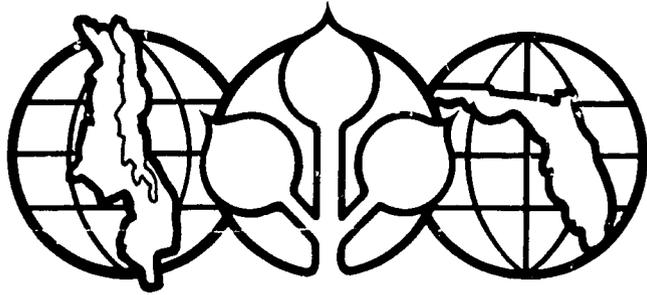


10-111-683 53
410000



Malawi Agricultural Research Project

Center for Tropical Agriculture
International Programs
Institute of Food and Agricultural Sciences
University of Florida

The Department of Agricultural Research
Ministry of Agriculture, Malawi

The U.S. Agency for International
Development

PD-AAR-673

12/1/80

QUARTERLY REPORT

October, November and December

1982

Project No. AFR 06 612-0202

Contract No. AID/afr-C-1653 (Malawi)

MP - 10

Table of Contents

I. INTRODUCTION.....	1
II. HIGHLIGHTS.....	1
III. TRAINING	
A. Participant Training.....	4
B. In-service Training	5
IV. RESEARCH	
A. Agricultural Economics.....	7
B. Farming Systems	8
C. Livestock/Pastures	9
D. Plant Breeding/Agronomy	10
V. TRAVEL AND MEETINGS	12
A. Gray	13
B. Hansen	13
C. Hodges	15
D. McCloud	15
E. Pasicy	15
F. Pervis	17
VI. SHORT-TERM TECHNICAL ASSISTANCE	17
VII. ADMINISTRATION	18
VIII. FINANCIAL.....	20
IX. PUBLICATIONS AND REPORTS	22
X. APPENDICES.....	23

List of Figures

Figure 1. Malawi Agricultural Research Project Inputs.....	3
--	---

List of Tables

Table 1. Participant Training Quarterly Report.....	4
Table 2. USAID Project Vehicle Miles.....	12
Table 3. Transactions University of Florida-IFAS Local Account.....	20
Table 4. Summary of Expenditures for the University of Florida-IFAS Local Account.....	22

I. INTRODUCTION

The University of Florida (UF) technical assistance team is in Malawi as part of the Malawi Agricultural Research Project, Af. 06 612-0202, the purpose of which is to strengthen the Department of Agricultural Research (DAR) of the Ministry of Agriculture (MOA). The project is funded by the United States Agency for International Development (USAID) and the Malawi Government (GOM). The University of Florida is administering the project as the Title XII contracting institution.

This, the tenth quarterly report, covers the third quarter of the Malawi 1982-83 fiscal year, October - December 1982.

II. HIGHLIGHTS

Research coordination and research-extension liaison are major concerns of the Malawi Agricultural Research Project. Three specific areas were worked on during the quarter: 1) the proposed restructuring of DAR, 2) modification of the farming systems/adaptive research effort and 3) improvement of linkages between DAR and Extension and Evaluation. Dr. R. C. Gray was appointed a member of the reorganization Steering Committee and Dr. S. F. Pasley was appointed to serve as a member of the Local Preparation Team.

Research coordination advanced based around use of the Apple II computers and project expertise in data analysis. Research and evaluation staff of Lilongwe Agricultural Development Division (LWADD), Lilongwe Agricultural Development Division (LADD) and the Agro-Economic Surveys came to Chitedze during the quarter to discuss their utilization of project computers under technical assistance team guidance, and the LWADD researcher spent more than a week at Chitedze entering 1981-82 trial data under the supervision of the Agricultural Economist. The Planning Division of the Ministry of Agriculture plans to bring an entire workshop of Ministry and Agricultural Development Division (ADD) administrators and staff to Chitedze in January for a demonstration of project computer capabilities.

Five new Professional Officers and three Technical Officers were hired in the Agricultural Economics, Farming Systems, Groundnut, Livestock/Pastures and Wheat Sections during the quarter. This increase in staff represents a solid GOM commitment in support of the project.

Six additional participant trainees departed in late December for graduate studies in the U.S.A. Twenty-three Malawian professional officers are now pursuing graduate programs in the U.S.A.

In-service training continued during the quarter with 35 participants attending a five day course at Chitedze Agricultural Research Station about on-farm trials. Dr. Pete Hildebrand from

the University of Florida Farming Systems Research and Extension Program led the course. Individual technical assistance team members continued on the job training with the newly hired staff.

Construction of a new office block at Chitedze Agricultural Research Station was completed and the Project offices were moved there in early November. The building was constructed by USAID funds and furnished by GOM and provides space for the Chief-of-Party and Project administrative staff, a conference room and a computer room to facilitate in-service training of DAR staff and subsequent efficient use of the computers furnished by the project.

Dr. H. L. Popenoe and Dr. C. F. Eno from the University of Florida made an administrative visit to the project in November. Dr. Popenoe is Director of International Programs at the University and Co-Chairman of the Joint Committee for Agricultural Research and Development of the Board for International Food and Agriculture Development (BIFAD), Agency for International Development. Dr. Eno, Coordinator for African Projects (Cameroon and Malawi) for the University, was formerly Chairman of the Department of Soil Science and is President-Elect of the American Society of Agronomy.

Dr. Mike Collinson from CIMMYT's Eastern Africa Economics Program (farming systems research) came for a week in November to discuss how his USAID supported program could strengthen the Farming Systems Research Program in Malawi.

A team from USAID/REDSO/Nairobi came for two weeks to begin planning a new Project that will encompass the second phase of the Research Project within an integrated framework of Research, Extension and Farmer Training. Technical assistance team members were consulted by the REDSO visitors and the Farming Systems Analyst worked as a member of the planning team. Following the external evaluation of the present Project in January-February, the Project Identification Document (PID) for the new project will be written and it is planned to have the new project funded by October 1, 1983.

Dr. Elver Hodges and his wife, Ruth, left Malawi in November after finishing his extended tour. Dr. McCloud, the Chief-of-Party, went to the U.S. in late November on combined official duty/home leave, leaving Drs. Pasley and Gray as Acting Chief-of-Party.

A summary of project inputs is presented in Figure 1 below.

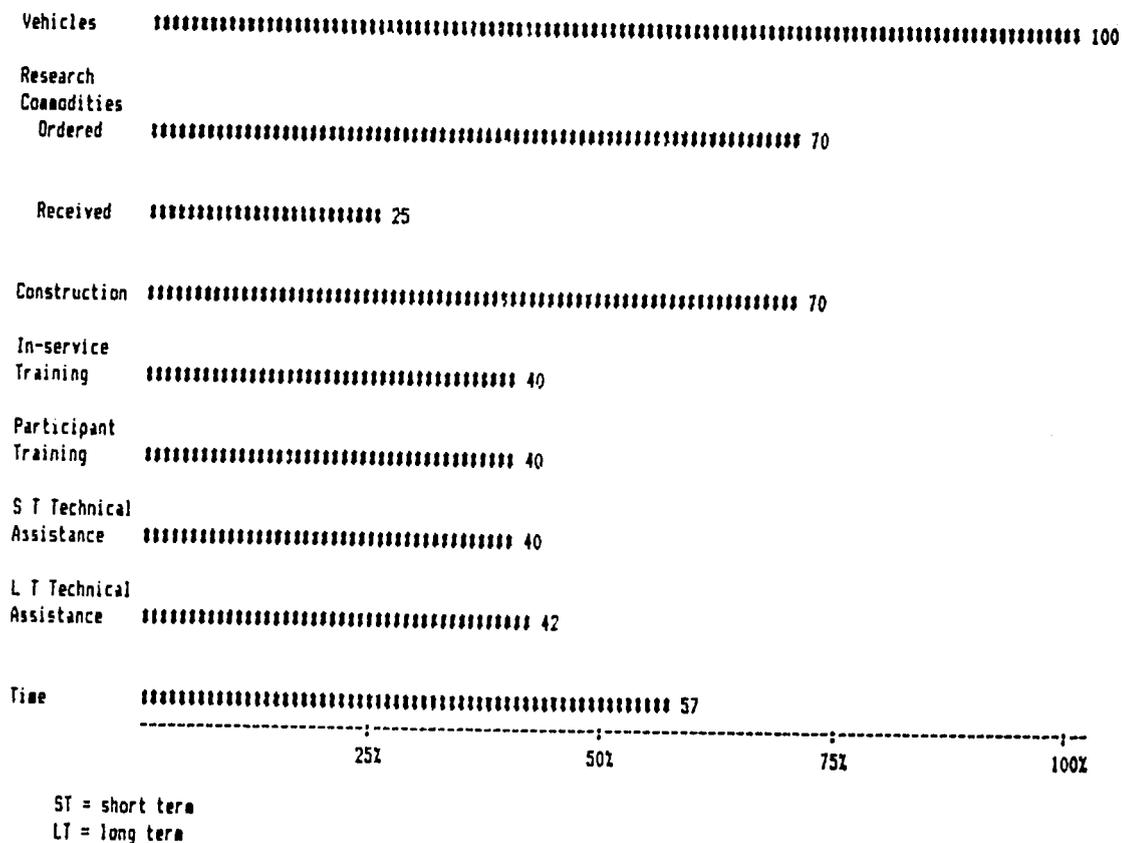


Figure 1. Malawi Agricultural Research Project, Summary of Inputs to December 31, 1982.

III. TRAINING

A. Participant Training

Participant training continues to be one of the most important project objectives. Six new participants were admitted to Graduate School in the U.S. and departed in late December to enroll in school in January 1983. With their departure, 23 Malawian professional officers were in the U.S. pursuing Ph. D., M.S. and B.S. degrees. Table 1 below lists the 17 participants who were in the U.S. during the quarter.

Table 1

 PARTICIPANT TRAINING QUARTERLY REPORT
 October 1 to December 31, 1982

Name	Training	Degree Program	Station	Departure	Months Accumulated	Due Back	Funded To	Degree
Chapola G.M.	Plant Pathology	Ph.D.	Bvumbwe	Dec 27 '80	24	Apr 84	Jun 84	
Chigwe C.F.B.	Sorghum Breeding	Ph.D.	Makoka	Dec 28 '81	12	Dec 84	Jun 85	
Chikwana R.	Agricultural Economics	M.S.	Chitedze	Dec 26 '80	24	Dec 82	Jun 83	
Chilembwe E.H.	Fruit Crops	M.S.	Bvumbwe	Dec 27 '80	24	Jun 83	Jun 83	
Chipala E.E.	Soybean Breeding	Ph.D.	Chitedze	Dec 26 '80	24	Dec 83	Jun 84	
Dzowela B.H.	Pasture Agronomy	Ph.D.	Chitedze	Dec 26 '80	24	Jun 84	Jun 84	
Gondwe M.T.	Vegetable Crops	M.S.	Bvumbwe	Dec 28 '81	12	Dec 83	Jun 84	
Khonje D.J.	Soil Microbiology	Ph.D.	Chitedze	Dec 28 '81	12	Dec 84	Jun 85	
Kisyonbe F.	Statistics	M.S.	Makoka	Dec 27 '80	17	Jun 82		Terminated
Mkamanga G.Y.	Crop Physiology	Ph.D.	Chitedze	Dec 26 '80	24	Jun 84	Jun 84	
Mtambo P.J.	Seed Technology	B.S.	Chitedze	Dec 28 '81	12	Dec 83	Jun 85	
Munthali J.T.K.	Animal Nutrition	Ph.D.	Chitedze	Dec 26 '80	24	Dec 83	Jun 84	
Mzembe C.P.	Irrigation Agronomy	M.S.	Kasinthula	Dec 27 '80	24	Jun 83	Jun 84	
Ngwira L.D.H.	Maize Agronomy	M.S.	Chitedze	Dec 28 '81	12	May 84	Jun 84	
Ntokotha E.M.	Soil Survey	Ph.D.	Lilongwe	Dec 26 '80	24	Jun 84	Jun 84	
Saka A.L.	Soil Physics	Ph.D.	Chitedze	Dec 27 '80	24	Dec 83	Jun 84	
Sibale P.K.	Groundnut Breeding	Ph.D.	Chitedze	Dec 26 '82	24	Jun 84	Jun 84	
Zambezi B.T.	Maize Breeding	M.S.	Chitedze	Jun 4 '81	19	Dec 83	Dec 84	
Total					330			

† Terminated without Degree in May 1982

Miss B. Nthakomwa, Assistant Agricultural Economist, went on educational leave in late December to pursue studies in Agricultural Economics, specializing in Production Economics and

Farm Management in the Food and Resource Economics Department of the University of Florida.

Participant training in farming systems began this quarter when Mr. Emmanuel N. Mwango left in late December to begin his M.A. degree program at the University of Florida in Applied Anthropology with a minor in Agricultural Economics. The four other Malawian staff in the section are enrolled for the GRE and TOEFL exams in early 1983. There is one more scholarship allocated to the farming systems program during this phase of the project, and competition will be keen.

Others who departed in late December were Mr. Charles T. Kisyombe, who went to North Carolina State University, Raleigh to pursue a M.S. degree in General Pathology; Mrs. F. C. Munthali, University of Florida for a M.S. in Wheat Agronomy; Mr. A. D. Gadabu, University of Florida for a Ph. D. in Entomology and Mr. A. B. M. Chiremba, University of Florida for a M.S. in Statistics.

B. In-service Training

1. Agricultural Economics

In order to increase the contributions that the Agricultural Economics Section can make to Farming Systems Research, it is desirable that the staff benefit from the experiences of a number of experts in Farming Systems methodologies. A request was therefore prepared that Mr. Nyondo and Mr. Jere, Assistant Agricultural Economists who joined the section during this quarter, be funded to attend a Farming Systems Workshop to be held in Harare, Zimbabwe in February 1983. Dr. M. Collinson and others will be conducting the workshop.

In order to increase the general use of quantitative analysis at Chitedze a tutorial (blackboard presentation followed by hands-on computer experience) of the A-STAT computer program was given. This tutorial was presented primarily for the Farming Systems staff and will be followed up by individual consultations as required.

2. Farming Systems

Two more staff members were hired during the quarter: Mr. G. M. Bulla and Mr. J. D. Ndengu. Both are recent Bunda College graduates, and their hiring brings the total number of Malawian professional staff in the section to five. Even more will be needed with the planned expansion of the farming systems/adaptive research program (see under research).

In-service training occurred formally and informally. A formal course about "On-Farm Trials: Design and Data Analysis" was taught at Chitedze October 4-8 by Drs. Peter E. Hildebrand and James Jones of the University of Florida Farming Systems Research and Extension Program and Dr. Hansen. On-farm trials were seen to be part of the farming systems research process, and the linkage between on-station and on-farm trials was clarified. Thirty five course participants became actively involved in analyzing Phalombe

and Lilongwe on-farm maize trial data using linear regression and a modified stability analysis to note locational differences. The TISS calculator was used throughout the course to acquaint everyone with its utility for regression analysis, and a compendium of course materials is being assembled to distribute within Malawi.

Informal training continued after the course ended. Dr. Jones remained to help train the section in statistical analysis techniques. All of the staff became familiar with the Data Factory program on the Apple computer from coding, loading and analyzing the Lilongwe survey data. Dr. Pervis oriented the staff to the A-Stat computer program. Some typing tutorial programs arrived, and the staff started on them and on the Super-Text word processor program. All of these activities, studying for TOEFL and GRE, and a continual flow of recommended readings kept everyone very busy.

3. Livestock/Pastures

Two staff members were added to the section during the quarter. Mr. Austin Zimba, filled the Reproductive Physiology position and Mr. J. W. Jiyani was assigned to one of the two new Technical Officer positions. Mr. Zimba was given assistance in becoming familiar with the Livestock Section and in development of a work plan. Mr. Jiyani was started on a training program and will work in both the livestock and pasture sections so that he will become familiar with all phases of the livestock/pastures program.

