorporate this project into the activities of EAAFRO. At this time an effort was made to establish a participant training program designed to develop African capability to ultimately replace AID-supplied research technicians. In FY71, the East African Community agreed to absorb the total cost of local labor, material and supplies without further AID reimbursement. The transition had been made from an AID-sponsored project conducted at EAAFRO to a project supporting a relatively high priority research objective with the broader goal of developing a capability to continue such research in EAAFRO when the project ended.

In FY69, AID incorporated a research element in the Animal and Crop Production Project (613-614) to fill selected established positions in EAAFRO together with training appropriate counterparts. This effort ran into difficulties in recruitment and five of the nine positions were put in question by an FAO study on research priorities which commenced its deliberations about the same time this project was initiated. However, three of these positions were filled and research began in the areas of sorghum breeding, nematology and soils physics.

In 1972, the Major Cereals and Legume Improvement Project and the Animal and Crop Production Project were terminated and combined into the present East African Food Crop Research Project. Existing personnel in both projects were incorporated into the new project and ongoing research was thus continued without interruption.

In 1974, USAID/Tanzania launched an agriculture project designed to research food crops in the lower altitudes in Tanzania. This research project is concerned with varietal research in low altitude maize and food legumes. USAID/Tanzania has contracted with IITA, Ibadan, Nigeria, and subcontracted CIMMYT, Mexico, to carry out this food crop research program. This research team is concentrating on yield improvement for the lower altitudes of Tanzania and compliments the disease resistant and high protein efforts proposed in this project revision.

In 1975, USAID and the FAO in Kenya are each planning to conduct feasibility studies on agriculture development in semi-arid areas. This study will probably lead to the identification of projects for these areas. The marginal rainfall areas subproject will be coordinated with these efforts should they become a reality.

The present Food Crop Research Project is a continuation of AID support to EAAFRO in food crop research that began in 1964. The revision of the present project is designed to continue this cooperation in food crop research with EAAFRO and make a major contribution to food production in East Africa.

C. Other Donor Assistance to Food Crop Research

1. The Rockefeller Foundation, as previously mentioned, made a major contribution to the beginning stages of food crop research in East Africa. Their grants for the construction of laboratories and other facilities both at Serere, Uganda, and Kitale, Kenya, did much to get food crop research started in East Africa. This assistance has been terminated and Rockefeller is not engaged actively at this time in supporting food crop research.

2. The British ODA has had a long history of assistance to food crop research in East Africa. Traditionally, they have been placing British scientists in key positions throughout the network of research organizations in East Africa. In the past two years, the ODA has shifted their emphasis from filling needed positions in food crop research to working on specific projects only. Notable in this effort is the work of Drs. Bock and Guthrie in the identification and purification of streak virus and sugar cane mosaic. This work will continue and the proposed disease resistance in maize subproject will be conducted in collaboration with these two scientists and will utilize their materials in promoting disease resistance.

3. Canadian technical assistance is continuing its research on wheat in both Tanzania and Kenya. Wheat research for East Africa is exclusively in the hands of the Canadians.

4. IITA and CIMMYT, in addition to the AID-funded project described in B above, will be the backstop for the protein laboratory work proposed for Kitale and will furnish germ plasm for the maize breeding work and other plant materials for continuation of food crop research in this project.

5. ICRISAT is presently negotiating with the University of Dar es Salaam, Morogoro, for the establishment of the East African Outreach Program. It is expected that, within the next year, this ICRISAT effort will be started on sorghum, millet and other semi-arid type food crops.

6. The UNDP/FAO is presently finalizing their plans for the establishment of a national soils survey center to be located near Tanga, Tanzania. The soils work which it is anticipated will be done by the FAO will be a tremendous assist to the marginal rainfall research and the sugar cane research proposed in this project.

D. East African Activities in Food Crops Research

During the colonial era in East Africa, the major research effort was concentrated on the production of export crops such as tea, coffee, hides and skins,

cattle, etc. In the period leading up to Independence for the East African countries, a start was made in research for food crop production. Beginning about 1960, emphasis on food crop research has continually increased. Since 1970, and particularly since the 1972-73 drought period, food crop production has emerged as the first priority item for the governments of Tanzania, Kenya, and Uganda.

In this period, Tanzania was forced to divert a large portion of its foreign exchange holdings from development efforts to food purchases just to avoid serious famine in the country. Kenya, though not as severely affected, also had to divert foreign exchange to the purchase of essential food commodities. With this lesson fresh in their minds, the governments of East Africa have reevaluated their former development priorities and have focused upon food production as their most urgent concern. Numerous production programs have been launched in order to offset the food deficit and emphasis is being placed on improvement of food production through research in all three countries. As a result of the above, EAAFRO has been requested to intensify its research in food crop production by each of the Partner States. EAAFRO is now in a position to be of greater service concerning problems of greater importance to the Partner States and people of East Africa than it has ever been. This is both an opportunity and challenge to EAAFRO to prove the benefits of regional cooperation by helping to solve problems critical to the development of the whole region. AID support of EAAFRO's efforts to respond to the needs of the Partner States has assumed a role of greater potential impact than it might have two or three years previously.

E. AID Studies Done on East African Food Crop Research

AID has completed two major studies of KEDEA-supported East African food crop research. Before the consolidation of the Major Cereals and Legume Improvement and Animal and Crop Production Projects, a complete evaluation was made to determine the feasibility of consolidating these two projects. The study was commenced by Dr. S. Litzenberger and completed in September 1972. In this paper Dr. Litzenberger, TA/AGR AID/W, concurred in the consolidation of the two research projects and supported the East African Food Crop Research PROP. The Litzenberger report evaluated the overall research problems and pointed up several areas of institutional development that were needed. At the time, it was not clear that the situation in Uganda would deteriorate to such a point that AID would be forced to withdraw its assistance from Uganda. Ensuing events, however, changed the picture considerably and implementation of the consolidated project became impossible. EAAFRO and KEDA then developed the present proposal for continuing USAID assistance to food crop research in East Africa. An AID-funded agriculture study team made a complete and in-depth evaluation of this revised project in February 1975. Their report strongly recommended the implementation of all six subprojects contained in the revised program. Detailed and in-depth analyses of each subproject are attached to this paper.

Other Studies on East African Food Crop Production

The World Bank has completed two agriculture sector papers, one on Tanzania and the other on Kenya. In each of these sector studies, one chapter has been devoted to agriculture research. In each case they have pointed up the extreme need for intensified research in the basic food crops for East Africa. Their reports support the proposed revision of this project.

F. Views of Regional Team

At each stage in the development of the Food Crop Research Project revision, USAID/Tanzania, USAID/Kenya, and REDSO have been consulted and have made inputs into the revision's development. The proposal and the scope of work for the study team were reviewed by all three AID offices. Their concurrence has also been received for going ahead with the research proposed under the revised project.

Section 2: Project Analysis

Economic

Calculations of cost/benefit ratio's for research projects are subject to extremely wide ranges of error. While costs can perhaps be calculated with some degree of accuracy, little precision is possible for benefits. For one reason or another, desired research results may or may not be achieved as projected. A hoped for or unforeseen breakthrough or discovery may yield immediate benefits while another finding may be of value only after additional years of research. Also, a promising line of research may be overtaken by events which drastically alter its relative significance. Finally, for research to produce benefits, it must be moved from the research station to the potential user. The rate at which the information reaches potential users and the speed of utilization will also vary widely and often not be within the research organization's control. To summarize, research costs can probably be calculated, but any quantification of research benefits will, at best, be educated guesses based on expectations applied to projected situations.

Given the difficulties in attempting to apply standard benefit-cost analysis to an agricultural research program, it may be more appropriate to use a cost-effectiveness approach. This involves either finding the least-cost method of achieving stated objectives or maximizing the return from a given amount of resources. The entire concept of a regional research organization working on common problems is an attempt to achieve cost-effectiveness. Consequently, the work of EAAFRO should implicitly reflect this approach. Identification by the Partner States of common needs, such as those identified and proposed for support in this project paper, is a first step. Developing research projects utilizing cost-effective analytic techniques is the second. Accordingly cost effective analysis can be employed by the study team. However,

it must be recognized that hard data on whether something is or is not cost-effective was also difficult to obtain. Instead, expert judgments, based on world-wide experience, that the course of action for each project will lead to desired results in a cost-effective manner are used.

With the above caveats in mind, an attempt has been made, by subproject, to identify beneficiaries and to quantify benefits or to indicate the annual benefit necessary to cover costs.

Subproject A-1: Protein Quality Laboratory

The benefits of a laboratory are: a) a savings of the cost involved in having the work done elsewhere (Mexico and Nigeria are the only alternatives); and b) reduced probabilities of losing samples, shorter result times and greater general convenience. The direct beneficiaries are the plant scientists using the services of the facility in their research efforts. In turn, quicker and/or higher quality research should result enabling better data to be provided to research users throughout East Africa.

The life of the laboratory facility is expected to be at least 20 years. Given this time horizon and a discount rate of 10 percent per annum, an annual benefit of $44,000 would permit full recovery of project costs ($375,280[1]) within the life of the facility. It was the judgment of the research team that this level of annual benefit will be exceeded with operation of the facility at capacity.

Subproject A-2: Breeding Methodology Research

Primary benefits from this project are an increased efficiency in plant breeding work and the projected improvement in the nutritional value of maize. Major beneficiaries will be plant breeders and, ultimately, both maize producers, as higher yielding varieties are developed, and maize consumers, as their intake of protein increases.

However, the benefits cannot be precisely quantified. Some evidence of the value of the work is provided by the fact that 3/4's of the hybrid seed utilized in Kenya stems from a maize line developed under this program. From

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1/ The project costs used in this section were the original figures developed by the agriculture study team. These vary slightly from the project costs developed for this paper. This difference is due primarily to the use of cost estimates more comprehensive and accurate in the preparation of this paper than were available to the team. Since these variations are minor and since the cost effective analysis can only be indicative, no changes were made in the team's original calculations.

the nutritional improvement aspects of the project, if a two percent increase in the utilizable protein content of maize were achieved (from eight to 10 percent), an increase in total protein supplies in East Africa of over 28,000 metric tons per annum would result.2/

An alternative to the above attempt to indicate some of the possible benefits is to determine a value of project benefits which would offset project costs. Over a 20-year period, with a 10-percent discount rate, project benefits would have to be $53,600 annually to equal project costs ($456,660). It was the judgment of the study team that this quantity of benefits is well within the range of potential benefits which could be expected from the project.

Subproject A-3: Breeding for Disease Resistance in Maize

The benefits of this research subproject are increased yields from the development of disease resistant or less susceptible varieties. The beneficiaries will be those farmers growing maize at lower elevations, most of whom are small holders.

According to East African experts, there are approximately one million acres of maize in the three countries which are affected by disease each year. It was judged by the study team that yield increases on this acreage of between five and 15 percent would be a reasonable expectation for the project. Under the assumption that a 10 percent increase over a current conservative yield estimate of 500 kilograms per acre is possible, the value of the increased production is about $5 million3/ per year. An annual increment of this magnitude for 20 years at a discount rate of 10 percent would have a present value of $42,566,000 compared to a project cost of only $618,140. This yields a benefit cost ratio of over 68:1.

Subproject A-4: Cropping Systems for Marginal Rainfall Areas

The ultimate benefit from this research will be higher yields in marginal rainfall areas as cropping systems which more effectively use the limited rainfall are developed and applied. The beneficiaries will be those farmers already occupying these areas as well as the growing number of people who are being forced into these lower-potential regions due to population pressure in the higher rainfall areas.

In the Partner States roughly 100 million acres fall into the marginal rainfall category. The study team estimated that through research an average yield increment of 25 percent could be expected in these areas at least four

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2/ The two percent applied to 50 percent of the estimated maize production of 2,800,000 metric tons annually.

3/ Using the 1975 Kenya price for maize of $.10 per kilogram.

times over a 20-year period. Using maize as an example, under the assumptions of a 10 percent utilization of the marginal rainfall acreage (10 million acres) with 20 percent planted to maize (2 million acres), a yield increase of 100 kilograms per acre (roughly 25 percent) would provide an additional 200,000 metric tons of production per year. The value at current prices would be about $20 million on an annual basis. This compares with an estimated project cost of $1.34 million. If a 25 percent increase could be achieved an additional three times, it is obvious benefits would almost unbelievably outweigh costs.

However, it should be noted that the above illustrative benefit is based on two key assumptions. First, that better systems of managing the limited rainfall can be developed which have the potential to increase yields; and second, that farmers will adopt the systems. If the occurrence of either of these is delayed, the benefits will be much smaller.

Subproject A-5: Sugar Cane Research

The benefits from the project will be increased per acre sugar cane yields. The most direct beneficiaries will be sugar cane producers, including some small holders under outgrower and settlement schemes. The economies of the Partner States will also benefit as foreign exchange is saved, due to reductions in sugar imports, and used for development purposes. (In 1973, Kenya imported sugar valued at over $18 million.)

Calculating the magnitude of the benefits again involves a number of assumptions. Based on U.S. experience, the study team suggested that yield increases of 15 to 20 percent are possible. Applying a 15 percent increase to 1974 production levels of 160,000 and 115,000 metric tons in Kenya and Tanzania, respectively, yields an annual increase of 41,000 metric tons. At current prices this volume of sugar would be valued at over $40 million. If only 25 percent of this amount were attributable to the project (a very conservative estimate) over a 20-year period it would still yield a present value of over $82 million when discounted at 10 percent. Given project cost of $1,284,540, this provides a benefit cost ratio of over 63:1. Clearly this subproject is economically feasible with considerable margin for increases in costs or decreases in benefits.

Subproject A-6: Plant Quarantine Station

The benefits from this subproject are: the maintenance of a capability to prevent or reduce the magnitude of potential damage to crops; and the reduction in effort and cost associated with the introduction, multiplication and dissemination of new germ plasm to plant breeders. Thus, the direct beneficiaries are those people seeking to bring into the EAC new planting materials. However, if the introduction of a potentially serious disease is prevented, the beneficiaries are everyone producing the crop and the Partner States in general.

Quantifying the benefits for this subproject is ... subject to an extremely wide range of error because of the assumptions which would be required. Earlier experience in East Africa, such as the inadvertent introduction of the cassava mite does, however, serve to demonstrate the very substantial benefits (damages precluded) which are possible. From a cost approach, a benefit stream of only $40,000 per year over 20 years discounted at 10 percent would be sufficient to cover project costs ($338,170). In the judgment of the study team, a very minor introduction of disease or pests could result in damages (benefits) far in excess of that amount.

Technical

The technology involved in all of the subprojects, with the exception of the marginal rainfall cropping systems, is well known and its adoption and use has been judged to be within EAAFRO's capability. The maize breeding and disease resistance subprojects use techniques which have long been employed by EAAFRO. The procedures involved in the protein laboratory have been worked out, tested, and accepted by maize breeders at a number of institutions. These procedures are relatively simple and can be learned in a reasonably short time. The instruments required for the protein laboratory are not highly sophisticated and can be maintained by facilities already available in East Africa.

The sugar cane research proposed for the revised project is an expansion of work already being carried out by EAAFRO. The soils laboratory recommended for this subproject does not represent the introduction of new technology into East Africa.

Continuation, for a two-year period, of AID assistance to the Plant Quarantine Station is necessary to ensure the smooth transfer of responsibility for the operation of the station from expatriate to indigenous personnel. Any new techniques involved in the operation of the station have already been introduced successfully and are now being performed by African personnel.

The extension of the maize breeding methodology already for a two-year period represents the completion of this project. No additional technology is required during this extension.

In the judgment of the AID-funded study team for East African food crops research, these projects are all considered feasible if the technical assistance, commodity support, and participant training are provided as planned. Under the assumption that the subprojects inputs will be available as programmed, KDCEA foresees no institutional problems to the successful completion of the proposed research due to EAAFRO's ability to adopt and use the technology involved in this research. Since these five subprojects are not introducing new research techniques as much as ... expanding EAAFRO's ability to apply technology it already ... to new and pressing problems, KDCEA feels fully confident in making ... judgment.

As described in Section 2 - Social and Political, [illegible] no major socio-cultural factors or institutional difficulties when the results of the proposed research are extended to the farmers of East Africa. This assumption is justified by a history of successful cooperation in extending improved maize varieties to the region's farmers and their adoption of these varieties.

Details of the technology involved in the five subprojects described above are presented in the Annexes to this project paper.

The cropping systems for marginal rainfall areas subproject represents a new concept of using technology already employed in East Africa to develop cropping patterns and cultural practices best suited to marginal rainfall areas. While the various inputs to the final cropping systems recommendations are the result of established and understood research technologies, the whole concept is so new that the combining of these techniques in such a manner as to produce cropping recommendations must be considered as the introduction of a new technology. For this reason this subproject will be discussed in detail in this section.

Subproject Goal: To produce a technically complete package of recommendations that, when implemented at the farm level, will increase and stabilise food crop production levels in the marginal rainfall areas of East Africa.

