UNCLASSIFIED
CLASSIFICATION

PROJECT EVALUATION SUMMARY (PES) — PART I

Report Symbol U-4

1. PROJECT TITLE	2. PROJECT NUMBER	3. MISSION/AID/W OFFICE
AGRICULTURE RESEARCH	621-0107	USAID/TANZANIA

4. EVALUATION NUMBER (Enter the number maintained by the reporting unit e.g., Country or AID/W Administrative Code, Fiscal Year, Serial No. beginning with No. 1 each FY) 82-2

☒ REGULAR EVALUATION ☐ SPECIAL EVALUATION

5. KEY PROJECT IMPLEMENTATION DATES			6. ESTIMATED PROJECT FUNDING	7. PERIOD COVERED BY EVALUATION
A. First PRO-AG or Equivalent FY 71	B. Final Obligation Expected FY 81	C. Final Input Delivery FY 82	A. Total $ ____ B. U.S. $8,496,000	From (month/yr.) 6/78 To (month/yr.) 4/81 Date of Evaluation Review

8. ACTION DECISIONS APPROVED BY MISSION OR AID/W OFFICE DIRECTOR

A. List decisions and/or unresolved issues; cite those items needing further study. (NOTE: Mission decisions which anticipate AID/W or regional office action should specify type of document, e.g., airgram, SPAR, PIO, which will present detailed request.)	B. NAME OF OFFICER RESPONSIBLE FOR ACTION	C. DATE ACTION TO BE COMPLETED
A. Ilonga station development plans which include physical facilities, research plot development and a furrow irrigation system should be expedited so that year round on-station research programs be systematically carried out.	MinAg/TARO/ IITA	Sept 1983
B. Increased donor and Ministry of Agriculture assistance in staff training, especially for advanced degrees, should be provided. Such training should be extended to include adaptive/extension personnel to promote the dissemination of research information to farmers.	TARO/MinAg	Sept 1982
C. A strengthened organizational management structure should be created at Ilonga ARI to promote coordination, cooperation, speedy commodity procurement and staff recruitment. Short-term in-house training in skilled trades required.	TARO/MinAg/ IITA	Sept 1982
D. The USAID and Ministry of Agriculture should assume a greater support/monitoring role in the implementation of the program. This will minimize operational difficulties and promote mutual trust.	USAID/MinAg	Sept 1982
E. Research results must be compiled in publishable form as a matter of top priority.	IITA/MinAg	Sept 1982
F. Greater attention must be given to maintaining the genetic stock.	IITA/Ilonga ARI Station Director	Sept 198[illegible]
G. If funds are available, the participant training program should be continued throughout the remainder of this project.	USAID/IITA/ TARO	August 19[illegible]

9. INVENTORY OF DOCUMENTS TO BE REVISED PER ABOVE DECISIONS

- ☐ Project Paper
- ☐ Financial Plan
- ☐ Logical Framework
- ☒ Project Agreement PACD EXTENDED
- ☐ Implementation Plan e.g., CPI Network
- ☐ PIO/T
- ☐ PIO/C
- ☐ PIO/P
- ☐ Other (Specify) _____
- ☐ Other (Specify) _____

10. ALTERNATIVE DECISIONS ON FUTURE OF PROJECT

- A. ☐ Continue Project Without Change
- B. ☐ Change Project Design and/or ☐ Change Implementation Plan
- C. ☐ Discontinue Project

11. PROJECT OFFICER AND HOST COUNTRY OR OTHER RANKING PARTICIPANTS AS APPROPRIATE (Names and Titles)

John Anania, USAID Project Officer
Cal Martin, REDSO/EA
David Redgrave, Colorado State University
D. R. Wood, Colorado State University
Joseph B. Goodwin, USAID Agr. Development Officer

12. Mission/AID/W Office Director Approval

Signature

Typed Name: Arthur M. Handly

Date: 11-12-81

AID 1330-15 (3-78)

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PROJECT EVALUATION SUMMARY (PES) — PART II

The following topics are to be covered in a brief narrative statement (averaging about 200 words or half a page per item) and attached to the printed PES facesheet. Each topic should have an underlined heading. If a topic is not pertinent to a particular evaluation, list the topic and state: "Not pertinent at this time". The Summary (Item 13) should always be included, and should not exceed 200 words.

13. **SUMMARY** - Summarize the current project situation, mentioning progress in relation to design, prospects of achieving the purpose and goal, major problems encountered, etc.

14. **EVALUATION METHODOLOGY** - What was the reason for the evaluation, e.g., clarify project design, measure progress, verify program/project hypotheses, improve implementation, assess a pilot phase, prepare budget, etc? Where appropriate, refer to the Evaluation Plan in the Project Paper. Describe the methods used for this evaluation, including the study design, scope, cost, techniques of data collection, analysis and data sources. Identify agencies and key individuals (host, other donor, public, AID) participating and contributing.

15. **EXTERNAL FACTORS** - Identify and discuss major changes in project setting, including socio-economic conditions and host government priorities, which have an impact on the project. Examine continuing validity of assumptions.

16. **INPUTS** - Are there any problems with commodities, technical services, training or other inputs as to quality, quantity, timeliness, etc? Any changes needed in the type or amount of inputs to produce outputs?