4. Plant Breeding

Prepared justification and arranged travel of Mr. W. G. Nhlane, Maize Breeder, to IITA to learn the methodology of screening for resistance to maize streak virus (MSV). MSV is becoming more serious in Malawi, especially in late-planted maize, and a usable screening technique is a must before breeding for resistance to MSV can begin.

5. Other

Dr. Charles F. Eno, Coordinator of African Programs and Soil Scientist from the University of Florida, presented a seminar on "Soil Testing and Recommendations to Florida Farmers Using the Computer" at Chitedze ARS (November 12, 1982). Approximately 50 people attended the seminar.

Dr. Hugh L. Popenoe, Director of International Programs for the University of Florida and Soil Scientist, presented a seminar on "Low Energy Agriculture for Smallholders" at Chitedze ARS (November 17, 1982). Approximately 50 people attended the seminar.

IV. RESEARCH

A. Agricultural Economics

During this quarter the research activities were concentrated around the development of the Agricultural Economics Data Bank. There is a large volume of data available in Malawi which, if brought together in a computer based environment, could be analyzed and interpreted to answer many questions of importance to policy making.

In addition to analysing data which is available at Chitedze we have had enquiries from LWADD and LADD about the possibility of having evaluation data analyzed. We welcome these opportunities and will comply to the extent that computer resources and personnel permit. One large data file from LWADD contains 19 agronomic variables and over 500 observations: one analytic tool to be used on it is analysis of variance. A LWADD research officer came to Chitedze in December and completed data entry of this file.

Work continues on the analysis of maize yield-fertilizer data in an effort to improve the fertilizer recommendations throughout the country. The computational work for LADD is almost complete. Data is available in the Data Bank for 7 of the 8 ADD's for 4 years.

Rice yield - fertilizer data is being prepared for data entry. However preliminary examination indicates that supplementary data will have to be obtained if it is to be useful.

In the analysis of the maize yield-fertilizer data the Apple II computer was used to handle the large volume of raw data and produce the regression coefficients of a quadratic function relating yield to nitrogen application rates. The economic analysis of this function was done on an HP 41CV programmable calculator (with printer attached). Two programs have been written for this calculator:

1) POLYN - A program which takes as input the:

- regression coefficients of the polynomial (quadratic) function produced by the A-STAT program on the Apple II computer,
- price of maize,
- price of fertilizer, and
- nitrogen content of the fertilizer,

and calculates the:

- optimal nitrogen application rate,
- optimal fertilizer application rate,
- optimal maize yield expected,
- marginal physical product (MPP),
- marginal value product (MVP),
- revenue minus fertilizer cost, and
- fertilizer / maize price ratio.

2) POLINT - This program calculates supplementary data to facilitate the hand plotting of the function on the scatter plot produced by APPLEPLOT from a specially written A-STAT file. It also calculates the roots of the polynomial (quadratic) equation - this information is useful as an estimate of the initial nitrogen availability in the soil. Specifically, the program takes as input the:

- regression coefficients of the polynomial,
- maximum nitrogen application rate on the scatter plot,
- maximum yield on the scatter plot, and
- levels of nitrogen application,

and calculates the:

- roots of the function (the absolute value of the negative root is an estimate of the initial nitrogen availability in the soil),
- the yield expected with the nitrogen application rate entered, and
- the (X,Y) coordinates in fertilizer, yield space in centimeters (thus facilitating preparation of the graph).

B. Farming Systems

One of the major research activities was analyzing data from the 1981-82 Lilongwe maize trials. Dr. Jones remained for several weeks after the course analyzing maize data, and Dr. Pasley provided continual assistance. Agreement was reached on some preliminary conclusions from this one year of data. On-station and on-farm trials gave very different pictures of the responsiveness to fertilization of "local" maize. The better soil quality on research station gave high yields without fertilizer and flatted the response for additional fertilizer applications. Consequently, on-station trial results showed fertilizer applications not to be profitable on "local" maizes, while on-farm trials (under soil conditions more similar to those actually faced by most smallholders) showed fertilizer applications to be profitable but not as much as when applied to improved varieties.

The first year of trials set the precedent that "local" maizes should be considered as part of the set of crops about which smallholders need more information and guidance. The Maize Agronomy Section has set up on-farm (district) trials starting in 1982-83 to provide data so that the Economics Section can work out production functions for several maizes, including "local." With this data an economic analysis can be made to guide policy about fertilizer recommendations. This is a good example of how the farming systems approach can provide guidance to various research sections in selection of smallholder research topics.

Coding and analyzing Lilongwe survey data continued as the other major research activity. Code books were written and as

more data were coded, analysis began with each staff member being responsible for a different questionnaire.

Several reports were produced during the quarter:

1. "Generation and Use of Data About Smallholders." For the USAID pre-PID team report.
2. "Research-Extension Linkages." For the USAID pre-PID team report.
3. "In-Service Training: December 1982 Report." For the Project.

The farming systems/adaptive research (FSR/AR) program needs modification now that the basic principles and procedures have been established. With the proposed restructuring of the DAR, a team of two Farming Systems Research Officers (FSROs), an economist and an agronomist in most cases, will be located in each ADD and will work closely with the Senior Agricultural Extension Officer and the Evaluation Officer, and in coordination with other DAR and ADD staff. This team will be in charge of farming systems/adaptive research for that ADD. The FSRO teams in all the ADDs will be directed by a national coordinator for FSR/AR.

C. Livestock/Pastures

Research activities in the Livestock/Pastures Sections continued to focus on the project objective of strengthening research programs in selected areas.

1. Mzuzu A.D.D. A pasture research program was started in the Mzuzu A.D.D. during the quarter by Dr. R. C. Gray and Mr. H. Msiska. The Mzuzu area has potential to become the major dairy production area of Malawi and an aggressive pasture research program is deemed to be essential for its success. Mr. Hector Nyasulu, technical assistant, was transferred to Lunyangwa ARS to supervise the work. Plans are to establish several trials at Lunyangwa ARS, Choma Livestock Multiplication Center (Department of Veterinary Services) and Mpanga Training Center (M.Z.A.D.D.). In addition, on farm trials will be conducted on 10 representative smallholder dairy farms.

2. Chitedze Grazing Trial. Work continued on construction of physical facilities. Construction of a spray race was started and since the electric fence equipment did not arrive from Florida as expected, it was necessary to construct subdivision fences of barbed wire in all 12 pastures so that rotational grazing could be practiced.

During the quarter, the grazing trial at Chitedze was started. The purpose of the trial is to "Measure the production of three grasses and one legume-grass combination in terms of beef production." Treatments are: (1) Boma rhodesgrass, (2) Boma rhodesgrass interplanted with Silverleaf desmodium, (3) Ntchisi panicum (*Panicum maximum*), and (4) No. 2 stargrass, Henderson (*Cynodon nlemfuensis*). Each plot is 1.5 hectares and the trial

has three replications.

Initially, 160 head of cattle were obtained from Dzalanyama Ranch for the trial. They were two-year old Malawi Zebu heifers weighing an average of 170 kilograms. The cattle were placed on the pastures during December. At the end of December, 12 to 16 head were grazing each pasture and it was determined that additional cattle would be needed to keep up with the rapidly growing forage and arrangements were made to obtain an additional 40 head from Dzalanyama Ranch.

The objective of this trial is to fulfill a major objective of the project " the determination of pasture productivity in terms of animal performance." This is a three year trial, so complete results will not be available until 1985.

3. Dairy Cattle Research. The Ca/P continued at Lunyangwa and the protein experiment continued at Chitedze. Work progressed on establishment of the three two-cow smallholder dairy units at the former Livestock Unit Farm at Chitedze. The Sahiwal crossbreeding study was started at Chitedze on December 1 and was continued at Lunyangwa. The Department of Veterinary Services, which operates the artificial insemination service, experiences periodic shortages of liquid nitrogen and this has impaired the services which they provide, especially at Lunyangwa, where conception rates from artificial insemination are very low. Plans are being made to order artificial insemination equipment so that our staff can do the insemination.

4. Poultry Research. The poultry project was delayed when a fire destroyed one of the three poultry houses on the former Unit Farms. The building has now been rebuilt and the chicks have been rescheduled to arrive in January 1983.

5. Sheep Research. Rams were obtained in early December for the study from the Mikolongwe Veterinary Center. Ewes will be obtained in January 1983 and the breeding program will then begin.

6. Stall-feeding Research. Sixteen head of Malawi Zebu and Friesian crossbred steers were on the groundnut top feeding trial. The data from this trial will be used with existing data to prepare a revised version of a proposed Extension Bulletin on the subject.

D. Plant Breeding/Agronomy

The majority of the time was spent in planning and organizing research trials for the coming growing season. The UF/USAID Plant Breeder now has responsibility for Maize Agronomy, Maize Breeding and Wheat Agronomy throughout the country. In addition, it was necessary to prepare work plans and budgets for Maize Agronomy in order for the DAR to establish research priorities and to allocate funds to finance the research. A major emphasis was placed on: reducing the number of trials to save money; designing trials in collaboration with the Agricultural Economist that will answer specific questions (e.g., the World Bank requested the economic optimum response of improved adapted varieties to nitrogen

fertilizer in each major agro-climate region - this information was not available from past research data); and trials emphasizing increased production without major economic inputs (e.g., reduced tillage operations, plant spacing and population, use of forage legumes, intercropped with maize as a green manure crop, etc.). Specific activities included:

1. Distributed seed and trial instructions to all stations conducting maize agronomy and breeding trials.
2. Completed work plans and budgets for maize agronomy for the 1983/84 season.
3. A collaborative research project between the University of Florida and DAR was implemented during the quarter. The project is a part of a worldwide study on "Factors Limiting Symbiotic Nitrogen Fixation From Crop Production in Developing Countries" and is titled "Meloidogyne spp. as Limiting Factors on Nitrogen Fixation by Forage Legumes in the Tropics." This effort is financed by a \$15,000 three year grant from USAID but is not a part of the Agricultural Research Project.

Sufficient land was acquired near Chitedze ARS for the study. This will be a three year effort and required finding someone willing to take land out of production for that time as well as finding land infested with nematodes.
4. Reviewed and critiqued a breeding plan for the Maize Breeder at Baka ARS. This individual has been reassigned from Chitedze ARS to ensure that the lakeshore area will receive increased emphasis in terms of maize breeding. This should increase the likelihood of developing new varieties for the smallholders in the area along with reducing travel costs to this area.
5. At the request of USAID/Malawi, determined the availability and cost of groundnut seed from the National Seed Company, Malawi. USAID/Uganda had requested this information because of a shortage of groundnut seed in that country.
6. At the request of USAID/Malawi, prepared a response to the ADO/USAID/Uganda on the availability of research data on groundnuts and soybeans on East Africa. Also discussed the best research center for these crops in terms of assistance in developing a national program in Uganda.
7. Arranged for planting of soybeans bred by a Malawian graduate student at the University of Florida. This represents part of his dissertation research.
8. Work was started on the preparation of research work plans and budgets for Wheat Agronomy for the 1983 season. Emphasis is being placed on identifying suitable varieties for each major growing region, determining optimum planting dates and seeding rates, and intercropping wheat in maize in order to make better use of available soil moisture.

V. TRAVEL AND MEETINGS

The USAID purchased vehicles continued to receive heavy use during the quarter by technical assistance team members and Malawian staff. Table 2 gives a summary of the vehicle use for the quarter and for the project to date.

Table 2
USAID Project Vehicle Miles Driven to December 31, 1982

Vehicle	Location	Oct.-Nov.-Dec.	Milage to December 31, 1982
Peugeot			
542D	Chitedze	5,353	38,164
715D	Bvumbwe	2,391	35,202
716D	Chitedze	4,913	36,242
754D	Chitedze	5,084	34,492
Land Rover			
653D	Kasinthuja	7,481	60,079
689D	Lunyangwa	11,062	42,632
690D	Chitedze	5,826	50,086
691D	Makhanga	1,470	48,358
692D	Chitedze	5,805	51,001
694D	Bvumbwe	6,507	37,018
690E	Mbawa	3,000	5,500 †
Nissan			
474E	Makoka	1,000	9,303 †
483E	Chitedze	6,949	16,269
484E	Chitedze	3,363	13,027
485E	Chitedze	5,497	18,628
	Total	75,701	496,001

† Estimated

Team members reported the following travel in project vehicles during the quarter: Gray 1,135; Hansen 2,806; Hodges 193; McCloud 1,835; Pasley 235; and Pervis 525; for a total of 6,829 miles or 9.0% of the total 75,701 miles driven by the USAID purchased vehicles.

One additional Landrover was purchased during the quarter and was assigned to the Mbawa ARS. Five additional motor cycles were purchased during the quarter, bringing the total number to 15 that are in use at the various research stations. These purchases completed the planned vehicle purchases for the project.

Team members continued to report participation in a wide range of activities within Malawi and abroad. Major meetings and travel by team members are reported below.

A. Gray

- October 5 - Bunda College to coordinate livestock research plans with Dr. P. Makhambera and Dr. J. Mtimuni.
- October 7 - Dzalanyama Ranch with livestock and pasture personnel from Bunda College.
- October 14- Bvumbwe Research Station to discuss livestock research possibilities and project equipment procurement with Dr. James Maida.
- October 15-
- November 3 - R/R travel to Athens, Greece.
- November 11- 51st Meeting of the National Livestock Development Committee, Ministry of Agriculture. This committee recommends National Policy on livestock development.
- November 16- Mbawa Research Station with Dr. J. T. Legg, Dr. H. Mwandemere, Dr. H. L. Popenoe and Dr. C. F. Eno. The purpose of the trip was to provide an opportunity for Dr. Popenoe and Dr. Eno to see an up-country research station, as well as a portion of central and northern Malawi.
- November 17- Met with Mr. Frank Alexander, Booker Institute, Ann Arbor, Michigan, consultant for the Department of Veterinary Services, who is working with a consulting team on livestock marketing.
- November 18- Dzalanyama Ranch, Livestock Production and L.A.D.D. to arrange for movement of 160 heifers to Chitedze ARS.
- December 1-2- Lunyangwa Research Station and Mzuzu A.D.D. with Mr. H. Msiska to organize the proposed pasture research program in M.Z.A.D.D.
- December 9 - Met with Department of Veterinary Services to discuss research collaboration.
- December 16- Met with Department of Livestock Production, Bunda College to discuss research collaboration.

B. Hansen

1. For two weeks (October 25 to November 4) worked in Lilongwe with a USAID team from REDSO/Nairobi that came here to design a PID for an agricultural extension project to parallel the research project. During the discussions it was decided to combine the next phase of the research project with the beginning of the

extension project so as to ensure stronger linkages between the two projects. Instead of writing a PID, therefore, the team wrote guidelines for it and worked out lists of information that the Ministry and the UF/USAID team should have ready. The USAID team will come to Malawi again in February (after the project evaluation) to write the new PID.