To create the package of recommendations for marginal area cropping systems, the following will have to be developed through research:

1. an ability to predict the water regime that a given crop or cropping combination will experience when soil, climate and cropping season are specified,

2. an ability to predict the yield of a given crop or cropping combination grown in a specified water regime,

3. recommendations for maximising crop yield response to supplementary irrigation water whenever it is available,

4. recommendations of cultural and conservation practices which will maximize water retention, infiltration and conservation in the cropping system,

5. recommendations, taking full advantage of new materials from plant breeding programs, of drought-escaping and drought-resistant varieties of the major food crops including sorghum, food legumes and millets.

This information, when combined with predictions of actual moisture availability developed from field checks of existing soil moisture and rainfall probability,

will permit rational evaluation of alternative systems of cropping. Planting dates can also be recommended using soil moisture information and an estimate of the time of probable onset of rainfall.

While the technology involved in the research described above is understood by EAAFRO and some research is actually going on in these areas, the coordination of the various inputs required to develop cropping recommendations will force EAAFRO to accept new and expanded responsibilities. EAAFRO will have to serve as: a) coordinator of all research activities related to food crop production in the marginal rainfall areas by all agencies, whether EAC, international, national governments, universities or other; b) an active disseminator to the national level planning and agricultural organizations of meteorological soil crop information and recommendations for field application of research findings which are ready for extension.

The AID-funded study team evaluated the actual and anticipated constraints to the success of this project and considered it feasible if the project inputs are available as programmed. RDOEA, while recognizing the required degree of coordination will be difficult to achieve, concurs in this evaluation. The interest in this project shown by the Partner State institutions concerned with agriculture and social development assures that the required cooperation will be forthcoming. It is expected that the rapid increase in population and the resulting pressures on food resources and available land will guarantee that this interest will be continuous.

Social and Political

While the long-term impact of the research to be carried out under the revised Food Crop Research Project may be considerable, there are no socio-cultural factors that will hinder the research or the adoption of agricultural practices or varieties developed during the course of this project by the area's farmers. Successful completion of the proposed research and the eventual extension of the results to the producers could result in a major increase in the economic activity of the rural areas. This would have a major effect upon East Africa's social, economic and political environments. However, this is considered a normal and desired effect of development and beyond the scope of this project.

Since the proposed research is in support of economic and social forces already in motion within East Africa (hybrid maize has already been adopted by the area's producers and the movement of people from highly productive to more marginal land is well underway), no unusual obstacles to the adoption of research results that promise to provide economic benefits are foreseen. The need to produce a high yielding, high protein maize that is acceptable to East African tastes is already well understood and considered to be a research and not a cultural problem. It is anticipated that farmer research results will not require the area's farmers to make any changes in their traditional methods of production beyond those which they have already proven themselves capable of. Their adoption of hybrid maize varieties and associated cultural practices shows their ability to take advantage of improved farming methods.

A potentially more critical problem is the survival of the whole EAAFRO main function. The problems facing the existing East African Community are serious and widely known. While the Community's service organizations such as EAAFRO are not the cause or focus of the existing dissatisfaction with the Community, they are affected by the growing weakness of support for regional cooperation now being experienced in East Africa. The immediate and long-term future of EAAFRO will only be determined when the Partner States resolve the questions involved in the operations of the four Community-owned corporations and when and if the Community Charter is revised. Political problems not related to EAAFRO have already delayed executive decisions required if EAAFRO is to fulfill its responsibilities to the Partner States.

As a small part of a large organization, it is clear EAAFRO must live within and environment over which it has almost no influence. At this time, the future of the Community and thus of EAAFRO remains unsettled. However, it is the consensus of opinion throughout East Africa that, while the shape of the East African Community may change, a regional cooperative organization will remain when the present problems are resolved. It is the opinion of the Directors of EAAFRO, concurred in by RDOEA, that the need for regional cooperation in agriculture is so obvious and apolitical that a regional research organization will continue to function in any future grouping of the three Partner States. Based on this evaluation, the Directors of EAAFRO continue to plan for the future and RDOEA has developed the revised Food Crop Research Project.

However, because of the uncertain future of regional cooperation in East Africa, RDOEA has refocused its assistance to the EAO from primarily institution building, as exemplified by the original Food Crop Research PROP, to assisting in the solution of specific problems common to two or more of the Partner States. Under this approach, EAAFRO is considered a means to isolate problems common to the Partner States and a channel through which the necessary resources can be directed towards solving these problems.

If RDOEA's interpretation of the political future of the EAC is incorrect, and if the decision is made to disband the Community, the revised Food Crop Research Project has been so designed that the research projects can be offered as a package on a bilateral basis to the Partner State most concerned. While RDOEA does not expect this to happen, the project was designed to minimize the potential loss if the Community becomes ineffective as a means of solving regional problems.

Policy

As stated earlier, the Partner States of the East African Community have made increased agricultural production their highest priority development goal. However, differing social and economic systems existing in the Partner States will affect the rapidity with which the research results will be extended and adopted by the farmers in each country.

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It can be expected that Kenya, with its more and more efficient markets and more realistic pricing policies, will experience the fastest adoption of varieties and/or cultural practices that are proven economically beneficial during the course of the proposed research. In Tanzania, due to the political nature of many of the economic decisions taken in the development of its rural areas and a socialist bureaucracy that may tend to avoid risks, the adoption of new agricultural practices may be delayed. It may also be expected that, due to socialist policies, the economic benefits resulting from the adoption of new production techniques will be more equitably distributed in Tanzania than in the other East African states.

In spite of these difference in the Partner States' social and economic systems, the pressure to increase food crop production throughout East Africa is so great that any research finding leading to an increase in production will, eventually, spread throughout the region.

EAAFRO's relations with agriculture scientists in the national research organizations vary but can generally be considered good. Due to the common policy of increasing food crop production and the pressure on East African scientists to produce results, the cooperation existing between the regional and national research programs can be expected to increase. The demands being placed upon East African scientists are a reflection of the increased emphasis being placed upon agricultural research by the Partner States in their efforts to increase food crop production. This emphasis upon agriculture is also expected to continue due to the economic pressures created by the need to import basic foodstuffs to meet the needs of the region's growing population as well as a growing awareness within the Partner States of the need to encourage rural development.

Financial

a) Besides its semi-autonomous Corporations, the East African Community is divided into several secretariats including the Secretariat for Communications, Research and Social Services under which EAAFRO operates. These secretariats operate on revenues derived from the customs and excise fees collected on behalf of the Partner States by the East African Community. After the budgets for the organizations within the East African Community are approved, the total amount is deducted from the Customs and Excise revenues and the balance is distributed among the three Partner States.

b) Budget development in the EAC follows somewhat the same lines as AID budget development. In February of each year, all departments within the Community are required to submit their budget estimates for the comm; financial year. The EAC financial year is the same as AID's, i.e., July 1 to June 30 of the following year. The budget estimate submitted by all departments in the Community is reviewed by the Finance and Administration Secretariat during the months of March and April. A proposed budget is then prepared by the Finance and Administration people during the month of May. In June of each year the proposed budget is presented to the East African Legislative Assembly. Upon the approval of the budget, the allocation of funds takes

place at the beginning of the financial year. Supplementary budget adjustments can be made during the financial year. These adjustments are usually made during the months of October and November.

EAAFRO follows the above budget development system and has been extremely fortunate in receiving the full amount requested and justified in their budget estimates over the past several years. In preparation for the coming financial year--1976--EAAFRO has already submitted budgets to the East African Community covering the expenses anticipated for establishing the subprojects proposed in this revision of the project paper. It is anticipated, as in the past, that these budget estimates will be approved and ample money will be made available for carrying out the proposed subprojects.

e) Budgets approved in the past several years show EAAFRO has leveled off at a total of about 9 million shillings per year. Considering the magnitude of the operation, this presents a very economical and efficient research endeavor minimizing the total cost for the research requested by the three Partner States. Following is a listing of approved budgets for the recent financial years:

FY 1970 - 7,091,173/- shillings
FY 1971 - 9,035,020/- shillings
FY 1972 - 9,628,500/- shillings
FY 1973 - 9,986,500/- shillings
FY 1974 - 9,200,000/- shillings (estimate)

d) The administration of EAAFRO's program was considered excellent by the research study team during their review of the program. They stated they found the financial, personnel, and logistics departments of EAAFRO to be running smoothly with action taken on time in most respects. EAAFRO has proven itself to be an effective and efficient administrator of its responsibilities. It is flexible in its administration within the limits of the regulations. AID assistance to EAAFRO in this project revision is restricted to the ongoing and established programs. Therefore, local financing and administrative support for subprojects included in this paper are already amply covered in EAAFRO's budget and there is no indication that there would be any problems in carrying the project through to its completion in 1980.

e) EAAFRO's contribution to the overall project as well as each of the individual subprojects in this revision is substantial. EAAFRO's total projected contribution to the project revision is $2,163,165 compared to an AID input of $2,815,800. A breakdown of the comparative contributions by subproject is as follows:

Protein Laboratory - EAAFRO - $174,580
USAID - $232,000

Disease Resistance in Maize - EAAFRO $[illegible],140
USAID $[illegible],400

Breeding Methodology - EAAFRO [illegible]
USAID - $178,450

Marginal Rainfall - EAAFRO - $383,030
USAID -1,045,050

Sugar Cane - EAAFRO - $698,040
USAID - $572,000

Plant Quarantine - EAAFRO - $408,305
USAID - $217,050

Scholarship Program - EAAFRO - $ 50,000
USAID - $100,000

The budget estimates for EAAFRO through 1980 were arrived at by assuming a continuation of the present level of financial support to EAAFRO by the East African Community.

Administrative

As part of its assignment, the study team for the East African Food Crop Research Project evaluated EAAFRO's overall administrative performance as well as its ability to support the individual subprojects. Its general findings are that EAAFRO:

> "Has important leadership role to plan in food crops research. Only minimum efforts are being expended in this area at present.
>
> "Found to be a fully operational organization with capacity to efficiently conduct important research on food crops.
>
> "Needs to narrow the scope of activities and concentrate on highest priorities (sic) needs. Food crops research offers an unique opportunity.
>
> "Greatest strengths are capable personnel with good leadership and generally adequate facilities and budget.
>
> "Greatest potential weakness is inability to recruit and keep superior scientists due to inferior salary structure relative to some other research establishments in East Africa.
>
> "Excessive time required to change programs because cumbersome EAC policies constrain response to pressing problems."

While KARDEA agrees with the study team's observation, it would like to point out that EAAFRO is required by its charter to conduct the research assigned to it by the Partner States and cannot expand or narrow its scope of activities

as it pleases. The problems of recruitment and ability to respond to pressing problems are not uniquely EAAFRO's but reflect the strains to which all the Community organizations are exposed. EAAFRO's leadership is aware of the difficulties these problems are causing but they do not have the power to change the Community's salary structure or decision making processes.

Even with these problems in the opinion of the study team, EAAFRO is fully operational with capable personnel and leadership and generally adequate facilities and budget. It has the capacity and authority to conduct the research proposed in this project efficiently.

During its evaluation of the individual subprojects contained in this proposal, the study team also considered EAAFRO's ability to manage the specific research projects. In each case EAAFRO was found to be fully capable of administrating the proposed subproject.

Since no changes are needed in EAAFRO's existing administrative systems to support the proposed research, RDOEA forecees no threat to successful project implementation arising from inadequate administration. RDOEA's evaluation is supported by the study team's analysis of EAAFRO's capability to manage the research proposed for the revised project.

Section 3: Project Implementation

A. Project Implementation Plan

1. Direct management and monitoring responsibility for the project within AID will rest with a direct-hire project manager located in the Regional Development Office for East Africa (RDOEA), Arusha, Tanzania. It is expected that the same project manager would also be responsible for the Freshwater Fisheries Research Project. Technical services under this project revision will be provided through a USDA PASA agreement with one of the members posted to EAAFRO headquarters appointed as the team leader. To alleviate the burden of administrative work, it is proposed that a local-hire administrative assistant be furnished for handling routine administrative duties for the research team. It is difficult to identify which of the six scientists posted to Muguga would be the proper selection for a team leader. At this writing, it would appear that the plant pathologist who is directing the Plant Quarantine Station at Muguga would be the logical choice. It is recognized that he will be completing his work at the end of FY 78 and a new team leader will need to be appointed at that time. A possible successor would be the agriculture economist who will be the last scientist on board at the end of the revised project. In addition to the administrative team leader, it is proposed that technical team leaders be appointed for each of the major areas of the project. In this context the technical team leader for the maize subprojects would be the maize geneticist presently heading the breeding methodology program at Kitale. The marginal rainfall project would have a technical team leader who would coordinate the activities of the program. This would logically fall to the

agro-meteorologist at Muguga. For the effort at Kibaha which includes both the sugar cane research and disease resistance research in maize, it would be most feasible to appoint the agronomist technical team leader on the sugar cane research program. The primary responsibility of the technical team leaders would be inter-project coordination.

2. Technical Services

A total of 11 PASA scientists would be provided in the revised project. In addition a local-hire administrative assistant would also be employed for the 4-year period. The maize research program would be comprised of; the maize geneticist, a protein laboratory specialist, a plant breeder for disease resistance, and a pathologist/virologist for disease resistance in maize. In the cropping systems for marginal rainfall areas subproject, there would be an agro-meteorologist, an agronomist, an agricultural economist, and an electronics specialist. In the sugar cane research program there would be a sugar cane agronomist and a soils scientist. In addition there would be the continuation of the plant pathologist in charge of the Plant Quarantine Station. Job descriptions for each of the new positions are included in the annex giving details on each subproject.

3. Single Contractor--U.S. Department of Agriculture

REDSA recommends the continuation of the present PASA agreement with the USDA for filling the positions listed above. Presently there are two USDA members on this project, i.e., the maize geneticist and the plant pathologist (quarantine). The original project was rendered somewhat unworkable because there were two contract sources for personnel. The International Institute of Education (IIE) was furnishing three scientists while the USDA was furnishing the balance. These men were working side by side with completely different sets of privileges and salary scales. To alleviate this problem in the future, REDSA recommends continuation of the present USDA PASA agreement for staffing the entire project.

4. Participant Training

The project revision provides US$462,550 for training 13 East African scientists in the U.S. plus 30 scholarships in East African universities to provide EAAFRO with a pool of degree-holding personnel. Each of the graduate school participants will be trained in a given specialty to allow the continuation of the research established by this project by East African personnel. In the marginal rainfall project two men have been designated for each of the four areas of research in order to staff this most important subproject adequately.

5. Commodities

Commodities totaling US$195,800 will be purchased during FY 76 in order to facilitate the establishment of each of the subprojects. Of this amount

$192,200 will be used for non-expendible commodities, while $3,600 will be used for expendible commodities such as laboratory chemicals, glassware, etc., to enable the protein laboratory to be started. Except for the initial purchase, all expendible items for the subprojects will be furnished by EAAFRO.

Included in commodities are seven four-wheel drive vehicles to be used by the field staff. Four of these vehicles will be based at Muguga, EAAFRO headquarters, for use of the six technicians posted there, two vehicles will be assigned to Kibaha for the three men posted there, and one vehicle will be assigned to Kitale for the two men posted there. It is not anticipated that replacement vehicles will be needed during the life of the project revision. All USAID scientists will be expected to conduct extensive field trips in connection with their research. It is, therefore, necessary that this number of vehicles be made available for them to carry out their responsibilities adequately.

6. Other Costs Including Travel and Per Diem

Other costs for this project total U$ 79,000. This low figure reflects inclusion of estimated, direct other costs under the USDA PASA in the personnel category.

7. Housing

Housing falls into two categories: housing furnished by EAAFRO, and housing furnished by AID. Since sufficient housing is unavailable and school facilities are inadequate at Muguga, REDSA has determined the direct-hire and PASA personnel working there will be housed in Nairobi. If housing becomes available at a later date, personnel will be given the option of moving to Muguga. EAAFRO has two senior staff houses under construction in Kitale for the maize geneticist and the protein laboratory specialist. Meantime, Kenya Government housing at Kitale station will be utilized by the two USAID technicians at EAAFRO expense. In Kibaha senior staff houses are available for the two sugar cane scientists. The plant breeder for disease resistance will have to find housing in Dar es Salaam and commute 30 minutes to Kibaha.

8. Local Costs

Local costs for this project will be financed by EAAFRO contributions to the REDSA/EAC trust fund. The present agreement with the East African Community for trust fund contributions includes reimbursement for USAID-furnished housing, travel performed in East Africa where per diem is paid by USAID, and the basic salaries of Community scientists when no counterpart is assigned to work with the U.S. funded scientist. Present contributions to the trust fund include: approximately 700 shillings per month for housing reimbursement; 300 shillings per month for travel in East Africa; and approximately 3,000 shilling per month for salary reimbursement when no counterparts are assigned. Due to AID regulations, the EAC cannot pay per diem for travel in East Africa directly to U.S. Government personnel. Therefore, per diem is paid to all PASA employees

from AID funds and the EAC reimburses the trust fund for this amount. Total estimated trust fund contributions for the life of the revised project are shown below.