17. **OUTPUTS** - Measure actual progress against projected output targets in current project design or implementation plan. Use tabular format if desired. Comment on significant management experiences. If outputs are not on target, discuss causes (e.g., problems with inputs, implementation assumptions). Are any changes needed in the outputs to achieve purpose?

18. **PURPOSE** - Quote approved project purpose. Cite progress toward each End of Project Status (EOPS) condition. When can achievement be expected? Is the set of EOPS conditions still considered a good description of what will exist when the purpose is achieved? Discuss the causes of any shortfalls in terms of the causal linkage between outputs and purpose or external factors.

19. **GOAL/SUBGOAL** - Quote approved goal, and subgoal, where relevant, to which the project contributes. Describe status by citing evidence available to date from specified indicators, and by mentioning the progress of other contributory projects. To what extent can progress toward goal/subgoal be attributed to purpose achievement, to other projects, to other causal factors? If progress is less than satisfactory, explore the reasons, e.g., purpose inadequate for hypothesized impact, new external factors affect purpose-subgoal/goal linkage.

20. **BENEFICIARIES** - Identify the direct and indirect beneficiaries of this project in terms of criteria in Sec. 102(d) of the FAA (e.g., a. increase small-farm, labor-intensive agricultural productivity; b. reduce infant mortality; c. control population growth; d. promote greater equality in income; e. reduce rates of unemployment and underemployment). Summarize data on the nature of benefits and the identity and number of those benefitting, even if some aspects were reported in preceding questions on output, purpose, or subgoal/goal. For AID/W projects, assess likelihood that results of projects will be used in LDC's.

21. **UNPLANNED EFFECTS** - Has the project had any unexpected results or impact, such as changes in social structure, environment, health, technical or economic situation? Are these effects advantageous or not? Do they require any change in project design or execution?

22. **LESSONS LEARNED** - What advice can you give a colleague about development strategy, e.g., how to tackle a similar development problem or to manage a similar project in another country? What can be suggested for follow-on in this country? Similarly, do you have any suggestions about evaluation methodology?

23. **SPECIAL COMMENTS OR REMARKS** - Include any significant policy or program management implications. Also list titles of attachments and number of pages.

INSTRUCTIONS FOR COMPLETING FORM AID 1330-15 & 15A, PROJECT EVALUATION SUMMARY (PES)—PART I & II

EVALUATION PROCESS - Officials of the Host Government and AID Mission should collaborate in periodic evaluation of the progress of each project. (For AID/W projects, participation of grantees is appropriate.) Timing of such regular evaluations should be linked to the key decisional requirements of the project, as listed in the Evaluation Plan included in the Project Paper and as confirmed in the Evaluation Schedule of the Annual Budget Submission; otherwise annually. A description of the evaluation process is found in Handbook 3, Part II, Chapter 8.

PURPOSES OF SUMMARY - The Project Evaluation Summary (PES) is prepared after each review to record information which is useful both to the implementors (including the Host Government and contractors) and to concerned AID/W units. It serves four purposes:

(1) Record of decisions reached by responsible officials, so that those who participated in the evaluation process are clear about the conclusions, and so that headquarters is aware of the next steps.

(2) Notice that a scheduled evaluation has been completed, with a brief record of the method and participation for future reference.

(3) Summary of progress and current status for use in answering queries.

(4) Suggestions about lessons learned for use in planning and reviewing other projects of a similar nature. The PES and other project documentation are retained in DS/DIU/DI and are available to project planners.

CONTENTS OF SUMMARY - A PES submittal has two parts, plus relevant attachments if any.
PART I REQUIRED: Form AID 1330-15 contains identifying information about the project and evaluation (Items 1-7), action decisions about the projects future (Items 8-10), and signatures (Items 11-12). Since the PES reports decisions, it is signed by the Director of the Mission or AID/W Office responsible for the project. Space is also provided for signatures of the project officer, host country and other ranking participants in the evaluation, to the extent appropriate.

PART II, OPTION 1: For regular evaluations, use continuation sheets to respond to Items 13-23 as outlined in the attached Form AID 1330-15A.

PART II, OPTION 2: For a special evaluation, the reporting unit may opt for a somewhat varied format, with a different sequence or greater detail in some areas, however, Items 13-23 should all be addressed.

ATTACHMENTS: As appropriate, reports of host governments, contractors, and others, utilized in the preparation of the evaluation summary, should be labeled A, B, C, etc., attached to the PES submittal (Missions are to submit 7 copies and AID/W Offices 7 copies) and listed under Item 23. Where it is necessary to transmit these source documents separately from the PES, Block 23 of the PES should note how this material was transmitted, when, number of copies and to whom.

SUBMITTAL PROCEDURE: Missions will submit the PES Facesheet, continuation sheets, and attachments under cover of an airgram which will be received by the Cable Room. AID/W Offices will submit the PES Facesheet, continuation sheets, and attachments to MO/PAV, Room B-930, NS under cover of a memorandum which cites any distribution instructions beyond the standard distribution. All AID/W Offices and most Missions will use the blank cut PES Facesheet and plain bond for continuation sheets, which can be reproduced on copiers. Those Missions preferring to use hecto, may order the form in hecto sets from AID/W, Distribution Branch. There will be a standard distribution made in AID/W of all field-originated PES's. Copies will be sent to the corresponding bureau's DP, DR, the country desk and Evaluation Office. Other copies will be sent to PPC, SER, PDC and DS (including DI and ARC). For AID/W-generated PES's, copies will be distributed to all bureaus.

