

report

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Evaluation of Tanzania Agricultural Research Project (621-0107)

Prepared by:

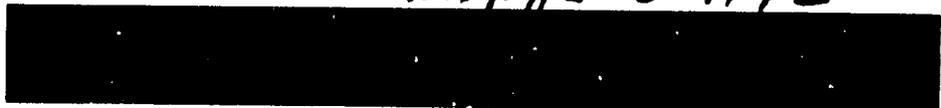
George E. Hull
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Submitted to:

AFR/DR/EAP
Agency for International Development
Washington, D.C.

August 1978

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**GENERAL
RESEARCH**



CORPORATION

7655 Old Springhouse Road, McLean, Virginia 22101



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SUMMARY

The Agriculture Research Project is progressing toward the realization of the broad objective "To assist the Government of Tanzania achieve its objectives of self-sufficiency in the production of major food crops." With the completion of five years of maize research and three years of research with food legumes, significant accomplishments have resulted as follows:

1. One composite variety of one hybrid of maize developed and released to seed farms and distributed by Tan Seed Company to small farmers. Breeder's stock of three other improved composites provided to seed farmers.
2. Maize production hand book developed for extension personnel and small maize farmers. *accomp.*
3. Three varieties of food legumes developed and released to seed farms and planted by some farmers.
4. Research information necessary for production of a food legume hand book has been developed and a printed hand book is to be completed during 1978.

The Project objective of providing training for Tanzanian personnel in order that they might successfully direct and conduct a National Research programme, is well underway. The Team observed Tanzanians with outstanding ability and with upmost interest in and dedication to their activities. Other Tanzanians are presently out of the country and are involved in short term or academic training and are reportedly individuals with high potential. Although the training program is slightly behind

schedule and even though this Team recommends that expatriates give increased attention to permitting Tanzanian counterparts to assume greater responsibility for research being conducted, we commend the TanGov, contract expatriates and USAID/Dar es Salaam for their training accomplishment to date.

After assessing Project progress to date the Team recognizes the need to expand the training of Tanzanians to include other disciplines which are essential to a balanced research program. Therefore, it is recommended that the Research Project include formal specialized training in various agricultural disciplines which will strengthen the research presently conducted by plant breeders and agronomists. REC

Visits to ARI trials and observation of a number of village trials and farmer fields made it obvious that two major problems of agriculture in Tanzania are plant disease and insects. Therefore, the Team strongly recommends the Project be amended to provide a plant protection expatriate to work on disease and insect problems of those crops included in the Project, and to provide leadership and training of Tanzanians in this critical field of specialty. REC

The Evaluation Team learned that a significant number of small farmers were utilizing the new varieties and the technical production recommendations developed for maize and legumes as a result of the Project. However, it is recommending an expansion of the Project to include an Extension Agronomist Specialist expatriate with four Tanzanian counterparts to establish communication and bridge the gap which presently exists between research and extension staffs. REC

The Team has seventeen specific recommendations which are advanced with the belief that they will greatly strengthen and contribute to the considerable progress which has already been achieved by this Agriculture Research Project. The implementation of these recommendations will require considerable time and effort on the part of the Project Coordinator (Chief of Party), the Director of the Crop Development Division of the MinAg and his Chief Research Officer. The successful accomplishment of the recommendations will require special attention at Ilonga ARI as well as in Dar es Salaam. Therefore, the Team recommends the Economist position be broadened + REC

to include the additional responsibility of Field Team Leader for the Project team of scientists who will be responsible for the necessary leadership with the Project expatriates to insure the implementation of the recommendations at the field level.

The recommendations are listed in the next section and are then supported by additional information contained in the remainder of this report.

RECOMMENDATIONS

ESSENTIAL TO IMPLEMENTATION OF PROJECT

Training

1. Training of Tanzanian personnel is the primary objective of the Agricultural Research Project. Therefore, major emphasis should be placed on the selection and training of a greater number of Tanzanians and when feasible steps be taken to shorten the period from selection to completion of formal training whether at the Bachelor of Science, Master of Science or Doctor of Philosophy level.

2. Expand the training program of the project to provide multi-disciplinary support for the National Research Program by providing academic training for Tanzanian personnel in disciplines such as Entomology, Plant Pathology, Plant Physiology, Agricultural Engineering, Weed Control, Agricultural Economics, and Soils.

Staffing

1. The production economist to be stationed at Ilonga should be recruited and selected with sufficient administrative experience and training to enable him to assume the added responsibility of Team Leader at Ilonga. This would bring about more effective coordination and integration among the Project scientists.

2. The breeding programs are now in need of additional assistance in plant protection. The position of an expatriate Plant Protection Specialist should be established.

3. High priority be given to the establishment of the position of an Extension Agronomist Specialist expatriate with a minimum staff of four Tanzanians with responsibility to establish and maintain effective

communication between research workers and the RADOs and DADOs and their respective staffs.

4. Establish a second legume program by posting a legume breeder/agronomist at the Lambo Estate upon the arrival of the replacement for the present legume agronomist.

Research Facilities and Programs

1. The approved plan for the much needed development of the Ilonga ARI should be placed in high priority for completion by the end of 1981.

2. Libraries of all ARIs participating in Project research should be stocked with pertinent scientific publications such as journals and reference books on a continuing basis.

3. The TanGov has made a policy decision that a hybrid maize breeding program should be initiated. Inasmuch as this is a determination by the host government and it is fully cognizant of the ramifications, the breeding program should be initiated during the 1978/79 crop season.

4. Conduct village trials only in major ecological areas and limit the number of trials so they can be adequately supervised and carried to completion subject to available budgets, personnel and transport.

SUPPORT TO PROJECT

Training

1. Greater utilization of kilombero ARI (katrin) personnel and facilities for maize and legume research program with more emphasis and expanded opportunity for qualified Tanzanian personnel to be included in the training program of the research project.

Staffing

1. Take action necessary to transfer administrative responsibilities to Tanzanian personnel for Project research with project expatriates providing advice and support as a part of the in-service training program.

2. Involve DADOs and RADOs in planning seminars and workshops for appropriate extension personnel and carry out the planned training to insure that research results are adequately communicated to extension personnel, and also to provide them the opportunity to communicate to research workers the problems and research needs of farmers.

Research Facilities and Programs

1. Develop and establish on the Lambo Estate a substation of the Lyamungu ARI specifically for research on beans/*Phaseolus*.
2. A detailed soil survey be made at each participating ARI and at their substations where Project research is conducted.
3. The Kilombero ARI (Katrin) be given serious consideration as the possible location for the National Center for Rice Research.
4. Approved research programs and budgets planned by the National Coordinating Committees should be funded through research budgets developed for each participating ARI with well identified line-items in the budget to adequately support the planned research. For example, each ARI involved in legume research should have a line-item in its budget with sufficient funds to support the agreed upon legume research.

INTRODUCTION

The original Contract between USAID and IITA (No. REDSO/WA-C-74-7) involved the three-year period November 1, 1973 through October 31, 1976. A second Contract (No. 621-001) covering November 1, 1976 through October 31, 1979 is now in effect. The areas of work concerned in the Contract include administrative organization of food crop research and research in maize and food legumes. In December 1977 AID Washington approved the Tanzanian Ministry request to include research with sorghum and millet crops.

The Agricultural Research Project was initiated in November 1973 by two expatriate scientists in maize breeding and agronomy. In 1974 a Legume Agronomist was added, and in 1975 a Legume Breeder-Pathologist and Project Coordinator (expatriates) joined the Project. The Ministry meanwhile assigned promising young field officers to work with the expatriates, and adds each year new staff as they become available from the University and Training Centers. The research work is conducted at nine ARIs and on many village trials representing various ecological areas.

Research planning and administration involves budget preparation, project planning and evaluation, manpower recruitment, development, and utilization; and reporting of research findings. Maize breeding and agronomic research are concerned with developing high yielding composites and hybrids suitable for high, medium and low and coastal altitudes, developing improved agronomic practices for the various ecological areas and conducting trials at ARIs and their substations, and farmers' fields. Research in food legumes and sorghum/millet breeding and agronomic practices involve making collections of germ plasm, developing varieties with high yield, disease and insect resistance and market acceptance, and conducting trials at research stations and farmers' fields.

PROCEDURE

REVIEW OF PROJECT DOCUMENTS

A set of project documents from the Fiscal Year 1971 PROP to the Project Paper Revision No. 1 FY 1977 was provided to each member of the team in advance. Special reports concerning current and future implementation of the project were made available in Dar es Salaam.

BRIEFINGS AND REVIEWING OF REPORT

In Washington the team was briefed by the staff from AFR/DP, AFR/DR/EAP and Jim Erikson of the AID Evaluation Division and Office of East and South African Affairs. At Dar es Salaam they were briefed by the Ambassador and at the Mission by Director, Program Officer and Agricultural Development Officer. At the MinAg the team was briefed by the Minister of Agriculture, Director of Crop Development Division and Chief Research Officer. The team also reviewed a draft of its final recommendations and for the evaluation report with the Ambassador, Minister of Agriculture and appropriate staff and officials of the AID Mission and MinAg Dar es Salaam.

FIELD REVIEW

Field experiments were examined, station staff interviewed and inputs and outputs reviewed at Ilonga, Kilombero (Katrin), Ismani, Njombe, Uyole, Lyamungu and Mlingano research stations during a 19-day field trip. This included inspections of the operations of Msimba Seed Farm, Seed Farm at Dabaga, Tanganyika Wattle Company, Njombe, Tanzania Seed Company and Arusha Foundation Seed Farm and interviews with RADO's and DADO's staff at National Faculty of Agriculture at Morogoro and at the Uyole Agricultural Center.

EVALUATION TEAM

The Evaluation team included a research agronomist (maize), research agronomist (food legumes), agricultural information specialist and agricultural research administrator (Project Leader).