Trust Fund Contributions from EAAFRO
(in Kenya shillings)

	FY 76	FY 77	FY 78	FY 79	FY 80
Housing	50,000	75,000	75,000	60,000	50,000
Travel	20,000	40,000	40,000	30,000	20,000
Salary	150,000	260,000	260,000	200,000	160,000
	220,000	375,000	375,000	290,000	230,000
	($30,000)	($55,000)	($55,000)	($40,000)	($34,000)

B. Evaluation Plan

1. Annual Work Plans

In order to provide a vehicle for in depth and in detail evaluation of this project, each USDA technician will submit a detailed work plan covering the coming 12-month period to EAAFRO and KIOEA. Technical team leaders, in collaboration with their counterparts in EAAFRO, will prepare individual subproject work plans each year. These work plans will then be submitted to the Director of EAAFRO and the KIOEA project manager for final approval. When approval is obtained and intermediate targets and goals for the coming year are agreed to, detailed implementation schedules will be prepared. These implementation schedules for each subproject will include both the administrative and technical aspects of the subproject. The preparation of work plans and subsequent detailed implementation schedules on an annual basis will assist both EAAFRO and USAID by establishing measurable targets of achievement and also assist greatly in the evaluation of each subproject as well as the overall project.

2. Annual Project Evaluation

An annual project evaluation will be held at the end of each financial year. In the absence of an evaluation officer at KIOEA, the agriculture project manager will assume this function. In May of each year, the project manager will notify the technical and administrative team leaders and the Director and Deputy Director of EAAFRO, the USDA project representative in the U.S. and any other interested parties to prepare themselves for the evaluation coming in the month of June. These individuals will be requested

to gather pertinent data and information to be used as a measurement against the detailed project implementation schedules, the work plans, the logical framework, etc. The USDA project representative from the U.S. should schedule his administrative and supervisory visits in accordance with the time of the project evaluation. If deemed appropriate, an outside consultant will be requested to participate in the annual evaluation. This will be determined as the project moves forward and the need arises for a more technically and highly qualified individual to assist in the evaluation. At the completion of the annual project evaluation, any revisions to the project paper, and alterations to the work plans will be made and the project appraisal report will be prepared by the agriculture project manager in collaboration with the Director of EAAFRO.

3. Evaluation Consultant Teams

a) The maize breeding methodology subproject is scheduled for completion at the end of FY 77 (June 1977). This subproject, as extended, covers a span of 12 years of research leading towards an improved methodology for conducting maize breeding. During the last two years of this project, a high lysine input will be made into the breeding methodology in an attempt to set the stage for the incorporation of a high protein element in the varieties of maize being grown in East Africa. In preparation for the phasing out of this highly technical maize breeding methodology subproject, a two-man consultant team of high qualifications will be requested to evaluate the project in January 1977. This would be six months prior to the completion of the project. This consultant team would be requested to review and evaluate the maize breeding methodology, and review and make recommendations for the possible establishment of a new subproject for incorporating high protein components into the maize varieties of East Africa. Depending on the recommendations of this two-man consultant team, a project revision may result.

b) Overall Mid-project Evaluation

In January 1978, an overall project evaluation by a team of U.S. consultants will be requested. This team will be comprised of experts in each field of research represented in the subprojects. It is expected this will be a five-man team. This mid-project evaluation will be used when necessary to realign or fortify the present project design.

c) End of Project Evaluation

In January of 1980, a consultant team representing experts in each of the subproject areas of research will be requested to conduct an end of project evaluation.

LIFE OF PRO[illegible]T FINA[illegible] [illegible]UMMARY

Category		Protein Lab	Disease Resistance	Breeding Methodology	Marginal Rainfall	Sugar Cane	Plant Quarantine	Scholarship Program	Sub Total	Total
1. Personnel	USAID	180,000	400,000	100,000	792,000	456,000	150,000	-	2,078,000	2,691,930
	EAAFRO	38,850	49,600	56,600	210,080	[illegible]	86,800	-	613,930	
2. Participant Training	USAID	27,000	40,100	53,350	14[illegible],650	40,100	53,350	100,000	462,550	639,[illegible]
	EAAFRO	8,850	14,100	20,270	52,230	14,100	17,625	50,000	177,175	[illegible]
3. Commodities Non-expendable	USAID	10,400	13,700	15,700	82,000	64,100	6,300	-	192,200	
	EAAFRO	[illegible]	4,000	17,400	36,000	9,000	17,000	-	96,200	485,7[illegible]
Expendable	USAID	3,600	-	-	-	-	-	-	3,600	
	EAAFRO	5,700	36,000	1[illegible]	3,000	88,000	61,000	-	193,700	
4. Land and Structures	USAID	-	-	-	-	-	-	-	-	
	EAAFRO	106,780	17,500	194,600	37,[illegible]	383,000	220,160	-	959,960	959,960
5. Travel, Per Diem and Other Costs	USAID	11,800	16,600	9,400	22,400	11,800	7,400	-	79,400	[illegible]
	EAAFRO	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	-	127,200	
SUBTOTALS	USAID	232,800	470,400	178,450	1,043,050	572,000	217,050	100,000	2,815,800	
	EAAFRO	174,580	133,140	321,070	283,030	698,040	408,305	50,000	2,168,165	
TOTAL		407,380	603,540	499,520	[illegible]	1,270,040	625,355	150,000		4,983,915

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Budget for AID Inputs
($000)

	FY76	FY77	FY78	FY79	FY80	FY81	Total
U.S. Technicians	305	560	500	413	280	20	2078
Participant Training and Scholarships	73.2	140.4	145	96	8		462.6
Commodities	195.8						195.8
Travel, Per Diem and Other Costs	9	20	20	20	8.4	2	79.4
TOTAL	583	720.4	665	529	296.4	22	2815.8

Project Implementation Staffing Plan

	Position & Subproject	Location	Man Months	FY76	FY77	FY78	FY79	FY80	FY81
1.	Protein Lab Specialist High Protein Laboratory Subproject	Kitale	36	XX	XXX	XXX	XX		
2.	Maize Geneticist (Incumbent L. Darrah 3rd tour) Breeding Methodology Subproject	Kitale	24	XXX	XXX				
3.	Plant Breeder for Disease Resistance Disease Resistance Subproject	Kibaha	51	XX	XXX	XXX	XXX	XX	
4.	Pathologist/Virologist for Disease Resist. Disease Resistance Subproject	Muguga	51	XX	XXX	XXX	XXX	XX	
5.	Agro-Meteorologist Marginal Rainfall Subproject	Muguga	51	XX	XXX	XXX	XXX	XX	
6.	Agronomist Marginal Rainfall Subproject	Muguga	51	XX	XXX	XXX	XXX	XX	
7.	Ag. Economist Marginal Rainfall Subproject	Muguga	51		XXX	XXX	XXX	XXX	X
8.	Electronics Specialist Marginal Rainfall Subproject	Muguga	39	XX	XXX	XXX	XX		
9.	Sugar Cane Agronomist Sugar Cane Subproject	Kibaha	51	XX	XXX	XXX	XXX	XX	
10.	Soils Scientist Sugar Cane Subproject	Kibaha	51	XX	XXX	XXX	XXX	XX	
11.	Plant Pathologist (Quarantine) (Incumbent M. Zadoks 2nd tour) Plant Quarantine Subproject	Muguga	36	XXX	XXX	XXX			
12.	Admin. Assist.-Local Hire	Muguga	51	XX	XXX	XXX	XXX	XX	
	Total Man Months		546	78mm	114mm	138mm	114mm	79mm	6mm
	On Board at End FY			11	12	11	7	1	0

Project Implementation Participant Training Plan

Job Title	Subproject	Total Man Months	FY76	FY77	FY78	FY79	FY80	Degree Required
Sr. Lab. Technician	Protein Lab	15		XXX	X			Short Term
Lab. Technician	Protein Lab	15			XXX	X		Short Term
Agronomist	Disease Resistance	24		XXX	XXX	X		M. Sc.
Plant Pathologist	Disease Resistance	24	XXX	XXX	X			M. Sc.
Plant Breeder	Breeding Methodology	36	XXX	XXX	XXX	X		Ph.D.
Plant Breeder	Breeding Methodology	24		X	XXX	XXX		M.Sc.
Agro Meteorologist	Marginal Rainfall	27		XXX	XXX	XX		M.Sc.
Agro Meteorologist	Marginal Rainfall	27			XXX	XXX	XX	M.Sc.
Agronomist	Marginal Rainfall	24	XXX	XXX	X			M.Sc.
Agronomist	Marginal Rainfall	24			XXX	XXX	X	M.Sc.
Ag. Economist	Marginal Rainfall	24	XXX	XXX	X			M.Sc.
Ag. Economist	Marginal Rainfall	24			XXX	XXX	X	M.Sc.
Electronics Specialist	Marginal Rainfall	24		XXX	XXX			Tech Certif.
Electronics Specialist	Marginal Rainfall	12	X					Short Term
Sugar Cane Agronomist	Sugar Cane Research	24	XXX	XXX	X			M.Sc.
Cadia Scientist	Sugar Cane Research	24	XXX	XXX	X			M.Sc.
Plant Pathologist	Plant Quarantine	36	XXX	XXX	XXX			Ph.D.
Plant Pathologist	Plant Quarantine	24	XXX	XXX	X			M.Sc.
Total		432	66	138	153	63	12	2 Ph.D. 12 M.Sc.
[illegible]			3	4	4	0	0	3 Sh. 1 Te:
Continuing			—	9	13	8	3	
Total			9	13	17	8	3	

PARTICIPANT TRAINING

No. of Participants	Duration (Man/Yr)	Cost USAID	Cost HARTO
Protein Laboratory			
2 Lab Technicians	24 M US 15 M CIMMYT	27,000	8,850
Disease Resistance			
1 Agronomist	24 M US	20,050	7,050
1 Plant Pathologist	24 M US	20,050	7,050
Breeding Methodology			
1 Plant Breeder	24 M US	20,050	7,050
1 Plant Breeder	36 M US	33,300	13,220
Marginal Rainfall			
2 Agro Meteorologists	54 M US	45,900	16,100
2 Agronomists	48 M US	40,100	14,100
2 Ag. Economists	48 M US	40,100	14,100
2 Electronics Specialists	27 M US	23,550	7,950
Sugar Cane			
1 Agronomist	24 M US	20,050	7,050
1 Soils Scientist	24 M US	20,050	7,050
Plant Quarantine			
1 Plant Pathologist - Virologist	36 M US	33,300	10,575
1 Plant Pathologist	24 M US	20,050	7,050
28	432 M.	362,550	127,175

In Schools in Panama (for B.Sc. and Masters in U.S. universities)

3-year program with 10 new men/year

USAID topping up $3,000/man year plus 10 per cent increase for rising costs with 10 new starts per year thus funding 30 students/year. 100,000 50,000

$462,550 $177,175

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Detailed Implementation Schedule

	Time Frame	Responsible Agency
FY 75		
Agriculture Resources Study Team	Feb 75	RDOEA/EAAFRO
Project Paper Drafted	Mar/Apr 75	RDOEA/EAAFRO
Revised Project Paper Approved	June 75	AID/W
FY 76		
Project Agreement Signed	July 75	RDOEA/EAC
PIO/T for USDA staff prepared/issued	July 75	RDOEA/EAC
PIO/Cs for vehicles and commodities prepared/issued	July 75	RDOEA/EAC
PIO/Ps prepared/issued for 7 trainees	July 75	RDOEA/EAC
Active recruitment of U.S. personnel	Aug/Nov 75	AID/W-USDA
Houses identified for incoming staff	Dec 75	USAIDS Dar/Nairobi RDOEA/EAAFRO
Arrival of 8 new USDA staff members	Jan 76	RDOEA/EAAFRO
Arrival of vehicles and commodities	Feb 76	RDOEA/EAAFRO
Work plans developed	Mar 76	RDOEA/EAAFRO
All subprojects operational	Apr 76	RDOEA/EAAFRO
Annual project evaluation	June 76	RDOEA/EAAFRO/USDA
FY 77		
Arrival of Agric Economist	July 76	AID/W-USDA
Project Agreement & PIO/T signed	July 76	RDOEA/EAC
PIO/Ps prepared/issued for 6 trainees	July 76	RDOEA/EAC
Electronics specialist return from training	July 76	RDOEA/EAC
Consultants (2) for evaluation breeding methodology/cytogenetics	Jan 77	RDOEA/EAAFRO

Completion breeding methodology subproject	June 77	RDCEA/EAAFRO
Annual project evaluation	June 77	RDCEA/EAAFRO/USDA

FY 78

Project agreement & PIO/T signed	July 77	RDCEA/EAC
PIO/Ts prepared/issued for 4 trainees	July 77	RDCEA/EAC
Annual work plans developed	July 77	RDCEA/EAAFRO
Five degree participants return	Aug/Sept 77	RDCEA/EAAFRO
Project evaluation consultant team	Jan 78	RDCEA-AID/W-EAAFRO
Completion plant quarantine subproject	June 78	RDCEA/EAAFRO
Annual project evaluation	June 78	RDCEA/EAAFRO/USDA

FY 79 & FY 80

Unless modified by evaluation consultants and annual evaluations, the project implementation during FY79 and FY80 will remain much the same as in FY78. The protein laboratory subproject will be completed in December 1978. As participants return, the USDA staff will be increasingly involved in in-service training. By project phase out, FY80, trained and experienced EAAFRO personnel will be available to carry out duties previously performed by USDA project staff.

PART III

Regional Protein Quality Laboratory Subproject

Life of Subproject: 3 years (January 1976 to December 1978)

Total Cost of Subproject: USAID $232,800
EAAFRO 174,580

$407,380

Personnel:

USAID Technician: Protein Laboratory Specialist		$180,000
EAAFRO Staff:		38,850
Protein Lab Specialists	2	
Sr. Lab Assist.	1	
Lab Assist.	2	
Clerk	1	
Stenographer	1	

Participant Training:

Protein Lab Specialists (2) to U.S. for 12 months plus CREDIT for 3 months. Total training, 15 months each. Sr. Lab Assist. to CYMMIT for 6 weeks.

USAID:	27,000
EAAFRO	8,850

Commodities:

USAID:	Laboratory equipment and chemicals to start the operation.	14,000
EAAFRO:	Replacement chemicals, additional equipment and lab maintenance/operation.	8,500

Land and Structures:

EAAFRO:	Construction has begun on the laboratory/office block plus one senior staff house, one intermediate staff house and three junior staff houses.	135,760

Travel, Per Diem and Other Costs:

USAID	11,600
EAAFRO	11,600

(A) Background and Present Situation

In Maize the opaque-2 mutant with higher lysine and tryptophan levels characteristically has a soft, chalky endosperm in most genetic backgrounds. But a hard endosperm is necessary for consumer acceptance in East Africa. Fortunately, in the presence of opaque-2 there are some modifier genes which contribute to a harder endosperm. Unfortunately, some of these modifiers result in lower level of lysine and tryptonhan. In this situation analysis for these amino acids is vital if the breeding work is to actually achieve desired results.

Within this limitation the conversion of breeding populations to opaque-2 version has been initiated in the Kenyan national program at Kitale, in the Tanzanian national program at Ilonga, and in the Ugandan national program at Namande. Conversion to maize of improved protein quality is also scheduled for the Embu and Katamani stations in Kenya in the near future. However, to date all these efforts are without benefit of a protein quality laboratory. The three Partner States have recognized the problem and requested EAAFRO to establish such a laboratory. Experimental stations that have indicated support for this facility and the number of samples they intend to send to the laboratory include: Ilonga Research and Training Institute, Kilosa, Tanzania (2000 probable samples per year); Kawanda Research Station, Kampala, Uganda (2000 probable samples per year); Kenya National Agricultural Research Station, Embu, Kenya (500 probable samples per year); Maize Genetics Division, EAAFRO, Kitale, Kenya (2000 probable samples per year); the Faculty of Agriculture and Forestry, Department of Crop Science and Production, University of Dar es Salaam, Morogoro, Tanzania, has also indicated interest and support for this facility especially if capability can be expanded to include millets, sorghum and rice. In addition it is estimated that Ethiopia, Malawi, and Zambia could generate as many as 1000 samples per year on a cost basis.

Other protein quality laboratories do exist, most notably those of CIMMYT in Mexico and IITA in Nigeria. The laboratory at CIMMYT serves their own breeding programs and provides limited service to Mexico and other Latin American breeding programs. However, it is not prepared to analyze samples from numerous breeding programs as evidenced by the fact CIMMYT is assisting Peru and Colombia to set up their own laboratories on the same general plan as that proposed by EAAFRO. Even if CIMMYT were willing, delays in getting test material to Mexico and analysis data back would seriously hamper selection programs. Regarding IITA, plant breeders in East Africa have expressed doubt as to whether samples could be successfully sent to Nigeria given the unpredictable importation complications and whether test results could be obtained in time for selection of the next generation.

(B) Subproject Description

1. Objectives:

a. To establish in EAAFRO a Protein Quality Laboratory for the support of breeding programs in EAAFRO and the Partner States aimed at

developing maize varieties and hybrids with improved protein quality. Analyses would also be provided to other countries in Eastern Africa on a cost basis. Initially, analyses would be exclusively on maize but, as methods are more clearly defined elsewhere, at least the millets and sorghum would be included.1/

b. To provide coordination and consultation with national and EAAFRO breeders in the interpretation and utilization of the laboratory data obtained.