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13. SUMMARY

The objective of this evaluation was to assess progress and constraints of the Agriculture Research Project (621-0107) to provide a basis for the design and implementation of the proposed Farming Systems Research (FSR) project (621-0156). To prepare for the new FSR project, this evaluation also reviewed and delineated those components of the present project that should be considered in the development of the second phase of the Agriculture Research extension services.

At the input level the evaluation team concluded the following in rank order of priority.

a. Resources must be reallocated so that research results can be compiled in publishable form. This will facilitate a review of the "state-of-the-art" of agricultural research to identify those recommendations that can be disseminated to farmers through extension as rapidly as possible.

b. Station development at Ilonga especially construction of research facilities and the levelling of research plots needs to be expedited. A critical review needs to be made on the construction of residential houses including provisions for social, health, and school facilities.

c. Donor assistance should be provided to plan, organize, and administer an in-country training program for adaptive researchers and extension personnel to promote the dissemination of appropriate research results to villages and farmers.

d. Management needs to be modified at Ilonga to promote coordination among various crop research programs, research planning and programming by Tanzanian scientists, speedy commodity procurement, staff recruitment, and training of supporting staff at Ilonga.

e. Greater attention must be given to properly maintain the genetic stock, especially of indigenous materials.

f. USAID and Ministry of Agriculture should increase their respective support and monitoring roles of research activities including station development at Ilonga.

At the output level it was concluded that:

a. Research facilities appear to be inadequate for a station of the importance accorded to a major food crop experiment station.

b. Planning and coordination among scientists at the station has been lacking because of inadequate Ministry of Agriculture and station administration.

c. While some new high yielding maize varieties have been developed and tested in villages, less has been accomplished in working with local varieties. The premature release of new varieties should be avoided to ensure that adequate adaptive testing has been carried out.

d. The sorghum breeding program is screening several high yielding, early maturing, improved sorghum varieties on-station but due to the lack of qualified Tanzanian staff, no off-station agronomy trials have been conducted.

e. No research has been conducted on millet because the contractor could not recruit a millet breeder and Ministry of Agriculture has provided no professionals.

f. The grain legume program has developed several new varieties, and the breeding program is using both indigenous and exotic lines. The program has initiated trials in all agro-ecological zones to test new varieties and cultural practices under farmer conditions.

g. While there exists a list of recommended cultural practices, it is uncertain whether those recommendations are passed to extension for diffusion to farmers.

h. This project has trained 17 long term agricultural scientists since 1976 and by 1983 will have trained a total of 39. Six of the 17 returned participants have left the project. Little training has been provided in professional supporting skills (i.e. pathology, entomology, microbiology, soils, and social sciences) and technical skills such as repair and maintenance of equipment, machinery, and facilities.

i. In-service training programs have not been undertaken on a regular and formal basis.

j. Linkages with extension and other supporting institutions at the regional, district and village level are weak and in some cases non-existent.

k. The feed-back system between researchers and farmers is weak and the village trial program has not been adequately supported by the Ministry of Agriculture.

At the <u>purpose level</u> it was concluded that:

a. Tanzanian scientists who have been trained are conducting research, but they are not sufficiently involved in planning and administering research.

b. Other than the farming systems research program which was initiated late in the project and the village trials there is no regular feed-back from villages to ensure an awareness of farmer problems.

c. Because of the insufficient number and type of trained Tanzanians now available to the project and their need to develop expertise in research planning, programming, and administration, continued donor assistance will be required to sustain effective research in food crops. However, future donor assistance should make greater use of short-term consultancies to support the work of Tanzanian scientists.

d. Foundation seed farms have been supplied with improved high-yielding quality varieties of maize, legume, and sorghum seed for multiplication. However, the amount supplied does not fully meet the demands of the foundation seed farms.

e. Physical facilities, machinery and equipment are not sufficient to fully support the maize, legume, and sorghum/millet research program.

f. Land presently used for research has not been properly graded and irrigated for conducting quality research.

g. National crop research coordinating committees have been established but they do not yet make an effective input into annual national research plans.

h. Tanzanian Government contributions to maize research have increased annually, but the total research effort at Ilonga and other sub-stations has not been sufficiently supported from the budget.

Based on the above EOPS the project purpose of "developing the capacity to plan, organize, and administer research for maize, legumes, and sorghum/millets" has only been partly achieved. Nonetheless, the project has helped to lay a firm foundation for a strong food crop research program for Tanzania.

At the goal level it was concluded that due to the weak institutional linkages among all components of the agricultural service and support system, villages and farmers have not fully benefited from this project. However, food crop research has benefited considerably since a solid foundation for future work will have been provided by the termination date of this project, especially in human resource and station development.