RESEARCH PROJECT EVALUATION

A. GENERAL

The Research Project has as its major purpose the development of a National Agricultural Research Program on food crops, such as maize, food legumes and sorghum/millet. This Project is central to the Tanzanian Government's objective of becoming self-reliant in the production of food crops and in the establishment of a critical reserve of food grains necessary to meet a prolonged drought or other national food emergency. The Project is basic to any effort to improve the standard of living of village farmers and it is consistent with the policies and priorities of the Tanzanian Government. The project does not duplicate on-going efforts of the TanGov and it is supportive of agricultural related projects of USAID and those of other donors.

Administratively, the Project is under the Crops Development Division of the MinAg. The field staff is headquartered at the Ilonga ARI. The Director of the Crop Development Division, the Chief Research Officer of that Division and the Ilonga ARI Director are the TanGov officials with primary administrative and executive responsibilities for the Project. The IITA contract Project Coordinator is the expatriate responsible for assisting the Ministry in the administration, direction and coordination of the Project.

The National Crop Research Coordination Committees for Maize and Legumes, and for Sorghum and Millets are functioning and are performing a part of their responsibilities in an effective manner. Perhaps their greatest achievement to date is greater communication and coordination of research programs, plans and accomplishments among their immediate

membership. The National Coordinating Committee structure provides a communication link as well as an organizational structure for planning, budgeting and reporting research pertinent to a given crop. The MinAg is responsible for nine ARIs with their various substations where the crops research is conducted. The Team was impressed with the degree of involvement and interest in the trials and cooperative work carried out under this Research Project. This was evident in discussions with the ARI Directors and their Field Officers. The Team does feel, however, there is a need to improve the timely evaluation of research data, and the development of official TanGov reports. Also there was little evidence that the project has developed publications (other than the Maize Handbook), held training meetings for extension personnel or otherwise made results available to farmers. (See Discussion, page 20, Reporting of Research.)

Project Relationship with Other US/AID Projects

This Research Project is directly related to all USAID projects in the food crops area. The team was favorably impressed with the contribution and evidence of influence the project is having with the other AID projects. Specific examples are:

1. Seed Multiplication Project (621-11-130-092). The general purpose of this project is to establish seed farms for the production of foundation seed. The Research Project has provided five maize varieties and three legume varieties of breeder stock to the seed farms. (See detailed discussion in Section C--Maize and Section D--Food Legumes.) The Tan Wattle Company, a seed farm which is financed by the Commonwealth Development Corporation, furnishes land, labor and other facilities for the maize research program. This research effort is carried out in accordance with the directions of the respective coordinating committees. A National Seed Company (Tan Seed) has been developed to distribute certified seed of the new recommended varieties.

2. The Agriculture Credit Project (621-11-140-117) is designed to provide technical assistance and grant funds to the Tanzania Rural Development Bank for the establishment of a small farmer loan program. Requests for loans are developed by DADOs and RADOs and such loan applications are supported with appropriate justifications statements. Those

reviewed by the Evaluation Team reflected knowledge and acceptance of varieties and fertilizer rates recommended by the project based on research results. It is anticipated the extent of this involvement will increase.

3. Agriculture Marketing Project (821-11-150-099) is supportive of the National Milling Corporation which is responsible for buying all grain farmers produce beyond their own subsistence needs. This grain is then distributed throughout the country as requested. Quality varieties developed for specific ecological areas and for specific uses are directly related to this marketing project.

4. Tanzania Agriculture Manpower Development (621-0119) provides for the expansion of MATI organizations to include farmer training wings. This is included in Amendment 1, Farmer Training and Production, approved 8 August 1977. The Research Project will provide practical information developed from research to be included in the training.

5. Tanzania Village Development Project (Project Paper No. 621-0143) which is designed to involve villages in establishing farm centers and through them to improve farmer practices by demonstrating and encouraging adoption of research recommendations, will utilize research information developed by the Project.

6. TanGov's National Maize Project (supported in part by Loan 621-018) is a first attempt to utilize improved technology in maize production in an educational program with small farmers. The National Maize Project is also supported by funds from the World Bank. Although it was reported to the Team that the recommendations of the World Bank program and those of KILIMO originally did not agree, it is believed this has been rectified by the publication Maize Production Hand Book, KILIMO, Dar es Salaam 1977. This is an excellent example of an important contribution of the Research Project. (See page 21 for further discussion of the Hand Book.)

Other donors are involved with agricultural research and the Evaluation Team had an opportunity to discuss and observe cooperative efforts between the Research Project staff and other donors as follows:

1. The Nordic countries have developed research facilities at Uyole Agricultural Center at Mbeya, and are actively involved in a Research-Extension Training program. Finland is the coordinating country for the project and the Center is organized as a parastatal. The cooperative research trials are being carried out with maize and food legumes on land, and with labor and other facilities provided by the Nordic program.

2. The National Soils Service funded by FAO-UNDP has its headquarters at Mlingano Research Institute, Tanga. The program consists of: (a) soil classification and survey for the entire country; (b) soil fertility trials to develop fertility requirements for different crops on different soils in various ecological areas; and (c) chemical analysis of soils.

The team believes there is good coordination with the above donors and their respective programs through the crop coordinating committees.

The Research Project is consistent with overall Tanzania agriculture sector objectives and the project and its objectives are known and appreciated by all segments of agriculture contacted by the Evaluation Team.

Constraints to Project Development

Although the Team was generally pleased with the project as it has developed to date, it has identified some aspects and or conditions which it feels merit special attention. These constraints to project development are as follows:

1. Selection and assignment of a sufficient number of Tanzanians to the project in order that they might be properly trained to administer and adequately staff a national research program after the USAID project is completed. It is also imperative that those trained in the project be permitted to continue as a part of the ongoing program.

2. Budget the TanGov funds sufficient to properly support the research program planned by the National Coordinating Committee, and identify the funds as line-items by crops in the budgets of the various ARIs. The Team received reports concerning field trials which were not completed due to lack of supervision, transport or field labor. In some instances research plots were not harvested due to lack of funds.

3. Project expatriates are presently involved in an inordinate amount of administrative and service type activities which reduces their research efforts and the time they can devote to training and development of Tanzanian staff. The Team believes much of this effort should be assumed by the proposed Team Leader/Production Economist and appropriate TanGov Personnel.

4. There exists a lack of effective communication between Research Institute staffs and Extension personnel (RADOs and DADOs). Although the Team learned of some cooperative efforts between the two organizations, the majority expressed real concern that a great gap exists between research and extension. Some of those contacted feel this gap has widened since Extension was removed from KILIMO jurisdiction in 1972. Failure to bridge this gap will seriously impede progress in the adaptation of research results to small farmer conditions. This is necessary for proper demonstration to farmers, which is essential to their wide spread adoption (See further discussion on page 20.)

The team reviewed the design and structure of the project and believes it is sound in design and in its approach to meeting the basic objectives of the TanGov. The team does recognize the need to expand the technical support base for research in general and specifically as it relates to the objective of this Project to establish a national system. It is recommended this be done by providing for academic training of Tanzanians in key disciplines as discussed on page 17. There is evidence that Tanzanian farmers will adopt new practices when they can see and evaluate the practices on their own or their neighbors' farms. The Team believes the major objectives of the Project will be reached at all levels if the void between Research and Extension is eliminated and the Extension organization is adequately developed. (See page 20.) All parties involved in the development on a National Research Project must recognize it is a long term program which must receive adequate support during years of abundant production as well as years of limited production. Support for research budgets, personnel and commodities must be on a sustained basis to obtain continuity of research efforts and to achieve long term objectives for agriculture.

The Team wishes to comm^end each of the major Project agents, i.e., TanGov, IITA Project personnel and USAID for their foresight in identifying the Project objectives and their sound approach to meeting those objectives.

Although a period of years will be required to adequately assess the training and the resulting competency of TanGov personnel, the team was most favorably impressed by the Tanzanians in responsible positions within the National Research Program. Although a number are away for training at any given time, the Team is optimistic they too will be competent to fill key positions and that the TanGov will recognize the importance of permitting them to remain a part of the National Research Program.

B. SPECIFIC

Staffing

TanGov agriculture research program is directed toward developing an effective agricultural research system with emphasis on maize, sorghum/millet and food legume crops grown by small farmers. Two major criteria were used to determine staff requirements. First the inputs should be such as to achieve the objectives of the Research Project. Second the staff should not be so large that the TanGov will not be able to take over the programs once the assistance is ended.

The AID funded technical staff is provided through a contract with IITA. The technical staff provides basic skills, on the job training and guidance to Tanzania staff and generally develops research programs for the individual crops. The recruitment of the first five scientists was slow. The two maize researchers arrived in November 1973, the Legume Agronomist in December 1974 and the Project Team Leader and the Legumes Breeder in October 1975. The Sorghum Breeder arrived early in 1978. The positions of Agricultural Economics and the Millet Scientists have not been filled. With the present Legume Agronomist leaving in September 1978 and with the possibility the present Legume Breeder will leave at the end of his contract in 1979, the legume program may be temporarily delayed.

The project provides that all Tanzanian research staff involved with maize, sorghum/millet, food legumes and supporting disciplines will receive at least short-term training. The total number projected to be trained academically during the life of the project is 67:

	<u>Personnel (Degree) to Be Trained*</u>		
	<u>Ph.D.</u>	<u>M.S.</u>	<u>B.S.</u>
Agronomist Coordinators	3	3	-
Research Agronomist	-	15	-
Production Agronomist	-	9	7
Plant Breeder/Coordinators	3	8	4
Ag. Econ. Biometrics, Training, Extension Plant Protection	4	11	-
Total	<u>10</u>	<u>46</u>	<u>11</u>

* Source: Project Paper Revision No. 1, 1977.