2. Spent four days with Dr. Mike Collinson who arrived from Nairobi for a short visit (November 5-9) to confer with the Ministry of Agriculture (especially DAR). He heads the CIMMYT Eastern Africa Economics Program which supports farming systems research (FSR) activities throughout East and Central Africa, and his program has received USAID funding to permit it to expand its support for USAID-funded FSR programs in the region. We discussed the best way for FSR to be implemented within DAR considering the proposed restructuring.
3. Spent several days in meetings with Dr. Hugh Popenoe, Director of the Office of International Programs at the University of Florida, and with Dr. Charles Eno, the new Coordinator of African Projects in that Office, about the FSR program and its role in the project.
4. Traveled to Blantyre in late November (21-23) for a meeting with Blantyre ADD to discuss the results of the 1981-82 Phalombe trials.
5. Visited Liwonde ADD November 24 to discuss their on-farm trial research program and their techniques for analysis of evaluation data. Invited their research officer up to Chitedze to use our Apple computer to analyze his 1981-82 data. He came for a week in December and worked with Dr. Pervis using the A-Stat program.
6. Met with Lilongwe ADD December 1 to set up a collaborative review of the farming systems in Ntcheu and Thiwi-Lifidzi Projects. Tentatively arranged to run a diagnostic survey in Ntcheu during March 1983 when the new horticulturalist, Dr. Calvin Arnold, should be here.
7. Attended an Evaluation Officers' Meeting December 15 at the Ministry and introduced our new staff.
8. Attended a Data Users' Conference at the Ministry December 16 to discuss our needs for NSSA data.
9. During the quarter, Dr. Hansen signed for 2,806 miles, almost all in the Peugeot's 716 and 754. This mileage included the trip to Blantyre and Liwonde, but most of the travel was daily ferrying between Chitedze and Lilongwe for TDY visitors and when working with the USAID PID team.

C. Hodges

Dr. and Mrs. E. M. Hodges left Malawi to return to the U.S. on November 17, 1982 at the termination of their two year tour. Dr. Hodges will shortly retire from the University of Florida after having served them for 40 years. They have returned to their home at Wauchula, Florida. The team members wish them well in their new adventure.

D. McCloud

Dr. McCloud accompanied Dr. H. L. Popenoe to Byumbwe ARS on November 19 to discuss the horticulture program with the Officer-in-Charge. They also traveled to Kasinthula ARS.

Dr. McCloud was on combined home leave/official duty in the U.S. from November 21, 1982 to the end of the quarter, and was scheduled to return on January 23, 1983.

While on official duty he accomplished the following:

1. Visited the Oilseeds Research group at Potchefstroom Research Institute in South Africa November 22-24 to obtain the latest research information and to collect groundnut yield data for use in the Crop Yield Dynamics course.
2. Attended the American Society of Agronomy meetings held at Anaheim, California November 28-December 3, 1982. This was the annual meeting of the society and agronomists world-wide attended. The meetings provided an opportunity for an exchange of information, the latest research papers were presented and the latest research equipment was displayed. The meetings were also attended by Malawian participant trainees.
3. Visited the University of Arizona December 2-5 to assist in setting-up Charles Chigwe's graduate research program.
4. Visited CIMMYT in Mexico December 5-11 to observe wheat and maize agronomy research, and collected yield potential data for the Crop Yield Dynamics Course.

E. Pasley

Many of the meetings resulted from the USAID/UF Plant Breeder acting as Head of the Maize Improvement Program. Also, the Plant Breeder was appointed to serve on the Local Preparation Team that is preparing recommendations for the restructuring of the Department of Agricultural Research. In addition, some of the activities resulted from the Plant Breeder serving as the Acting Chief-of-Party while the Chief-of-Party was on home leave.

Specific activities included:

1. Attended the 29th Seed Technology Working Party Meeting,

DAR, GOM, as the representative of Maize Breeding.

2. Met with Drs. Eno and Popenoe, IP-UF, to discuss maize research in Malawi and career plans.

3. Met with Mr. Moore, Pioneer Ltd, (RSA) and arranged remuneration to DAR for conducting Pioneer maize trials. In the past, this service had been provided free of charge at the expense of monies allocated to the Malawi Maize Improvement Research Program.

4. Met with a team from USAID/Nairobi to discuss agricultural research and extension. The team was in Malawi to prepare a PID for upgrading extension.

5. Met with an irrigation specialist from Israel to discuss the need for small scale irrigation research. He agreed that this should be a high priority item if the goal of increasing smallholder productivity is to be realized.

6. Met with a representative of the World Bank to discuss Malawi's fertilizer requirements in terms of quantity and type. It was agreed that more research was needed to answer these specific questions.

7. Spent considerable time with a short-term technical consultant for Farming Systems explaining analysis and interpretation of biological data, maize production in Malawi, the biology and anatomy of the maize plant, the need for specific varieties for specific ecological zones, plant response to nutrients, and differences between unimproved, improved open-pollinated and improved hybrid maize varieties.

8. As the UF/USAID representative on the Local Preparation Team, accomplished the following:

a. Attended frequent team meetings to prepare our terms of reference and plan of work.

b. Visited Karonga, Kasungu, Lilongwe, Mzuzu and Salima A.D.D.s to discuss the reorganization of the DAR with Program Management and Extension.

c. Attended team meetings to discuss our findings and to prepare a report for the Steering Committee. Approval from the Steering Committee on our recommendations is necessary before the plan can be finalized.

9. Attended the Hybrid Corn and Sorghum Conference the week of December 6 in Chicago. Some excellent contacts were made and many private seed companies expressed an interest in this part of Africa. Public and private maize breeders expressed a willingness to exchange germplasm if ways can be found to comply with Malawi's phytosanitary laws.

10. Met with other TA team members to discuss the restructuring of the DAR and to solicit their inputs.

F. Pervis

- November 1 - Met with USAID PID team.
- December 6 - Attended meeting of Ad Hoc Committee on Computer Use in the Ministry of Agriculture.
- December 15- Attended meeting of the ADD evaluation officers regarding data use and introduced the new Agricultural Economics Section staff.
- December 16- Attended the second meeting of the Ad Hoc Committee on Computer Use in the Ministry of Agriculture.

VI. SHORT-TERM TECHNICAL ASSISTANCE**Dr. James Jones.**

Dr. James Jones, anthropologist from the University of Florida Farming Systems Research and Extension Program remained from September 26 until November 12. After working with the in-service training course October 4-8 and in-service training of the staff, he remained to help while the USAID/REDSO PID team was here and then to meet with Dr. Mike Collinson.

Dr. Peter E. Hildebrand.

Dr. Peter E. Hildebrand, agricultural economist and Coordinator of the University of Florida Farming Systems Research and Extension Program, was in Malawi for eight days (October 2-9) to present a short course about on-farm trials.

Dr. Mike Collinson.

Dr. Mike Collinson, Agricultural Economist and Coordinator for CIMMYT's Eastern Africa Economics Program, visited Malawi for five days (November 5-9). His visit was not arranged or funded by this project, but is included here because of its relevance to the project. He came to see how this USAID-supported program could best support the development of a strong Malawian farming systems research program. The visit was very useful in promoting an informed concern for farming systems research.

Dr. H. L. Popenoe

Dr. Popenoe, Director, International Programs, University of Florida, arrived in Malawi on November 14, 1982 and departed on November 21, 1982. This was his first visit to the project site. During his stay, he visited Evumbwe, Chitedze and Mbawa Research Stations, as well as GOM and USAID officials and team members.

Dr. C. F. Eno

An administrative visit was made to the project by Dr. C. F. Eno, who was appointed to the position of Coordinator of African Projects, International Programs, University of Florida in October. Dr. Eno arrived in Malawi on November 3, 1982 and departed on November 19, 1982. During his visit, he spent considerable time with team members and GOM officials becoming familiar with the project activities. The team members greeted his appointment and visit with enthusiasm.

VII. ADMINISTRATION

1. Administrative visits were made in November by Dr. H. L. Popenoe, Director of International Programs and Dr. C. F. Eno, African Programs Coordinator, University of Florida.

2. Dr. Gray made a major effort during the quarter to order project commodities. Orders for the Bvumbwe station were completed and forwarded to Florida for procurement, as well as additional orders for Chitedze. Final orders for most commodities for all stations should be completed early in 1983.

3. Construction. The new Chitedze office building was completed and the project offices for the Chief-of-Party and his support staff were moved into the facility in early November. Mrs. Marcia Gray voluntarily made draperies for the new office building and they were installed in late December. The new building contains eight rooms and houses the Chief-of-Party, stenographer-secretary, senior accounts officer, assistant accounts officer, typist and clerk general duties as well as providing a room for conferences and a computer center. Furniture for the building was provided from USAID Construction funds.

Plans were made to meet with the USAID/REDSO engineer early in 1983 at Bvumbwe to coordinate construction of greenhouses and cold rooms at that station.

A contract was awarded for construction of the Bvumbwe Soils Laboratory during the quarter and construction was begun.

Work progressed slowly on the Chitedze housing and it is hoped that some of the houses will be available in early 1983. Several new support staff members have been assigned to the USAID project at Chitedze and housing is extremely critical, with several of the new staff living at and commuting from the Likuni Campus of the College of Natural Resources.

4. A filing system was established for the project by Mrs. Marcia Gray on a volunteer basis during the quarter. A file directory was printed and distributed.

5. A list of names of Malawi Professional Officers to take the next TOEFL examination in March 1983 was submitted to and approved by DAR. Additional names were also submitted and approved by DAR to take the GRE examination in April 1983. Received from IP-UF

- and transmitted to CARO the list of registration numbers for individuals scheduled to take the TOEFL examination.
6. Prepared USAID Receiving/Inspection Reports for 4 Nissan pickups, 1 Landrover 5 motorcycles and three shipments of laboratory equipment purchased by the project.
 7. Arranged visas, briefings and travel advances for six Malawians that left for the U.S. in late December to attend Graduate School. Clearance from GOM was received at the last minute and processing was extremely frantic. Steps are being taken to identify people leaving in the next six months so that processing can be completed in an orderly fashion.
 8. Prepared training plans for the six students entering Graduate School in the U.S. in January 1983.
 9. With much help from other TA team members, began preparations for the external review scheduled to start on January 24, 1983.
 10. Prepared and submitted to USAID/Malawi and the DAR, a TDY request for Dr. E. T. York. Dr. York would help in the reorganization of the DAR and in planning Phase II of the project.
 11. Prepared and submitted to USAID/Malawi and the DAR, a TDY request for Dr. D. Hubbell, University of Florida and Mr. Khonje, graduate student, University of Florida. This would be part of Mr. Khonje's dissertation research and Dr. Hubbell would supervise him.
 12. Prepared and submitted a justification and request to USAID/Malawi and DAR, for the extension of Dr. A. Hansen, Farming Systems Analyst, to April 30, 1983.
 13. Worked with Dr. Hansen, Project In-Service Training Coordinator, CARO and USAID/Malawi to process out-of-country in-service training requests for the next six months.
 14. Met with the Acting USAID/Malawi Representative to discuss the Inspector General's Audit report of the project. Previous to this, the other TA team members and I had formulated courses of action to correct the deficiencies noted on the audit. The Acting AID representative concurred with our approach.
 15. Devised a procedure to account for travel advances (audit report criticism).
 16. Began developing an overall work plan for the project (audit report criticism).
 17. Prepared and paid the ninth reimbursement claim to the Malawi Government.
 18. Assisted Dr. and Mrs. Hodges in pre-departure arrangements. The Hodges completed their tour in Malawi and departed for the U.S. on November 17, 1982.
 19. Received GOM approval for the appointments of Dr. L. Janicki

as General Agronomist and Dr. C. Arnold as Horticulturist on the project technical assistance team and forward their nominations to USAID/Malawi for approval. Dr. Janicki and his family are scheduled to arrive in Malawi on January 8, 1983.

20. Compiled team work plans, and prepared a revised Work Plan booklet for distribution to UF, MA, USAID and the team.

21. Met with CARO and recommended approval of Chickwana's, Chipala's and Sibale's requests to come to Malawi for thesis research. Recommended postponement of Chapola's disease survey.

22. Completed the 1982-83 January-March Quarterly-Annual Report and started work on the eighth, ninth and tenth quarterly reports.

VIII. FINANCIAL

Table 3 shows transactions from the University of Florida Local Account for the period October 1, 1982 through December 31, 1982, while Table 4 summarizes the expenditures by program for the quarter and for the project to date.

Table 3

Transactions-University of Florida-IFAS Local Account October, November and September, 1982

Date	Details	MK	MK
October			
1	Balance Brought Forward		28,051.18
4	J. C. Jones - Per diem advance	100.00	
4	Securicor Service- guards Oct.	510.65	
4	Manica - Airline Ticket, Hodges, S.A. trip	580.00	
	- Airline Ticket, Msiska, S.A. trip	580.00	
	- Telexes and freight	187.54	
4	Chitedze ARS - Utilities, electricity	418.16	
8	P. Hildebrand, advance	150.00	
19	Dr. S. F. Pasley, per diem reimb.	373.82	
19	Hodges - Travel advance, S.A. trip	299.19	
19	H. D. Msiska - Travel advance, S. A. trip	299.19	
22	Malawi Hotels -Accommodations,Hildebrand	286.70	
25	D. E. McCloud - Travel advance	482.96	
25	Land Valuation - Utilities, water	125.70	
25	Manica Travel - Air tickets, Gray's R&R	2,921.00	
	- P. Hildebrand, addition air fare	106.00	
	- S.F. Pasley, air ticket	97.00	
	- Freight and telexes	180.92	
25	Malawi Hotels - Accommodations, J. C. Jones	905.42	
27	W.G. Nhlane - Travel Advance, IITA trip	950.00	
28	Deposit	25,265.73	
29	J. C. Jones - Per diem advance	150.00	
29	Securicor Services - November	494.20	

Table 3 (continued)

Date	Details	MK	MK
November			
10	J. C. Jones - Per diem advance	100.00	
15	D. E. McCloud - Air tickets, home leave	3,894.00	
22	Manica Travel - Air tickets, Pervis's medical, S.A.	620.00	
	- Additional air fare, J. C. Jones	310.00	
	- Air tickets, Hodges	2,942.00	
	- Freight and telexes	1,106.00	
22	Malawi Hotels - Accommodations, J. C. Jones	474.07	
22	Capital Hotel - Accommodations, J. C. Jones	275.10	
22	Lands Valuation - Utilities, water	61.59	
22	S. F. Pasley - Air ticket, Chicago	2,671.00	
22	S. F. Pasley - Air ticket, Mzuzu	114.00	
23	Chitedze ARS - telephone	88.88	
December			
3	A. Hansen - Passport photos	31.25	
4	Securicor - Services Nov.-Dec.	747.05	
4	Malawi Hotels - Accommodations, J. C. Jones	219.43	
4	Manica - telexes	88.85	
4	Chitedze ARS - Utilities, electricity	175.48	
14	A. Hansen - Reimb. two passports	33.60	
15	D. W. Pervis - Reimb. 10 box discs	108.00	
21	Malawi Government - 9th Reimb. claim	7,425.21	
22	A. Gadabu - Travel advance	560.00	
23	F. C. Munthali - Travel advance	560.00	
23	C. T. Kisyombe - Travel advance	560.00	
23	E. N. Mwango - Travel advance	560.00	
23	B. R. Nthakomwa - Travel advance	560.00	
23	Manica Travel - Air ticket, E. N. Mwango	1,456.50	
	- Air ticket, C. T. Kisyombe	1,456.50	
	- Air ticket, A. Gadabu	1,408.00	
	- Air ticket, A. M. Chiremba	1,408.00	
	- Air ticket, B. R. Nthakomwa	1,408.00	
	- Air ticket, F. C. Munthali	1,456.50	
	- Air ticket, B. R. Nthakomwa	97.00	
	- Air ticket, E. N. Mwango	97.00	
	- Telexes	230.46	
30	Lands Valuation - Utilities, water	104.80	
31	Securicor - January services	621.20	
31	Manica - Telexes	36.20	
31	Bank charges - Ledger fee	5.00	
		44,728.68	53,316.91
	Plus wrong debit, check no. 496	6.71	
	Less unrepresented checks	19,445.37	
		25,290.02	
	Balance Carried Down		25,290.02
	Balance as per bank statement		28,026.89

Table 4

Summary of Expenditures for the University of Florida-IFAS Local Account by Program

October-November-December 1982		
Program	Quarterly Expenditures Oct. - Nov. - Dec.	Total Expenditures since project began
	MK	MK
Maize, Breeding and Agronomy	3,565.09	13,940.94
Groundnut, Breeding and Agronomy	1,655.59	4,837.43
Pasture Agronomy	3,037.92	15,086.22
Livestock	9,201.58	20,233.61
Horticulture, Fruits and Vegetables	-----	11,608.11
Agricultural Economics	805.70	6,287.47
Farming Systems	92.17	9,538.10
Soil Fertility	-----	8,219.76
Research Coordination	4,376.56	13,565.99
Library	-----	1,659.12
Participant Training	12,379.96	20,678.46
In-service Training	3,357.71	33,795.89
Vehicles First & Second Purchase	56,671.25	197,758.89
Overhead Not Assignable by Program	7,877.68	85,525.90
	-----	-----
TOTAL	103,021.41	442,735.89

Overhead should be divided among the following programs: Maize, Groundnut, Pasture, Livestock, Horticulture, Agriculture Economics, Farming Systems and Research Coordination (12.5% each).