The following important lessons have been learned which have implications for completion of current activities and structuring the proposed FSR project:

a. Future assistance to food crop research must be programmed and ranked on the basis of an immediate assessment of the "state-of-the-art" of the recommendation generated by research in Tanzania and elsewhere which can be disseminated to farmers in production packages. It follows that assistance to agricultural extension in packaging available and appropriate research results for dissemination to farmers must now be given top priority. In the future, research programs must be planned to address the needs of farmers in specific

agro-ecological zones identified by researchers and extensionists working as a team jointly with farmers. Appropriate in-country training to facilitate these joint efforts must be initiated now.

b. The technical research capability is developing faster than the management and organizational capability. Management at Ilonga must be restructured and both USAID and the Ministry of Agriculture must provide better backstopping and support.

c. Every effort should be made to improve and upgrade the social and physical facilities at Ilonga so that the station will attract good scientists and develop as a "center-of-excellence" in food crop research for Tanzania and other African countries.

d. Tanzanian scientists should have greater input into the organization and administration of research; respective national crop research coordinating committees must be made to work more effectively. Greater attention needs to be given to maintaining the genetic stock, especially of indigenous materials.

14. EVALUATION METHODOLOGY

The evaluation was conducted to appraise the progress of the present project in meeting its stated objectives and as a basis for designing and implementing a new project. The new project will be a continuation and expansion of present work and this evaluation looks at those components that should be continued, modified, or terminated. The evaluation is also an important aid in providing guidance to the transition from one project to another to complement staffing and ongoing research activities. It also provides a basis for identifying the need for additional equipment, supplies, training, and continued station development which will be the responsibility of the next project.

The evaluation was carried out by Colorado State University. The team (Dr. David Redgrave, Dr. James Barron, Dr. Donald Wood, Dr. Alex Dotzenko of CSU and Dr. Cal Martin of REDSO/EA) reviewed project documents and materials prior to arrival in country. A briefing by USAID/Tanzania and the current chief of party provided historical background and an overview of the project. The team then visited the Ilonga station and held detailed discussion with both expatriate and Tanzanian staff in all functional groups: maize, sorghum, grain legumes, farming systems, and station development. The team also reviewed staffing and training programs.

Discussions were held with Mr. David Masanja, Principal Secretary, Dr. John Liwenga, Director of Research in the Ministry of Agriculture, Dr. J. Kasembe, Director General of Tanzania Agricultural Research Organization (TARO), Dr. J. De Vries, Head of Agricultural Education and Extension, Faculty of Agriculture at Morogoro, the Principal of Agriculture Training Institute at Ilonga, and Mr. E. Lujuo, Farm Manager, Msimba Seed Farm. The team also visited the Hombolo sub-station to observe facilities and research plots.

A meeting with the District Agricultural Development Officer in Kilosa and the Regional Agricultural Development Officer in Dodoma provided perspective on the problems and opportunities for extension programs using research results.

15. EXTERNAL FACTORS

The world economy has undergone a significant shift as a result of OPEC pricing policies for oil. Tanzania has been seriously affected because of their need to generate larger amounts of foreign exchange to purchase oil (project at 55 percent of foreign exchange earnings). Also the improvement of the transportation system is important for movement of agricultural inputs and products but this necessitates foreign oil consumption.

The food crop research program is directly affected by the increased cost of petrol and the resultant limitations on travel when petrol is not available. Some field test results at outlying locations were lost because of inability of researchers to travel on a timely basis to establish trials or collect data.

Worldwide price inflation since 1975 has increased the cost of supplies and equipment for research. When combined with chronic shortages of foreign exchange this poses serious challenges to the country. Because of these higher costs of transport and materials it will be necessary to consolidate some research programs at fewer locations.

The Tanzanian Government's present agricultural research strategy is to "revitalize research by ensuring a more precise aim at the problems of the farmer, by providing the means to do research, and by ensuring that the extension link operates efficiently. The focus of the strategy is, therefore, the linking of research extension, and the farmer (i.e. farming systems approach). However, to carry out this strategy, the government is only allocating approximately TShs. 54 million ($6.6 million) or .5% of the total value of production from the agricultural sector as compared to more than 2% in developed countries. The resources allocated to implement the strategy is insufficient to have a measurable impact on the farmers, thus further investment in agriculture research is required. This was manifested in the project in that sufficient funds were not made available to carry out some activities, especially village level trials.

The national decentralization program has also resulted in a larger organizational gap between research and extension. Consequently, the available research results are not effectively moving through a system which gets them in a form for wide dissemination to farmers. The Tanzanian Government's educational policies and the University of Dar es Salaam's stringent entrance requirements have limited the pool of Tanzanian students who could have been trained at higher levels under the project. The pattern of expectations at high policy levels may have contributed to the thin spread of limited resources over too many research activities, especially in the maize program. Finally, the UN FAO blanket recommendations for

fertilizer use have inhibited the dissemination of area specific recommendations generated by Ilonga.