2. Relationship to Other Subprojects:

The activities of the laboratory would be closely integrated with the subprojects on maize breeding methodology and opaque-2 as they are introduced into some of the populations and with breeding for disease resistance and protein quality in low altitude maize.

(C) Technical Feasibility of the Subproject

1. The procedures to be used in the laboratory have been well worked out and tested by Villegas and Mertz, and have been accepted by maize breeders at a number of institutions. The climate at Kitale is similar to that of Mexico City so that there should be no adverse effects from this source. The procedures employed are relatively simple and can be learned in a reasonably short time by a qualified trainee. The instruments used are not highly sophisticated and critical spare parts will be supplied. Repair service is available in Nairobi.

With these considerations and the availability of laboratory space and essential utilities, the operation of the laboratory will be technically feasible.

1/ Analysis of millet samples can be added without difficulty when a suitable methodology is determined. In grain sorghum, the protein nutritional value is dependent both on the levels of lysine and tryptophan and on the levels of interfering tannic acids. Therefore, analyses of both the limiting amino acids and the tannic acids are necessary. Simple analytical methods for tannic acids are now being developed under the sponsorship of USAID in the grain sorghum project at Purdue University.

To date, no simple method of analysis of the limiting amino acid, methionine, in legume seeds has been developed. But when such methods are developed, the analysis of legume seeds could, undoubtedly, be phased into operation at this facility.

2. Location of Subproject:

There are several possible sites in East Africa for the location of the protein laboratory. The choice of Kitale was made because EAAFRO and Kenya's highly successful maize breeding programs are located there. Cooperation, consultation and integration on matters of project planning, distribution of work for the protein lab, planting of trials, and the joint use of facilities between the staffs of the two projects would be highly beneficial. Also approximately 40 percent of the samples to be analyzed in the initial year will be generated there by the EAAFRO and Kenyan breeding programs located in Kitale.

Temporary laboratory space has been made available by the station director and the station has been designated as a substation of EAAFRO. EAAFRO has the authority and plans have been completed for the construction of a permanent office/laboratory facility as well as housing for the staff of this project. The office/laboratory building will serve both the maize breeding methodology program and the protein laboratory and will provide very adequate facilities.

The basic utilities, water and electricity, as well as telephone are available and reasonably reliable. Transport of samples to Kitale may be somewhat of a problem, but a significant portion of the samples will be generated at Kitale. In previous years, it has been possible to cope with the transport problem in the case of seed sent out for the East African maize variety trial each year. Scheduled air service which carries freight is available several times a week to and from Kitale. With both all-weather roads and air transportation connecting Kitale with all major towns and cities, a suitable and convenient system of transporting samples can be established.

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JOB DESCRIPTION OF USAID PROTEIN LABORATORY TECHNICIAN

Duty Station: Kitale, Kenya

Residence: Kitale, Kenya

Training: M.Sc. or B.Sc. with considerable experience in protein biochemistry. A familiarity with the various analytical procedures for protein and amino acids are essential.

Experience: Two years of experience in protein biochemistry including analytical procedures for protein and the various amino acids. Some experience in the care, maintenance and minor repair of such laboratory instruments as pH meters, colorimeters, centrifuge and balance.

Duties: Provide leadership in the establishment and operation of a new Protein Quality Laboratory in East Africa. Duties also include the training of laboratory assistants and facilitation of a transfer of full responsibility for the laboratory to an East African counterpart. The technician will be in charge of the analysis of maize, millet and sorghum (possibly other grains or legume seeds at a later date), particularly for total protein by micro-kjeldahl and tryptophan by the Opiansen-Blauth colorimetric method as modified by Hernandez and Bates, but also including less frequent analyses for lysine by the colorimetric method developed by Tsai and modified by Villegas.

Assist the breeders in planning the scheduling of their submission of samples in order to distribute the analytical workload as evenly as possible throughout the year. Consult with the breeders in the interpretation and utilization of the laboratory data.

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PART III

Maize Breeding Methodology Research Subproject

Life of Subproject: Originally designed for 10 years (1964-1974). This subproject revision extends the original subproject for an additional 2 years to allow the completion of the evaluation phase of 14 out of 17 trial cycles. Total life of subproject: 12 years.

Total Cost of Subproject Extension: USAID $178,450
EAAFRO 321,070

$499,520

Personnel:

USAID Technician: Maize Geneticist		$100,000
EAAFRO Staff:		56,600
Research Officer Trainees (Plant Breeders)	2	
Scientific Assistant	1	
Laboratory Assistants	3	
Auxiliary Staff	13	
Clerk	1	
Stenographer	1	
Drivers	2	
Casual labor		

Participant Training:

Plant breeders (2) to U.S. for 24 months each for graduate studies leading to a Masters Degree.

USAID:	53,350
EAAFRO:	20,270

Commodities

USAID:	4-wheel drive vehicle, 4-row corn planter, moisture motor, desk computer	15,700
EAAFRO:	Farm machinery, moisture tester, farm vehicle, farm supplies	42,400

Land and Structures:

EAAFRO:	Contruction has begun on the laboratory/office block plus one senior staff house, one intermediate staff house, and 13 junior staff houses.	194,600

Travel, Per Diem and Other Costs:

USAID	9,400
EAAFRO	7,200

(A) Background and Present Situation

The breeding methods study was initiated in 1964 to compare different methods of recurrent selection under East African conditions using local and introduced populations of maize (Zea mays L). The project was designed to assist national maize research programs in East Africa in the selecting of breeding methods best suited for their own seasonal patterns, available resources, desired rate of improvement, and ultimate commercial use of the improved populations in each national maize breeding program. Comparisions of methods included ear-to-row selection with several variations, mass selection, half-sib selection (recombining remnant selfed seed), S line selection, full-sib selection, and reciprocal recurrent selection. Different germ plasm materials, testers, plant populations, and selection intensities within a given breeding method were additional variables examined in the study. Materials used were Kitale II (KII), Ecuador 573 (EC573), and Kitale Composite A (KCA) derived from the advanced generation of the KII X Ec573 cross. The names suggest the origin of the initial germ plasm.

The study has proven to be very successful as evidenced by the fact that breeding programs of at least seven African countries have formed composite breeding populations and are improving them by methods recommended by the EAAFRO breeding methods study. Breeders in national programs were informed of the results in regional workshops for cereal researchers organized and held on a biannual basis. Such workshops are now held under the direction of the participating corn breeders from various African countries. The Kenya breeding program shifted in 1973 from S^1 to reciprocal recurrent selection on the basis of the results to that date of the EAAFRO study.

A direct contribution of the maize breeding methods study to the agriculture of East Africa is the use of EC573 (R12)C5, an improved population, as the male parent in 76 percent of the hybrid seed sold in Kenya. Further, Ec573 (R12)C2 and Kitale II (RII)C2 are the parental lines of Tanzania's highland commercial hybrid 611C. The same populations are being directly utilized commercially in Ethiopia.

The present status of the experimental work is summarized below. The selection phase of 14 of the original 17 experiments has been completed.

1) S 8 will finish the fifth cycle in July 1977 (forming a low yield population).

2) HI 16 will finish the fifth cycle in July 1977 (low yielding inbred tester).

3) F 18 will finish the fifth cycle in July 1976 (full-sib selection).

Other experiments not completed because they were initiated later than the above which should be continued with the possible earliest evaluation date are as follows:

1) Mass selection in KCA at a low plant population density (M17, cycle 10, 1978).

2) S1 selection in Kitale II and Ec573 (S21, cycle 10, 1981 and S22, cycle 10, 1980).

3) Reciprocal recurrent selection with an inbred tester in Kitale II and Ec573 (R1^{3}, cycle 10, 1984 and R1^{4}, cycle 10, 1984).

The evaluation trials envisioned for the original 17 experiments and earliest possible evaluation dates are:

1) Ear-to-row and reciprocal recurrent selection in Kitale II and Ec573 in 1976 and 1977 (plus 1978 if possible) at 7 to 9 locations.

2) Ear-to-row and mass selection in KCA in 1976 and 1977 (plus 1978 if possible) at 7 to 9 locations.

3) S1 half-sib with parent population, low yielding population, and low yielding inbred line as testers; and full-sib selection. Three of these populations are expected to be available in 1976, the other two in 1978.

Although 10 years of the breeding methods study have been completed, from the above analysis it can be seen that some populations will not be ready until 1977 and others even later. The reason for this increased span of time is related to the time required to produce generations of maize rather than the volume of work. Consequently, the study team recommended that AID continue the project for two years beyond its currently scheduled termination. During the two year extension, the time spent by the breeder on evaluation of the experiment will decrease as the number and extent of the trials decreases. It is suggested that a major effort be made during this period to design ways and solicit cooperative arrangements of time and facilities to ensure that evaluation will be completed after the termination of the project.

(B) Subproject Description

1. Objectives:

a. To complete the breeding methods study, including evaluation and publication of results, so that it will make the maximum contribution to all existing maize breeding programs.

b. To continue to supply lines and populations with improved disease resistance and agronomic traits to the Partner States for use in the production of commercial varieties and hybrids.

c. To design and test a program to convert some improved populations to opaque-2 with hard endosperm in both high and low altitude maize. This will be in support of the Partner States' maize breeding programs and will attempt to coordinate these programs.

2. Relationships to Other Subprojects:

a. To assist in the establishment of the protein quality laboratory at Kitale as it is being set up and to guide and consult with the disease resistance breeding from low altitudes as it is initiated.

b. To continue to assemble the high altitude regional variety trials and to cooperate in testing the low altitude regional variety trials assembled by OAU-JP-26 (as per agreement).

c. To provide young maize breeders from the Partner States with four to six month periods of training at Kitale.

(B) Technical Feasibility of Subproject

1. EAAFRO, with the USAID sponsored leadership, has demonstrated a unique capability to effectively achieve the objectives of this project.

2. Adequate land, irrigation facilities and trained field labor exists to permit proper operation of the project.

3. EAAFRO provides adequate office/laboratory space to permit efficient work.

4. EAAFRO also provides enough operating funds so that operations can run smoothly.

5. An excellent working relationship exists between Kenyan Ministry of Agriculture personnel and EAAFRO technicians so that each benefits from being physically together at Kitale.

6. There is a demand and utilization of project results in East Africa and in various other parts of the world that gives impetus for excellent achievement.

7. The most critical need is to adequately train the counterpart who has reportedly been appointed so that he can assume the project leadership before the current USAID project leader completes his present assignment.

8. Phasing in the hard endosperm opaque-2 characters during the life of this project will require the services of an efficiently operating protein laboratory. USAID assistance as outlined in the protein laboratory subprojeet is most essential.

PART III

Disease Resistance in Maize Subproject

Life of Subproject: 4 years (January 1976 to March 1980)

Total Cost of Subproject: USAID $470,400
EAAFRO $133,140
$603,540

Personnel:

USAID Technicians:		$400,000
Maize Breeder		
Plant Pathologist		
EAAFRO Staff:		49,600
Research Officer Trainees (Breeder Counterparts)	2	
Research Officer Trainees (Pathologist counterparts)	2	
Scientific Assistant	1	
Laboratory Assistant	1	
Field Staff	3	
Steno Clerk	1	

Participant Training:

Breeder/Agronomist and Plant Pathologist to U.S. for graduate studies for 24 months each leading to a Masters Degree

USAID:	40,100
EAAFRO:	14,100

Commodities:

USAID:	4-wheel drive vehicle, irrigation equipment, scientific laboratory and office equipment	13,700
EAAFRO:	Irrigation well bore hole, pump and motor, fencing materials, tractor, implements and farm supplies shared with sugar cane station.	20,000

Land and Structures:

EAAFRO:	5 acres of land in proximity of sugar cane station suitable for disease resistance research, field office/storage shed land clearing and leveling	17,500

Travel, Per Diem and Other Costs:

USAID	16,600
EAAFRO	31,940

(A) Background and Present Situation

There is no breeding station dedicated to breeding for disease resistance in low altitude maize. Nor has natural selection in indigenous maize populations resulted in the build up of varieties with improved resistance to the most serious disease, maize streak virus (MSV). Now, however, several sources of resistance have been confirmed at EAAFRO by Doek and Guthrie using leaf hopper transmission in the greenhouse. These sources include Michoacan 21 X Stiff Stalk Synthetic, Mexico 55, Yucatan 16, Guatemala 252, TZB-Sr, and Reunion Revolucin 198. Increased seed from sib pollinations among resistant plants is being made available to interested breeders and can serve as the basis for an accelerated maize streak breeding program. Other sources of resistance are likely to be found as work progresses. Immunity or high resistance may not be necessary, or even desirable, if tolerance enables plants to develop normally in spite of infection and some symptom development.

(B) Subproject Description

1. Objectives:

a. To establish EAAFRO research in the low land maize area where streak and other diseases are severe.

b. Incorporate resistance to MSV into adapted low altitude composites (five such composites are now available) to form broad based populations. Resistant material already identified by EAAFRO will be a starting point, others undoubtedly will be found.

c. Determine inheritance of streak resistance. The mode of inheritance is essential in determining the type breeding program carried out.

d. As a second priority, search for and, when available, begin to incorporate resistance to H. Maydis, P. Polysora and other diseases that become economically important.

2. Relationship to Other Subprojects:

a. Close cooperation with the highly successful EAAFRO maize breeding methodology subproject will strengthen and support this project by supplying some of the initial breeding material, by advising on the most efficient breeding methods to accomplish objectives, and by input from the experienced USAID technician in getting the new project underway.

b. The protein laboratory subproject will have a direct input as simultaneous selection for opaque-2 and vitreous endosperm as well as disease resistance progresses. The laboratory would also be of assistance in the interpretation of results obtained on selections tested.

c. The plant pathologist-virologist on this subproject would be involved in the identification of materials showing resistance to virus and other disease problems for the breeding program. He may also be requested to assist the sugar cane and the quarantine subprojects although his first priority would remain with the disease resistance breeding program.

(C) Technical Feasibility

1. Technical:

a. The MSV cannot be transmitted mechanically and with controlled leaf hopper transmission only very small numbers of plants can be tested for resistance. Natural infection in maize populations grown in the field during the regular season tends to be unreliable--thus, screening for resistance is difficult. However, experience indicated more consistent infection of susceptible plants may be obtained in irrigated crops during the dry season as the insects move from nearby grass as the plants mature and dry out.

b. It is not always possible to determine streak on the basis of symptoms; but an antiserum has been produced by Bock and Guthrie, workers at SAARRO, which permits positive identification. Obviously, this enhances the possibilities for an effective breeding program.

c. Initial sources of resistance to streak are available. With effective screening, other sources should be found in introduced germ plasm.

d. With off-season nurseries under irrigation and the favorable environment in the Kibaha area, effective screening for streak, etc., will be possible.

e. Protein quality laboratory will make incorporation of opaque-2 with vitreous endosperm possible.

f. Willingness to cooperate indicated by national breeders will make testing under diverse environment possible.

2. Location of Subproject:

In breeding for resistance it is desirable to locate the program where the disease (or diseases) is likely to occur regularly with reasonable severity. Each of the three sites in Tanzania appear to fulfill this requirement.

The Ilonga station would have the advantage of close proximity and the possibility of better cooperation and interchange with the Tanzanian-IITA maize program there. However, housing for staff and office/laboratory facilities are not available there. Location at Morogoro would have the advantage of cooperation with the staff of the Faculty of Agriculture of the University of Dar es Salaam; but again, physical facilities are not available.

The Kibaha location has the primary advantage in that is already a designated substation of EAAFRO and the EAAFRO sugar cane breeding program is located there. Housing and office/laboratory space would be available there. Contact between Kibaha and EAAFRO at Muguga and Kitale will also be somewhat easier than either Ilonga or Morogoro. Morogoro and Ilonga are only a 2- and 3-hour drive respectively from Kibaha on a good road.

Land for nurseries and field plots at Kibaha would have to be one mile away from the station itself because of the rule against the growing of maize in the station which is liable to bring in virus diseases detrimental to sugar cane. This would be somewhat of a disadvantage, but not insurmountable. Another possible problem is the need for irrigation so that off-season nurseries, more favorable for streak development, can be grown satisfactorily. Considering all factors, Kibaha seems to be the most logical location.

JOB DESCRIPTION FOR USAID PLANT BREEDER FOR DISEASE RESISTANCE IN MAIZE PROJECT

Duty Post: Kibaha, Tanzania (30 minutes drive from Dar es Salaam)

Residence: Dar es Salaam, Tanzania

Training: Ph.D., or M.S. with considerable experience in plant breeding, with some background in plant pathology.

Experience: At least 5 years experience in plant breeding. Some experience with maize or other cross pollinated crop would be highly desirable.

Duties: Initiate breeding program for resistance to streak (MSV) and other diseases in maize populations adapted to low to medium altitude conditions. Introduce known sources of resistance to streak into the best currently available populations, and by the most efficient recurrent selection methods available, build up the field resistance of the populations. To the degree possible, simultaneously introduce opaque-2 and improve the protein quality of the populations. Breeding methods would be chosen on the basis of the Kitale methodology study findings and in cooperation with USAID geneticist at Kitale. Protein quality testing would be done at the protein laboratory to be located at Kitale. Technician would have assistance of virologist, USAID technician, located at Muguga on disease aspects. Populations with improved disease resistance and protein quality would be supplied to national breeders for final selection and release.