IX. PUBLICATIONS AND REPORTS

- Hansen, A. "Generation and Use of Data About Smallholders." Prepared for USAID pre-PID team report.
- Hansen, A. "Research-Extension Linkages." Prepared for USAID pre-PID team report.
- Hansen, A. "In-Service Training: December 1982 Report." Mimeograph.
- Nthakomwa, B. R. "Economic Evaluation of Powertiller vs Oxen for Rice Production in Malawi." December 1982. Mimeograph.
- Pervis, D. W. "Agricultural Economics Data Bank Standards." November 1982 (Revised Dec. 14, 1982). Mimeograph.

APPENDICES

CONCEPTUALIZING THE PROPOSED USAID-FUNDED AGRICULTURAL
RESEARCH AND EXTENSION PROJECT

Six major areas were discussed in October-November 1982 as probable centers of attention in a new USAID-funded Agricultural Research and Extension Project. The following two papers describe two of these project areas. Both papers were written by Dr. Art Hansen, the Farming Systems Analyst of the present MA/UF/USAID Agricultural Research Project.

Appendix A is Generation and Use of Data About Smallholders.

Appendix B is Research-Extension Linkages.

GENERATION AND USE OF DATA ABOUT SMALLHOLDERS

Sources of Direct Data About Smallholders

Each of these sources provides different data, either due to collection methods or scope of sampling. Data collection is sometimes seen as incidental to the primary purpose of the agency, i.e., ADMARC, credit, extension.

1. National sample surveys of agriculture (NSSA)
2. Annual surveys of agriculture (ASA), just beginning
3. Evaluation surveys (ES)
4. Agro-economic surveys (AES)
5. National census of population (NC)
6. Extension field staff comments (EXT)
7. ADMARC records of cash inputs and marketed outputs
8. Credit records of inputs
9. Farming systems surveys (FSS)
10. On-farm trials (OFT)
11. University faculty and student studies

1-4 The NSSA and ASA are national agricultural sector analyses which provide data for national level planning. The NSSA is only once every ten years but its large sample size allows its data to be useful down to the project level, whereas the ASA has a reduced sample size so its annual data is only useful down to the ADD level. ASA only began in 1981/82, and there have been two NSSA (1968/69 and 1980/81), the more recent collecting a very extensive range of data.

The ES are confined to project areas but provide annually the equivalent of NSSA data on the projects, although not usually as ambitious as the 1980/1981 NSSA. There exists the potential for special studies in any given year.

The AES previously were one year studies of soon-to-be-project areas and similar in scope to ES. At present the AES is being modified to focus on farm management and cost of production (including labor) surveys which will begin in 1983/84.

All of the above provide similar data based on the use of the same methodology, although each has a distinct sampling frame. The data are collected over a 9-12 month period (including the whole cropping season) by enumerators who reside in villages and collect data from 20-25 households each. Acreage in various cropping patterns, yields of most important crops, and household labor availability are always collected as well as sometimes additional material.

The primary problem with all of the above is that, due to a variety of personnel and computer issues, the data are usually only subjected to rudimentary analysis. The major clients appear to be MOA or other national level planners and international or bilateral funding agencies. The most important clients who are neglected are ADD and project management and research, all of whom could utilize client-oriented analyses to better structure and plan their programs according to sectoral analyses of smallholder problems and constraints.

A more positive way to see this is to say that the data collected by No. 1-4 have invaluable potential; the sunk investment in collection is much greater than what remains to be invested in analysis, while the payoff from a marginal investment would be a significant contribution to an upgraded and more productive research and extension program.

The constraints to analysis are:

- a) lack of trained analysts and competing demands for the time and attention of existing analysts (NSO and evaluation staff).
- b) centralized computing facilities which are a bottleneck causing major delays in processing and impeding any expansion of analysis,
- c) standardized computer programs which aggregate the data and produce minimal results and,
- d) most important, the lack of understanding and training on the part of potential clients as to the potential for themselves of properly analyzed data.

A coordinated solution would include:

- a) training of
 - i) DAD, ADD and project management in the value of this data and how to ask questions of the data,
 - ii) analysts and programmers for MOA (DPE probably), perhaps NSO, and ADDs (evaluation staff) - this would include original start-up training plus continuing in-service workshops.
 - b) provision of technical assistance of a full time programmer to work out canned programs that
 - i) would allow lower level **analysis** flexibility in handling data and/or
 - ii) would answer a range of typical client questions - these questions may be generated through the management training process.
 - c) provision of mini or micro computers at MOA level (DPE probably or in the proposed Central Statistical Unit in Lilongwe) and at ADD level (for evaluation not **accounting** purposes) flexible programs should be designed for these decentralized computers.
5. The National census of population, housing and employment is conducted every ten years (1966-1977) and is a companion national sector analysis to the NSSA. Data on shifts in smallholder population (migration), off-farm employment and standards of living are important to the same potential clients. The same constraints and solutions apply as for No. 1-4, although no programmer would be specifically assigned to this data base.
6. Extension field staff are in continual contact with farmers and are in a unique position to monitor smallholder responses to recommendations and general patterns of smallholder behaviour.

Only a few surveys (seven in four ADDs) have been conducted thus far in Malawi since the program started in 1981, and the process has advanced past the survey stage in only three ADDs.

Although the farming systems program is now based in a section of DAR, the work requires the active collaboration of many departments (DAR, DAD, DPE, NSG, etc.) at many levels. Data from No. 1-8 are used as prelude or background for FSS as well as being used to verify FSS conclusions. The process forms close working relationships among research, ADD and project staff as they jointly identify problems and plan solutions.

On-farm trials (OFT) are a way to collect data on smallholder environments; when the trials also include farmer management (alone or in collaboration with research) the data includes smallholder management and decision-making. In a smallholder-oriented research program these on-farm farmer-managed trials are the final step in the transition of recommendations from research to extension. Only one demonstration of these trials has occurred in Malawi (in 1981/82) from the farming systems process.

The primary problems with FSS and OFT are their lack of institutionalization in Malawi and the inter-departmental nature of farming systems work. Due to the unfamiliarity, many MOA staff need training in the purpose and methods. Continued technical assistance is necessary until a Malawian staff is trained in the DAR section. Formal institutional linkages need to be created with extension and management at the MOA and ADD levels and within DAR at the various stations and within various commodity programs.

11. Numerous faculty and students from Bunda and Chancellor Colleges (and some university-related foreign scholars) have conducted studies of smallholders; these studies vary immensely in quality, scope and focus. Although most are small scale surveys, some analyze data from the other sources.

- a) These accumulated studies need to be inventoried.
- b) After inventorying the needs of research and extension, pertinent studies or sets of studies could be selected for further analysis or for communication as is.
- c) There exists the potential of setting out a list of topics that research and extension want studied and presenting that to the university to guide their faculty and students in selecting what to study. This feedback of client interest to researchers would be very valuable.

RESEARCH-EXTENSION LINKAGES

Certain linkage mechanisms already exist at various levels. Research and extension senior staff meet at MOA level and in regional committees. Extension staff at MOA, ADD and project level attend field days at research stations. Extension Aids publishes handbooks, guides and bulletins for extension staff that are based on research recommendations. Research staff coordinate with ADD and project staff on the placement, and sometimes the monitoring, of district research trials (on-farm research-managed trials) which are conducted in large numbers every year. Finally, informal contacts occur throughout the system, and there is an established way for extension to communicate major emergency needs (stopping armyworm, for instance) to research through the ADDs and MOA.

In spite of the existence of these linkages there remain major problems in:

- a) effective communication of research recommendations to extension and to smallholders;
- b) effective communication to research of the empirical problems, constraints and priorities of smallholders and extension;
- c) effective communication between research and extension to facilitate joint problem-identification and problem-solving at the ADD and project levels.

These problems manifest themselves in various ways. Research and extension at all levels tend to blame the other department for any delays in smallholder adoption of improved production practices. This reflects a mutual lack of confidence and the inadequacy of collaborative activities in which each learns to appreciate the skills and work of the other. Research recommendations are usually national in scope and do not reflect ecozone or micro-environmental variations in natural (soils, rainfall patterns) or farming systems (cropping, crop-livestock, on and off-farm enterprise patterns) factors.

Extension recommendations sometimes run counter to what is recommended by research without any effective resolution (or communication) of the discrepancies. Regional committees are an anachronism in NRDP but no replacements at ADD or project levels are yet institutionalized

There is no ADD or project level group in charge of a) assessing extension needs for research information and/or further adaptive trials, b) communicating that to research, c) clarifying discrepancies or communicating corrective information, and d) coordinating the gathering and analysis of necessary additional data, whether from adaptive trials or surveys.

At one time MOA experimented with a specific post of Research-Extension Liaison Officer based in DAR at the MOA level. This approach was not seen as very effective by the University of Florida/USAID team designing the agricultural research project because it channelled all liaison-linkage to one man rather than distributing that responsibility throughout the system.

REFORMS IN PROCESS

Recent improvements in the system have been implemented although their final forms are not yet definite. Each ADD has been formally assigned a local counterpart research station; the personnel of that station are to be the immediate research resource for ADD questions or concerns. Individual personnel at the counterpart stations will be assigned full or part time to working with adaptive research trials in ADDs and projects, although details are not yet worked out.

Two new research sections have been established, one in farming systems analysis and another in agricultural economics; these provide socioeconomic analysis capability and, with the farming systems approach, a working precedent and methodology for involving research and extension staff in collaborative work at ADD and project levels.

Research sections have summarized their data and recommendations for the past five years by ADD, and these summaries have been distributed to ADDs and their counterpart stations. This was to have been accompanied by annual research-extension workshops at each ADD in which both staffs compared notes and clarified what should be recommended, but this has not yet been implemented.

Specific seminars and workshops on specific commodities or subject areas are to be convened whenever significant advances in research make them appropriate; otherwise the routine clarification would be left to the annual workshops.

Although the reforms noted above address the issue of effective communication between research and extension, questions remain as to the final form in which they will be implemented, most specifically concerning the research staff assigned to ADD adaptive trials. Will one full time research professional officer (plus technical staff) be assigned per ADD or will several officers be assigned part time to each ADD's adaptive trials? Will this staff be stationed at the research station or at the ADD? Under the jurisdiction of the Program Manager (PM) of the ADD or under the Officer-in-Charge (OIC) of the station?

These questions of staffing and jurisdiction are as yet unsettled, as is the issue of the extent to which DAR resources (staff, funding) will be assigned to adaptive work. In any event there are several other aspects of this ADD level linkage that need to be examined.

One concerns necessary construction. Two of the counterpart stations (and possibly a third) need to be upgraded since a counterpart station needs at least three professional level staff, and those two stations only have one professional each. Office and housing for extra professionals and supporting technical staff will be needed, whether these people are assigned to the station, ADD or in the field.

Another issue is that the existing communication gaps and lack of collaboration will not be solved by assignment of isolated individuals. Some ADDs have their own research and trials officers, and their presence has helped but not solved the problem. The issue of jurisdiction (PI or OIC) highlights the feeling that the adoptive DAR staff will be isolated on one end or the other (DAR or ADD). What is required is a collaborative team at the ADD level that combines the resources of research, extension and evaluation.

One suggested way to implement this is to form an adaptive research/extension team (ARET) at each ADD. The team could consist of three DAR specialists (two of which would be an agronomist and a socioeconomist) and three ADD specialists (extension, evaluation, crops or research and trials), possibly under the joint leadership of the PI/OIC. The ARET would be a working group to: (a) analyze priorities in the ADD for smallholder-oriented research, probably utilizing the farming systems approach in combination with evaluation surveys;)b) plan, implement and monitor adaptive on-farm trials and subsequent turnover to extension and demonstration; (c) coordinate the collection of additional data with client-oriented analysis of existing data.

By incorporating the major research and extension units within a small working group the formation and operation of ARET would institutionalize a collaborative problem-identifying and problem-solving process at the major operational level (ADDs). Most of the units already exist for such a team; the only new components will be the adaptive research staff (agronomic and socioeconomic); and their availability will be considered as part of the planned restructuring of DAR.

Research-extension linkages need to be strengthened at other levels than the ADD. Proposals for management workshops (another project area) address this since senior HQA staff must work out for themselves how to coordinate at HQA level.

Management workshops at the ADD level would include, among other topics, ARET implementation and arranging annual workshops (2-3 days) for senior staff followed by refresher in-service training for lower level staff (FA level).

Another area to investigate is the comprehensiveness and correctness of Extension Aids bulletins, handbooks and guides. These published materials serve as the library for extension staff (with Za Achikumbi for farmers). An inventory of existing materials must be accompanied by updating and widespread distribution as part of extension in-service training.

APPENDIX 4

IN-SERVICE TRAINING

UNIVERSITY OF FLORIDA / USAID
TECHNICAL ASSISTANCE PROJECT

December 1982

TABLE OF CONTENTS

1. Program Accomplishments
 - A. Conferences, networking, etc.
 - B. Sponsored courses and lectures in Malawi
 - C. On the job training
2. Projected Activities
 - A. Conferences, networking, etc.
 - B. Sponsored courses and lectures in Malawi
3. The Budget
 - A. Before Fiscal Year 1983
Conferences, networking, etc.
 - B. Before Fiscal Year 1983
Sponsored courses and lectures in Malawi
 - C. Before Fiscal Year 1983
Calculators
 - D. Fiscal Year 1983
Conferences, networking, etc.
 1. already spent
 2. projected expenses
 - E. Fiscal Year 1983
Sponsored courses and lectures in Malawi
 - F. Fiscal Year 1984
 - G. Budget Summary

1. IN-SERVICE TRAINING ACCOMPLISHMENTS DECEMBER 1982 REPORT

There are three main components of the in-service training program of the MA/UF/USAID Agricultural Research Project. These three are briefly described, after which the activities accomplished thus far under each component are listed in chronological order.

1. One component is encouraging and funding Malawian agricultural research staff to:

- attend international and national conferences, workshops and short courses and
- establish better networking with other research staff in Malawi, in other countries and in International Agricultural Research Centers (IARCs).

Many of these conferences, workshops and short courses are in other countries, although some are in Malawi. We encourage people to attend and to present papers on their research. Closer working relationships with IARCs, other national research programs and with academic researchers add an important dimension to strong research programs. Sometimes the project provides total or partial funding, and sometimes we only assist in making arrangements and contacts.

2. A second component of in-service training is sponsoring and funding lectures, conferences, workshops and short courses here in Malawi. Some of these are directed by our long-term technical assistance team, while others are led by short-term (TDY) consultants. This training in Malawi has the advantage of permitting many more Malawians to attend at lower cost, and the Malawian staff are able to interact among themselves in a professional way.

3. The third component is on-the-job training by the long-term and TDY technical assistance people. This is strongest among the Malawian staffs of the sections where the technical assistance team members are assigned, but some on-the-job training also occurs among the staffs of other sections.