During FY 1977 and FY 1978 the following training programs were made available to Tanzanian Staff.*

	<u>1977</u>	<u>1978</u>
Continuing degree studies	6	13
New degree programs	7	10
In-service training or workshop	21	15

Some degree training was done earlier by USAID outside the contract but the major emphasis began in FY 1976 when five B. Sc. and one M.Sc. programs were started (one Ph.D. program was already underway). Two new B.Sc. and five M.Sc. programs were started in FY 1977, in FY 1978 five new B.Sc. and five new M.Sc. programs were initiated. Although the Faculty of Agriculture at Morogoro offers training leading to the B.Sc. degree, only a few graduates from this Faculty are assigned to this Project. Although most of the formal degree training is done by AID primarily in the USA, Ford Foundation and the Nordic aid programs have sponsored students for B.Sc. training. On-the-job training is done through supervision of IITA Contract staff in Tanzania, and in-service programs by IITA, CIMMYT and ICRISAT. Nine B.Sc., two M.Sc. and one Ph.D. degree candidates and 15 short-term candidates will be completing their training in 1978. This will greatly strengthen the technical staff and improve the supervision of the Research Project.

The Team feels that the training of Tanzanians to a level at which they can undertake a sound on-going research program has up to the present progressed quite satisfactorily. The Team, however, believes that it will be very difficult to obtain in the future the large number of candidates necessary to meet the objectives of the Project. There is a very limited number of degree graduates available in Tanzania to meet the great demands in all sectors of the economy. To speed up the training program it is suggested that (a) the period from selection to completion of the formal training, whether at the B.Sc., M.Sc. or Ph.D. level, be shortened, and (b) universities that enable a candidate, under adequate supervision, to conduct thesis research in Tanzania be selected.

* Source: Dr. Paul Duffield, Project Coordinator.

To improve and broaden the present staff the Team recommends that the training program of the Project be expanded as soon as possible to provide multi-disciplinary support for the National Research Program by providing academic training for Tanzanian personnel in disciplines such as: entomology, plant pathology, plant physiology, agricultural mechanization, weed control, agricultural economics and soils. In the distant future, steps should be taken for training in such fields as crop ecology, seed production, and statistics. To meet the immediate critical needs, it is suggested that, as soon as possible, an Extension Agronomy Specialist (expatriate, see page 21) and a Plant Protection Scientist (expatriate) be added to the Maize and Food Legume Projects to strengthen and balance the program. Diseases, insects, and weed control problems are of such magnitude that it is important for the present Breeders and Agronomists to adequately cope with them. The addition of sorghum/millet crops to the Project adds further to the problem.

Although only a few candidates have returned from the training programs, the Team was favorably impressed with their overall performance. The research plots reflected good management and sound planning. The candidates reflected real interest and sincere dedication to their work. The Team believes that, if possible, the Contractor should select scientists (expatriates) that are more mature and possess considerable experience in their fields of specialization. The Team realizes that this is often difficult as many more new Ph.D. graduates are available as compared to those with experience.

Research Coordination

In July 1974, the MinAg completely revised its administration and research organizations. Previously each ARI conducted an independent research program. As a result of the reorganization, there is a National Research Crop Coordinating Committee for each crop. Each committee is composed of representatives from various agencies, such as Regional Offices, the University and TanGov Agricultural enterprises. Programs formulated by the crop coordinators of the National Coordinating Committees are those reviewed and sanctioned by the Director of Research of MinAg. Projects are designed by individual members of the National Crop Coordinating

Committees in close consultation with the Directors of ARIs at which the research work is to be conducted. The individual projects are integrated into the National Program by the Coordinators. Plans are made by the scientists who perform the work at each ARI with assistance by the Project Leader.

Even though an established mechanism is present for coordination of action and principles within and between research projects, it has not been fully implemented. For example, among some program leaders at the Ilonga ARI, coordination is often lacking in activities such as: use of facilities, travel, casual labor, etc. Visits made to the Ilonga ARI only once or twice a month by the Project Coordinator (Chief of Party), who is stationed at MinAg headquarters at Dar es Salaam, do not provide the administrative guidance necessary for effective integration of the Maize and Food Legume Research Project. The team suggests that the Production Economist to be stationed at Ilonga ARI should be recruited and selected with sufficient experience and training in administration to enable him to assume the added responsibility of Field Team Leader at Ilonga. The Field Team Leader along with the Director of Ilonga ARI would bring about more effective coordination and integration among the Project scientists.

In general only a limited amount of integration exists between the research enterprises of the MinAg, Faculty of Agriculture, Morogoro and Uyolet Agriculture Center. However, excellent cooperation exists between the Maize and Food Legume Project scientists, the Uyolet Agricultural Center, Mbeya, and the Tanganyika Wattle Company, Njombe. In fact, both of these organizations supply the land and casual labor without cost to the project. An excellent relationship exists between the Project Coordinator and the MinAg officials in regard to: (a) the future expansion of the cereal and food crop research activities, and (b) plans to meet Tanzanian food crop research requirements. For example, sorghums and millets have recently been added to the program and root crops and rice may soon be incorporated in the Research Project.

Budget disbursements at the ARIs are sometimes used for the production of crops rather than for the research enterprises. Allocation for research should be line-itemed by project and/or function to ensure the implementation of the research within the allotted funds.

The dissolution of the East African Agricultural Research Organization has stopped all cooperative research on maize and sorghum in Uganda, Kenya and Tanzania. This will weaken the maize and sorghum research program since it will no longer be possible to obtain and exchange superior germ-plans, new varieties and hybrids, and data from cooperative variety trails, etc.

Sorghum and millet are the most drought resistant crops and the most suitable for the lower rainfall areas of Tanzania. The recently approved sorghum research program should be fully implemented immediately since it will provide the most reliable source of grain foods in the lower rainfall areas, the most critical areas of food shortages during severe drought years. (See page 26 for details.)

Reporting of Research

The Team was often confronted with expressions of need for results of research in usable form for dissemination to village farmers. Although the transition from results of experimentation to farmer practice is always difficult in a developing country, there was wide-spread agreement that many Tanzanian farmers would adopt new practices if and when they were properly explained and demonstrated.

Those contacted were in general agreement that there is a real void between Research ARI staffs and the Regional District Agricultural Development Officers (Extension). This concern was expressed by those involved in research and by those responsible for extension programs.

Under the TanGov plan for decentralization, the Extension Service is administratively responsible to the Office of the Prime Minister and each RADO is administratively responsible to the Regional Development Director. Likewise, the DADO is responsible to the District Director. The extension organization has only a staff relationship to the MinAg and this is for technical assistance. There is an Extension Section within the Crop Development Division of the MinAg but it has little contact with the RADOs and DADOs. With Research Staffs under the MinAg and the Extension Service responsible to the Office of the Prime Minister, there is a lack of communication and coordination between these two organizations which are vital in bringing about change in agricultural production practices essential for increased food production.

Both organizations recognize there is a serious void between them and both are searching for a way to bridge the gap. Often research personnel have gone directly to the village and have completely by-passed the Extension personnel; thus Extension representatives are not informed and cannot support the research effort. A number of those contacted made reference to seminars and workshops which had been conducted by ARIs in the past years and all indicated an interest in having these training opportunities reinstated.

The Team saw few examples of extension-type publications. One exception was extension publications prepared by the Extension Division of the Uyolet Agricultural Center which are available to the RADOs and DADOs. This Division also conducted some training meetings for Extension personnel.

This cooperative effort needs to be extended on a national basis, but will be dependent upon the establishment of a unit responsible for the functions described for the Extension Agronomist Specialist position.

The National Maize Coordinating Committee has produced a Maize Production Hand Book for Extension personnel and maize producers which is a good beginning but it needs to be simplified to be adequately utilized by Extension personnel and especially by maize producers. For example, it would be much easier for farmers to understand fertilizer recommendations in terms of fertilizer amounts rather than in terms of actual nutrients contained in the fertilizer. Also many farmers probably would not have weights and measures which would enable them to follow the insecticide recommendations for stored grain. Simplified instructions which are easy for the Extension workers to understand and explain are essential for effective use.

The edible legume breeding and agronomic research unit has not developed extension-type publications to date. They recognize the need and indicated that upon completion of their third year of research effort in 1971 they would have information which would be sufficiently tested and would be developed into a handbook for release.

The Evaluation Team recognizes the importance of effective communication between Research staffs, Extension staffs and the farmers and has recommended the establishment of an Extension Agronomist Specialist (expatriate) with a minimum staff of four Tanzanians. The Team recommends

that this group be responsible to the Extension Section of the CDD of the MinAg and that they be stationed in Ilonga ARI. It would be the group's responsibility to keep in close communication with research personnel in order that it might know of research findings. The research results would then be adapted to farm conditions and demonstrated to Extension personnel and by them to farmers. Likewise, the Extension Agronomist Specialist unit would establish a close relationship with Extension personnel and through them would be well versed on the problems and research needs of the farmers they serve. This important relationship would enable them to relay these extension and farmer interests and needs to appropriate research personnel. Thus, with these individuals having specific responsibility for establishing and maintaining communication, the transfer of information from research files to actual farmer use would be greatly facilitated.

The Extension Agronomist Specialist would also be responsible for determining training needs of Extension personnel and would facilitate the planning and implementation of such training. He and his staff would identify publications, demonstrations and other teaching methods to be developed and made available to Extension personnel for their use in their education work with farmers. These materials would be discussed and developed with appropriate Research and Extension personnel so the Extension personnel would understand their purpose and feel adequate in their use.

The system of national coordinating committees has greatly facilitated communication among those directly involved with research programs, although there was some indication that the effectiveness of the committees varied and some operate in a perfunctory manner. One ARI Director reported official research reports required by the MinAg are three years behind schedule. These reports provide an analysis of the complete data obtained in a given year and become a part of the official research records of the Government. The Team wishes to emphasize the importance of bringing the reports up to date and keeping them timely. Timeliness of all reports is important to an effective program.

Facilities and staff necessary for publishing extension-type manuals were not available at the Ilonga ARI and are not available within the MinAg. The Team did observe some equipment at Katrin and Uyole ARIs. Elaborate equipment is not required at this stage of development, but it is essential

that a unit with extension responsibility have the capability to produce simple mimeograph and/or multigraph publications. The availability of funds for publications varied with the respective ARIs; however, the Team recommends the establishment of a budget for publications at the Ilonga ARI.

The Team visited a number of the village trials and was told how the trials serve to demonstrate improved practices to farmers and serve as a mechanism for obtaining feedback from farmers concerning their problems and research needs. The Team believes the village trials have an important research purpose but have little value in either disseminating information or securing farmer feedback. (See page 34.)