JOB DESCRIPTION FOR USAID PLANT PATHOLOGIST FOR DISEASE RESISTANCE IN MAIZE

Duty Station: EAAFRO Headquarters, Muguga, Kenya

Residence: Nairobi, Kenya

Training: Ph.D. or M.S. with considerable experience in plant pathology/ virology.

Experience: At least 3 years experience in research and field work on virus diseases of crop plants. Some experience with maize would be desirable.

Duties: Monitor disease of maize, particularly viruses, in low and medium altitudes of Partner States. Work with low elevation maize breeder, USAID technician, in developing conditions favorable for disease development, streak initially, and selecting for resistance or tolerance. Verify field resistance in controlled greenhouse tests with viruliferous leaf hoppers. Conduct search for other possible sources of resistance. Serve as consultant on disease problems for EAAFRO sugar cane breeding program and for maize breeding methodology/high quality protein program. Consult with Quarantine Division Head on problems of mutual concern.

Note: Candidates for this position should consult plant pathology situation statement following.

Plant Pathology Situation Statement

Plant Pathology - EAAFRO - February 1975

Plant Pathologist/Virologist

EAAFRO has presently 3 virologist posts. For one there is a trainee studying for the M.S. at Maryland. The other 2 are vacant. There are two English virologists working with EAAFRO at Muguga, Drs. K. Bock and E. J. Guthrie. Since 1973, they have been supported entirely by British ODA with their commitments being on the viruses and virus diseases of maize and legumes. They apparently have no EAAFRO input except physical facilities, i.e., office, laboratories, glass houses, nursery plots and residences. They have ultracentrifuge, spectrophotometers, etc.--all instruments needed for basic virology research.

Their work involves the critical identification of viruses. For example in maize streak virus they have purified it, characterized it morphologically (by electron microscopy in England) and serologically and prepared antiserum as an aid in identifying the virus in field collections. They have checked isolates for occurrence of different pathologic strains. They have imported maize germ plasm and have been screening these for field resistance to MSV. They have also been searching for resistance to the maize strain of sugar cane mosaic virus (SCMV). In maize, MSV and SCMV are the two that they have commitments to primarily--stripe and line viruses are being watched.

Their premise is that, if they can make positive identification of a virus that occurs in East Africa and the virus is well known in other parts of the world, they may be able to obtain resistant germ plasm from the places where the virus has been studied previously. Thus, they would avoid random searches of germ plasm collections.

With MSV they have found the virus to be remarkably stable. A strain previously worked with is still available and its pathological behavior is the same as more recent isolates. They have also found plants with various degrees of resistance or tolerance from several sources as listed in their report on the Disease Resistance Subproject. Individual plants are tested by moving viruliferous leaf hoppers alternately from a known susceptible plant to a test plant and then to another susceptible plant. If the known susceptible plants come down with virus, but the test plants show little or no effects, then they are sure that the plants do have some resistance. These plants are allowed to flower and then sibbed within sources and selfed the next generation and also crossed with susceptible plants to begin a determination of inheritances so that, eventually, use in breeding programs can be more efficient. Some of the other virus problems in food crops that they are working with are peanuts, cassava, cucurbits, etc. Again, they are sorting out the viruses involved and looking for useable resistance.

These men constitute virtually the only plant virology expertise in East Africa and there is a great need for more hands to work on the problems and particularly to train East Africans in this field. The national institutions

are fairly well supplied with staff with mycology and bacteriology training. With the importance of virus diseases, especially in food crops, there is a deficiency in virology.

For these reasons, we are recommending that an additional plant pathologist, one with considerable experience with virus diseases, from the U.S. should be added to the support of the EAAFRO effort. This technician would have primary responsibility for the disease aspects of the disease resistance breeding program in identifying diseases, encouraging epidemics, and with selecting, etc. Secondarily, he would be an advisory resource for both the sugar cane breeding and quarantine projects. He would also oversee the on-the-job training for one or two research officer trainees as available. This technician position would greatly strengthen the plant pathology area for EAAFRO. Hopefully, the trainees eventually would fill the vacant EAAFRO virologist posts.

Dr. Ben U. Ngundo, Acting Head of the EAAFRO Plant Pathology and Nematology Division, is a recently trained nematologist. At present he is rather isolated as there are no other EAAFRO plant pathologists, much less nematologists, at most. He obviously has reason to feel lonely in this position. There appears to be no hope that another nematologist, USAID technician, will be forthcoming. At present there is no remedy for that situation. The proposed pathologist/virologist tied to the maize disease resistance program, but located at Muguga, may be of some help.

PART III

Cropping Systems for Marginal Rainfall Areas Subproject

Life of Subproject: 5 years (January 1976 to September 1980)

Total Cost of Subproject:	USAID	$1,045,050
	EAAFRO	383,030
		$1,428,080

Personnel:

USAID Technicians:		$702,000
Agro-meteorologist		
Agronomist		
Agricultural Economist		
Electronics Specialist		
EAAFRO Staff:		210,080
Research Officer Trainees		
Agro-meteorologists	2	
Agronomists	2	
Agricultural Economists	2	
Electronics Specialists	2	
Supervisory Officer	1	
Field Officers	6	

Participant Training:

Agro-meteorologists (2), agronomists (2), agricultural economists (2) for 24 months each training in U.S. leading to a Masters Degree. Electronics specialists (2) for 24 months each training in U.S. leading to a specialist diploma.

USAID:	348,650
EAAFRO:	52,230

Commodities:

USAID: 4-wheel drive vehicles (4), neutron soil depth moisture gauges (4), lysimeter, evaporation pans (8) irrigation equipment.	82,000
EAAFRO: Scientific laboratory equipment, irrigation bore holes, pumps and motors (3), laboratory and farm supplies.	44,000

Land and Structures:

EAAFRO: 5-acre sites in 3 locations, clearing and leveling, irrigation structures, evaporation structures.	37,920

Travel, Per Diem and Other Costs:

USAID	22,400
EAAFRO	38,800

(A) Background and Present Situation

Population pressures are forcing unprecedented numbers of people to live in areas where the production of annual food crops is severely limited by lack of available moisture. Estimates of population growth in these areas ranges between 3.1 percent per year to a rate as high as 10 percent. Hard data on the land areas involved are not readily available but the magnitude of the problem can be estimated by assuming that it is the area which receives 20-30 inches of rainfall annually. This amounts to 13 percent, 33 percent and 10 percent of the total land areas of Kenya, Tanzania, and Uganda respectively. An additional 72 percent of Kenya, 15 percent of Tanzania, and 12 percent of Uganda receive less than 20 inches of rain annually.

About 2000 square kilometers of the 20-30 inch area in Kenya are being considered for irrigation development projects and 30,000 square kilometers are considered "medium potential" land where production is limited by lack of available moisture. Tanzania has expressed an intention to develop 20,000 square kilometers in irrigation projects but the amount of land in the marginal rainfall areas suitable for agricultural development has not been accurately determined. The intention to use these areas has been dramatized by the decision to relocate the national capital to Dodoma in a marginal rainfall zone. Many of the resettlement villages (ujamaa villages) are located in marginal rainfall areas. The rainfall pattern tends to shift to a unimodal type in Tanzania and the definition of marginal rainfall areas will be somewhat different from that in Kenya.

Not as much attention has been focused upon the Ugandan marginal rainfall area because most other areas receive high rainfall but population pressures there too are forcing development of these areas.

Some research in these areas has been conducted. Rainfall and evaporation data have been recorded for many years throughout the Partner States. In general these data have been reliable and adequate for most purposes. However, the evaporation data will need to be adapted to fit the crop production needs of agriculture because evaporation pans are typically located in a small grassed plot that is allowed to die back during the dry season. Calibration of these data are possible by obtaining evaporation data from adjacent pans at a few locations where the grass is irrigated and kept green.

Soils data have been collected and soils characterized most completely in the areas of high productivity and principally as a base of soil fertility

recommendations. Some data on soil depth and water holding capacity are available but most soils have not been characterized and mapped on a large scale for most areas of East Africa.

Considerable research has been reported on cultivation practices that favor infiltration and retention of rainfall as soil moisture in East Africa and elsewhere in the world. Although a great deal is already known about soil conservation practices in Kenya, there appears to be a certain slackness in application of this knowledge.

Studies of ox plowing and other intermediate technology for the relatively extensive agriculture that will be characteristic of the marginal rainfall areas is also underway at various places in the community. (University of Nairobi, Johnston and Honeycroft.)

However, there are large gaps in available information. Particular studies and surveys are needed on soil textures, water holding capacity and depth and structure of soils in most marginal rainfall areas; root system development, crop water requirements, proportions of soil water extracted and the response to water deficits at different developmental stages for various crops; rates of planting of a particular crop which are appropriate under conditions of marginal rainfall, constraints on production such as insects, labor, etc.; and the efficiency of different resource combinations in marginal rainfall areas.

In conducting the necessary research, U.S. experience in the Great Plains and work being conducted at the international research centers, particularly ICRISAT, will be valuable.

(B) Subproject Description

1. Objectives:

a. To develop recommendations for cropping systems which will both increase and tend to stabilize food crop production levels in the marginal rainfall areas of East Africa. The recommendations developed will be based on:

i. an ability to predict the water regime which a given crop (or cropping combination will experience when soil, climate, and cropping season are specified,

ii. an ability to predict the yield of a given crop (or cropping combination) grown in a specified water regime.

b. To develop recommendations for maximizing the crop yield response to supplementary irrigation water whenever it is available.

c. To establish EAAFRO in a coordinating role with agencies whose activities relate to food crop production in marginal rainfall areas. Specific areas of concern in this role include:

i. an ability to adapt soil tillage and conservation practices which will maximize water retention, infiltration and conservation in the cropping system,

ii. an ability to use with full advantage materials from plant breeding programs concerned with developing drought escaping and drought resistant varieties of the major food crops including sorghum, food legumes and millets.

d. To establish in EAAFRO the capability for translation and further refinement of data output from the marginal rainfall experiment for utilization by farmers, agricultural development planners and the directors of private and public agricultural programs in East Africa. Specific areas of concern include:

i. a determination of social and economic constraints in implementation of cropping system recommendations,

ii. appraisal of alternative strategies for implementation and assessment of cropping system recommendations.

2. Relationship to Other Subprojects

As the preferred cereal crop in East Africa, maize requires full research attention in all aspects. Thus other subprojects relating to development of new maize varieties (breeding methodology), their disease resistance, and their nutritional qualities (protein laboratory), all are expected to make valuable contributions to the subproject on marginal rainfall areas.

(c) Technical Feasibility

The proposed marginal rainfall program is to be modeled after studies begun at the University of California at Davis in 1969, and which are currently being carried on jointly by the CID Universities. (A consortium of the Universities of Arizona and California and Colorado State and Utah State Universities. The acronym "CID", meaning "Consortium for International Development" has been adopted.) The objective is to quantify the growth characteristics of principal crops which influence their water use and yield expectations.

Different crop types and growth patterns result in different water requirements, different patterns of actual water uptake from the soil, and different yield responses to water deficits in different growth stages. It should be noted that the pertinent crop growth characteristics may differ between varieties as well as species.

Once experimentally quantified, the crop characteristic information may be combined with planning site measurements of climate and soil to predict the water use and yield expectations. The method also specifies the most efficient way to utilize any available supplementary irrigation water.

The proposed research program is to work simultaneously at four levels as follows:

1. A conceptual guidance and scientist training level at the University of California at Davis.

2. Basic research on pertinent growth characteristics of principal crops at EAAFRO, Muguga.

3. Applied research which thoroughly tests the transferability of findings made at Muguga to the marginal rainfall environment, and to extend the research effort to spacing and varietal trials. Possible sites for these experiments are Katumani in Kenya and either Morogoro or Ilonga in Tanzania.

4. Farming level observation trials to test the predictive capability of the method at the point of use, and to further study effects of yield and water use influencing factors such as plant spacing and fertilization. Two such trial sites are contemplated in each Partner State. These may be located either on national or university stations or in marginal areas of particular interest for development.

Under the above operational plan and given the physical facilities and staff of EAAFRO and the Partner States, the spirit of cooperation which exists among all of these, and the proposed technical and commodity assistance, the subproject will be technically feasible.

JOB DESCRIPTION OF USAID AGRO-METEOROLOGIST

Duty Station: EAAFRO Headquarters, Muguga, Kenya

Residence: Nairobi, Kenya

Training: Ph.D. in agro-meteorology or soils science with emphasis on soil-water-plant relationships.

Experience: At least 3 years experience in research involving crop growth and soil water monitoring. Experience in agro-meteorology is desirable but not required.

Duties: Direct the project including supervision of the design and instrumentation of the major research installations. The director will, in consultation with staff, design, conduct and analyze the experiments outlined in the sub-project proposal. Other duties include effecting liaison and cooperation with other units of EAAFRO, research agencies, and program planning agencies related to development of the marginal rainfall areas. Responsibility extends to initiating an evaluation of project activities with consultants and responsible authorities. He shall be the educational officer of the project and will organise seminars and similar events to disseminate research findings to appropriate officials involved in marginal rainfall area agriculture. He will supervise the on-the-job training of counterpart technicians and their transition to full responsibility.

JOB DESCRIPTION OF USAID AGRONOMIST

Duty Post: EAAFRO Headquarters, Muguga, Kenya

Residence: Nairobi, Kenya

Training: M.Sc. Degree or better.

Experience: At least 2 years experience in designing, conducting and analyzing experiments under conditions of limited rainfall.

Duties: Assist the agro-meteorologist in his duties with particular responsibility for developing cropping systems appropriate to the marginal rainfall area. During the cropping season assume responsibility for supervision of experiments in Tanzania. Assist in the training of counterpart technicians and assist in orderly transition of their duties to full responsibility.

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JOB DESCRIPTION OF [illegible]

Duty Post: [illegible]

Residence: Nairobi, Kenya

Training: Ph.D. in agricultural economics or economics with research specialization in resource economics and area development.

Experience: At least 3 years experience in research involving relationship between the agricultural sector and regional economic development. Experience with agricultural applications of linear programming and inter-industry analysis would be highly useful.

Duties: Provide leadership in applications of agricultural economics as a part of a multidisciplinary team whose objective is to develop an agronomic based cropping systems prediction capability for marginal rainfall areas. Primary concern will focus on identifying the economic implications of alternative systems, and to assess potential economic constraints and strategies which could be used in their operationalization. Duties also include training of research officer counterparts and facilitation of a transfer to full responsibility for agricultural economic input in continuation of cropping systems studies.

JOB DESCRIPTION OF USAID ELECTRONICS SPECIALIST

Duty Station: EAAFRO Headquarters, Muguga, Kenya

Residence: Nairobi, Kenya

Education: Beyond high school and certificate of satisfactory completion of electronics maintenance and repair course from technical or vocational school.

Experience: Recent experience as indicated competence in the use, maintenance and repair of neutron soil moisture depth gauges and scalers.

Duties: Assist in the installation of electronic equipment in the experimental sites so that it operates reliably and is reasonably accessible for maintenance. Assist in taking readings when appropriate and repair instruments that are broken or inoperative. Assist in the training of laboratory assistants in the use of electronic equipment. Duties also include the on-the-job training of a counterpart technician in facilitating the orderly transfer of responsibility to the counterpart.

PART III

Sugar Cane Research Subproject

Life of Subproject: 4 years (January 1976 to March 1980)

Total Cost of Subproject: USAID $ 572,000
NAAFRO 698,040

$1,270,040

Personnel:

USAID Technicians:		$456,000
Sugar Cane Agronomist		
Soils Scientist		
NAAFRO Staff:		172,000
Research Officer Trainees		
Sugar Cane Agronomists	2	
Soils Scientists	2	
Research Officers	3	
Scientific Assistants	2	
Laboratory Assistants	3	
Drivers	3	
Stenographer	1	
Casual Labor		

Participant Training:

A sugar cane agronomist and a soils scientist to U.S. for 24 months each leading to a Masters Degree.

USAID:	40,100
NAAFRO:	14,100

Commodities:

USAID:	4-wheel drive vehicle, irrigation equipment, desk commuter, scientific equipment for soils laboratory, freezer unit.	64,100
NAAFRO:	Laboratory and office equipment, farm machinery, irrigation bore hole, pump and motor, farm and lab supplies.	97,000

Land and Structures:

NAAFRO:	Irrigated land at Kibaha plus other locations (about 500 acres), 3 senior staff houses, 2 intermediate staff houses, propagation house, cold storage block.	383,000

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Travel, Per Diem and Other Costs:

USAID	11,800
EAAFRO	31,940

(A). Background and Present Situation

EAAFRO started discussions on the need for a sugar cane variety development program as early as 1963. The major goal of the proposed project was to improve sugar production by breeding clones suited to East African environments that were resistant to the more important diseases, particularly smut and mosaic. It was not until 1966 that breeding work was initiated and the first crosses were made at Mtwapa, Kenya, by Mr. B. de L. Innis in 1967. Prior to this time, about 150 varieties were imported from various countries. Among these were CO421, NCO310, and NCO376 which continued to be the major varieties in the area. During and after this time, sites were selected for national research centers at Kibos, Kenya, Efakara, Tanzania, and Kituza, Uganda. A Disease Testing Unit, as part of the EAAFRO Sugar Cane Breeding Division, was established at Kawanda, Uganda, in 1969. The EAAFRO Sugar Cane Breeding Division was established temporarily at Mtwapa, Kenya, in 1966 but was moved to permanent headquarters in Kibaha, Tanzania, in 1972. New facilities including office/laboratory buildings, housing for staff, implement shed, and crossing shelter were completed in 1971. A photoperiod house for inducing and synchronizing flowering and space for juice extraction equipment (Jeffico Cutter-Grinder) are currently under construction at the same site.