1A. CONFERENCES, NETWORKING, ETC.

More details are found in the appropriate Project Quarterly Reports and files UF/60/10/15 and UF/60/10/16.

1. Dr. H. K. Mwandemere, Officer in Charge of Chitedze ARS and Soil Chemist, was funded to attend the First International Congress on Dryland Farming (25 August-5 September 1980) at Adelaide, Australia. His report is available.

2. Dr. H. K. Mwandemere, Officer in Charge of Chitedze ARS and Soil Chemist, and Mr. E. M. Ntokothe, Soil Surveyor with Kasungu ADD, were funded to attend the First OAU/STRC Inter-African Soil Science Congress (10-15 November 1980) in Accra, Ghana. They presented three papers:

- Soil Genesis, Survey and Classification in Malawi.

- The State of Soil Science Development for Agricultural Production in Malawi - A Progress Report.
 - Soil Fertility Evaluation and Improvement in Malawi.
- A report on the congress is available.
3. Mr. G. M. Chapola, Plant Pathologist at Chitedze ARS, was assisted to attend a Workshop on Plant Quarantine (13 November-4 December 1980) at New Delhi, India. The workshop was sponsored by FAO.
 4. Mr. M. B. B. Kasowanjete, Ranch Manager of Dzalanyama Ranch and Animal Breeder/Geneticist, was funded to attend a Workshop on the Breeding of Trypanotolerant Livestock in West and Central Africa (26 November-5 December 1980) in Lome, Togo. His report is available.
 5. Mr. R. E. N. Sauti, Officer in Charge of Lunyangwa ARS and Agronomist (Coordinator for Root Crops), was assisted to attend an Eastern Africa Regional Root and Tuber Crops Workshop (23-28 November 1980) at Kigali, Rwanda. His report is available.
 6. Mr. Y. E. Nyironggo, Farm Machinery Research Officer at Chitedze ARS, was funded to attend a UNESCO-sponsored Sub-regional Workshop on Identification and Financing of Sub-regional Co-operative Research Projects in Eastern and Southern Africa (1-5 December 1980) at Nairobi, Kenya. The workshop report is available.
 7. Dr. V. W. Saka, Nematologist at Bvumbwe ARS, was funded to attend an International Workshop on Pigeon Pea (15-19 December 1980) at Patancheru Andhra Pradesh, India. The workshop was co-sponsored by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the Indian Council of Agricultural Research (ICAR). His report is available.
 8. Mr. Y. E. Nyironggo, Farm Machinery Research Officer at Chitedze ARS, was funded to attend a Farm Machinery Testing Workshop (19-23 January 1981) at Nakuru, Kenya. The workshop was sponsored by the Commonwealth Secretariat and the Kenyan Government.
 9. Mr. A. J. Chiyembekeza, Groundnut Breeder, was funded to attend the Second International Seminar on Winged Bean, Psophocarpus Tetragonolobus(L.) (19-24 January 1981) at Colombo, Sri Lanka. The seminar was sponsored by the International Council for the Development of Underutilized Plants (ICDUP). Report is available.
 10. Dr. H. K. Mwandemere, Officer in Charge of Chitedze ARS and Soil Chemist, was funded to attend an International Conference on Soils with Variable Charge (11-18 February 1981) at Palmerston North, New Zealand.
 11. Mr. P. H. Moyenyembe, Wheat Agronomist at Chitedze ARS, Mr. C. J. Matabwa, Soil Scientist at Chitedze ARS, and Dr. D. E. McCloud of our project were funded to attend a Wheat Workshop (9-13 March 1981) at Mount Makulu ARS, Zambia. Their reports are available.
 12. Mr. L. D. M. Ngwira, Senior Maize Agronomist at Chitedze ARS, was funded to attend a Workshop on Reduced Tillage Systems (9-20 March 1981) at Ibadan, Nigeria. The workshop was sponsored by the International Institute of Tropical Agriculture (IITA). His report

is available.

13. Dr. V. W. Saka, Nematologist at Bvumbwe ARS, was funded to attend the Fifth Symposium and General Meeting of the Nematological Society of Southern Africa (17-18 March 1981) at Mount Edgecombe, South Africa. Dr. Saka presented a research paper on the "Investigation of Nematicidal Activities of Aqueous Extracts of 'bitter' Cassava Peel and Tung Cake Against *Meloidogone javanica*." His report is available.
14. Mr. F. H. Mnyenyembe, Wheat Agronomist at Chitedze ARS, and Mrs. Mgomezulu, Farming Systems Officer at Chitedze ARS, were funded to attend a Farming Systems Workshop on Adaptive On-Farm Experimentation (21-30 April 1981) at Nairobi, Kenya. The workshop was sponsored by the Eastern Africa Economics Program, based in Nairobi, of the International Maize and Wheat Improvement Center (CIMMYT). The project also assisted the Department of Agricultural Development to send two of their staff: Mr. S. Hiwa, Evaluation Officer of Liwonde ADD and Mr. A. Ng'ong'ola, Crops Officer of Blantyre ADD. Reports from the two DAR staff are available.
15. Mr. D. R. B. Manda to attend the Regular Meetings for Plant Production, Plant Protection and Subcommittee for Seed, Southern African Regional Commission for the Conservation and Utilization of the Soil (SARCCUS) in South Africa (10-17 October 1981).
16. Mr. B. E. Moyo, Agronomist at Maloka ARS, was funded to attend a Farming Systems Workshop on Diagnostic Surveys (27 October-6 November 1981) at Nairobi, Kenya. The workshop was sponsored by the Eastern Africa Economics Program, based in Nairobi, of the International Maize and Wheat Improvement Center (CIMMYT). His report is available.
17. Mr. M. L. Matsonga, Library Assistant at Chitedze ARS, was encouraged and assisted to attend a Library Assistant Certificate course (December 1981-June 1982) in Malawi. Training for the agricultural library staff was one of the recommendations from our IDY librarian's report in 1981. The training was sponsored by the Malawi Library Association. His report is available.
18. Dr. B. K. Mwandemere, Officer in Charge of Chitedze ARS and Soil Chemist, was funded to attend the First OAU/STRC Inter-African Conference on Bio-Fertilizers (22-26 March 1982) at Cairo, Egypt.
19. Mr. R. E. N. Sauti, Officer in Charge of Lunyangwa ARS and Agronomist (Coordinator for Root Crops), was funded to attend a Workshop on Root and Tuber Crops Germ Plasm Distribution (2-7 May 1982) at Ibadan, Nigeria that was sponsored by the International Institute of Tropical Agriculture (IITA).
20. Mr. F. H. Mnyenyembe, Wheat Agronomist at Chitedze ARS, was assisted to attend a cereal agronomy/rainfed training course (May-November 1982) at Texcoco, Mexico. The course was sponsored by the International Maize and Wheat Improvement Center (CIMMYT).

21. Mrs. E. Sibale, Maize Breeder at Chitedze ARS, was assisted to attend a maize breeding course at CIMMYT and to visit the Agronomy Department, University of Florida, to see their breeding program (June-September 1982).
22. Dr. H. K. Mwandemere, Officer in Charge of Chitedze ARS and Soil Chemist, and Dr. S. F. Pasley of our project were funded to visit rainfed and irrigated wheat production areas of Zimbabwe and Kenya (22 June-3 July 1982). Their report is available.
23. Mr. M. B. B. Kasowanjete, Ranch Manager of Dzalanyama Ranch and Animal Breeder/Geneticist, Mr. H. D. Msiska, Pasture Agronomist at Chitedze ARS, and Mr. Mtukuso, Animal Scientist at Chitedze ARS, were funded to attend the Regular Meeting of the Standing Committee for Animal Production, Southern African Regional Commission for the Conservation and Utilization of the Soil (SARCCUS) and a Workshop on Extension Strategies for Increased Animal Production in Salima, Malawi (12-16 July 1982). A report of the meeting and workshop is available.
24. Mr. H. D. Msiska, Pasture Agronomist at Chitedze ARS, and Dr. E. M. Hodges of our project were funded to attend the Fourth Regular Sub-Committee Meeting on Veld and Pasture, Southern African Regional Commission for the Conservation and Utilization of the Soil (SARCCUS) in South Africa (August 1982). Their report is available.
25. Mr. W. G. Nhlane, Officer in Charge of Baka ARS and Maize Breeder, was funded to go to the International Institute for Tropical Agriculture (IITA) in Ibadan, Nigeria for personal tutoring in methodology for screening maize for maize streak virus (1-5 November 1982).

1B. SPONSORED COURSES AND LECTURES ETC. IN MALAWI

More details are found in the appropriate Project Quarterly Reports, TDY Trip Reports and file UF/60/10/25.

1. Dr. Max R. Langham, TDY Agricultural Economist from the University of Florida, presented a lecture on "What Determines Farmer Interest in Adopting Improved Technology: An Economic Perspective" at Chitedze ARS (20 February 1981). Approximately 25 people attended.
2. Dr. D. E. McCloud, Chief of Party and Groundnut Agronomist, taught a Crop Ecology course at Chitedze ARS during March and April 1981. This was similar to the Agronomy 6511 course Dr. McCloud taught at Florida. The course was taught over seven weeks with a total of 38 hours of classroom and laboratory instruction. Fourteen research staff attended. An outline of the course is in the Project Quarterly report for January-March 1981 (MF-3).
3. Dr. D. E. McCloud, Chief of Party and Groundnut Agronomist, taught a Crop Yield Dynamics course at Bvumbwe ARS for one concentrated week (31 August-5 September) during 1981. Ten research staff

attended the course. An outline of the course is in the Project Quarterly Report April-June 1981 (MF-3).

4. Dr. A. Hansen, Farming Systems Analyst and Anthropologist, gave two lectures on "Farming Systems Research: Theory and Practice in Malawi" during 1981. The first was at Chitedze ARS (25 September) to more than 60 people from the Ministry of Agriculture, Chitedze and various ADDs. The second was at Bvumbwe ARS (30 October) to more than 75 people from Bvumbwe and other ARS and several ADDs. Copies of the paper have been distributed widely.
5. Dr. A. Hansen, Farming Systems Analyst and Anthropologist, Dr. O. I. Edge, Head of the Crop Production Department of Bunda College and Agronomist, and Dr. I. McLean, Horticulturalist, co-sponsored a Intercropping Conference for research staff at Chitedze 20 October 1981. Four people gave presentations, and thirteen people attended from Chitedze and Bvumbwe ARS and Bunda College. Proceedings of this conference are being printed now for distribution within DAR and Bunda College, and plans are being made for a subsequent conference on the same subject.
6. Dr. A. Hansen, Farming Systems Analyst and Anthropologist, sponsored a Conference on Socioeconomic Research in Rural Lilongwe at Chitedze ARS 23 January 1982. Eleven papers were presented, including two by Chitedze staff, and 32 people attended from various Ministries, ARS, ADDs and from Chancellor and Bunda Colleges. Proceedings of this conference are in preparation to be printed and distributed by the project within Malawi.
7. Dr. D. N. Maynard, TDY Horticulturalist from the University of Florida, and Dr. I. B. McLean from the project presented two lectures on nitrogen, phosphorus and potassium uptake and the importance of these and other elements in plant physiology and deficiency disorders at Bvumbwe ARS (15 March 1982).
8. Dr. D. B. Hensel, TDY Horticulturalist from the University of Florida, presented a Potato Production course at Bvumbwe ARS (26-30 April 1982).
9. Dr. Calvin Arnold, TDY Horticulturalist from the University of Florida, taught a Fruit Crops course at Bvumbwe ARS (18-21 May 1982). About 50 people attended. Course outline and list of participants are available.
10. Dr. Suresh Rao, TDY Soil Physicist from the University of Florida, presented two lectures on "Quantitative Aspects of Water and Agrochemical Management in Crop Production". The first was at Chitedze ARS (16 August 1982) and the second at Bvumbwe ARS (23 August). About 40 people attended the first and 45 the second.
11. Dr. Dale Hicks, TDY Extension Agronomist from the University of Minnesota, taught two Experimental Design and Research Methodology courses. The first was at Chitedze ARS (6-10 September 1982) and the second at Bvumbwe ARS (13-16 September). Approximately 27 people attended the first and 32 people the second. The project has printed a set of course papers for distribution within Malawi.
12. Dr. Peter E. Hildebrand, TDY Agricultural Economist from the

University of Florida, Dr. A. Hansen from this project, and Dr. James W. Jones, TDY Anthropologist from the University of Florida, taught an On-Farm Trials: Design and Analysis course at Chitedze ARS (4-8 October 1982). Thirty five people attended the course. A compendium of course papers is being prepared for distribution within Malawi.

13. Dr. Charles E. Eno, TDY Soil Scientist from the University of Florida, presented a lecture on "Soil Testing and Recommendations to Florida Farmers Using the Computers" at Chitedze ARS (12 November 1982). Approximately 50 people attended.

14. Dr. Hugh L. Popenoe, Director of International Programs for the University of Florida and Soil Scientist, presented a lecture on "Low Energy Agriculture for Smallholders" at Chitedze ARS (17 November 1982). Approximately 50 people attended.

1C. ON THE JOB TRAINING

More details are found in the appropriate Project Quarterly Reports.

This category of in-service training is more amorphous than the others. One consistent feature has been the provision of programable calculators and computers and instruction in how to use them. This is designed to eliminate the present system in which a research officer consistently sends his or her data away to the Biometrics Section at Makoka ARS for routine analysis. Aside from this general emphasis, each member of the technical assistance team has individual interests in on the job training. Informal tutoring occurs throughout the working days and months between the technical assistance team members (and the better trained Malawian professionals) and their less skilled research colleagues. Some training exercises have been set up by different team members while others rely on informal tutoring. Probably the only way to adequately assess this type of training is through interviewing the various team members and many Malawians.

2. PROJECTED IN-SERVICE ACTIVITIES

2A. CONFERENCES, NETWORKING, ETC.

More details are found in the file UF/60/10/5.

1. Mr. C. J. Matabwa, Soil Scientist at Chitedze ARS, to visit three places in South Africa for a total of two weeks:
 - Congress on Weeds, Crops and Soils at Stellenbosch 22-28 January 1983.
 - Small Grains Research Centre at Bethlehem, Natal 29 January - 1 February 1983.
 - Grain Crops Research Institute at Pietermaritzburg 1-4 February 1983.
2. Dr. James Maida, Officer in Charge of Bvumbwe ARS and Soil Chemist, to visit the University of Florida for two weeks (mid to late February 1983) to confer with the Departments of Vegetable Crops and Fruit Crops about the Bvumbwe horticultural program and the Soil Science Department about soils research.
3. Mr. B. S. C. Phiri, Mr. W. I. Kawonga and Mr. G. M. Bulla, all of Farming Systems Analysis Section of Chitedze ARS, of Farming Systems Analysis Section of Chitedze ARS, and Mr. J. K. K. Nyondo of Agricultural Economics Section of Chitedze to attend a three week course in diagnostic surveys at the University of Zimbabwe (7-21 February 1983). This is part of the course sequence sponsored by the USAID-funded CIMMYT program from Nairobi.
4. Mr. A. P. Mtukuso, Animal Scientist at Chitedze ARS, accompanied by Dr. R. C. Gray of our project, to visit the International Livestock Center for Africa (ILCA) in Addis Ababa, Ethiopia, for one week (late February 1983).
5. Mr. A. J. Chiyembekeza, Groundnut (Peanut) Breeder, Mr. C. E. Maliro, Groundnut Agronomist, and Mrs. E. Ngwira, Groundnut Pathologist, all of Chitedze ARS, accompanied by Dr. D. E. McCloud of our project, to visit Potchefstroom Research Station in South Africa for one week (28 February - 4 March 1983).
6. Mr. E. S. Muwalu of Crop Storage Section of Bvumbwe ARS, to visit Kenya for two days (possibly in March 1983) to study potato storage.
7. Mr. W. G. Nhlane, Officer in Charge of Baka ARS and Maize Breeder, Mr. J. D. I. Kumwenda, Officer in Charge of Ngabu ARS and Maize Agronomist, and Mrs. E. M. Sibale, Maize Breeder at Chitedze ARS, to attend a SARCCUS symposium in South Africa and visit ARS in Zimbabwe and Zambia for two weeks in March 1983.
8. Mr. B. S. C. Phiri, Mr. W. I. Kawonga, Mr. G. M. Bulla, and Mr. J. D. Ndengu, all Farming Systems Research Officers at Chitedze ARS, accompanied by Dr. A. Hansen of our project, to visit the Zambian Adaptive Research and Planning Team (ARPT) headquarters and field sites for one week in March 1983.