Continuity of Research and Funding Problems

Budgeting funds to adequately support research is a continuing problem in developing countries. The United Republic of Tanzania is faced with the problem of insufficient funds to support all recurrent expenses and to meet all development needs of the country. Often the return on funds invested in research is on a long term basis and thus there may be official questions from time to time concerning value received from funds invested. Although limitation of funds has reduced certain phases of the Research Project (e.g., number of village trials completed), the Team is confident the TanGov is determined to meet its national goal of self-sufficiency in the production of major food crops and thus is prepared to support research at an acceptable level. The Katrin ARI is one recent example of continued TanGov support after the withdrawal of donor support. This station was established and staffed with expatriates by West Germany; upon their withdrawal in 1976, the TanGov continued its support of the research program, although at a somewhat reduced level.

It is difficult to project what the future TanGov budgets for research will be. Bumper crops for a period of years which result in large surpluses of grain might conceivably make it politically impossible to gain approval for budgets necessary to maintain research programs at a high level. However, the Team was impressed with the expressed desire of the Minister of Agriculture and other high level officials of MinAg to develop and maintain a national research program which will help transform their subsistence

farming to a type of agriculture which will greatly contribute to their gross national product.

The physical research facilities at Ilonga ARI were probably the most inadequate of the ARI facilities visited by the Team. The TanGov has developed plans for greatly improving the land and facilities at Ilonga ARI and has approved a four-year plan for its completion. (See further discussion of the ARI development plans, page 37.) Completion of these facilities will greatly facilitate all research programs at Ilonga ARI.

Although the Team considered Ilonga ARI as a possible site for rice research, it is the Team's recommendation that the Katrin ARI be seriously considered as the Center for the rice research. The facilities at the Katrin ARI, the extent of present rice production and the potential for future expansion make it a logical location for rice research. (See page 37.)

Others

1. Progress on Recommendations Made by the 1976 Evaluation Team

The Team reviewed the ten recommendations of the May 1976 Evaluation Report in an effort to assess progress in the implementation of those recommendations. There was insufficient information concerning the status of training at the time of the previous evaluation to make comparisons between the situation as it existed then and as it is now. However, the Team found the TanGov, Research Project personnel, and USAID officials are working together to bring about improvements in the Project on a continuing basis. Areas where there is continuous effort and progress is evident are as follows:

- a. The development of Tanzanians capable of assuming responsibility for the research program.
- b. The improvement of physical facilities at the Ilonga ARI as evidenced by the development and approval of the four-year development plan.
- c. Continued research on the development of high lysine maize.
- d. Development and release of two short season maize varieties/hybrids especially adapted to areas of limited rainfall.
- e. Initiation of sorghum and millet research program with employment of the Sorghum Breeder, March 1978.

f. Addition of a Production Economist position to Project and recruitment for a qualified individual underway during past year.

Recommendations where this Team saw evidence of some progress with need for additional development were as follows:

a. Development of a statement of goals and objectives of the National Agricultural Research Program and each of its crop components.

b. Need for further development and implementation of the budgeting system and the administration of the budgets at the ARI level.

The only recommendation of the previous evaluation which has not been implemented is stated as follows:

Assume the responsibility for training extension trainers in the use of project outputs and provide the inputs, including an extension training specialists, to do it.

The present (1978) Evaluation Team has a recommendation designed to bridge the communication gap between Research and Extension which will also provide for the intent of the above recommendation. (See page 21.)

In addition a number of recommendations of this Evaluation Team are related to the recommendations of the 1976 Evaluation and serve to emphasize and build on those earlier recommendations.

2. Maize and Food Legume Project and the Small Farmer

Benefits to small farmers are evident as a result of the Maize Research Project. Visits to the seed farms and Tan Seed Company verified their production and distribution of recently developed maize varieties and hybrids. The development and release of the Maize Production Hand Book by the National Maize Coordinating Committee has greatly contributed to farmer utilization of information developed by the Maize Research Project.

Although there is evidence small farmers are adopting new varieties and improved cultural practices recommended in the Maize Production Hand Book, this evidence is either subjective or based on the assumption that, since newly developed varieties are distributed by Tan Seed Company, and that new varieties are ordered by RADOs for villages of their respective regions, then village farmers must be planting the new varieties. There were subjective reports, such as the observation of one District Planning Officer that the morale of Extension personnel within his district was improving since they were able to observe some change in farmer practices as a result of their efforts with the National Maize Program.

Research in maize and food legumes is utilizing the village trials as the method for checking the adaptability of their research to the various ecological areas and to small farmer conditions. (See page 34.)

The establishment of the Extension Agronomist Specialist position will make it possible to develop a program of simple farm demonstrations which will greatly strengthen the effort to adjust and adapt research findings to small farmer needs and to farmer field conditions.

3. Sorghum and Millet

Sorghum and millet are very drought resistant and are the most suitable crops for areas of lower rainfall and fertility. With superior varieties and improved agronomic practices they can provide the most reliable source of grain crop in the marginal agricultural areas, the most critical regions of food shortages during severe drought years. Sorghum and millet have been added recently to the Project. At present, the sorghum research is underway at ARIs at Ilonga, Ukiriguru and Mtwara. The present staff includes one Ph.D., one M.Sc., four B.Sc. (one in training), and eight with certificates or diplomas. Dr. Sam Mukuru, Plant Breeder, formerly with the sorghum program in Uganda is the coordinator. The Agronomist (expatriate) position for sorghums and millet is still unfilled. Other staff positions such as Plant Pathologist, and Entomologist, when available, are necessary to implement an effective program. Also, consideration should be given to coordinating the sorghum investigations of Ilonga ARI with those at the Faculty of Agriculture, Morogoro. In addition to the training of agricultural scientists, the Faculty could supervise, through graduate student thesis projects, research that would solve some agronomic, disease, insect and other problems of sorghum.

4. Soil Surveys

Soil surveys are necessary to make reliable recommendations for the use of the land, the application of improved agronomic practice and for general planning. Soils vary greatly in their characteristics as well as in their response to fertilizer, varieties, cultivation, drainage, irrigation, etc., and the National Soil Survey Project at Mlingano ARI, Tanga, is the headquarters for the soils work in Tanzania. Field experiments conducted on the soils located at the ARIs and substations reflect variations in soil type, texture, fertility, slope and drainage. Before permanent

field research plots are established, a detailed soil survey is essential to select the most desirable sites for experimental plots such as fertility adjustments, land leveling and provisions for drainage. Detailed soil surveys are not available for the land used for experimental purposes at the ARIs. The Team recommends that a detailed soil survey be made at each pertinent ARI and at their substations. It is suggested that funds be provided as soon as possible by the Contract for the services of a Soil Supervisor consultant (expatriate) to make a detailed soil survey map for each of the land sites used for experimental trials at the ARIs and substations where Project research is conducted.

C. MAIZE BREEDING AND AGRONOMY TECHNICAL EVALUATION

Objectives

The specific objectives of the maize breeding and agronomy program stated in the Contract between the International Institute of Tropical Agriculture (IITA) and the United States Agency for International Development (USAID) are:

1. Development of high yielding hybrids and varieties suitable for high, medium, low and coastal altitudes.
2. Development of improved maize agronomic practices for these major ecological areas of Tanzania.
3. Initiation of the testing of these varieties and practices in selected stations and farmers fields.

A more general objective is to provide assistance to the United Republic of Tanzania to strengthen the agricultural research program of the Ministry of Agriculture with initial emphasis on:

1. Budget preparation.
2. Project planning and evaluation.
3. Manpower recruitment, development and utilization.
4. Reporting and utilization of research findings and results.

Accomplishments

The maize research program was initiated in late 1973 with the arrival of the expatriate maize agronomist and breeder. The first agronomist was provided by the Ford Foundation for a period of two years, and after his departure there was no agronomist for about one and a half years. The maize program has nearly completed five years of active research. The experimental information and trials developed and/or completed during this relatively short period are very significant. The varieties and hybrids developed under the program have greatly improved the potential for yield increases for the farmers who have switched from the older traditional varieties to these recently released by the maize breeder. The maize agronomy program has provided the farmers with information relative to time of planting, fertilizer practices, insect and weed control measures.

As a result of the maize breeding program, Tuxpeno and H6302 have been developed, released, and seed is available to the farmers. Other varieties and hybrids listed below are improved selections of UCA and Katumana not yet released. A brief description of each follows:

1. Low elevation

a. Ilonga Composite A (ICA)

Heterozygous population, very tall stalk lodging susceptible to rust, good yield potential. Days to flower - 61.

b. Tuxpeno

Relatively uniform population of short stature, stiff stalks ear placement 1 to 1.2 meters, good yield potential. Moderate resistance to rust, moderately susceptible to *Fusarium* stalk rot under water logged conditions. Days to flower - 63.

2. Intermediate elevation

a. H632

Three-way cross of reasonable yield potential and stalk quality. High ear placement. Moderately resistant to *Helminthosporium turcicum*. Days to flower - 90.

b. H622

Double cross similar to H632, has three of the same inbreds for parents.

c. Ukiriguru Composite A (UCA)

Heterozygous population, very tall, moderately susceptible to *H. turcicum* and to rust. Days to flower - 90.

Note: Advanced selections are being tested which have better disease resistance, higher yield, and stalk quality equivalent to, or better than, H632.

3. High elevation

a. H613

Three-way hybrid which is very tall and has considerable stalk lodging. Not presently produced. Days to flower - 110.

b. H614

Three-way hybrid which is very tall, has considerable stalk lodging and yield potential similar to H613. The single

cross parent for this hybrid is a better producer of seed than the single cross for H613.

c. H6302

Three-way hybrid which is very tall, very good stalk quality, high yield potential, and good disease resistance. Days to flower - 110.

4. Early maturing

Katumani

Heterozygous, early maturing variety with reasonable resistance to H. turcicum and rust. Poor stalk quality, but reasonable yield potential. Days to flower - 40 (Ilonga); 50 (Njombe).