16. INPUTS

The agreement specified that the donor would be mainly responsible for (a) technical assistance, (b) participant training, (c) commodities and (d) other costs. The Tanzanian Government was to provide (a) physical facilities, e.g., land, buildings, etc.; (b) local support in staff; and (c) operational costs. This joint effort was to result in the establishment of stations with adequate facilities and equipment necessary to conduct research programs. It is apparent at this stage (one year prior to the completion of the project) that, in some respects, both the donor/contractor and the Tanzanian Government did not adequately meet their obligations.

a. Although lower-cadre participant training was satisfactory, high level training of local staff fell short of its target by about 50%. This is attributed mainly to failure of the Tanzanian Government to assign enough potential participants to the project and failure of the contractor to place the participants in U.S. Universities on a timely and orderly basis. As a result, participation of Tanzanians in implementing and managing the program has not been sufficient.

b. While office space for the staff was adequate during the life-of-the project, lack of housing at the beginning of project posed difficulties in recruiting staff. The expanded research and training program developed during this project has over extended present facilities, thus additional facilities to provide working space for 40 scientists will be needed in any follow-on project.

c. The contractor could not recruit the required expatriate personnel for sorghum/millet and agricultural economics sections at the early stages of the project.

d. Vehicles for field transport were obtained, but the state of the motor pool/storage, farming equipment, and transport provision for off-station work is still unsatisfactory.

e. The availability of reference materials, data processing facilities, publications, etc., has not been given appropriate priority.

17. OUTPUTS

The project outputs were revised during the life of the project, by an amendment dated 15 February 1977. The assessment of actual accomplishments are based on the revised outputs listed in the amendment.

a. Fully developed research station and substations, including appropriate equipment and facilities to permit quality food crop research programs to be carried out.

The evaluation team visited two research stations. These were Ilonga, the major food crop research station, and Hombolo, a sub-research station at Dodoma. The Hombolo substation focuses primarily on low altitude semi-arid food crops such as sorghum, millet, and some grain

legumes.

The farm equipment at Ilonga appeared to meet the very basic requirements for conducting research. It was reported that most farm equipment was available for preparing seedbeds and establishing trial sites. However, at certain times field equipment was inoperable because of the lack of spare parts and the delays in repairing equipment. In general, laboratory facilities are below the standard required for a research station. The scientists working at Ilonga stated that detailed soil analysis, computer analysis, food nutrient analysis, and specific chemical analysis were normally conducted at other government laboratory facilities. In most cases the results of these detailed analyses from on-station laboratories took a number of months to complete and it was something less than a satisfactory arrangement.

The team was informed that new machinery and equipment is on order from the U.S. and is in shipment to Tanzania as well as some farm equipment which remains to be ordered.

The development of the Ilonga Research Station into the National Center for Food Crops Research began in May 1980. Progress has been hampered by the lack of land development equipment. However, the engineering staff have been able to develop the 160 hectares master land use plan, construct peripheral roads, surface drains, storm water drains, and a workshop/store building on the site. In addition, an irrigation system utilizing water from a lake reservoir has been designed and two bore wells have been dug to provide potable water to proposed research facilities.

It is anticipated that it will take approximately 3 years to fully develop Ilonga Research Station, hence this particular output is judged incomplete at the time of this evaluation.

b. <u>Plans, budget, administrative, and management techniques and coordination procedures developed to permit effective management, administration, and coordination on the food crop research system.</u>

A minimum of coordination is taking place among scientists at the station. Experiments in each commodity group appear to be primarily designed by the expatriate scientist with minimum input from the Tanzanian staff. As an example, the Ilonga research entomologist reported that little, if any, advice is sought from the entomology staff to plan research trials on maize, grain legumes, and sorghum. Furthermore, the Tanzanian research staff assigned to various commodity teams expressed an opinion that their involvement in planning and designing experiments was minimal. The annual commodity research work plan has been developed at the Ilonga station with priorities being set by the specific

commodity research team. It was reported that the government Crop Research Coordinating Committee has never issued an annual priority research work plan for the various substations. Much more could have been done to strengthen the Crop Research Coordinating Committee in establishing research priorities. The output was judged completed but the organizational management structure needs to be strengthened.

c. For each agro-ecological zone at least one new high-yielding variety of maize was developed and tested and two local varieties improved.

This output has been partly attained as described in a report titled "Review of the Maize Research Program." The report states that a number of varieties of maize have been released between 1969 and 1978, namely, Ukiriguru Composite (UCA), Ilonga Composite (IC), Tuxpeno, H 6302, and H 614. The maize breeding program devoted a large part of the efforts in selection and testing germplasm from CIMMYT with limited attention to improve indigenous lines. In the period from 1973 to 1980 the breeding program has been involved with recurrent selection of materials for low and high elevations. This work has focused on UCA, Katumani, and IC. It is believed that the Maize Research Coordinating Committee should have played a stronger role in directing and prioritizing maize research. If this had been the case, the premature release of the Tuxpeno variety based solely on exotic material could have been avoided. In spite of this, the work on crossing Tuxpeno with Ilonga Composite is a welcome development and should be encouraged.

The breeding program has been based on population improvement and development of synthetic varieties through multi-location testing of progeny to improve adaptation and yield stability. In addition the program has developed 4 populations for use in the high and intermediate elevations and 4 populations for the low elevation areas. Two populations for the highland were developed to meet the need of a long season population which could be used in a hybrid development program. They have superior grain type and ear rot resistance as compared to their comparable hybrids. In the low elevations all of the new populations have superior agronomic qualities including better streak resistance.