9. Mr. H. D. Msiska, Pasture Agronomist at Chitedze ARS, to visit two places in Zimbabwe for one week (possibly in April 1983):

- Zimbabwe Grasslands Research Station.
- Henderson Research Station.

10. Mr. H. D. Msiska, Pasture Agronomist at Chitedze ARS, to visit two places in Kenya for one week (possibly in May 1983):

- National Agricultural Laboratory and the National Library in Nairobi.
- National Agricultural Research Station and National Seed Company in Kitale.

11. Mr. W. Y. Kayange of Luyangwa ARS, Mr. N. D. B. Mwanlisi of Mbawa ARS, Mr. Genda of Chitala ARS, and Mr. Knox C. Chithenga of Chitedze ARS, all Technical Officers in Livestock, accompanied by Dr. R. Gray of our project, to visit the Naviaska Institute of Dairying in Kenya for one week (possibly in May 1983).

12. Mr. J. K. K. Nyondo and Mr. O. A. H. Jere, Assistant Agricultural Economists at Chitedze ARS, accompanied by Dr. D. Pervis of our project, to visit IITA in Nigeria and CIMMYT in Kenya for two weeks in May 1983.

13. Mr. J. H. Luhanga and Mr. E. P. Kantikana of Seed Technology Section of Chitedze ARS, to visit several places in Kenya for one and a half weeks (possibly in July 1983):

- National Seed Quality Services headquarters in Nairobi.
- Kenya Seed Company.
- the main wheat breeding station at Njoro.
- Kenya Farmers' Association.

14. Mr. C. J. Matabwa, Soil Scientist at Chitedze ARS, to visit two places in the USA for a total of two weeks (possibly in July 1983):

- Soil Science Department of North Carolina State University, Raleigh, North Carolina.
- International Fertilizer Development Center at Muscle Shoals, Alabama.

15. Mr. W. A. Kadyampakeni, Senior Instrument Technician at Chitedze ARS, to attend a course (possibly in July 1983) on maintenance of Perkin Elmer Atomic Absorption Spectrophotometers so that the new equipment will be well-maintained. We have not yet selected the appropriate locale but it will probably be in the USA (or in South Africa) and last for approximately three weeks (or less).

2B. SPONSORED COURSES AND LECTURES IN MALAWI

More details are found in the file UF/60/10/10. There are no anticipated costs for the first three since most would be for those personnel already at the ARS. The fourth is still indefinite in size and composition so no costs have been estimated. Therefore, these projected courses and lectures are not noted in the following budget.

1. Dr. D. Pervis will present a lecture at Chitedze ARS in late January 1983 to explain the Agricultural Economics Data Bank Standards and will later repeat the lecture at Evumbwe ARS.
2. Dr. D. Pervis will give a short course on Introduction to Economic Principles at Chitedze ARS in March 1983 and will later repeat the course at Evumbwe ARS.
3. Dr. H. K. Mwandemere and Dr. S. F. Pasley will coordinate a Cereals Workshop to be held at Chitedze ARS in May 1983.

3. IN-SERVICE TRAINING BUDGET DECEMBER 1982 REPORT

3A. BEFORE FISCAL YEAR 1983 CONFERENCES, NETWORKING, ETC.

More details about 1980-82 in-service conferences, short courses, etc. are found earlier in this report, the appropriate Project Quarterly Reports, and the files UF/60/10/15 and UF/60/10/16.

Budget items are listed as airplane tickets, per diem advances, per diem reimbursements, and general accommodations for in-Malawi course attendance. The term "advance" as used in this budget refers to per diem expense money advanced to the traveller. Except for one instance noted below, all of these advances have been accounted for to the Chief of Party and may now be more suitably considered per diem.

1. Dr.H.K.Mwandemere, Australia, 1980.

ticket	MK 2304.50	\$ 2920.03
advance	MK <u>1595.16</u>	\$ <u>2021.23</u>
TOTAL	MK 3899.66	\$ 4941.26
2. Dr.H.K.Mwandemere and Mr.E.M.Ntokotha, Ghana, 1980.

ticket	MK 984.50	\$ 1247.46
ticket	MK 984.50	\$ 1247.46
advance	MK 1001.24	\$ 1268.67
advance	MK <u>1001.24</u>	\$ <u>1268.67</u>
TOTAL	MK 3971.48	\$ 5032.26
3. Mr.G.M.Chapola, India, 1980.

advance	MK 255	\$ 323.11
---------	--------	-----------
4. Mr.M.B.B.Kasowanjete, Togo, 1980.

advance	MK 400	\$ 506.84
---------	--------	-----------
5. Mr.R.F.N.Sauti, Rwanda, 1980.

advance	MK 260	\$ 329.45
---------	--------	-----------
6. Mr.Y.P.Nyirongo, Kenya, 1980.

advance	MK 100.00	\$ 126.71
reimbur	MK <u>97.23</u>	\$ <u>123.20</u>
TOTAL	MK 197.23	\$ 249.91
7. Dr.V.W.Saka, India, 1980.

advance	MK 400	\$ 506.84
---------	--------	-----------
8. Mr.Y.P.Nyirongo, Kenya, 1981.

advance	MK 250	\$ 296.33
---------	--------	-----------
9. Mr.A.J.Chiyembekeza, Sri Lanka, 1981.

advance	MK 450	\$ 533.39
---------	--------	-----------
10. Dr.H.K.Mwandemere, New Zealand, 1981, no cost.

11. Mr.P.H.Mnyenyembe and Mr.C.J.Matabwa, Zambia, 1981.		
advance MK 500	\$	592.65
advance MK <u>500</u>	\$	<u>592.65</u>
TOTAL MK 1000	\$	1185.30
12. Mr.L.D.M.Ngwira, Nigeria, 1981.		
advance MK 500	\$	592.65
13. Dr.V.W.Saka, South Africa, 1981.		
advance MK 320	\$	379.30
14. Mr.F.H.Mnyenyembe and Mrs.Mgomezulu, Kenya, 1981.		
ticket MK 425.50	\$	465.56
ticket MK 425.50	\$	465.56
advance MK 450.00	\$	522.36
advance MK <u>450.00</u>	\$	<u>522.36</u>
TOTAL MK 1751.00	\$	1975.84
EX. Mr.Gausi, England and Italy, September 1981, expended funds are <u>not yet totally reimbursed</u> to project, trip not taken due to illness.		
ticket MK 1882.00	\$	2184.63
advance MK <u>460.77</u>	\$	<u>534.86</u>
TOTAL MK 2342.77	\$	2719.49
15. Mr.D.R.B.Manda and Dr.V.W.Saka, South Africa, 1981.		
ticket MK 550	\$	638.44
ticket MK 550	\$	638.44
advance MK 800	\$	928.64
advance MK <u>750</u>	\$	<u>870.60</u>
TOTAL MK 2650	\$	3076.12
16. Mr.B.F.Moyo, Kenya, 1981.		
advance MK 750	\$	870.60
17. Mr.M.L.Katsonga, Malawi, 1981-82, no cost.		
18. Dr.H.K.Mwandemere, Egypt, 1982.		
advance MK 850	\$	930.07
1-18 and EX	TOTAL	MK20247.14 \$24448.76

3B. BEFORE FISCAL YEAR 1983 SPONSORED COURSES AND LECTURES IN MALAWI

More details about 1981-82 sponsored lectures and short courses in Malawi are found earlier in this report, the appropriate Project Quarterly Reports, and file UF/60/10/25.

1. Dr.D.E.McCloud, course at Bvumbwe ARS, Aug-Sep 1981. Accommodations for actual living expenses were paid for 9 DAR staff who attended from distant ARS.

Accommo MK 106.50	\$	123.63
Accommo MK 50.00	\$	58.04
Accommo MK 2.00	\$	2.32
Accommo MK 106.50	\$	123.63

Accommo MK	117.25	\$	136.10
Accommo MK	97.75	\$	113.47
Accommo MK	106.50	\$	123.63
Accommo MK	106.50	\$	123.63
Accommo MK	103.50	\$	120.14
Accommo MK	<u>106.50</u>	\$	<u>123.63</u>
TOTAL MK	903.00	\$	1048.22

3C. BEFORE FISCAL YEAR 1983 CALCULATORS

These calculators were purchased for use by DAR staff as they learned to perform their own analyses. The two types of calculators have been widely distributed to various ARS.

5 TI55 MK	151.92	\$	192.50
5 TI55 MK	151.92	\$	192.50
1 HP41C MK	181.39	\$	215.00
1 HP41C MK	181.39	\$	215.00
1 HP41C MK	181.39	\$	215.00
10 TI55 MK	299.36	\$	347.50
1 HP41C MK	<u>260.17</u>	\$	<u>302.00</u>
TOTAL MK	1407.54	\$	1679.50

3D. FISCAL YEAR 1983 CONFERENCES, NETWORKING, ETC. 3D1. ALREADY SPENT

19. Mr.R.F.N.Sauti, Nigeria, 1982.
advance MK 1300 \$ 1365
20. Mr.P.H.Mnyenyembe, Mexico, 1982.
advance MK 130 \$ 136.50
21. Mrs.E.M.Sibale, Mexico and Florida, 1982.
advance MK 200 \$ 210
22. Dr.H.K.Mwandemere, Zimbabwe and Kenya, 1982.
ticket MK 835 \$ 876.75
advance MK 700 \$ 735.00
TOTAL MK 1535 \$ 1611.75
23. Mr.M.B.B.Kasowanjete, Mr.H.D.Msiska and Mr.A.P.Mtukuso,
Malawi, 1982.
advance MK 257.16 \$ 270.02
24. Mr.H.D.Msiska, South Africa, 1982.
ticket MK 590.00 \$ 516.20
reimbur MK 299.19 \$ 266.28
TOTAL MK 879.19 \$ 782.48
25. Mr.W.G.Nhlane, Nigeria, 1982.
ticket MK 1092.00 \$ 993.72
advance MK 950.00 \$ 845.50

	TOTAL	MK 2042.00	\$ 1839.22
19-25.	TOTAL	MK 6343.35	\$ 6214.97

**3D. FISCAL YEAR 1983
CONFERENCES, NETWORKING, ETC.
3D2. PROJECTED EXPENSES**

More details about these projected 1983-84 out of country in-service expenses are found in the file UF/60/10/5.

1. Mr.C.J.Matabwa, South Africa, Jan-February 1983.

ticket	MK 1210.00	\$ 1101.10
advance	MK <u>895.40</u>	\$ <u>814.00</u>
TOTAL	MK 2105.40	\$ 1915.10
2. Dr.James Maida, USA, February 1983.

ticket	MK 3250.00	\$ 2957.50
advance	MK <u>783.20</u>	\$ <u>712.00</u>
TOTAL	MK 4033.20	\$ 3669.50
3. Mr.B.S.C.Phiri, Mr.W.T.Kawonga and Mr.G.M.Bulla, Zimbabwe, February 1983, no cost because funded by CIMMYT.
4. Mr.A.P.Mtukuso, Ethiopia, February 1983.

ticket	MK 1058.00	\$ 962.78
advance	MK <u>554.40</u>	\$ <u>504.00</u>
TOTAL	MK 1612.40	\$ 1466.78
5. Mr.A.J.Chiyembekeza, Mr.C.E.Maliro and Mrs.P.Ngwira, South Africa, Febr-March 1983.

tickets	MK 1860.00	\$ 1692.60
advance	MK <u>2748.90</u>	\$ <u>2499.00</u>
TOTAL	MK 4608.90	\$ 4191.60
6. Mr.E.S.Muwalo, Kenya, March 1983.

ticket	MK 695.00	\$ 632.45
advance	MK <u>315.80</u>	\$ <u>288.00</u>
TOTAL	MK 1011.80	\$ 920.45
7. Mr.W.G.Nhlane, Mr.J.D.T.Kumwenda and Mrs.E.M.Sibale, South Africa, Zimbabwe and Zambia, March 1983.

tickets	MK 2463.00	\$ 2241.33
advance	MK <u>3296.70</u>	\$ <u>2997.00</u>
TOTAL	MK 5759.70	\$ 5238.33
8. Mr.B.S.C.Phiri, Mr.W.T.Kawonga, Mr.G.M.Bulla and Mr.J.D.Ndengu, Zambia, March 1983.

vehicle	MK 500.00	\$ 455.00
advance	MK <u>3110.80</u>	\$ <u>2828.00</u>
TOTAL	MK 3611.80	\$ 3283.00
- 1-8. TOTAL MK22743.20 \$20684.76

**3E. FISCAL YEAR 1983
SPONSORED COURSES AND LECTURES IN MALAWI**

1. Dr. Dale Hicks, courses at Chitedze ARS (6-10 September 1982) and at Svumbwe ARS (13-16 September).
2. Dr. Peter E. Hildebrand, Dr. A. Hansen and Dr. James Jones, course at Chitedze ARS (4-8 October 1982).

The accommodation costs (actual living expenses) for all three courses are lumped together and presented by the individual bills received from hotels, rest houses and restaurants.