The final draft annual progress report for 1977 gives a clear indication that the maize breeding program is continuing at a very satisfactory level. Evidence of this was also seen during the Team's visit to the Agricultural Research Institutes (ARI's) and other test sites. For example, leaf streak in corn has become a relatively serious disease in certain areas, and significant progress is being made in developing maize varieties resistant/tolerant to the disease.

The maize agronomy program has been hampered somewhat by the lack of a maize agronomist from late 1975 until early 1977. However, through the assistance provided by the Contract maize breeder and the Tanzanian maize agronomist, the program was still carried out. In the areas of higher elevation and longer rainfall, the configuration of plant stands is not important as long as a density of 44,000 plants per hectare is maintained, and the application of nitrogen fertilizer has given both an economic and statistically significant response to yield. More trials are needed before recommendations can be made to the farmers. Weed control trials are being conducted to determine the effect of hand weeding versus the application of chemical herbicides on maize yields. Some of these trials need to be analyzed to determine which methods are economically sound.

Specific Evaluation of Maize Program

The scope of work for the evaluation of the Project specifically sets forth pertinent points to be evaluated and assessed. Where these are directly related to the maize breeding and agronomic programs, comments and/or recommendations have been made. (See Annex, page 59.)

1. Staffing

a. The present balance of staff and other resources provided by both IITA and the TanGov are in accord with the Contract. The TanGov should continue its efforts to supply recruits of high caliber to the research program in order to develop a cadre of trained research workers.

b. The progress made toward academic training is somewhat behind schedule. This often times is the result of an over zealous plan and not allowing for slippages which limit the number of personnel available for training. Every effort should be made to keep to the present training schedule and wherever possible send more students abroad for training by reducing the time between study grants.

The in-service training certainly appears to be adequate. Wherever the length of this training can be shortened or eliminated to afford a student the opportunity to take academic training, it should be.

The Tanzanians are being used to conduct on-going research under the supervision of the Contract staff, but there was little evidence of the Tanzanians conducting research on their own or carrying out experiments which they designed.

c. The Contractor was unable to supply a maize agronomist from late 1975 until early 1977. This placed a larger research load upon the breeder as he continued the agronomy trials to the best of his ability and available time. The present staff is well qualified to conduct the planned research program in maize. Like most developing countries, the Tanzanians feel that personnel with several years of experience would best fill their needs and the Contractor should keep this in mind.

A production economist has been under recruitment for about a year, but no candidate has been proposed. Inasmuch as this position was

given high priority at the time the Project was revised, the Contractor should provide a person for this position without much further delay.

d. During the initial phase of the maize program, heavy emphasis has been placed on breeding and agronomy which is rightly justified. However, as the program develops and expands further, other disciplines will become important. No doubt it will be necessary and advisable to plan for a multidiscipline program before it is too late. Therefore, it is deemed important to start training a staff of Tanzanians in several different disciplines such as entomology, plant pathology, plant physiology, weed control, agricultural mechanization, statistics, and soil science. A staff should be trained in these disciplines at least to the M.Sc. degree. It may not be necessary that all of them be assigned specifically to maize research, but at least there should be at least one trained in each of these disciplines to work on the major food crops of the country.

Diseases and insects are becoming more important as the project advances. Due consideration should be given to including an expatriate staff member trained in plant protection techniques. This expatriate could assist the breeders in maize, sorghum, legumes and millet and provide on-the-job training to the Tanzanian staff.

e. From observations and discussions it appears that the Tanzanian staff has a very definite potential for taking over and carrying out sound research programs. At the same time it must be realized that it takes several years to educate a person from the diploma level (two years of university training) to an M.Sc. or Ph.D. In some instances it appears that the Tanzanians could be given more responsibility than they now have and that they should be assigned specific research problems to carry out. By doing this, they will learn and at the same time gain confidence in conducting experiments.

2. Research Coordination

It should be noted that IITA is the prime contractor and provides the Project Coordinator and legume scientists. Subcontracts have been let with CIMMYT to supply the maize breeder and agronomist and with ICRISAT to

furnish the two sorghum/millet research workers. The linkage between the expatriate staff and these International Centers is good. Most of the Tanzanian staff members are given the opportunity of receiving in-service training at one of the International Centers, and undoubtedly this is an aid to establishing a relationship and knowledge of the Centers.

Maize composites and hybrids have been released and breeders/foundation seed made available to the four Tanzanian Seed Farms for multiplication and sale to the Tanzanian Seed Company. From observations and visits to these two latter organizations, it was determined that good working relationships exist and should continue.

The maize scientists attached to the Project have established a good rapport with faculties at Morogoro and Uyolet. The same is true for the Tan Wattle Co. where land, staff, labor, and inputs are made available without cost to the Project.

The IITA team, and maize research workers in particular, are making considerable progress toward the creation of a national research effort. The expatriate members must realize early on that this effort is a Tanzanian one and should turn over the planning and administrative functions to their Tanzanian counterparts in the very near future. This will give the Tanzanians the necessary experience and training in managing and operating the national programs. At the same time it will relieve the expatriate scientists of these responsibilities so that they can devote more of their time to research.

One of the principal objectives of the maize program is to develop composites/hybrids which are adapted to the various ecological zones of the country and at the same time have a high yield potential.

The newly established sorghum and millet program will eventually provide improved varieties/hybrids for those areas which are drier and less suitable for maize. Discussions and plans are under way to add rice to the Project which will add more diversity to the cereal production in the country.

Some of the TanGov officials have expressed a strong desire for more emphasis to be placed on the local development of hybrids rather than

rely solely on outside sources for inbred lines. It is a TanGov decision to establish such a program, and the development of inbred lines should be initiated now for it will take several years before a hybrid can be tested, released for seed production, and planted by farmers. At the time this decision is made, the staff available and required must be taken into full consideration. If the staff is limiting, as it is presently, a diminution or dilution effect on the present breeding program is likely to occur.

Hybrids may prove to have certain specific advantages over the composites, but it must be realized that for the farmers to take full advantage and make good use of hybrids that an effective and efficient extension service must be available and ready to demonstrate the advantages of the hybrid(s). The farmers must be made aware of the fact they must purchase new hybrid seed each planting season.

The seed production and distribution must be well established and operate effectively to provide this seed to the farmers. Since it costs more to produce hybrid seed maize than composites, the farmers must be convinced of its value and be willing and able to purchase it. The hybrids must have a net economic advantage over the composites or varieties.

The present balance between basic research (breeding), field testing (village trials), economic research and farming systems research appears to be skewed. For example, some of this is due to the lack of personnel, such as the production economist provided for in the Contract has not come on board. The research on breeding and farming systems is accomplishing a great deal given the constraints it faces.

Considerable emphasis, involving personnel, transportation and budgets is given to village trials. These trials are designed to generate appropriate data from which recommendations to farmers can be made. The trials are grown on fields associated with Ujamaa villages or primary schools. Thus, the data are collected from farmers' fields.

The three maize trials planted at one location are a variety trial, a fertilizer trial, and a management trial. A variety trial contains four or five commercially available varieties/hybrids plus the local check

which is often times an advanced generation hybrid. The fertilizer trial is a factorial or partial factorial encompassing combinations of nitrogen, phosphorous and potassium. The management trial contains weeding treatments, insecticide treatments and fertilizer. The results of these trials are analyzed statistically and used as a basis for making recommendations to the farmers.

To insure reliable data, an officer is assigned full time to manage the trials in an area. Experience has shown that a capable officer can handle between six and ten locations during the growing season. In order to do this the officer must have transport available on a regular basis. Since trials have to be visited weekly or bi-weekly, the only vehicle approach has been to assign a vehicle specifically for this task.

(The information in the above three paragraphs was taken from a mimeographed paper entitled "Village Trial Experience of Tanzanian Maize" Research Program by David Sperling.)

In the Project Plan of Work it is stated that "Much of this work (accumulation of data for making recommendations) was done in village trials which have an important demonstrational value along with being irrefutable evidence to the farmer that specific practices can be of value to him."

It is an illusion to believe that these trials, even though they have been termed simple, have much if any demonstrational value to the farmers. Even in countries where farmers are better trained and further advanced, trials of this sort in most instances are too complicated for the farmers to be able to observe the plots and them form valid conclusions. The design of the village trials no doubt provides significant information to the research worker, particularly after being statistically analyzed.

Time and again it was reported by TanGov officials that one of the major constraints was trained manpower; it seems that with this shortage and where one person can manage only from six to ten trials that at this juncture it would be wiser to use the limited available manpower for specific research than the village trials. In 1977, 47 maize village trials

were distributed and data were received from 26. This is 55 percent of those distributed. Low rainfall and poor maintenance and/or shortage of spare parts for the vehicles were given as the main causes of the failure of the trials.

Until all of the constraints can be removed or significantly decreased, the village trials program should not be increased and serious consideration should be given to its reduction in number by limiting the trials by planting them in only the major ecological and production areas.

3. Reporting of Research

a. The present method of obtaining feedback from farmers on production problems is very informal. Until an effective agricultural extension service is manned with trained personnel and established with linkages to the Agricultural Research Institutes, little in the way of two-way communications can be expected. Presently, the desires and needs of the farmers is made known by the research workers traveling throughout the country and having discussions with individual farmers, DADO's, and RADO's.

The establishment of a post for a subject matter specialist for the food research project at Ilonga would be a start in the proper direction. As the agricultural extension service staff becomes better established, serious consideration must be given to the development of subject matter specialists to be the connecting link between research and extension. This linkage must be set up in such a fashion so that research findings are presented to the farmers through the extension staff and the farmers must be able to present their needs to the research workers.

b. Considerable progress has been made in research administration and organization at the national level. The recruitment of Tanzanian manpower is proceeding as well as can be expected as the limited facilities, staff, and budget at the academic institutions prevent larger numbers of students. Many and most of the administrative and coordinating activities associated with the Project at the national level are being satisfactorily accomplished. The majority of the commodities to be purchased for the Project by the Contractor have been procured and are either at location or

have been ordered. The participant training program is fairly routine at this time but requires a continual effort by the Contract staff.