The agronomy program has focused on on-farm testing to develop appropriate agronomic practices that will enable the farmer to maximize returns yet avoid high levels of risk. Trials were designed to test varieties, fertilizer rates and various management regimes. From these results, production packages have been tested and proposed for 11 geographical areas which encompass four major ecological zones of maize production.

On-station trials at Ilonga and nine sub-stations have looked at new insecticides for stalk borer control, furadan for streak control, plant distribution and plant density. As new or improved technologies are found, the results are tested in the village trials discussed above.

d. For the major sorghum/millet areas of Tanzania at least one new, high-yielding variety of both sorghum and millet developed and tested and two local varieties of each improved. This will include short-term varieties for seasons of delayed rainfall.

Several new sorghum varieties have been screened and tested on-station but have not been released. Off-station testing must be completed before new varieties will be released. This will begin in the 1981/82 planting season. The sorghum research program has suffered because an expatriate scientist provided was only for two years and, no senior level Tanzanian scientists were available to the program. The end result has been a weak breeding program with no new varieties released, thus the output was partially achieved. The sorghum program has worked on production constraints with some general recommendations on cultural practices, e.g., plant populations, time of planting, weeding, and fertilizer treatments.

The sorghum program has initiated a limited amount of breeding and evaluation work on both indigenous sorghum lines and exotic germplasm. The testing of sorghum lines is being done at Ilonga and at substations. However, no village trials have been conducted. The project has never provided an expatriate scientist to work on millets. The only work observed on millets was one variety evaluation trial at Hombolo substation using exotic varieties from ICRISAT.

e. For three agro-ecological zones at least one new variety of food legumes developed and tested and two local varieties improved.

The breeding program in grain legumes has released two cowpea varieties, TK1 and TK5, and one green gram variety, Nuru, thus, meeting the objectives of the output. The breeding program is utilizing both indigenous and exotic lines. The grain legume program appears to be built around a concerted effort to work with indigenous legume lines. The breeding program is also conducting trials on disease resistant varieties and the free modulating abilities of soybean varieties. The agronomic phase of the program is conducting trials on time of planting, insecticide evaluation, weed control, leaf plucking, double cropping, and plant populations. In addition to the agronomic trials at Ilonga research station, the grain legume program has initiated village trials in all zones to test new varieties and cultural practices under farmers' field conditions.

Agronomic trials on monocropping and mixcropping using cereals and legumes have been conducted in Morogoro, Dodoma, Iringa, Tanga, Mwanza, Lindi, Mtwara, Tabora, and Coast Regions.

The village trials program was started during the 1975/76 planting season. These simplified management trials have been tested on-station and were part of the agronomic trials. About three to five elite varieties developed in the breeding program are included in the village trials.

f. A package of practices available for use for each recommended variety of each food crop being researched.

Recommendations of agronomic management practices for cowpea growers are in the process of being compiled and published for extension personnel. It was interesting to note that the average cowpea yields on the farmer fields are about 200 kg/ha and sometimes less. But if the farmers were to use improved varieties and minimum management practices his yields could easily be between 1800 and 2200 kg/ha.

Bulletins of detailed recommendations of agronomic management practices which are in the process of being compiled:

1. General: "Improved Cultivation of Cowpea in Tanzania"
2. "Growing Cowpea in the Morogoro Region"
3. "Improved Soybean Cultivation in the Morogoro and Lindi Regions"

These publications include some very useful tips to the Extension worker on minimum inputs and management practices for high yields. The contents of these publications will include the best varieties to use, preparation of seedbeds, fertilizer application, time of planting, spacing and plant population, weed, insect and disease control, harvesting, drying, threshing and storage of seed. The three publications will contain recommendations that should increase production by at least 50%.

g. Trained Tanzanians capable of managing and conducting food crop research which will continue to maximize production

The long-term participant training program has involved 39 participants of which 17 have returned from their studies with 22 still in training. Of the 17 returned participants, 6 have left the project to take up positions within the Ministry of Agriculture or in other government parastatals. The participants returning to the project are assigned as follows: 3 to the maize program, 5 to the grain legume program, 1 to the sorghum program, and 2 working on land development. The participants still in training programs are divided in the following fields: 5 for maize, 10 for grain legumes, 4 for sorghum, 1 for entomology, 1 for plant pathology and 1 for

agricultural economics. It is noted that two participants were trained in land development, two are being trained in entomology and plant pathology, one is being trained in agricultural economics with the remaining 34 either trained or in training in plant breeding and agronomy. Thus, there seems to be unduly heavy emphasis placed on plant breeding and agronomy training at the expense of trained scientists in fields such as soils, entomology, microbiology, plant pathology and agricultural economics.

There were 64 participants sent to the International Agricultural Research Institutes (IITA, CIMMYT and ICRISAT) for short-term training in maize, legumes, sorghum, millet, rice, and land development. Three participants will be sent to ICRISAT for heavy equipment repair, maintenance, and operations.

The project will have trained 103 participants. This will exceed the 67 participants projected by the Project Agreement.

h. An inservice training program in both research and extension developed and in use.