The present status of the variety development program conducted by EAAFRO in cooperation with national research centers is shown in the following table. Study team observations and available data indicate one or two improved varieties will probably be available within 3 or 4 years. The EA.69 series is ready for final testing in the balanced lattice trial at some estates and national research centers. Research on other aspects of sugar cane production has not been initiated by EAAFRO or the national research centers. Some sugar estates are doing elementary research on salinity, entomological problems, cultural practices, and weed control.

Problems facing sugar cane research are: (a) an inadequate number of trained personnel to carry out a broad based program on variety development, particularly an agronomist to provide leadership in advanced selection and variety testing in cooperation with national research centers and estates; (b) no trained personnel to conduct research on salinity, compaction, percolation and fertilizer requirements; (c) the national research center at Efakara, Tanzania, has not yet assigned a research officer to sugar cane. Consequently, two TA series of seedlings were lost which has created a gap in the program; and (d) inadequate irrigation facilities at the Kibaha station has limited expansion of the program; (e) the sugar cane pathologist located at Kawanda, Uganda, has been able to travel to Kenya and Tanzania only occasionally.

Number of Seedlings, [illegible] and
Advanced Selection at [illegible]
From 19[illegible]

Place	Series	Seedlings	Number in First Year Selections	Number in Second Yr. Selections	Randomized Block Trial	Latin Squnre	Balanced Lattice
Kibaha	-	-	-	-	-	-	-
Kibos*	EA 69	15,483	1,616	53	16	16	NYS **
Kituza	EA 69	10,993	1,580	37	4	4	NYS **
Efakara	EA 69	994	135	9	9	4	NYS **
Kibaha	EA 70	-	-	-	-	-	-
Kibos	EA 70	40,664	4,632	210	44	5	NYS **
Kituza	EA 70	30,046	2,645	101	30	IF ***	-
Efakara	EA 70	-	-	-	-	-	-
Kibaha	EA 71	-	-	-	-	-	-
Kibos	EA 71	73,965	7,000	555	48	16	NYS **
Kituza	EA 71	3,663	633	IF***	-	-	- **
Efakara	EA 71	3,000	196	32	6	IF***	-
Kibaha	EA 72	-	-	-	-	-	-
Kibos	EA 72	-	-	-	-	-	-
Kituza	EA 72	17,040	1,912	IF***	-	-	-
Efakara	EA 72	-	-	-	-	-	-
Kibaha	EA 73	20,000	NYS**	-	-	-	-
Kibos	EA 73	14,593	1,147	316	21	NYS**	-
Kituza	EA 73	3,752	NYS**	-	-	-	-
Efakara	EA 73	-	-	-	-	-	-
Kibaha	EA 74	1,500	NYS**	-	-	-	-
Kibos	EA 74	26,663	736	NYS*	-	-	-
Kituza	EA 74	20,000	NYS**	-	-	-	-
Efakara	EA 74	1,500	NYS**	-	-	-	-

NOTE: * Some of the seedlings and selections [illegible] from at Ilonga.

** NYS means not yet selected.

*** IF means in the field and may be selected if condition of plants will permit.

Kibaha, Efakara - Tanzania
Kibos - Kenya
Kituza - Uganda

(B) Subproject Description

1. Objectives:

a. Provide high yielding, disease resistant, drought tolerant, sugar cane varieties.

b. Improve Kibaha station by supplying supplemental irrigation to insure adequate plant growth and flowering so that its major function of providing true seed from crosses can be accomplished even in years with low rainfall.

c. Distribute the best eight or 10 advanced selections from each originating national research center to the other national research centers and sugar estates (12 in total) to increase the probability of obtaining improved varieties for the different microclimates.

d. Provide information to sugar estates on salinity, compaction, and percolation problems.

e. Provide sugar estates with better cultural practices and management schemes.

f. Provide a soil testing service for sugar estates and outgrowers.

g. Train research officer candidates to replace the USAID agronomist and soils scientist.

2. Relationship to Other Subprojects:

The direct links between this subproject and the other subprojects will be relatively small. Research information developed on salinity, compaction and percolation problems will be useful to the marginal rainfall subproject as it involves irrigation. Soils data from the Soils Testing Laboratory may also be of use to one or more of the other subprojects.

It is also the case that several sugar cane diseases are diseases of maize--most importantly, maize and streak virus. Thus, techniques of isolating these diseases, identifying them or incorporating resistance developed in this subproject or in the maize disease resistance subproject will have cross-project benefits.

(C) Technical Feasibility of the Subproject

1. The Kibaha station is operational to a substantial degree. With adequate irrigation, the climatic conditions are favorable for flowering of sugar cane and, therefore, the primary function of crossing can be successfully accomplished. Laboratory space is available for soil and water research.

2. National research centers have been established where seedlings and subsequent selections can be grown.

3. A number of sugar estates are anxious to cooperate with EAAFRO and national research centers personnel in conducting research trials. Many estates have agronomists to assist with the research work.

4. There is a nucleus of trained EAAFRO and national center professional and support staff who can carry out a successful program if assistance is provided.

5. Methods for inducing and synchronizing flowering of cane have been developed and are in use.

6. Standard sugar cane research techniques proven in other parts of the world will be used.

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JOB DESCRIPTION OF USAID SUGAR CANE AGRONOMIST

Duty Post: Kibaha, Tanzania (30 minutes drive from Dar es Salaam)

Residence: Kibaha, Tanzania

Training: Ph.D. in crop breeding/agronomy with at least some training in pathology. A good understanding of emperimental design related to variety testing and cultural practices is essential.

Experience: At least 5 years experience in crop breeding and/or agronomic research related to variety testing and/or agronomic research (cultural practices). Some experience with sugar cane would be highly desirable. In lieu of sugar cane experience, the candidate should visit the USDA Sugar Cane Research Stations at Coral Point, Florida, and Houma, Louisiana, and the Experiment Station of the Hawaiian Sugar Planters Association for a two-week orientation period at each location.

Duties: Provide leadership in the advanced selection stages and replicated variety testing beginning at year 5. The agronomist will be responsible for distributing the 8-10 best selections from the originating national research centers to other national research centers and all estates (12 in total) in the Partner States. He will work with estate agronomists in carrying out the testing program from the 15-foot row through the balanced lattice trial. Analysis and interpretation of data will be his responsibility. The agronomist must be able to recognize common sugar cane diseases and to test for reaction to smut (Ustilago scitomenia) if necessary. In addition, the agronomist will conduct research on cultural practices and management schemes as time permits. This work should be conducted in cooperation with the soils scientist (chemist).

JOB DESCRIPTION OF USAID SUGAR CANE SOILS SCIENTIST (CHEMIST)

Duty Post: Kibaha, Tanzania

Residence: Kibaha, Tanzania

Training: Ph.D. in soil chemistry/physics with adequate training to establish a soil testing laboratory aimed at recommending fertilizer requirements for sugar cane.

Experience: At least 5 years experience in research dealing with soil chemistry, soil physics, or soils testing. Experience in salinity problems would be desirable.

Duties: Establish and supervise soils testing laboratory aimed at making fertilizer recommendations for sugar cane. Establish and supervise sugar cane juice analysis laboratory for determining fibre percentage, brix and pol of sugar cane samples from the variety development program. Conduct research on salinity, percolation, and compaction of problem soils. Advise sugar cane growers on water quality for irrigation and management schemes for problem soils. Cooperate with the agronomist on fertility and cultural practices research.

PART III

Plant Quarantine Station Subproject

Life of Subproject: Originally designed for 6 years (1970-1976). This subproject revision extends the original subproject for an additional 2 years to allow hand over of the Directorship to a qualified East African by June 1978. An EAAFRO employee with potential to assume the role of Director has been identified and is now in training in the U.S.

Total cost of Subproject Extension: USAID $217,050
EAAFRO 408,305
$625,355

Personnel:

USAID Technician: Plant Pathologist (Quarantine)		$150,000
EAAFRO Staff:		86,800
Research Officers	3	
Scientific Assistants	3	
Laboratory Assistants	8	
Clerk-typist	1	
Auxiliary staff	14	

Participant Training:

Continuation of a plant pathologist/virologist in the U.S. for 35 months leading to a Doctors Degree and a plant pathologist to U.S. for 24 months leading to a Masters Degree.

USAID	53,350
EAAFRO	17,625

Commodities:

USAID:	Fumigation apparatus, incubator equipment, mist propagation equipment, refrigerator.	6,300
EAAFRO:	Laboratory, greenhouse and propagation equipment, greenhouse and laboratory supplies, chemicals, glassware, scales.	78,900

Land and Structures:

EAAFRO:	Land (8 acres), 40 greenhouses, 2 propagation houses, laboratory/office block, 3 senior staff houses, 3 intermediate staff houses, 10 junior staff houses.	220,160

Travel, Per diem and Other Costs:

USAID	7.400
EAAFRO	5,720

(A) Background and Present Situation

The East African Plant Quarantine Station (EAPQS), as part of EAAFRO, provides post-entry plant quarantine services for the three Partner States. The EAPQS, at its site at Muguga, Kenya, is the only plant quarantine facility in East Africa.

Importations of plant materials into East Africa are governed by the regulations stipulated in the eighth non-legal draft of the Plant Protection (Importation) Order which was last revised in July 1974. The East African Standing Technical Committee on Plant Imports and Exports (EASTCPIE) determines the plant quarantine policy and regulations of the East African Community. This Committee is made up of two representatives (usually the senior entomologist and senior plant pathologist) from each of the Partner States in addition to the Head and Senior Horticulturist of the EAPQS who act as Chairman and Secretary of the EASTCPIE, respectively. The plant quarantine regulations, as indicated in the Plant Protection (Importation) Order, can only be changed by unanimous consent of all the Committee members.

Depending on the risks involved to the agriculture in East Africa, the importation of plant material falls into the three broad categories:

i. Imports which are prohibited because of the extreme risks involved, e.g., alternate hosts of certain rust fungi,

ii. Imports which must pass through quarantine because there is a risk of introducing a serious pest or pathogen. However, passage of the plant material through quarantine provides sufficient safeguard to allow detection of the pest or pathogen, if present, in or on the host plant, e.g., seeds of soybean, cuttings of sugar cane,

iii. Imports which can enter East Africa under permit because the genera are imported from designated countries or areas where there is little or no risk of introducing new or serious diseases or pests provided the exporter has met the requirements specified in a permit which is issued by the Ministries of Agriculture in the three Partner States, e.g., potato seed tubers from the U.K. and The Netherlands. Plant importation permits for all plant material that enters East Africa through the EAPQS are issued by the Head, EAPQS.

The present situation at the EAPQS is as follows:

1. Large numbers of importations of plant material are processed through the quarantine station each year (400 in 1972). Many are allowed to come in under permit and are not detained at the station. While the time required to process material which is subject to actual quarantine varies considerably depending on growth rate and the tests required, it is understood that the rate of release has improved considerably in recent months.

2. Material which has come through quarantine (e.g., sugar cane) has proved to be remarkably clean.

3. Since 1970, the attitude of the station has changed to one of assisting importation of material rather than one of stopping entrance.

4. There have been no official complaints from Partner States during the period following 1970.

5. Efforts are being made to improve communications between the EAPQS and potential recipient research institutions in the Partner States. The head of EAPQS has visited a number of research institutions with this in mind and has been able to bring about better understanding of the quarantine function. A bulletin in both English and Swahili which discusses the need for plant control, the dangers of introduced plant pests and the operation of EAPQS is now being printed.

However, the EAPQS still operates under the following constraints:

a) The high elevation and the lower than optimum temperatures that can be maintained in glass houses at the station are not conducive to normal growth of certain of the more tropical plants such as sugar cane. Under these unfavorable conditions some disease symptoms may not be expressed (an example is the sugar cane mosaic virus).

b) Facilities for increase of plant material released for distribution after quarantine are rather limited, therefore, the quantity available is not enough to satisfy demands. It may not be a function of a plant quarantine station to provide large quantities of materials to recipients, nevertheless, there is demand for an organization to increase materials for distribution. An additional propagation greenhouse is under construction at the quarantine station but it is unlikely that even this facility will satisfy the demand.

(B) Subproject Description

1. Objectives

a. To maintain the present standards of the Plant Quarantine Service until a qualified African Director can assume full responsibility for position in June 1978.

b. To import and provide to recipients, disease- and pest-free plant materials that fall in the category of plants requiring quarantine for entry into East Africa.

c. To provide enough material to recipients so they can effectively increase the material for its intended use.

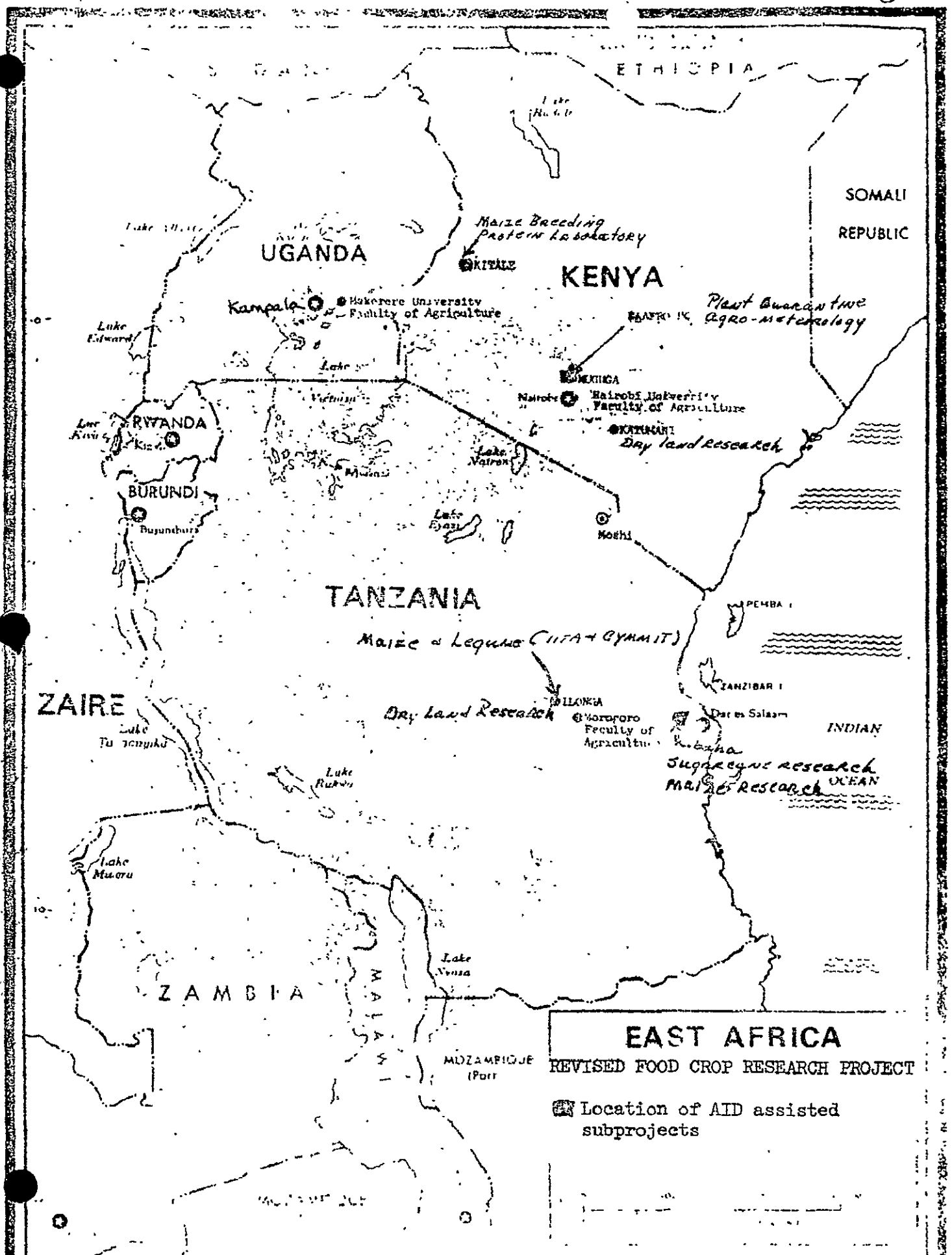
d. To provide plant quarantine information to people who may wish to import plant materials.