From observations and discussions during the Team's evaluation, it is apparent that the research staff is in need of more day-to-day leadership and coordination. It is recommended that the Production Economist, who is under recruitment for posting at Ilonga ARI, be selected with the additional qualifications and experience to enable him to also assume the role of the Field Team Leader. There are already seven established positions at Ilonga, and the Team is recommending an additional two expatriates, making a possible total of nine scientists. The Field Team Leader should have an agricultural/production economist as his professional counterpart and the Director of the Ilonga ARI as his administrative counterpart.

c. It is understood that plans have been approved and funds available to improve the physical research facilities at the Ilonga ARI. These plans include the leveling and provision for irrigation of about 80 hectares. Once these improvements are completed, the Ilonga station should be better suited for research on upland crops. Irrigation will provide the means to carry out research through the calendar year.

If it is determined that rice will be included as another of the food crops under the Project, due consideration should be given to conducting this research at the Katrin Station. Some of the best equipment and facilities of the Tanzanian ARIs for crop research, and especially rice, are now available there. Furthermore, it is located in a valley where rice appears to have a large potential for expanded production. It is readily realized that Katrin is somewhat isolated but not appreciably greater than Ilonga. There is a nucleus staff already at the station which could inaugurate a research program with some outside assistance and increased budgeting support.

4. Progress and Implementation

a. The Team observed many farmers' fields of maize during its 19-day field trip. It is very apparent from discussions with the Tanzanians

that the benefits of maize research is directly benefiting the small farmer. This was particularly evident from visits to the Seed Farms and Seed Company which produce and market the recently developed maize varieties and hybrids. Many of the farmers are practicing planting maize in rows and at the near recommended plant densities.

b. From discussions with the Tanzanians and expatriates at the Seed Farms, it was determined that the research staff was providing seed of improved varieties/hybrids of maize for multiplication. This may not have been the case during the initial stages of the establishment of the Seed Farms before the research on maize was undertaken.

c. Improved production packages have been developed through applied research and the village trials. This information is available in the publication prepared by the National Maize Coordinating Committee. An increase in the extension service staff and the provision of transport would greatly enhance the maize production program at the farmers' level.

d. The research programs on both maize and food legumes is definitely responding to the farmers' practice of multi- or inter-cropping. The agronomic village trials clearly show the results of the efforts of the research staff. No doubt these need to be continued, refined, and expanded as staff and more funds become available.

Summary

1. Staffing

Throughout Tanzania it was the Team's experience to find that trained manpower is the major constraint to productive research. It will take several years to train and develop a cadre of research personnel who can effectively carry out an agricultural research program and more specifically for good crops. A temporary solution to this shortage is to hire qualified expatriates and have them assist in bridging the gap until Tanzanians can be properly trained and have gained the necessary experience. However, it is only through academic training and further experience either within the country or abroad that this obstacle to the manpower

shortage in general and more specifically to the constraint in agricultural research can be overcome. The most unfortunate part is that it takes several years of scholastic work to adequately train research workers.

The Tanzanian Government is fortunate in that the Project has addressed this shortage of trained scientists in two different ways. One is by providing in-service training as well as both undergraduate and graduate degree training. This portion of the Project is meeting its goals fairly well but needs continuous monitoring to take advantage of all opportunities.

The second way of alleviating this shortage is through the Contractor's scientific staff who is filling the gap. There have been and still are vacancies of staff to be provided by the Contractor. It is realized that it is somewhat difficult to recruit and hire qualified expatriate research workers, but the Contractor has assumed this responsibility and should make a determined effort to fill the two vacant positions as quickly as possible.

The development of a national coordinated research program in maize is the responsibility of the Maize Research Project. An annual meeting is held to prepare a program of work by the maize coordinating committee. Presently, breeding and production agronomy comprise the two sections of the program.

The breeding section is involved in improving and testing varieties as well as supplying seed farms with adequate quantities of breeder seed. One of the major problems of variety improvement is increasing resistance to local diseases and this is being solved satisfactorily.

The production agronomy section is responsible for developing an economical package of practices that can be recommended to maize producers. A package is recommended for an ecological area only after the village trials have been grown in that area at a number of locations for at least three years and proven to be significantly better. The packages now contain recommendations for insecticide and fertilizer rates and weed control.

The project has so far emphasized breeding and agronomy. There is already evidence for the need for expertise in other disciplines. A production economist is under recruitment by the Contractor. Other disciplines such as plant pathology and entomology need to be included in the research program and require the services of an expatriate plant protection specialist. In the very near future it can be expected that problems will arise which call for applied research in other disciplines. It is time now to begin to train a team of scientists of the interrelated disciplines so that these respective areas of research can be undertaken.

2. Research Coordination

Provision is made in the Contract for assistance in research planning and administration at the national level through the services of the Project Coordinator. He is the link between the Ministry of Agriculture and the expatriate research staff at the Ilonga ARI. Better staff coordination would result in posting a Field Team Leader at Ilonga where he could be of greater assistance to the research team by working with them on a daily basis. The Field Team Leader's major concern at this juncture should be to coordinate the efforts of the expatriate research staff and this can be done only through a close working relationship and frequent discussions. He could also relieve the team of some of its administrative duties which detract from the efficiency and effectiveness of the research workers. It is recommended that the Production Economist to be posted at Ilonga be selected with additional qualifications and experience suitable for him to also be the Field Team Leader.

The Contract team has made significant strides toward the development of a national research effort. For example, the expatriate maize breeder now serves as the Chairman of the National Maize Research Program and is to be commended for the job he has done. At the earliest time feasible these responsibilities should be turned over to a Tanzanian who could gain experience and training in this position from the expatriate.

The research results on maize breeding and production agronomy have without question been of significant importance in increasing productivity of the crop. The release of one composite and one hybrid and

improvement of two previously released composites during the first five years is truly a mark of accomplishment. The maize technical production package developed by the agronomist is an achievement which will greatly benefit the small farmers. All of this research needs to be continued and refined.

The Ministry of Agriculture has made a policy decision that greater emphasis should be placed on a hybrid maize program, and it is the duty of the breeder to carry out this decision. Those responsible for this decision must realize that with the current shortage of trained manpower that it may have a diminution effect on the present breeding program for developing composites. They are cognizant of the ramifications of seed production, distribution, and extension of knowledge of hybrid production both on the seed farms and farmers' fields.

One of the major thrusts of the maize program is the carrying out of village trials on varieties, fertilizer, and management. Considerable effort and manpower are required each season for these trials. They are planted in the various ecological zones of Tanzania and serve as a means of verifying the research results obtained at the ARI's and AES's. With the present budget restrictions and manpower constraints, the number of these trials should be kept at an operational minimum but still in sufficient numbers to cover the ecological conditions in the major maize producing areas.

3. Reporting

The annual reports prepared for maize breeding and agronomic production have been timely and presented the research results in a satisfactory manner. They have been used as means of providing the research data to the annual meeting of the maize research coordinating committee.

At this annual meeting a program of work is developed for the following planting season. By the addition of a subject matter specialist, either expatriate or Tanzanian, greater feedback from the farmers to the committee could take place. The scarcity of extension workers also makes this feedback more difficult.

4. Project Implementation

During the five operational years of the Project, nine maize varieties/hybrids have been released for multiplication and distribution to the farmers. Seed of these have been increased and sold to the Tan Seed Company for further sale to interested farmers. The linkages between the breeder, seed farms, and seed company appear to be well established and functioning as planned.

The agronomists have developed a technical production package for the maize producers. Those farmers who have adopted these practices are able to significantly increase their production.

The maize agronomists have been working on multi-cropping systems which have provided the farmers with the research information on fertilizer, plant densities, insecticide and weed control measures and practices. These have significantly increased the yields of the traditional farmers who have carried them out in their fields.

There are plans and funds to improve the physical plant and experimental plot areas of the Ilonga ARI. Once these improvements are made, the research can be expanded on the irrigated areas and the office, laboratory and workshops areas will greatly facilitate the research and day-to-day operations. Emphasis should be made on making these improvements as soon as possible.

The Ministry of Agriculture has proposed that research on rice be included in the Project as soon as funds can be made available. When the facilities at the Katrin ARI and the nearness of this station to a large potential rice production are compared relatively to other possible sites, it is recommended that Katrin be selected as the station for rice research.

D. FOOD LEGUMES AND AGRONOMY EVALUATION*

Introductory

After meeting with USAID officials, the US Ambassador, and officials of the Ministry of Agriculture during the period of June 19-22, 1978, the Evaluation Team visited various ARIs and their substations, seed farms, TAN Seed Company and consulted with RADOs and DADO in the Southwest and Northwest areas of Tanzania. This tour lasted from the 22d of June through July 9, 1978. John Samki, Director of the Mlingano ARI, accompanied our team and was most helpful in arranging for meetings and staff at all locations. Paul Duffield, Project Coordinator, and Bill Jadwin and Bob Gilson from USAID/Dar es Salaam accompanied us on different segments of the tour. David Sperling, Project Maize Breeder, was with the team the first fifteen days of the tour, and Frank Brockman, Legume Agronomist, was with the team the final three days.

1. Ilonga ARI: Frank Brockman, Legume Agronomist, and Prabodh Patel, Legume Breeder.

Cowpeas. Expect disease-resistant high-yield variety by the end of the 1979 season. Variety SVS-3 has a virus but is a superior cowpea at most locations. This variety will not be released to seed farms.

Green Grams (Mungbean). A selection of green grams will be released as a variety in 1979 and will be named NURU (Tvau 81). Foundation seed is being multiplied and certified seed is being produced this year at the National Seed Farm.

Soybeans. Bossier variety has proven superior at all stations where tested and has been released to seed farms for increase. Other introductions at Lyamungo and Mlingano locations look as good or better to this reviewer. One or more superior varieties should result from further testing.