Accommo MK	690.04	\$	614.14
Accommo MK	324.50	\$	288.81
Accommo MK	47.25	\$	42.05
Accommo MK	175.00	\$	155.75
Accommo MK	572.54	\$	509.56
Accommo MK	180.07	\$	160.26
Accommo MK	699.64	\$	622.68
Accommo MK	572.54	\$	509.56
Accommo MK	2351.28	\$	2092.64
Accommo MK	47.33	\$	42.12
Accommo MK	<u>146.00</u>	\$	<u>129.94</u>
TOTAL MK	5806.19	\$	5167.53

**3F. FISCAL YEAR 1984
CONFERENCES, NETWORKING, ETC.
PROJECTED EXPENSES**

9. Mr. H. D. Msiska, Zimbabwe, April 1983.

ticket MK	297.00	\$	270.27
advance MK	<u>577.50</u>	\$	<u>525.00</u>
TOTAL MK	874.50	\$	795.27
10. Mr. H. D. Msiska, Kenya, May 1983.

ticket MK	695.00	\$	632.45
advance MK	<u>432.30</u>	\$	<u>393.00</u>
TOTAL MK	1127.30	\$	1025.45
11. Mr. W. Y. Kayange, Mr. N. D. B. Mwanjisi, Mr. Genda and Mr. Knox C. Chithenga, Kenya, May 1983.

tickets MK	2780.00	\$	2529.80
advance MK	1403.60	\$	1276.00
rentcar MK	<u>495.00</u>	\$	<u>450.00</u>
TOTAL MK	4678.60	\$	4255.80
12. Mr. J. K. K. Nyondo and Mr. D. A. H. Jere, Kenya and Nigeria, May 1983.

tickets MK	2183.00	\$	1986.53
advance MK	<u>2244.55</u>	\$	<u>2040.50</u>
TOTAL MK	4427.55	\$	4027.03
13. Mr. J. H. Luhanga and Mr. F. P. Kantikana, Kenya, July 1983.

tickets MK	1390.00	\$	1264.90
advance MK	<u>1172.60</u>	\$	<u>1066.00</u>

	TOTAL	MK 2562.60	\$ 2330.90
14.	Mr. C. J. Matabwa, USA, July 1983.		
	ticket	MK 3250.00	\$ 2957.50
	advance	MK <u>789.80</u>	\$ <u>718.00</u>
	TOTAL	MK 4039.80	\$ 3675.50
15.	Mr. W. A. Kadyampakeni, USA, July 1983.		
	ticket	MK 3250.00	\$ 2957.50
	advance	MK 1174.80	\$ 1068.00
	course	MK <u>550.00</u>	\$ <u>500.00</u>
	TOTAL	MK 4974.80	\$ 4525.50
9-15.	TOTAL	MK22685.15	\$20635.45

3G. BUDGET SUMMARY

BEFORE FISCAL YEAR 1983

Conf, networks	MK 20247.14	\$ 24448.76
Sponsored	MK 903.00	\$ 1048.22
Calculators	MK <u>1407.54</u>	\$ <u>1679.50</u>
TOTAL	MK 22557.68	\$ 27176.48

FISCAL YEAR 1983

ALREADY SPENT BY DECEMBER 1982

Conf, networks	MK 6343.35	\$ 6214.97
Sponsored	MK <u>5806.19</u>	\$ <u>5167.53</u>
TOTAL	MK 12149.54	\$ 11382.50

FISCAL YEAR 1983

PROJECTED EXPENSES JAN-MAR 1983

Conf, networks	MK 22743.20	\$ 20684.76
----------------	-------------	-------------

FISCAL YEAR 1983

TOTAL PROJECTED EXPENSES THROUGH MARCH 1983

Conf, networks	MK 29086.55	\$ 26899.73
Sponsored	MK <u>5806.19</u>	\$ <u>5167.53</u>
TOTAL	MK 34892.74	\$ 32067.26

TOTAL SPENT THROUGH DECEMBER 1982

Conf, networks	MK 26590.49	\$ 30663.73
Sponsored	MK 6709.19	\$ 6215.75
Calculators	MK <u>1407.54</u>	\$ <u>1679.50</u>
TOTAL	MK 34707.22	\$ 38558.98

FISCAL YEAR 1984 PROJECTED EXPENSES

Conf, networks	MK 22685.15	\$ 20635.45
----------------	-------------	-------------

TOTAL BUDGETED FOR LIFE OF PROJECT

USAID	\$102300.00
-------	-------------

TOTAL SPENT AND PROPOSED THROUGH 1984

MK 80135.57	\$ 79879.19
-------------	-------------

BALANCE REMAINING

\$ 22420.81

ECONOMIC EVALUATION OF POWERTILLER VS OXEN FOR RICE PRODUCTION IN MALAWI

B.R. Nthakomwa

The objective of this analysis is to determine if selling a powertiller and purchasing a team of oxen to produce rice is a financially sound farm management adjustment. Two scenarios are examined. The first makes the change before the powertiller is worn out and the Net Present Value of the change is used as the decision criterion. The second scenario assumes the change is made after the powertiller is worn out and comparisons are made between the NPV's and internal rates of return of the two options (buying a new powertiller or a pair of oxen and equipment).

SCENARIO 1

It is assumed that the farm consists of 10 hectares of rice cultivated land. This land is currently being worked by a powertiller with one operator. The powertiller can cultivate 18 ha of land during the growing season.

Under this Scenario the powertiller is sold and a pair of work oxen purchased. At the time this change is made the powertiller is four years old and has one more year of useful life. The work oxen can cultivate 10 ha in the growing season.

As a result of the change, the farmer will benefit from the sale of the powertiller and the wage of the released labour. However, he will incur the costs of buying the work oxen and the wage of the oxen handler. It is expected that the powertiller will last for five years and the oxen will last for 7 years. For a feasible comparison between powertiller and oxen, 10 hectares are assumed cultivated by both. To reflect the greater capacity of the powertiller its costs have been reduced accordingly in the calculations of costs and benefits.

DATA

Cost of powertiller: K3,330
Life time of powertiller: 5 years
Operation period: 40 days/season
Salvage value of powertiller after 5 years: 0
Area cultivated by powertiller in a season: 18 ha
Fuel consumption: 17 litres/ha
Maintenance cost: 20% of cost over life
Fuel cost: MK0.782/litre
Lubrication cost: 3% of fuel cost
Wages of powertiller operator: K0.21/hr
Oxen cost: K300/pair
Oxen plough: K80
Oxen Ridger: K96 - not used in rice production
Oxen cultivator: K110
Ox-cart: K700
Life time of oxen and equipment: 7 years
Area cultivated by oxen in one season: 10 ha

Maintenance cost of oxen implements: 20% of cost over life
 Wages of ox-handler: K0.84/day
 Operation time in a day: 7 hours
 Discount rate: 12%

ASSUMPTIONS

We assume straight line depreciation with zero salvage value after 5 years. So the powertiller is sold at the price it is worth after depreciating for 4 years. Yields do not increase due to changing to oxen. Wages remain constant over time. Fuel prices and consumption rate, remain constant over the life of the powertiller. Maintenance costs are low at the beginning of the powertiller's life and increase as the powertiller ages; the same assumption is made for oxen implements.

Due to the higher capacity of the powertiller, the benefit of selling it is reduced proportional to the excess capacity.

CALCULATION OF COSTS

1 Maintenance cost:

Oxen-implement: 20% of new value a period of 7 years rising from 1% in the first year to 6% in the last year.

2 Labour cost of working days - oxen handler: $40 * K0.84 / \text{day} = K33.60$

COSTS.

YEAR	MAINTENANCE	WAGES	TOTAL
0	9	33.60	42.60
1	17	33.60	50.60
2	18	33.60	51.60
3	27	33.60	60.60
4	29	33.60	62.60
5	34	33.60	67.60
6	44	33.60	77.60

CALCULATION OF BENEFITS

1. Proceeds from sale of powertiller since the powertiller has depreciated during the first four years; the value in last (fifth) year is $(1/5 * 3300 / 1.8) = K367$
2. Maintenance costs avoided: 20% of purchased price over 5 years period rising from 2% to 6% in the last year.
3. Fuel costs avoided: Under assumptions made and data condition report, the cost of fuel per operation period is calculated as: $- K0.702 / \text{litre} * 17 \text{ litres/ha} * 10 \text{ ha} = K132.94$.
4. Lubrication cost avoided: Calculated as 3% of fuel cost $(3/100 * 133) = K4.00$
5. Value of labour released: By employing an ox-handler, the powertiller operator is released for alternative work at $(K0.21 * 7 * 40 / 1.8) = K32.67$

BENEFITS:

Yr	Cap.cost <u>avoided</u>	Maint.cost <u>avoided</u>	Fuel cost <u>avoided</u>	Lub.cost <u>avoided</u>	Value of Labour <u>released</u>	Tot.benefits
0	367	110	133	4	32.67	646.67
1	1833	37	133	4	32.67	2039.67
2	0	55	133	4	32.67	224.67
3	0	73	133	4	32.67	242.67
4	0	92	133	4	32.67	261.67
5	0	110	133	4	32.67	279.67
6	367*	37	133	4	32.67	573.67

*Reduces to 1/5 of 1833 to reflect capital cost avoided for only 1 year of use.

THE ANALYSIS.

The analysis applied is the calculation of the Net Present Value of the stream of benefits and operating costs. If this value is greater than the cost of purchasing oxen and equipments (K1190) then the change is a financially sound adjustment.

year	Benefits	Costs	CashFlow
0	646.67	42.60	604.07
1	2039.67	50.60	1989.07
2	224.67	51.60	173.07
3	242.67	60.60	182.07
4	261.67	60.60	201.07
5	279.67	67.60	212.07
6	573.67	77.60	496.07

NPV=K3147.03 at a discount rate of 12%.

From the analysis it is clear that the introduction of oxen to replace the powertiller would be a sound adjustment because the Net Present Value of the change is greater than K1190. Some of the reasons for this result are:-

- low cost of buying oxen as compared to the powertiller.
- the powertiller has higher operating costs like fuel and lubrication oils while the oxen and implements have much lower operating costs.
- comparatively, oxen implements have low maintenance costs.

SCENARIO 11

In this scenario, it is assumed that the farmer waits until the powertiller wears out - then he must decide either to buy a new one or oxen plus equipment.

It is just at this point that the profitability analysis of using a powertiller or oxen is evaluated; therefore the cash flow will include capital expenses of powertiller in years zero and five and the NPV must be compared to zero not the initial capital investment.

These two options will be compared in terms of the yield from the capital investment using NPV and the Internal Rate of return (IRR) as decision criteria. The net benefits from rice regardless of equipment is assumed to be K40 per ha. Since 10 ha of land can be cultivated using oxen, and 18 ha can be cultivated using powertiller, benefits of K400 and K720 respectively will be used.

The analysis is as follows:-

POWERTILLER

Year	Capital expense	Maint.	Fuel	Lub.	Wages	Total
0	3300	66	239	7	59	3671
1	-	99	239	7	59	404
2	-	132	239	7	59	437
3	-	165	239	7	59	470
4	-	198	239	7	59	503
5	1320	66	239	7	59	404

OXEN

year	cap.exp	maint.	wages	total
0	1190	9	33.60	1232.60
1	0	17	33.60	50.60
2	0	18	33.60	51.60
3	0	27	33.60	60.60
4	0	29	33.60	62.60
5	0	34	33.60	67.60
6	0	44	33.60	77.60

POWERTILLER

Year	Benefit	Cost	Netbenefit
0	720	3671	-2951
1	720	404	316
2	720	437	283
3	720	470	250
4	720	503	217
5	720	1691	-971
6	720	404	316

OXEN

Year	Benefit	Cost	Netbenefit
0	400	1232.60	-833
1	400	50.60	349
2	400	51.60	348
3	400	60.60	339
4	400	62.60	337
5	400	67.60	332
6	400	77.60	322

* NPV for Powertiller is -2518.27 at a discount rate of 12%.

* Internal Rate of Return is -63.1%

NPV for Oxen is 563.01 at a discount rate of 12%.

Internal Rate of Return is 33.9%

This analysis indicates that the oxen are a better investment

than powertiller. This can be seen from the yields each investment provides. On the one hand, using a powertiller yields negative values for both NPV and internal rate of return. It would even be better to invest the money used to purchase the powertiller, in a bank account because it would at least yield 10-12%. On the other hand, using oxen yields 33.9%.

CONCLUSION

The conclusion drawn from Scenario 1 is that a farmer who is using a powertiller (in the 4th year of the 5 year life of the equipment) to cultivate rice would benefit financially if he changes to oxen immediately. At this point it should be noted that in Scenario 1, the analysis does not take into consideration the profitability of producing rice, it considers only the benefits of making a change from the powertiller to oxen. Therefore we cannot tell from this analysis if producing rice is profitable, we can only conclude (from Scenario 1) that oxen are better investment than a powertiller.

From Scenario 11, the farmer would get a higher return on investment if he buys the oxen rather than a powertiller. From this, we can generally conclude then that oxen are a better investment than the powertiller for Malawian rice farmers where the assumptions used in these analyses are realistic.

This analysis involves assumptions which are both favourable and unfavourable to the uses of oxen and powertiller.

- For both scenarios, the assumption that the fuel prices remain constant over the life time of the powertiller is not realistic because in reality fuel prices are changing.
- The assumption that wages remain constant could have either a favourable or unfavourable bias - depending on which increases faster, the wage of powertiller operator or the oxen handler.
- The assumption that fuel consumption rates do not change over the life of the powertiller has a bias favourable to the powertiller since fuel consumption will normally increase with age.
- The assumption that salvage value of the powertiller and oxen implements after their useful life is zero has unfavourable bias but is realistic because the market for scrap metals in Malawi is very insignificant.
- The assumption of benefits of K40/ha may or may not be realistic but is used due to lack of data. In any case it would not change the conclusions regarding the powertiller vs oxen. It only affects the profitability of rice using any technology.

AGRICULTURAL ECONOMICS DATA BANK

STANDARDS

Agricultural Economics Section

Chitedze Agricultural Research Station
P.O. Box 158, Lilongwe 1
MALAWI
November 1982
(Revised Dec. 14, 1982)

Introduction

The standards presented in this document are to be used for the Data Banks of the Agricultural Economics Sections on all research stations; other sections are welcome to follow them for their own data if they wish, but any data to be analysed by Agricultural Economics should be stored according to these standards. No attempt is made to follow any standards already set up by other agencies. It is intended that these standards be updated periodically as needed. When such updating requires a reformatting or other changes to data already in storage, a detailed explanation of the needed changes should be prepared and released at the same time that the new standards are issued.

The data storage will take three forms:

1. a descriptive statement of each file using the DB-Master computer program
2. disk storage of the data using the A-STAT computer program other storage systems may be used but A-STAT is recommended
3. Hard copy listings of 1 and 2.
4. an office file with all information about the data including 3.

The data analysis conducted will, of course, depend on the type of data and the problems to be addressed. The program A-STAT is specifically designed to perform regression analysis, analysis of variance etc. and has the capability of producing the data on standard DOS data files which can be read by other programs. The results of analysis can be reported using SUPERTEXT and the APPLEPLOT programs.

Data Storage

The program DB-Master is used to set up a file of descriptive information of all data files in the system.

1. name of file
2. disk on which the file is located
3. storage system (A-STAT etc.)
4. location from which data obtained
5. date that data was collected
6. variables (variable names and meanings)
7. number of observations
8. source of data (name of researcher or dept. of origin)
9. date that the data was obtained from the source
10. general comments

The program A-STAT is currently the standard data storage program although other programs may be used as appropriate and available. Standards for file names and variable names are as follows:

1. Generally, file names should be short and chosen to distinguish them from each other in a meaningful way. For example LADDB1 is preferable to LADDC, because it specifically indicates how it differs from LADDB2 (years)
2. Disk names should also be chosen to uniquely distinguish them from each other. This will often refer to the kind of data on the disk or perhaps a disk sequence number. It is desirable not to completely fill a disk with the raw A-STAT data files because during analysis by A-STAT, many intermediate files are created and space must be available for them.

3. Currently the A-STAT program can handle up to 45 variables per observation. Variable names should be short but meaningful and unique. Those which have been used in the past are:

- NIT - nitrogen application rate (kg/ha)
- P205 - phosphorus application rate in the form of P205 (kg/ha)
- YIELD - yield of the crop (kg/ha)
- ADD - the ADD code
- DIST - district code (not the same as ADD)
- SITE - code of the actual site from which data was collected
- VARTY - variety code of the crop
- ENT - enterprise code
- PROJ - project code

Codes

Many of the variables are given values which are codes representing various aspects of the observation. A-STAT is able to sort or delete according to the values of one or more of these, thus their inclusion can be very valuable for manipulating the data.

ADD Codes: Together these codes cover the entire country.

Code	ADD
1	KRADD (Karonga)
2	MZADD (Mzuzu)
3	KADD (Kasungu)
4	LADD (Lilongwe)
5	SLADD (Salima)
6	LWADD (Liwonde)
7	BLADD (Blantyre)
8	NADD (Ngabu)

PROJ = Projects occur within ADD's and it is sometimes desirable to identify data by project.

KRADD - Code 1

Code	Project
1	

MZADD - Code 2

Code	Project
1	

KADD - Code 3

Code	Project

LADD - Code 4

Code	Project

SLADD - Code 5

Code	Project
------	---------

LRADD - Code 6

Code	Project
1	Namwera
2	Kawinga
3	Balaka
4	Mangochi
5	Zomba

DIST : District Codes are superimposed on the ADD divisions and together cover the whole country.