7. Relationship to Other Subprojects

As indicated, all exotic plant materials introduced into East Africa must pass through or be approved by the EAPQS. Such introductions play a vital role in the research and breeding programs of the subprojects for disease resistance, breeding methodology, marginal rainfall and sugar cane. The ability and efficiency of the EAPQS in clearing materials thus has an important direct effect on these programs. In the future as contacts with international research organizations are expanded with additional flows of germ plasm, the role of the EAPQS as a channel for the provision of these materials to breeders will become even more significant.

(C) Technical Feasibility of the Subproject

The fact that the EAPQS is currently operating in an increasingly efficient manner demonstrates the technical feasibility of the subproject.


ETHIOPIA
SOMALI REPUBLIC
UGANDA
KENYA
Maize Breeding Protein Laboratory
KITALE
Kampala
Makerere University Faculty of Agriculture
Plant Quarantine Agro-meteorology
NAKURU
Nairobi
Nairobi University Faculty of Agriculture
KATUMANI
Dry land research
Lake Edward
Lake Victoria
Lake Kivu
RWANDA
Kigali
BURUNDI
Bujumbura
Lake Natron
Lake Eyasi
Moshi
TANZANIA
Maize & Legume (CIMMYT)
PEMBA I
ZANZIBAR I
LUSAKA
Dry Land Research
Morogoro Faculty of Agriculture
Dar es Salaam
Kibaha
Sugarcane research
Maize research
INDIAN OCEAN
ZAIRE
Lake Tanganyika
Lake Rukwa
Lake Mweru
Lake Nyasa
ZAMBIA
MALAWI
MOZAMBIQUE (Port
EAST AFRICA
REVISED FOOD CROP RESEARCH PROJECT
Location of AID assisted subprojects

Project: East African Food Crop Research
618-11-110-657

PROJECT DESIGN SUMMARY

PART III
Annex C

Logical Framework Model

Narrative Summary	Objectively Verifiable Indicators: Measures of Goal Achievement: (A-2)	Means of Verification (A-3)	Important Assumptions
Program or Sector Goal: (A-1) Increase the production and quality of selected food crops in East Africa.	1. Self-sufficiency in selected food crops in East Africa. 2. Increased use of high yielding, high protein food crop varieties.	1. Agricultural statistics from East African Community and Partner States. 2. Economic data from international organizations.	Assumptions for achieving goal targets: (A-4) 1. Agriculture services functioning in adequate manner to support expansion of agricultural production. 2. System of incentives established in Partner States to encourage producers to expand production using the best available technology. 3. Continuing high priority for food crop production in each of the three Partner States.
Project Purpose: (B-1) To support selected EAAFRO research efforts in food crops and cropping systems that are critical to an increase in food production and quality throughout East Africa.	Conditions that will indicate purpose has been achieved: (B-2) 1. Research goals as established in the subprojects for maize, [illegible] cane and marginal land cropping, fulfilled and the information made available to the planners and research organizations of the Partner States. 2. Protein quality laboratory operating in support of breeding programs in maize and other crops in East Africa and the surrounding countries. 3. Plant Quarantine Station under direction of an East African and fully staffed by local personnel. 4. EAAFRO local staff: upgraded through participant and local scholarship programs; able to continue and expand research carried out under this project.	(B-3) 1. Distribution of research results in form of improved varieties, cropping systems recommendations, reports and evaluations. 2. Existence of functioning protein quality laboratory. 3. EAAFRO staffing patterns for the Plant Quarantine Station and Research Institutions. 4. Site inspections.	Assumptions for achieving purpose: (B-4) 1. US personnel and commodities available in timely manner. 2. Continued adequate financial and institutional support for the selected research efforts either on a regional or national basis. 3. Qualified East African personnel available for local scholarship program and advanced training in the US.

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Project Outputs: (C-1)	Magnitude of Outputs: (C-2)	(C-3)	Assumptions for achieving outputs: (C-4)
1. Research results leading to improved breeding methods, and disease resistance for maize.	1a. Disease Resistance-Kibicha operational April 1976; identification and purification of endosperm with streak virus and sugar cane mosaic resistance by June 1977; disease resistant maize populations available to national maize breeders by December 1978.	1. EAAFRO research reports and records. National research organizations aware of and using results of AID-supported research.	1. Outputs established for programs are realistic.
2. High yielding sugar cane varieties and related research results.	1b. Breeding Methodology-complete evaluation of methodology in 14 out of 17 experiments by July 1978; make preliminary design and tests incorporating opaque-2 into East Africa's maize breeding program.	2. EAAFRO staffing patterns.	2. Communications between regional and national research programs continue to be effective.
3. Research recommendation for food crop production in areas of marginal rainfall.	2. Sugar Cane-distribute to national and estate research workers at least two improved varieties for final field testing and large scale planting by 1978; distribute information on solutions to salinity, compaction and water-colation problems stemming from soils research by 1979.	3. Project evaluations.	3. Improvement in EAAFRO's ability to recruit and hold qualified personnel.
4. Functioning protein quality lab.	3. Upland Maize-complete [illegible] research and present recommendations to national researchers and planners on maize by December 1976; sorghum by December 1977; millet and/or food legumes by December 1978; cropping systems by 1979.	4. On site inspections.	
5. Plant Quarantine Station fully staffed by East African personnel.	4. Protein Lab-Quantitative March 1976; samples processed 1st year 6,000; 2nd 8,000; 3rd 10,000.		
6. Increased capability of EAAFRO staff to continue and expand research started by USAID-funded scientists.	5. Plant Quarantine-Develop the station to handle all functions of plant quarantine by indigenous staff by 1978.		

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		6. Scholarship Program-Train 30 students to BS level in East African universities bonded to EAAfro for staff expansion. Eighteen participants returnad from advanced training in US and third countries. All training completed by 1980		
Project Inputs: (D-1) By Category USAID Contributions: Technical Personnel 45 man years Participant Training 423 Man months Scholarship Program Commodities Travel, Other Costs		2,078,000 362,550 100,000 195,800 79,450 2,815,800	Implementation Targets:(D-2) See Part II, Section,3, Project Implementation	(D-3) 1. AID project agreements and PIOs. 2. Project implementation plans. 3. Project evaluations. 4. EAAFRO and Partner State records and reports.	Assumptions for providing inputs: (D-4) 1. Adequate EAAFRO and Partner Sta budget and manpower resources. 2. Timely AID support in personnel and commodities. 3. Availability of participants for training program.
EAAFRO Contributions: Personnel Participant Training Scholarship Program Commodities Land & Structures Travel, Other Costs		613,930 127,175 50,000 289,900 959,960 127,200 2,168,165			
Inputs by Subproject:	USAID	EAAFRO			
1-Protein Lab	232,800	175,500			
2-Disease Resis-tance	470,400	133,140			
3-Breeding Methodology	178,450	321,070			
4-Marginal Rainfall	1,043,050	383,030			
5-Sugar Cane	572,000	698,040			
6-Plant Qrntne	217,050	408,305			
7-Scholarships	100,000	50,000			
	2,815,800	2,168,165			

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B

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Annex D

PART III

Description of the East African Agriculture and Forestry Research Organization (EAAFRO)

The East African Agriculture and Forestry Research Organization (EAAFRO) is a regional research organization serving the three East African countries, Kenya, Uganda and Tanzania. It is administered by and forms a department of the East African Community (EAC).

EAAFRO was first established at Nairobi in 1948 and absorbed the former East African Agricultural Research Institute established at Amani in Tanganyika in 1944 which in turn had replaced the earlier East African Agricultural Research Station set up at Amani in 1927. The present headquarters of EAAFRO, including the central laboratories, experimental farm and forest plantations, were established at Muguga, some 27 kilometres north-west of Nairobi, on an estate donated by the Government of Kenya. This 1178-hectare estate is shared with the East African Veterinary Research Organization (EAVRO). Close liaison is maintained between the two organizations and they are jointly responsible for the library which is the largest and most complete library for agriculture and ancillary sciences in East Africa.

Not all EAAFRO's Research Divisions are sited at Muguga. The Sorghum and Millet Division is at Serere Research Station, Uganda; the Maize Genetics Division is at the National Agricultural Research Station, Kitale, Kenya; the Sugar Cane Breeding Division is located at Kibaha, near Dar es Salaam, Tanzania. The Disease Research Unit of the Sugar Cane Breeding Division is established at Kawanda Research Station, near Kampala, Uganda. One other Division, the East African Herbarium, is on a site adjacent to the National Museum in Nairobi. EAAFRO leases a 1620-hectare ranch near Athi River for animal husbandry and range management research. Responsibility for animal husbandry research is shared with EAVRO.

General and Research Policies

EAAFRO forms part of the Communications and Research Secretariat of the East African Community and as such is responsible to the Research and Social Council for all matters of general policy. Its research program is governed by the East African Natural Resources Research Council which consists of a Chairman and Deputy Chairman, two representatives each from the Governments of Kenya and Uganda, three representatives of the Government of Tanzania, and five scientists. Two of the scientists are local residents and one of them represents the Universities of East Africa. Of the three overseas scientists, two are nominated by the Overseas Development Administration, U.K., while the other is nominated by EAAFRO through the Secretary General, EAC. Each of the East African Governments may appoint a further two or more assessors to attend the council meetings.

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Terms of Reference

EAAFRO is responsible for undertaking research in the fields of agriculture and forestry on problems that:

1. are common to at least two of the East African countries and can be investigated most efficiently and economically by a regional research organization;

2. require longer-term investigations or more intensive study than can be undertaken by national departments;

3. require highly specialized and expensive equipment or the services of such specialists as can only be justified on an East African basis.

EAAFRO is not concerned with purely local problems unless specifically invited to investigate them by a national department. Likewise, EAAFRO is not an advisory organization as such, though scientific advice and guidance are readily given by the research staff on request to national and other research workers.

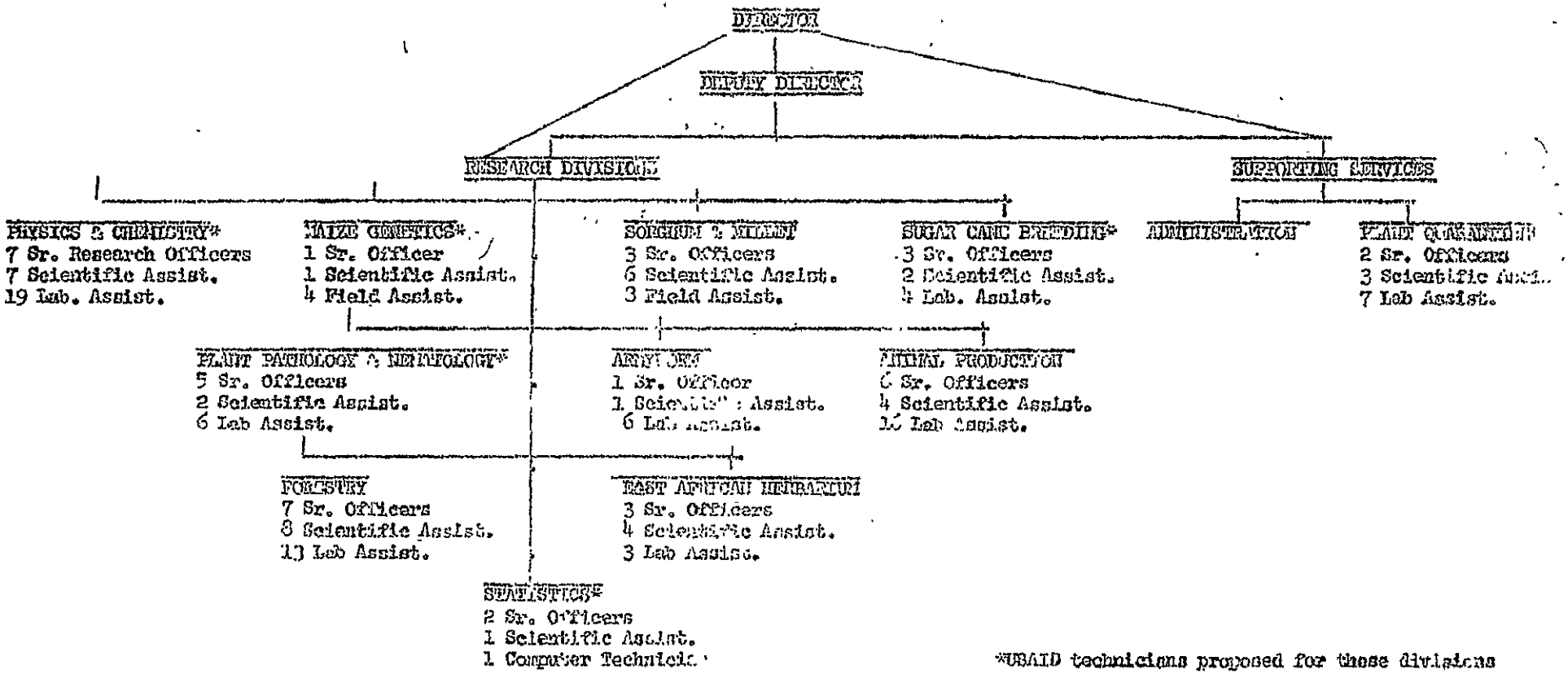
Research at EAAFRO is as much concerned with the solution of problems as it is with the acquisition of new knowledge. Much of the research consists of projects carried out with the cooperation of other research institutes. EAAFRO's program is designed to meet the needs of the national departments of agriculture and forestry and is determined by the requests and recommendations which emerge from the deliberations of a series of committees on which these departments and EAAFRO are represented.

Research requirements are first discussed by the Specialist Research Committees, which may be standing or ad hoc, and which are convened and chaired by EAAFRO specialists. These Specialist Committees are composed of research workers in the appropriate disciplines and cover the fields of agricultural botany, agricultural meteorology, agricultural machinery, pasture research, rangeland research, herbicides, entomology and insecticides, coffee, sugar cane, soil fertility, forestry, wildlife and statistics. EAAFRO is also associated with the Specialist Committee on Animal Physiology, Nutrition and Breeding which is convened by the Director, EAVRO.

The recommendations of these committees are submitted for approval to the appropriate Research Coordinating Committees of which there are four, namely, Agriculture, Animal Industry, Forestry and Wildlife. These are convened by EAC under the Chairmanship of the Deputy Chairman of the East African Natural Resources Research Council, and the Director, EAAFRO, is a member of each committee. Other members are the appropriate Directors or Commissioners of Agriculture and Veterinary Services, the Chief Conservators of Forests and representatives of the wildlife organizations of the three national governments.

The recommendations of the Coordinating Committees are duly considered by the Research Council, but the implementation of the program approved by the Council is dependent on financial provision being granted by the East African Legislative Assembly.

EAAFRO STAFFING PATTERN



*USAID technicians proposed for these divisions

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PART III

Environmental Impact

The direct impact of this project on the environment will be very small. The acreages involved in the research efforts are miniscule relative to the area of East Africa; and as far as can be determined, the research itself will be non-polluting and will not negatively affect either the human or physical environment.

Indirectly, as a generator of usable information and new varieties and as contributor to preventive efforts aimed at halting the introduction of possible devastating disease, this project has the potential to significantly affect human welfare, natural resources and environment.

In a general sense, it is expected that the project will have a positive environmental effect. An effective plant quarantive station will help prevent the introduction of plant diseases and pests which could create problems with one or more crops and result in unforeseeable environmental damage. Breeding maize varieties more resistant to disease will in-increase per acre yields. Developing appropriate cropping patterns for marginal rainfall areas will increase the productive capacity of these areas and help conserve natural resources. Introducing opague-2 characteristics into maize populations will positively affect protein intake levels of a great proportion of the population in the Partner States. Finally the breeding methodology study allows the more efficient development of higher yielding varieties which again could reduce the acreage of growth needed to provide adequate supplies of maize, the areas staple.

With the exception of the plant quarantine activity, each of the other subprojects also posseses the potential for some negative environmental effects. This follows because a higher level of agricultural production is implicit in each. In turn, this implies a more intensive agricultural effort which, without adequate attention, could have a less than positive influence on the environment.

Potential though as yet unidentified problems could develop with the cropping systems for marginal rainfall areas. At present, limited rainfall prevents heavy settlement of these fragile lands because they cannot support large numbers of people under current technology. As management systems are developed, however, new lands will be placed into production and additional people settled in these areas. Drought beyond the capabilities of improved management systems combined with larger populations could lead to more rapid deterioration of ground cover, leading to a greater erosion risk when rains return.

However, since there is a growing utilization of these areas due to expanding population pressures on the existing higher potential areas with virtually no effort being made to make this land more tolerant from a production and environmental point of view we feel that this component will have a beneficial impact. This utilization will continue with or without the research proposed in this project and if traditional agricultural practices are employed will cause predictably serious consequences. Also, the use of new areas does imply a reduction in the pressure or in the rate of pressure growth in existing areas, i.e., less intensive, no more intensive, or only slightly more intensive cultivation with position conservation benefits. On balance, it is our judgment that both the objectives of the project and environmental consideration can be addressed in a complementary fashion.