It was reported that no formal inservice training program of any kind exists at the time of this evaluation. There is on-the-job training given by expatriate staff to the Tanzanian counterparts working on the various commodity crops. Therefore, this output was not fully achieved.

i. Establish reinforced linkages to appropriate national institutions, regional/international research institutes and foreign universities.

The project appears to have developed strong linkages with international institutions. These linkages are achieved primarily by expatriate scientists from IITA, ICRISAT, and CIMMYT. Also, the international centers have supplied plant materials for testing, selection, and screening trials. There was little evidence that effective and meaningful linkages have been established with appropriate national institutions. There are probably two exceptions—the linkage developed between the Faculty of Agriculture and Ilonga research station in the area of farming systems research and between foundation seed farms and the Ilonga research station in the area of management practices utilizing improved seed varieties. The output was achieved in terms of establishing linkages.

j. Improved linkages to seed multiplication farms involving continuous contact and the provision of sufficient breeder seed to meet seed farm demands.

The Msimba seed farm manager reported that excellent relationships exist with the research scientists and the professional staff of the farm. Ilonga researchers have been readily available to guide seed farm employees in observing and checking breeder seeds for

off-type plants, disease, and insect resistance and plant uniformity of composite varieties. It was also reported that the Ilonga station has been providing sufficient breeder seed to meet the seed farm needs. The output was partially achieved because very little follow-up work is done with the Arusha and Dabaga seed farms.

k. A feedback system from farmers and villages through an annual program of village trials covering both varieties and agronomic practices.

The village trials program has been conducted for a number of years on grain legumes and maize. The village trials are located in 8 regions representing a wide range of different micro-ecological environment within a region or district in which the desirable crop variety could be further selected and management practices further refined. The sites for the trials program are selected near a primary or secondary school for maximum exposure to the people of the village. The school sites proved more advantageous over the farmers' fields because the teachers and students participated in the trials from planting to harvesting. The research trials officer demonstrated to the teachers and students the required management practices for high yielding varieties. The teachers and students were able to keep the seed after data was collected for planting the next growing season. The system as practised now has provided very little feedback to researchers on desirability of new varieties.

18. PURPOSE

The purpose of the project is to "develop the capacity to plan, organize, and administer an agricultural research system for maize, sorghum, millet, and food legumes."

To determine the degree to which this purpose has been attained it is necessary to examine the extent to which the End of Project Status (EOPS) has been achieved. These are:

a. 67 trained Tanzanians planning, administering, and conducting ongoing applied research aimed at improving the productivity of the small farmer.

The long-term training program lists 39 participants sent for training. Of this number 17 have returned and 6 are no longer with the project. Sixty-four participants have been sent for short-term training—some of these have become long-term participants. Those participants now available to the project are definitely helping to conduct research, but they need to be more involved in planning and administering research.

b. Regular feedback from villages to ensure an awareness of farmers' problems.

A farming systems research program was initiated during the final two years of the project. This was a pilot effort only. This program is operational in 4 villages in Kilosa District (and will be expanded in the new Farming Systems Research Project). While village trials have been undertaken in several locations, it is doubtful whether these trials have proven to be an adequate mechanism for identifying farmer problems.

c. Donor expertise no longer required to sustain effective research in food crops.

This project has significantly increased the number of trained Tanzanian scientists working in food crops research but it will not have provided sufficient staff to sustain effective research in food crops. The failure to attain this EOPS is due to an over-estimation of the pool of students available for training, especially at higher degree levels. Of the 39 participants sent for long-term training 14 were first sent for B.S. level training, 21 for M.S., and 4 for Ph.D. training. The need to train 40% of the long-term participants at the B.S. level severely constrained the number of participants that could be sent for advanced degrees. This problem of obtaining sufficient numbers of students with B.S. degrees for advanced training is due to the limited output of 6th form graduates.

d. Foundation seed farms in the major altitude/ecology zones annually supplied with improved high-yielding, quality varieties of maize, legume, and sorghum/millet breeder seed for multiplication.

This EOPS will have been only partly fulfilled as only a limited number of new varieties have been developed.

e. Physical facilities and items of equipment on Ilonga Station and Hombolo Substation sufficient to support the maize, sorghum, millet, and legume research program.

From the list of equipment and physical facilities that were to be available at the end of the project the following will not be operational or only partly operational:

1. research laboratories for plant protection and soils;
2. laboratory equipment such as microscopes, isolation chambers, balances, pH meters, centrifuges, calculators, and glassware.

f. Land on research stations properly graded and watered for the conducting of quality research programs.

The project is presently developing 50 hectares for irrigation for the land described by this EOPS. This development is partially completed but will not be finished by the end of the project.

g. National research plans for maize, legumes and sorghum/millet updated annually.

The National Crop Coordinating Committees NCCC) hold annual meetings to discuss national research programs and priorities. Budget estimates are made based on the specific research programs agreed to at the NCCC meetings for each commodity or factor program. However, the research priorities are not ranked and funding is usually less than what is asked for. As a result, important commodity research program such as maize and legumes end up with much less than needed to carry out the programs.

h. Annual research outputs adequate to fully support approved and annually updated production goals with research results disseminated as appropriate.

Given the shortfall in the development of the station and the staffing levels it has not been possible to meet this EOPS. On the other hand, annual production goals have yet to be defined in relation to the resources and ability of primary producers to meet targets.

i. National research system adequately financed on yearly basis with sufficient funds included in the five year plan.