Code	District
1	Chitipa
2	Karonga
3	Rumphi
4	Nkhata Bay
5	Mzimba
6	Kasungu
7	Dowa
8	Mchinji
9	Lilongwe
10	Nkhotakota
11	Ntchisi
12	Salima
13	Dedza
14	Ntcheu
15	Blantyre
16	Zomba
17	Chiradzulu
18	Machinga
19	Mangochi
20	Mwanza
21	Mulanje
22	Thyolo
23	Chikwawa
24	Nsanje

SITE CODES BY ADD

LRADD - Code 1

Code	Site
1	Baka
2	Lufila
3	Wenya
4	Vinthukutu

5	Nkwali
6	Nkhangwa
7	Chisenga
8	Nyungwe
9	Bugulira
10	Kavukulu
11	Meru
12	Lupembe
13	Mpata South
14	Mpata North
15	Mlare
16	Kameme
17	Hara
18	Wovwe
19	Mwanganakulu

MZADD - Code 2

<u>Code</u>	<u>Site</u>
1	Katumbu
2	Bolero
3	Chisimuka
4	Inulwe
5	Ng'unga
6	Evengu
7	Lacheche
8	Emanyaleni
9	Lunyangwa
10	Euthini
11	Enjeni
12	Bulala
13	Mperembe
14	Bapani
15	Mjinge
16	Jenda
17	Phazi
18	Mbawa (Light)
19	Mbawa (Heavy)
20	Chisasa
21	Maula
22	Mkwale
23	Mphamba
24	Mafundeya
25	Zombwe
26	Nkozo
27	Chintheche
28	Mbawa (s.w.)
29	Patowo
30	Makolo

MZADD - Code 3

<u>Code</u>	<u>Site</u>
1	Matutu (Kamwendo I)

2	Dzoolle
3	Kanwendu II
4	Nkhwazi
5	Malomo East
6	Malomo West
7	Malomo South
8	Ntchisi North
9	Madisi West
10	Mponela
11	Nkhamenya
12	Lisasadzi
13	Kalumo
14	Dzaleka
15	Mwangara
16	Zulu
17	Khongo
18	Mhanda
19	Chimbwanda
20	Njakwa
21	Chiwisi
22	Chulu
23	Kapiri
24	Malomo (?)

LADE : Code 4

Code	Site
1	Unit 43
2	Unit 3
3	Unit 30
4	Unit 5
5	Unit 9
6	Unit 10
7	Unit 12
8	Unit 13
9	Unit 15
10	Unit 27
11	Chitedze
12	Kabeleke
13	Kandao
14	Mwalo
15	Mphepozinai
16	Madzanje
17	Mpamadzi
18	Kambilonjo
19	Mtonda
20	Tsangano
21	Kasinje
22	Pengapenga
23	Unit 28
24	Unit 44
25	Unit 11
26	Colby
27	Bembeke
28	Mikuyu
29	Kamenya

30	Mtendere
31	Nyombe
32	Mpeta
33	Chingoni
34	Mpita
35	Kalewe
36	Asafu
37	Bawa
38	Mawonde
39	Unit 24
40	Unit 14
41	Unit 42
42	Unit 6
43	Unit 32
44	Kasinje (Nameje)
45	Chimutu
46	Maonde
47	Unit 23
48	Unit 21
49	Unit 31

SLADD - Code 5

Code	Site
1	Lifuwu
2	Chitalo
3	Mtakataka
4	Salima Area 3
5	Benga
6	Salima Area 1
7	Salima Area 2
8	Chipoka
9	Ngodzi
10	Mthibula
11	Kakasi
12	Bua
13	Katimbila
14	Mpamantha
15	

SWADD - Code 6

Code	Site
1	Menjanga
2	Nkhambir:
3	Msizi
4	Khole
5	Majiga
6	Masudu
7	Mkutumula (Bwanje Valley)
8	Akubulila (Bwanje Valley)
9	Nhwani (Bwanje Valley)
10	Kosamu (Bwanje Valley)
11	Kamgomo (Bwanje Valley)
12	Balaka

13	Toleza
14	Liwonde
15	
16	Chikweo
17	Nampeya
18	Nyanju
19	Chingale
20	Kalalichi
21	Nyambi
22	Malosa
23	Bazale
24	Masuku
25	Makoka
26	Likhoma
27	Mlomba
28	Dagalasi
29	Makanjira
30	Namwera
31	Namalaka
32	Kapalamula
33	Nanyumbu
34	Chilema
35	Chendausiku (Balaka)
36	Chilupa
37	Likakhala
38	Domasi
39	Ntali
40	Mlamba
41	Mwilya
42	Chingwenya
43	Luwulika
44	Utale
45	Nkope
46	Mtuwa

BLADD - Code Z

Code	Site
1	Phalombe area 1
2	Phalombe area 3
3	Phalombe area 4
4	Siledi
5	Chiwembu
6	Chamloalira
7	Thuchila
8	Bvumbwe
9	Thambani
10	Kanono
11	Gola I
12	Kasonga
13	Neno
14	Njuli
15	Phalombe area 2
16	Daudi
17	Mwanje
18	Naminjiwa

NAME Code 8

Code Site

Fertilizer Codes

Code	Fertilizer
1	20-20-0
2	Calcium Ammonium Nitrate
3	Ammonium Sulphate
4	Urea
5	14-20-0

Enterprise Codes

Code	Enterprise
1	Maize
2	Groundnuts
3	Rice
4	Tobacco
5	wheat
6	Stall Feeders
7	Chickens
8	Goats
9	Hogs
10	Dairy
11	Pasture
12	Legumes
13	Melons
14	Maize & Groundnuts
15	Maize & Beans
16	Maize & Cowpeas

VARIETY CODES

Maize = Code 1

Code	Variety
1	UCA
2	CCA
3	SR52
4	MH12
5	Local

Groundnuts Code 2

Code	Variety
1	Chalimbana
2	Manipintar

Rice - Code 3

<u>Code</u>	<u>Variety</u>
1	Bluebonnet
2	Faya
3	Nilo 11

Tobacco - Code 4

<u>Code</u>	<u>Variety</u>
1	

Stall Feeder Breed Codes

<u>Code</u>	<u>Breed</u>
1	

END OF TOUR REPORT - Dr. Elver M. Hodges, Pasture Agronomist

Period: October 10, 1980 to November 17, 1982

PROJECT TITLE: MALAWI AGRICULTURAL RESEARCH (612-0202)

I. **PROJECT PURPOSE:** Strengthen the capability of the Department of Agricultural Research to provide socially acceptable and economically sound research for smallholder needs in satisfactory quality and quantity and in form useable by extension service.

II. **FODDER AND PASTURE:** The identification of more productive indigenous and introduced fodder and pasture crops and upgrading production and utilization procedures in order to increase smallholder livestock enterprise output.

III. **PROJECT OBJECTIVES - VERIFIABLE ACTIVITIES - ACCOMPLISHMENTS**

A. Strengthen research programs in forage production and management as relating to smallholders.

1. Increase the genetic base of species available for fodder and forage production.

a. Indigenous materials of *Panicum*, *Cynodon*, *Glycine* and other genera were collected in the Northern Region of Malawi in August 1981 by a team headed by Mr. H. D. Msiska. These were planted for initial observation at Chitedze in the 1981/82 growing season. They will be continued in the 1982/83 season. This process of identifying different types of indigenous germplasm is a continuing one.

b. *Cynodon* accessions brought from Florida (all originally collected from Africa) were lost through confusion in procedural channels. *Cynodon* germplasm from the SARECUS nursery at Estcourt, Natal, S.A. was planted at Chitedze in May 1982. *Cynodon* material from the extensive collection at Henderson Research Station, Mazoe, Zimbabwe is in the process of obtaining in November 1982. Active effort is underway to obtain N-fixation active *Cynodon* from Professor H. R. Chheda, University of Ibadan, Nigeria, November 1982.

2. Evaluate the effect of site and management practices on production and utilization of forage species.

a. Promising Grasses. Replicated trials with locally identified "promising grasses" have been harvested for yield over two wet seasons, 1980/81 and 1981/82. Yield differences between accessions were significantly different on a yearly basis but lacked year-to-year consistency. Yield responses to frequency of harvest were significant and consistent, with lowest yields obtained at the most frequent harvest interval.

Setaria accessions. A Parallel trial with *Setaria* spp selections made in Malawi, also covering two years, exhibited more consistency in year-to-year yield. Response to harvest frequency was the same with most frequent harvest producing lowest total yield. Leaf percentage varied from 50 to 73 per cent; some high yielding accessions possessed excellent leafiness. A fungus disease (*Tilletia echinocephala*) severely compromises seed production of the *Setaria* grasses.

b. *Leucaena*. The third year of harvest, 1980/81 of an experiment to evaluate the effect of stump height and harvest frequency on leaf yield of *Leucaena* showed more frequent harvest (8 week intervals) to be significantly more productive than longer intervals. This was similar to the 1979/80 season's results. However, there was no effect from stump height in 1980/81, a contrast with the previous season when the 30 cm. treatment was superior.

- c. Grass/legume competition. Quadrat harvests of plots involving combinations of three adapted grasses and three tropical legumes yielded variable results during two years of experimentation. The plots were mob-grazed and allowed to regrow during both 1980/81 and 1981/82 wet seasons. The grasses and legumes remained in good balance and survival of the legumes into the 1982/83 growth period will be indicative of their potential in our on-going legume-grass sward.
 - d. Extension of nursery material to locations outside Chitedze is part of the 1982/83 season work plan.
 - e. The spacing x regrowth interval experiment with Mtchisi panicum (Guineagrass) was planted in February 1982 and will be ready for first season harvest in December 1982. This grass has the potential for green chop or grazing use and plant spacing has a strong relationship to the cost of establishment.
3. Leucaena as a source of protein for livestock production.
- a. Seed lots of 12 leucaena selections from the world leucaena collection were received from the University of Florida in November 1981. These were planted at Chitedze in December 1981 but very few plants were obtained. Residual fractions of the seed will be planted in the 1982/83 season. The potential of this well-adapted legume merits consistent and continuing exploration of its genetic variations and agronomic and nutritional values.
 - b. The Malawi-FAO Program used a Christy-Morris pellet mill which remained with Ngabu ADD after the FAO work was finished. This was moved to Chitedze and placed in operation during January-June 1981 (The Farm Machinery Section - Chitedze furnished the mechanical skills). It was found that air-dry leaf, containing 8-10% moisture produced an excellent leucaena leaf pellet with no additives needed. Screening leaf midribs and midrib branches increased the pass through rate but only a moderate level of cleaning was needed. It proved essential to feed 3 kilograms of maize meal mixed with 250 ml of cooking oil into the die so the glazed leucaena pellets were not left in the 1 cm. holes. The mill has been used from March to October 1982 to prepare pellets of leaf leucaena for National Seed Company for a trial quantity for export to Europe. Pellets of blended leaf have been prepared for the Veterinary Division on a cooperative basis.
 - c. Leucaena leaf harvest for pelleting procedures was harvested and stored - 1.5 metric ton in April-July 1981; 1 metric ton in May-July 1982 for feeding evaluation in conjunction with the Livestock Section, Chitedze.

B. Determine the Productivity of adapted pasture species in terms of animal production; develop a pasture base for livestock research.

- 1. Evaluation of adapted forage cultivars in terms of actual animal product per unit of area is a prime objective of the project.
 - a. In accord with the above, plans for a balanced experiment were developed, field area was allocated and surveyed and basic preparations were accomplished in the period from February to May 1981.
 - b. Final site preparation, delivery of seed materials from National Seed Company and vegetative planting material block staging were accomplished from June to November 1981.
 - c. In cooperation with Dr. R. C. Gray, all three replicates of four pasture types were planted and completely established during January to February 1982.

The treatments are as follows:

- I. Boma rhodesgrass
- II. Boma rhodesgrass interplanted with silverleaf desmodium
- III. Mtchisi panicum guineagrass
- IV. Henderson No. 2 stargrass

The pasture unit in each replicate is 1.5 Hectares in area; the entire experimental area was fertilized with 250 kg/ha single superphosphate in February 1982.

- d. All work was on schedule in November 1982 except for a delay in obtaining fertilizer for the experimental areas.

2,3,4. Work planning and seed procurement are on schedule as of November 1982. There is a problem with importing Cook Stylo seed from Australia. This will interfere with some of the planting for research cattle support.

C. Procure equipment for processing experimental forage plant samples and other agronomic plant research materials.

1. Components for electric heated, thermostatic regulated sample drying ovens have not been received as of November 1982. The original requests were dispatched to Florida in November 1981 but procurement problems have been severe. The ovens apply not only to forage crops but to other sections of Chitedze Research.
2. Extensive parts replacement for the Allen plot harvester are being installed by the maintenance shop of the Chitedze Station. The repairs were delivered and stored away for several months before being located for installation in November 1982.
3. Laboratory rooms for livestock and pasture were without water, work surfaces or storage. One full length desk with formica top and one sink were installed in the livestock area; one full length bench with formica top and with storage cabinets built below and one sink were installed in the pastures laboratory; outside taps were installed on both sides of the laboratory-office building. These latter are used in grounds upkeep and for hose-pipes to adjacent nursery plots.

D. Conduct in-service training for fodder and pasture technical staff; other teaching.

1. Bunda College of Agriculture had no professional forage crop staff and four lectures on forages were delivered to advanced students - June 1981.
2. Accompanied Mr. H. D. Msiska to the regular meeting of the SARCCUS subcommittee for Veld and Pastures, Nylsulei Ecosystems Project, Transvaal, South Africa - 24-26 August 1982; consulted with staff at the Animal Nutrition Center, Irene, Transvaal, 27 August 1982. This was Mr. Msiska's first trip outside Malawi.

E. Training of Malawian Professional research personnel to M.S. and Ph.D. levels.

1. Mr. B. H. Dzowela registered at the University of Florida, Gainesville, Florida in January 1981 to begin his program working toward the Ph.D. degree in forage crops. His projected completion date is June 1984.
2. Mr. H. D. Msiska took the GRE on 16 October 1982 as a step toward entering a Masters' degree program as soon as the forage research program permits his departure.

F. Additional project-related technical staff.

1. One experienced technical assistant in forage work was transferred in November 1982 from Chitedze Agricultural Station to Lunyangwa Agricultural Research Station in order to provide skilled supervision for forage work in the Mzuzu ADD. A new technical assistant, a recent graduate of Colby College, arrived at Chitedze in October 1982. This person represents the first addition to the technical capability of the pasture section since this Technical Assistance Team member arrived in Malawi in October 1980.
2. Two Technical Assistant positions were established under the project, so one position remains to be filled.

G. Issue research publications for Technical Officers and Technical Assistants in extension service dealing with smallholder forage and livestock.

1. The publication "Leucaena Production in Malawi" was published by Extension Aids in June 1981. This was based on extensive working papers prepared by FAD and was prepared as a summary by Mr. B. H. Dzowela. The final manuscript was edited by USAID Technical Assistance staff at the request of the Chief Agricultural Research Officer.
2. "Pasture Handbook for Malawi", second edition, has been completely reticulated, costs updated and prepared for final editing, November 1982.

H. Other project-related activities.

1. The most pressing need in the forage crops program within the Department of Agricultural Research was to carry out the research plans already prepared and underway. Coordination was simplified by the central location of projects and personnel at Chitedze. The greatest opportunities in planning lay in strengthening the base research, obtaining additional germplasm and exploring the opportunities for research effort at points other than Chitedze. A major constraint in developing new opportunities lies in the time needed to accomplish staffing changes.
2. The participant training coordinator assignment made by the Chief-of-Party in June 1982 was given attention briefly before reverting because the Technical Assistance Team member was terminating his contract.
3. The Technical Assistance Team member attended the sessions and tours of the XIV International Grassland Congress and Forage Producers Forum, 14-24 June 1981 at Lexington, Kentucky, USA. The regular R&R round trip fare to Athens, Greece was paid by the USAID Project with all additional transportation being paid on a personal basis.
4. The Grassland Congress period was followed by vacation in July 1981.