Phaseolus. Beans - Canadian Wonder (a red kidney bean type) is being increased at Arusha and other locations. At most locations this is a superior bean and is preferred by Tanzanians as a food. A blackbean

* Edited by the Evaluation Team.

variety has greatly outyielded the Canadian Wonder but most Tanzanians do not relish this bean. The breeder will make crosses to try to change the seed coat color, but this will take several seasons.

Pigeon Peas. Very little research has been done on this crop, but they have assembled a germ-plasm collection. Research on this crop should be expanded as it is quite drought tolerant. Interplanting pigeon peas with maize has proven successful.

Chickpea. Shows promise at Uyole ARI, and if it can be successfully grown, it will have potential as a cash crop as well as an excellent food.

Germplasm collection and evaluation is being carried out with cow peas, green grams, soy beans, phaseolus and pigeon peas.

Crossing Program. Cowpea crossing has been under way for several years; a program of crossing phaseolus is just getting started. Research should be intensified on the phaseolus (bean) since it is the most important food legume in Tanzania.

2. Statement

1977 was the second full season for food legume research. A cholera outbreak essentially halted the movement of people; therefore trials were limited in 1978. Some research vehicles were temporarily confiscated to help control the disease problem.

Problems. Dr. Frank Brockman, Legume Agronomist, is leaving Tanzania within the next two months and no immediate replacement is in sight. This will limit the agronomic legume research in 1979 unless an experienced legume researcher can be secured. Tanzania in-training will do some research but will require guidance. An all-out effort should be made to replace Brockman before the fall. Dr. Patel's (the Legume Breeder) contract terminates in 1979. His intentions to continue should be determined soon in order that a replacement might be secured, preferably before Patel leaves. The breeding program in legumes is more complicated; therefore an on-site discussion and exchange of information with a replacement is needed before Patel leaves.

The formal degree program in legume breeding and agronomy and on-the-job training in legume variety, fertilizer, intercropping and interplanting trials should be pushed more vigorously so Tanzanian specialists can take over upon the termination of the Research Project.

Weeds. Utilization of chemical weed control to reduce the need for hand weeding requires a trained expert; therefore, proper training of one or more of Tanzanians as Weed Specialists should be considered. In many areas of Tanzania weeds are considered to be a number one problem.

Insects. A Plant Protection Specialist trained in entomology and plant pathology is of great importance in any effort to improve the production of food legumes in Tanzania. Insects, such as stink bugs and aphids, do major damage to legumes, and presently there is not an insecticide which provides adequate control.

Irrigation. With drought always a hazard, supplemental water should be considered where feasible. Hydraulic rams might be utilized to lift water from rivers and streams to elevations necessary for the water to be utilized for surface irrigation. Hydraulic rams utilize the flow of water as the source of power. No supplemental power source is required for their operation.

Phaseolus Recommendations

Since beans are the number one food legume and the Lambo Estate near the Lyamungu ARI would provide an excellent location to conduct research on the legumes, the team recommends that a substation be established there for research on phaseolus and cowpeas. An expatriate Legume Breeder Agronomist stationed at the Lambo site is suggested.

Seed Introduced into Tanzania

On 20 June 1978 the following varieties of peanut and soybean seed were turned over to Frank Brockman, Legume Agronomist:

Peanut seed: Early Bunch, Altivia, Florispan, NC-Fla 14, Florunner.

Soybean seed: UFVI, Santa Rose, Jupiter, Vicoja, Cobb, Mineira.

The Jupiter and Cobb soybean varieties are already in trials in Tanzania.

Some of the peanut and soybean varieties were developed at Florida specifically for countries in South American near the equator and may do well in Tanzania. Numerous circulars and bulletins from the Florida Agricultural Experiment Station pertaining to soybeans, peanuts, cowpeas, pigeon peas, sunflowers and kenaf were also given to Dr. Brockman. Perhaps some of these will prove useful to Tanzanian agriculture.

Evaluation of Work

Progress has been slow but steady in developing adapted varieties and in increasing yields of cowpeas, green grams, phaseolus and soybeans. Continued progress will be dependent on the availability of trained agronomists in production and breeding during the next three to four years.

The training of Tanzanians is proceeding but should be speeded up. The expatriate scientists provided are of high quality; however, all positions have not been filled, and now some of the scientists are leaving and replacements have not been selected.

Delivery of equipment, supplies, transport, etc., has been slow.

The food legume research is slightly behind predicted schedule but is making progress.

The preceding problems or situations are in no way the fault of AID/DAR as delays are usually present in the development of a new project.

Scope of Work (see Annex)

1. General

a. The food legume phase of this project supports all legume research. Duplication by IITA, NORDIC, TanGov, FAO, and other agencies is not in evidence, and all researchers are cooperative.

b. The most serious constraints to project development are insufficient funds, lack of transportation, and inadequate maintenance of vehicles and equipment. Some ARI's and seed farms, such as those at Katrin, Uyole, Arusha Seed Farm, Lyamungu and Mlingano, have better facilities than at Ilonga.

c. As of now there is little evidence of a transfer of legume research responsibility to the Tanzania staff. Expatriates in legume

research should increase their efforts to provide training for the Tanzanian staff.

2. Specific

Legume breeding and Agronomic Programs: The legume phase is in its third year and is not as far along as the maize program. Some farmers are accepting some of the better cowpeas, green grams, and phaseolum, and this is particularly true of the Canadian Wonder bean. Soybeans are grown at few locations, but there is some interest in their use as feed for poultry and swine. Sweet lupines are also under investigation.

a. Staffing

(1) IITA furnishes much of the training for the technical staff on the project. In 1977 four Tanzanians were in the degree program and in 1978 six are studying for degrees while two are in-service training in the legume program. One legume specialist completes his contract and plans to leave in August and the other, an Indian, probably will leave in August 1979.

(2) Academic training has been slow. More capable Tanzanian technicians should be sent off to college for B.Sc. and M.Sc. degrees. Those going for an M.Sc. degree should be allowed to continue for the Ph.D. degree instead of returning to Tanzania for two years of work. At least two Tanzanians should be going for a Ph.D. in crop breeding and legume agronomy. There has been too much turnover in expatriate personnel for best results.

(3) The Contractor has been having difficulty in recruiting competent scientists to staff the food legume positions in the Project. The maize and food Legume Research Project provides for eight positions but presently there are six employed.

(4) Future personnel requirements: Need replacement for Brockman, Legume Breeder Agronomist, immediately. May need replacement for Patel, a Legume Breeder Agronomist, mid-1979 should Patel plan to leave at the end of his contract. Need Tanzanian in formal program of training for the Ph.D. degree.

Presently a young lady with a B.Sc. degree, Miss Taeali A. Masha, is working in legume agronomy and should be encouraged to continue her education and work toward an M.Sc. with some training in entomology. A young man, Mr. Furah F. A. Mbowe, also in legume agronomy plans to enroll at Kansas State University this year and work toward an M.Sc. degree.

(5) Tanzania nationals with an aptitude for study and research should be encouraged to go for advance degrees. The expatriates who observe these nationals on a daily basis should be qualified to recommend those who should go for further training.

b. Research Coordination

(1) The food legume research must be pursued, but in addition the sorghum-millet field needs more staffing; these two crops will enter directly into the food chain and in years of drought will be a mainstay.

(2) IITA, TanGov and other organizations are working together toward the same goal.

(3) The food legume researchers plan to publish a legume handbook at the end of the 1978 season. Publishing of this handbook should receive top priority.

(4) The diversity of crops and improved varieties being developed by the Project should help avert serious food shortages in case of drought. Sorghum, millet and pigeon peas are all drought-resistant crops and can produce grain in a minimum period of time.

(5) Basic research (breeding), field testing and village trials are progressing in normal fashion. Economic research is practically non-existent. Farming systems, such as intercropping and rotations, are getting more study with encouraging results.

(6) It would be difficult for the TanGov and international institutes to continue as they are now if USAID participation is withdrawn. The linkages are strong but can be improved.

c. Reporting of Research

(1) There is a need for more feedback from farmers on production problems. Extension-type education and characterizing of farmers' problems are needed; feedback is minimal at this time.

(2) There is normal progress in research administration; however, Tanzanians should be encouraged to take over responsibility for day to day operations, funds, supplies, repairs, etc. This would provide them with needed experience and would relieve the researcher of these duties so they could devote more time to training their Tanzanian colleagues.

More mimeograph, Xerox, leaflet and/or handbook publications should be provided with recommendations on varieties, fertilizers, dates of planting, spacing, seed treatment, insecticides, herbicides, crop rotation, etc. Some of these should be printed each season (timely) for distribution to all RADOs, DADOs, village extension workers and interested farmers. The Maize and Legume Research Coordinating Committee meets several times a year and is responsible for operation of the National Research Program.

There should be line-item financing in ARI budgets for legume research to be conducted by the ARI so they can properly plan and conduct the research on legumes.

d. Continuity of Research and Funding Problems

The Ilonga ARI's research facilities need improvement. A four-year development plan has been approved and is scheduled to begin this year. Facilities for processing seeds are very poor, equipment is not too plentiful and needs upkeep or repair. Researchers feel they need two pickup trucks for transportation and for moving seed varieties from field to processing station. A number of other ARIs have better facilities than that at Ilonga. More spare parts should be on hand (stockroom), and equipment should be kept in better repair. The guest house mentioned in several previous reports has not been completed.

Future expansion of root crop and rice research could be done at Ilonga ARI as they have sufficient land area; however, the Evaluation Team feels the Katrin ARI has excellent facilities and is located in the major

rice production area. The soil and water situation at Katrin is superior to that at Ilonga. Root crops could be at either station.

e. Other

(1) Considerable progress has been made since the last consultants' recommendations were made. There is little progress in improving the buildings and equipment. There is evidence the small farmer is benefiting. Maintenance of equipment and grounds need improvement.

(2) Three improved varieties of legumes have been released to seed farms.

The Canadian Wonder bean - Arusha Seed Farm

A new Green Gram 'NURU' - Msimba Seed Farm

Bossier soybean - Msimba Seed Farm

(3) Improved production packages for food legumes are at hand; however, printed instructions or details are not available. Plans are to print a legume handbook this year. Production of practices for each crop should be processed as soon as possible.