National recurrent expenditures for maize research increased from approximately 50,000 shillings per year before the project began. In the period from 1973 onwards annual expenditures have ranged from 300,000 to 400,000 shillings per year. Similar data on the sorghum, millet and grain legume programs are not available but they have not increased significantly as reflected in the limited size of the programs. The proposed MOA funding levels for supporting the three major food crops research will be TShs. 40.7 million for maize, TShs. 18.2 million for grain legumes, and TShs. 12.3 million for sorghum and millet. The TShs. 71.3 million over the next 5 years represents an average of TShs. 14.25 million per year.

j. Farmer feedback system established to test suitability of research.

As stated earlier a FSR program has been initiated in the last two years of the project on a pilot basis. This and the village trial program represent the beginning of the development of this feedback system. This system will be further expanded in the new project.

SUMMARY

In general, the project purpose as defined by the EOPS has been only partially achieved. This is largely because the EOPS represented an overly optimistic rate of progress for the project. This was especially true with respect to staffing levels for both national and expatriate personnel.

19. GOAL

The goal of the project is "to assist the government of Tanzania achieve its objectives of self-sufficiency in the production of major food crops."

The project has partly contributed to meeting the above goal by:

a. Expanding the number of Tanzanian scientists trained in food crop research.

b. Developing a village trial program that forms the basis for developing regional or district recommendations.

c. Developing a national variety testing program.

d. Providing the necessary infrastructure for a food crop research center.

In terms of the measures of goal achievement presented in the PP these measures could not be achieved primarily because they grossly overstate the impact of the present project on agricultural output. As structured and managed, the present project can only be perceived as laying the foundation for an integrated food crop research program using a farming system approach to link farmers, extension, and research more effectively.

20. BENEFICIARIES

The interaction among all agricultural support institutions help to explain the process by which agricultural research directly benefits and facilitates the work of these institutions and, therefore, the farmer indirectly. It must be clearly understood that the primary beneficiary of this project has been the food crop research system in general and the Ilonga Research Institute itself. This evidenced by the fact that by the completion date of this project more participants will have been trained for Tanzania by AID over the 1973-1982 period than in any other African country*. It is this accomplishment which has given Ilonga the unique and important mandate as the major food crop research center in Tanzania.

21. UNPLANNED EFFECTS - See External Factors Section

*This is an extremely significant accomplishment, in spite of the actual shortfall relative to the number projected to be trained under this project.

22. LESSONS LEARNED

AID assistance to agricultural research is now in an important transitional phase until the proposed Farming Systems Research)FSR) project commences. The lessons learned are intended to guide activities during the transition period and the design and implementation of the proposed FSR project.

a. Of paramount importance now is the immediate documentation of all available research results in publishable form. This will facilitate a review and assessment of the "state-of-the-arts" in agricultural research (done in Tanzania and in other regions of Africa having similar agro-ecological conditions) to identify those recommendations which can be disseminated to farmers as production packages as rapidly as possible. This assessment will also provide important guidelines for planning and programming future food crop research, extension, training, and other agricultural support activities.

b. The technical research capability appears to be developing faster than the organizational and management skills for research. Management of the food crop research program has been fragmented and not as well coordinated as it might have been. At Ilonga there has been little attempt to integrate the various crop research programs and consequently they have evolved as semi-independent activities with primary direction coming from expatriate staff. This situation has developed for several reasons. It appears that IITA was primarily concerned with providing research scientists, but gave little attention to project management and capacity building. The Chief of Party (COP) was not given the authority to integrate, coordinate, and supervise various components of the research program. As a result, individual scientists looked to their home institutions for direction rather than to the COP, or the Ministry of Agriculture. It is essential that even during the transition phase that the Ministry of Agriculture assign a well qualified person to be the Director of Research at Ilonga. The director must be given the authority to organize, coordinate and carry out research.

c. In the future, AID and other donor assistance must be geared to the entire institutional complex (research, extension, and training) responsible for the systematic generation and dissemination of new recommendations and production packages to increase agricultural production as quickly as possible in specific agro-ecological zones.

d. AID must provide more effective project monitoring and support. There must be continuous involvement and technical evaluation of contractor performance by AID personnel.

e. There must be increased contact and coordination with agricultural extension and field officers at all levels.

f. Tanzanian scientists, administrators, and other professionals should move more rapidly into operational and decision-making activities.

g. Greater use should be made of short-term expatriate backstopping, advisory, and supporting services so that research programs are increasingly undertaken by Tanzanians. Much more contractor home office involvement and support especially in training and administration is needed.

h. Training should be provided at all levels and in other skills supporting research and extension as well as operation and maintenance of the station and its facilities.

i. The Faculty of Agriculture at Morogoro should produce more students of agriculture. The proposed FSR project could finance scholarships for these students.

j. The national crop research coordinating committees must increase its professional membership and every effort should be made for those committees to function effectively.

k. Every effort should be made to improve and up-grade the facilities (social and physical) at Ilonga so that the station will attract high level scientists and function as a "center of excellence" in food crop research for Tanzania and other countries in East Africa.