For the other subprojects it is believed the potential detrimental effects from information generated are much less consequential. Reducing the incidence of diseases, developing higher yielding varieties or introducting high lysine characteristics may release land from food production for other crops. Some of these crops might be more taxing on the soil or lead to greater erosion than maize cultivation. These factors would have to be weighed against the benefits and the application of appropriate remedial technology. Also the use of improved varieties usually requires better cultivation and management with a view to sustaining production levels. If total production is increased or if only the quality of the production is raised, there is an opportunity to raise the welfare of the population. Where malnutrition, a shortage of protein and lack of caloric intake are periodic and persistent problems, this is an important consideration. Again, on balance, it is our judgment that the benefit of increased production of the same or better quality foods with appropriate attention to environmental considerations can be mutually addressed to overall advantage.

Developing better sugar cane varieties would only appear to have a negative impact if the Partner States decide that sugar exports are more important than food production. In this case, the impact would be on human welfare rather than natural resources. However, since sugar cane production extracts a good deal from the soil, some care must be exercised to maintain fertility levels. Smallholders may exploit their soil for a short time with detrimental long-range effects. Nevertheless, the potential affected acreages are relatively small and any detrimental environmental effects can be overcome with the application of appropriate technology.

In recognition of the potential environmental implications discussed above, non-project environmental specialists will be made available under this project to identify any potential environmental hazards

that may materialize or be anticipated during project implementation and to develop appropriate remedial measures such as changes in project design. These consultants will visit every research site at least once every six months and will work closely with other project technicians to ensure that environmental considerations are integrated in all research activities.

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Annex B

PART III

Effect of the Project on the Role of Women in East Africa

In general the East African countries accord women the same technical and legal status as men. The basic philosophy of the Tanzanian government theoretically allows for no discrimination. In Kenya there have been repeated calls by the highest government officials for women to participate in and benefit from development activities. The official policy toward women of the Ugandan government is not known.

Nevertheless, in spite of the above and the few social taboos against women assuming a more equal role, a woman's position, outside the small modern section, is normally inferior. In the conservative, small farming sector this is particularly the case. However, traditional concepts are changing and women are taking a more active role in the economic life of the Partner States.

Within the above environment, the direct effect of the project on the role of women will probably be small. EAAFRO is an equal opportunity employer and has a number of women on its staff in both technical and secretarial/clerical positions. Reportedly, the organization is highly pleased with the performance of the professional women and is actively seeking additional qualified women to fill existing vacancies. However, the project will not result in a sizeable expansion of staff and consequently the number of women who will directly benefit from project activities will be limited. But, qualified women employed by EAAFRO will be afforded an equal opportunity to be participants in the training components of the assistance and it is expected that a number of women will be trained under the project. This training should improve their performance and increase their prospects of promotion to higher-level, more responsible positions.

The indirect project effect on women as agricultural producers could be sizeable but is nearly impossible to determine. Women are the traditional food producers in much of East Africa. Higher food crop yields and higher labor productivity could enhance their role as marketable surpluses are generated, time and/or money become available for new agricultural or non-agricultural activities and as they assume greater economic importance in the family. The scanty evidence seems to indicate that, as families enter the market economy, the welfare of women increases and their role vis-a-vis men becomes more important. In essence contact with the "larger" world via the market tends to subvert and alter the traditional society. But the actual rate of change will depend on the strength of existing traditions and how easily they can be altered. Undoubtedly, this will be a slow process on which any short-run project will have only a minimal effect.

To summarize, the project should directly affect, in a positive manner, a number of women working in EAAFRO. The project may also indirectly improve the relative position of women as agricultural producers as results generated are used to increase small farmer productivity and market participation.

Annex - H

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PART III

Scholarship Program

1. Background

In the past, the EAC has had considerable difficulty recruiting graduates from the three East African universities to fill vacant positions. Most students are sent to the universities under bond to their respective country and are employed by their government immediately after graduation. The few graduates available for EAC employment are those who, for one reason or another, are not employed by their government and are thus released from bond.

In recognition of this recruitment problem, the EAC, assisted by RDOEA, started its own scholarship program in 1971. Secondary school graduates were selected for EAC scholarships and sent to East African universities bonded to the EAC for 5 years after their graduation. In 1974, the first students under the EAC scholarship program graduated and were employed by several of the EAC organizations. This program appears to be very successful, not only in improving recruitment but also in upgrading the quality of personnel available. Last year's first graduating class of 16 people turned out one honors student, 5 first class, 6 upper second class, 2 lower second class, one pass, and one fail: an excellent result for the initial scholarship effort by the EAC.

EAAFRO has experienced severe recruitment problems in its efforts to fulfill its commitment to AID for participant training from the very beginning of this project. The U.S. participant training program is for graduate school level training only. Those few B.Sc. degree holders hired by EAAFRO, in most cases, did not qualify for advanced degree training. It was not until the scholarship program presented suitable candidates for graduate school training in 1974 that the participant training program was able to begin to meet its goals. Presently, EAAFRO has 14 of its 15 Research Officer Trainee positions filled with 11 of these now in training for advanced degrees overseas.

Following the PAP review in AID/W, RDOEA received word that the students currently enrolled under the EAC scholarship program would be the last to be funded by RDOEA and any future enrollment funded by RDOEA would be restricted to the food and nutrition sub-sector. In keeping with this instruction, RDOEA is including a scholarship program as an element of the E. A. Food Crop Research Project with the number of new scholarships awarded reduced from 30 to 10 annually over the next three years.

2. Project Implementation

Beginning with the 1975-76 academic year, EAAFRO will award 10 scholarships to selected candidates to attend one of the East African universities (Nairobi, Makerere, and Dar es Salaam) for a three-year period to obtain a B.Sc. degree in one of the agriculture disciplines for which EAAFRO has a need and holds vacant positions. In early 1976, the second group of 10 scholarship candidates will be selected for enrollment at the East African universities in FY77; and in early 1977, the final group will be selected. The three-year university training for all 30 scholarship holders will be completed by the end of the project (1980).

NORAD will monitor the scholarship program and fund approximately two-thirds of the total cost. Funding will be on a reimbursable basis. It is estimated the total cost for 30 candidates to complete their B.Sc. degree in agriculture will be $150,000. EAAFRO will contribute a shilling equivalent of $50,000 while NORAD will contribute $100,000 toward the scholarship program.

This scholarship program will have a major impact on the Africanization of EAAFRO. As a research organization, the key staff in EAAFRO must be university degree holders. The shortage of qualified personnel over the years has forced EAAFRO to employ expatriates for many of the key staff positions. The availability of an additional 30 university graduates will allow EAAFRO to fill, with very few exceptions, the key staff positions with East Africans by 1980.

Under the participant training section of this project paper, a total of 18 EAAFRO staff members will receive graduate school degrees and/or specialized training for food crop research. Nine staff members will depart for training in FY76 and complete their training by 1977 thus releasing 9 research officer trainee positions to be filled by the first graduates under the scholarship program. EAAFRO has research responsibilities in areas other than food crop research. The staffing and training of EAAFRO personnel under the Food Crop Research Project will divert a major portion of EAAFRO's available research officer trainee personnel in this field an curtail staffing other research sections with East Africans for a four-year period. This scholarship program will enable EAAFRO to continue its Africanization program in food crop research and also meet its personnel needs in other areas of agriculture research.

ANNEX II

Small Farmer Implications

The results of research described in this project has had and continues to have a significant impact on the small farmer. It is generally recognized that EAAFRO, the only major source of basic food crop research, impacts on the small farmer through the research and agricultural production personnel in member states who work closely with farmers of all economic levels and are increasingly assisting the small farmer.

The major areas of research to be emphasized under the revised project, maize production and cropping systems for marginal rainfall areas, clearly focus on the needs of the small farmer, i.e. those now attempting to produce food crops on marginal lands and the traditional maize growers who represent a substantial segment of East Africa's rural poor.

East Africa's small farmers, for the most part, are maize growers. Through the maize breeding program of the past 10 years, these farmers have already received the benefits of increased yields directly as a result of AID efforts in these areas. For example, in Kenya during the 1974 growing season, 331,572 hectares were planted with hybrid maize. Of this acreage 292,358 hectares or 86 percent was cultivated by small farmers. The AID maize geneticist in Kitale, Kenya, developed the parent material for the hybrid seed. This increased 1974 production by 217,000 metric tons valued at $26,800,000. A similar situation exists in the southern highlands and Kilimanjaro region of Tanzania and in some areas of Ethiopia where the use of hybrid seed developed by this project is having a major impact on food production.

The revised project is designed to improve the parent materials used for both hybrids and composite maize varieties by incorporating disease resistance and higher protein qualities into the high yielding parent material. Small farmers, particularly the rural poor, do not normally protect their maize crop from disease with pesticides. The only effective way to help the small farmer protect his maize from plant disease is to breed resistance into the seed he is using. The value of higher protein content in the staple food of East Africa is of great nutritional importance to the rural poor.

The population explosion in East Africa is forcing more and more people to farm land that was formerly considered unsuitable for food crop production. This trend will continue and expand as the population forces more people onto marginal land. Research proposed under this revised project is designed to develop a cropping system for marginal lands which will enable the rural poor to produce food crops on an adequate and continuing basis. The small farmer at present is producing below the subsistence level. The ultimate goal of this research will be to make possible production of food crops at a level above subsistence and to provide a productive life for these small farmers. It is estimated that one million small farms in East Africa will receive benefits from this research by 1980.

When compared with the above subprojects, sugar cane research is expected to have somewhat less of an impact on the small farmer due to the production advantages of estate farms. It is estimated that 26% of the sugar cane is harvested by small farmers and sold to the refineries under contract. As grown in East Africa, sugar cane is a labor intensive crop. Large rural labor forces are under permanent employment to plant, cultivate, and harvest sugar cane. An estimated 120,000 small farmers raise sugar cane in East Africa while total rural employment in the sugar industry for 1976 is expected to reach one million.

The plant quarantine subproject is designed to protect East African agriculture from the introduction of pests and diseases from outside East Africa. The small farmer is the poorest equipped and least able to combat disease and insect infestations. Protecting him from these pests is an important aspect of this project.

UNITED STATES GOVERNMENT

Memorandum

O: Annex I 96 -

TO : PPC/DPRE, Mr. Arthur Handly

DATE: 4 August 1975

FROM : AFR/ESA, Jerry Knoll

SUBJECT: East African Food Crops Research, Subproject C, Sugar Cane Research

As you will recall earlier in the year, PPC/DPRE decided to defer approval of the $572,000 sugar cane research component of the $2.8 million Food Crops Research Project PP revision proposed for the East African Community until such time that a linkage more acceptable to PPC/DPRE could be demonstrated between the benefits of sugar production and the poorest majority.

Since initial DPRE objections were interposed, AFR/ESA has done additional research in this regard both through contacts with RDOEA and the IBRD. The following is a summary of these follow-up activities.

I. RDOEA's Comments

A. The Mission estimates that a total of 200,000 people including 126,000 small holders are directly dependent on sugar cane production for their livelihood. From this point of view alone, sugar cane production is demonstrably assisting the poor in taking a more active part in the economic life of the EAC and to lead more productive and dignified lives.

B. East African sugar production is based upon a number of core or central estates either privately or publicly owned surrounded by small outgrowers or farmers. In Kenya there are three publicly and two privately owned estates, while in Tanzania two are owned by the public sector, one by the private sector, and the fourth is jointly owned with 70% ownership resting with the public sector.

C. During 1974 Kenya produced a total of 163,000 tons of sugar, 76,000 of which were produced by small holders. The remaining production was about equally divided between private and public estates. The GOK estimates that public estate-small holder production will rise from 115,000 tons in 1974 to 160,000 tons

in 1978. It is anticipated that approximately 70% of this total will be produced by small to medium scale farmers in association with public estates.

D. Tanzania plans to increase sugar production from 97,000 tons in 1974 to 425,000 in 1980. Tanzania will assume complete control over the remaining privately owned estates and will initiate some form of public sector production system during this period.

The sugar cane research activities proposed for funding under the revised FY 76 East African Food Crops Research project will be conducted for the principal benefit of the above activities and will be closely supportive of the IBRD's involvement in the Kilombero Sugar Company project in Tanzania. This pilot project, which is further discussed below, is attempting to integrate small farmers (outgrowers) into the cane production cycle on a firm and business-like footing and is viewed by the IBRD as a potential prototype for the effective assimilation of the small cane producer into the complex sugar production industry.

II. Kilombero Project

A. IBRD loan funds are supporting the development of a new sugar estate and outgrower land adjacent to the new estate in Kilombero, Tanzania. This project is projected to produce an average annual increase of 45,000 tons of sugar and 16,000 tons of molasses with a market value of about $17.0 million based on 1975 prices. The annual net savings in foreign exchange available for other equity oriented projects is estimated at U.S. $14.0 million.

B. The first phase of the project includes the development of 7,300 acres of sugar estate and 4,600 for independent growers. The second part of the project involves the construction of refinery and ancillary facilities capable of handling 2,400 metric tons of sugar per day. Outgrowers will also receive technical assistance from the GOT's Agricultural Service Division in such areas as plant selection, land clearing and preparation, seed stock development, and transportation of cane from fields to processing plant.

C. It is anticipated that real outgrower family income would rise from $275 during the first year to around $725 by the sixth or final year. Direct paid salary benefits would also be accrued by 200 supervisory and technical specialists trained from locally available manpower. The IBRD believes that there will be little or no labor dislocation involved among the estimated 4,000 outgrowers involved in this project.

III. EAC Sugar Cane Research Coordination

A. Sugar cane research in East Africa is coordinated by the East African Agriculture and Forestry Research Organization (EAAFRO)

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which is the principal recipient of sugar cane assistance under the Food Crops Research Project.

B. EAAFRO has been involved in the development of sugar cane research for the three partner states (Kenya, Tanzania, and Uganda) since 1963. There is no other long-term research conducted in East Africa. Some sugar estates are doing elementary agronomic, entomological, and soils research.

C. EAAFRO established permanent headquarters with new facilities in Kiugha, Tanzania in 1972. This is the headquarters for sugar cane research that the proposed AID project would further develop by adding 1) Research Agronomist, 4-5 years; Research Soil Scientist, 4 years, 2) Commodities, $64,000; 3) Training for two Africans, and 4) Consultation Services.

D. In both Kenya and Tanzania a concerned effort is being made to utilize existing processing facilities to capacity and to establish new sugar cane production areas with accompanying sugar refineries. (Five in Kenya and three in Tanzania.) These expansion programs are to focus around a nucleus of public estates with small growers providing a major portion of inputs.

IV. Estimated Cost/Benefit Impact

A cost benefit ratio conservatively estimated at 1:100 is projected for this activity. Based on similar research efforts in other major sugar producing areas of the world, increases in yield of up to 20% per hectare are not uncommon. It is anticipated that this project will have a similar impact on production in the East African Community. Utilizing FY 1974 production figures for Kenya and Tanzania as a base, it is estimated that if only a 10% increase in production is generated by the research in question, the total cost of the sugar cane production research component will be substantially exceeded by the value of increased production during but a single season. Based on today's prices a total annual increase of 15% in production would have a value of $20,000,000 million. Assuming that an annual increase of one-half this magnitude is achieved from improved cultivation over the next 20 years, the total value of increased production would amount to $170,000,000 during this period.

V. Summary

In reviewing the foregoing, it should be remembered that research activities per se do not impact directly on the small farmer or the poorest majority since the sole outputs of such activities are processes and approaches, which, if applied, result in quantitative and qualitative improvements/increases in sugar cane production.

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As these processes are disseminated to end-users both the small and large scale producers receive appropriate benefits. Under the leadership of EAAFRO, improvements are constantly being made in the dissemination of research information to sugar growers of all economic levels. To further explore how the small sugar cane cultivators can be more effectively utilized in the production of sugar cane, AFR/ESA plans to request that the Mission revise the sugar cane research component of the Food Crops Research Project to provide for appropriate research into this critical area.

We hope that this additional information is responsive to your concerns. If there are any further questions, we would be glad to meet with you.

cc: AFR/DP, R. Huesmann

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Department of State

TELEGRAM

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ORIGIN AID-46

INFO OCT-01 AF-06 EB-07 /060 R

DRAFTED BY AFR/ESA:HMARWITZ:BWC
APPROVED BY A/AID:DPARKER
AFR/ESA:HKUGLER/JKNOLL
GC/AFR:EDRAGON
AFR/DS:PLYMAN
AFR/DP:RHUESMANN
TA/AGR:JMALCOLM
AA/AFR:SADAMS/DBROWN (DRAFT)
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TAGS:

SUBJECT: EAST AFRICAN FOOD CROPS RESEARCH 618-110-10-657

DAR FOR RDOEA AND USAID, NAIROBI FOR REDSO AND USAID

1. WISH TO COMMEND RDOEA FOR PREPARATION COMPREHENSIVE AND WELL-REASONED PROJECT PAPER REVISION FOR SUBJECT PROJECT AND HEREBY AUTHORIZE PREPARATION AND NEGOTIATION OF APPROPRIATE PROJECT AGREEMENT AND IMPLEMENTATION DOCUMENTATION SUBJECT TO APPROPRIATE RDOEA ATTENTION TO FOLLOWING CONCERNS RAISED