(4) Farmers are adopting new varieties and practices. This is primarily due to improved varieties distributed by seed farms. Extension is weak.

(5) The research program is responding to farmer needs and improving on the multi-cropping patterns used by them. Both multi- and inter-cropping and combinations thereof are being developed.

(6) Phaseolus (bean) breeding should be located at the Lyamungu if a substation can be developed on the Lambo Estate. This appears to be an ideal location to breed the phaseolus as well as soybeans and cow-peas. Soil and climatic conditions at the Lambo Estate are better for these crops than those at Ilonga. Both expatriates should be legume breeder agronomists and do both breeding and agronomy research and train their national counterparts to do the same.

Food Legume Situation

The 1977 report on maize and legume research has been prepared but is not yet in print. Legume research, particularly off-station village

trials, was greatly reduced for 1978 because of the cholera epidemic. Vehicles are sequestered and people were limited in moving about the country. Three years results will be available for the legume agronomic trials when the 1978 data are collected and analyzed. Plans are under way to prepare in 1978 an extension-type publication that will make recommendations on dates and rates of seeding, spacings, fertilizers, inter-cropping, etc., for the legume crops.

1. Breeding/Pathology Section

This work is headed by IITA expatriate Pradodh N. Patel with Tanzanians Henry K. Leyna, Catherine A. Kuwite, and E. Marengé at Ilonga ATI. Margaret M. Mkuchu is at Uyole ARI; Epimaki M. K. Koinange at Lyamunga ARI, and Catherine S. Muhalet is away in degree training. These Tanzanians make a good group to carry on legume breeding and related pathology.

The objectives of this section are to identify high-yielding, varied genotypes of cowpea, phaseolus beans, soybeans and green grams by testing at a number of sites; and to stabilize yields through breeding against stress factors such as pests and diseases, identify sources of resistance and incorporate them in the breeding program.

2. Recommendations for Breeding/Pathology

a. Divert most of the research effort presently expended on cowpeas to the phaseolus (bean) as this is considered the most important food legume crop in Tanzania.

(1) Select higher-yielding disease-free red beans from Canadian Wonder and other introduced material.

(2) By crossing, change blackbean seed coat to red, yellow or white. Most Tanzanians do not like to eat black beans; however, at most locations black beans produce much higher yields than red or other colored beans. Black beans may yield 3000-4000 Kg/ha compared to a yield of 1200-1700 Kg/ha for Canadian Wonder.

b. Put more emphasis on training Tanzanian nationals so they can assume responsibilities for the legume research program.

c. Cowpeas will probably never be as important to the Tanzanian diet as the phaseolus bean, so spend less time on cowpeas. There are already many types of cowpeas adapted for home use.

d. Work more closely with legume agronomist and maize agronomist.

Agronomy Section

The agronomy subprogram is headed by IITA expatriate Frank E. Brockman with Tanzanians Mgheni E. T. Mmbaga, Furah F. A. Mbowe, Joseph K. Mligo, Tuaeeli A. Masha, P. M. Mapema, and N. S. Mwangosi, all at Ilonga ARI. C. M. Mayona is at the agriculture research center at Nyole. Ramadhani I. Chambuya and Epimaki M. K. Koinange are at Lyamungu ARI; Juhudi Y. Chambi at Naliendeie; Alphonse M. K. Mhoja at Ukiliguru ARI; and Mary Mgonja and Imelda J. Ndamugoha at Maruku; Fred Z. Machange, Joseph A. Asenga and Anderson E. M. Temu are in degree training. These Tanzanians make a good group to carry on agronomy research with legumes necessary for the development of a production package handbook which contains recommendations for extension and their use in working with village farmers.

The objectives of this section are to:

1. Identify critical management factors.
2. Develop practical and economical practices for growing grain legumes.
3. Develop and refine production practices for grain legume crops.
4. Prepare a production handbook for extension and grain legume producers.

In 1977 agronomic legume experiments were conducted at Ilonga ARI, eleven other research stations, and at 30 village trials.

Recommendations for Legume Agronomy

1. Put out fewer village trials and collect more data from those planted. Do not plant more than can be supervised.
2. Spend less time with cowpeas and put more effort on phaseolus beans, the most important food legume in Tanzania.
3. Place Tanzanian nationals in charge of some plots to get training so they can take over at the end of the project. (Note: Brockman

leaves in a few weeks and no replacement is in sight.) I doubt enough responsibility has been placed on the nationals up to now to supply leadership.

4. Pigeon pea management, such as cutting off plants when 18-24 inches in height back to 12-18 inches to cause branching and heavy fruiting and other management practices, should be investigated.

5. Print handbook on legume agronomic practices for extension and small farmer use.

6. Work more closely with legume breeder and maize agronomist.

7. Tanzanian staff should be trained as soon as possible to undertake the agronomic trials for the food legume crops. In the meantime the legume breeder/agronomist at Lyamungo should assume the responsibility of the legume agronomic trials.

The Evaluation Team recommends the legume agronomist position be filled with a second legume breeder/agronomist. One of the legume breeder/agronomists would be stationed at the Lambo Estate if it is developed on a substation of the Lyamungo ARI. The legume breeder/agronomist at the Lambo station would be charged first with breeding phaseolus (beans) for increased yield and disease resistance and then research on other crops, such as soybeans and cowpeas, would follow. Both breeders would take the responsibility of directing Nationals in fertilizer, variety, management, weed and insect control experiments.

ACRONYMS

AID	Agency for International Development
ARI	Agricultural Research Institutes
CDD	Crops Development Division
CIMMYT	International Maize and Wheat Improvement Center
DADO	District Agricultural Development Officers
IBRD	International Bank for Reconstruction and Development (World Bank)
ICRISAT	International Crop Research Institute for the Semi-Arid and Tropics
IITA	International Institute of Tropical Agriculture
KILIMO	Ministry of Agriculture (Swahili)
MATIs	Ministry of Agriculture Training Institutes
MinAg	Ministry of Agriculture
NARS	National Agricultural Research Systems
PAR	Project Appraisal Report
PP	Project Paper (an AID project proposal)
RADO	Regional Agricultural Development Officers
TanGov	Government of United Republic of Tanzania
USAID	United States Mission to Tanzania

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Annex

SCOPE OF WORK OF EVALUATION

GENERAL OBJECTIVES

Reassess in light of present economic circumstances and the agricultural production situation within Tanzania, and progress to date, the goal and purposes of the Tanzanian Agriculture Research Project, i.e., to train Tanzanians to staff and maintain an ongoing research program and to provide expatriate scientists, commodities and other cost support necessary for the design, initiation and development of an agriculture research program.

Examine the relationship of the Project and other USAID and other donor, or Tanzanian undertakings to determine the extent to which the Project reinforces, duplicates, or is coordinated with other efforts and is consistent with overall Tanzania agriculture sector objectives.

Examine the constraints to project development and the interrelationships with other organizations necessary to successful comprehensive development.

Validate the design and the structure of the project as formulated in Revision No. 1 to the Project Paper, with respect to internal consistency, adequacy of resources in relation to requirements, effectiveness of the project in reaching objectives at the output, purpose and goal levels.

Evaluate the performance individually of major project agents, i.e., contractors, TanGov and USAID.

Analyze the effectiveness of each of the major project agents in moving toward expected results of the project components, the most important being whether there is a transfer of research capability to the Tanzanian staff.

SPECIFIC TASKS OF TEAMS

Assess and examine the three aspects of research operations, including: maize breeding and agronomic programs, legumes breeding and agronomic programs and verification of results at the farm level.

Staffing

1. Assess the present balance of staff and other resources provided by both International Institute of Tropical Agriculture (IITA) and the TanGov.

2. Assess progress made toward academic and in-service training and in using Tanzanians to conduct on-going research.

3. Assess contractor ability to supply high quality staff on time and with proper qualifications. Make recommendations, if any.

4. Review projected future personnel requirements, both expatriate and national, needed to reach project objectives. Recommend types of personnel, background, and training required.

5. Evaluate the type and quality of academic training of Tanzanian nationals in light of present and future research needs. Recommend changes, if any.

6. Assess evidence that Tanzania staff has capability and is gaining capability to take over specific tasks (examine each job held by an American).

Research Coordination

1. Examine current organization and planned expansion of the project. Determine the proper scope and direction to meet Tanzanian food crop research requirements.

2. Examine the linkages between IITA, other organizations and TanGov and assess the adequacy of need for reinforcement.

3. Assess progress being made by the IITA team toward the creation of a "national" research effort for maize and food legumes.

4. Assess project objectives in relation to recent Tanzanian experiences with food shortages and the need to stress such factors as drought resistant varieties; make recommendations.

5. Examine the present balance between basic research (breeding) field testing, economic research and farming systems research.

6. Assess evidence of permanent linkages between TanGov and the international institutes and evaluate the changes that these relations will continue after USAID participation is withdrawn.

Reporting of Research

1. Examine the effectiveness of present methods of obtaining feedback from farmers on production problems.

2. Examine progress made in research administration, organization, and the establishment of effective information flows, publishing reports and budgeting adequate funds for same.

Continuity of Research and Funding Problems

1. Assess current and future TanGov budgets in relation to the ability of TanGov to assume full fiscal responsibility and support for personnel, equipment and project operations upon phase-out of USAID support.

2. Examine the physical research facilities, equipment and land at Ilonga research station to determine suitability for current project activities and possible future expansion into root crop and rice research. If Ilonga is not deemed suitable, tentative recommendation should be made for alternative sites. Comment on future budget requirements.

Other

1. Assess progress of the project toward implementation of past evaluation and consultants' recommendations. Determine if any evidence exists to show that the project is directly benefiting the small farmer.

2. Determine progress made in supplying improved varieties to the seed farms.

3. Determine progress in development of improved production packages for each crop.

4. Determine progress made with regard to farmers adopting new varieties and assess the effectiveness of methods used to measure adaptation.

5. Determine if the research program is responding to farmer needs vis-à-vis the multicropping pattern presently in practice by them.