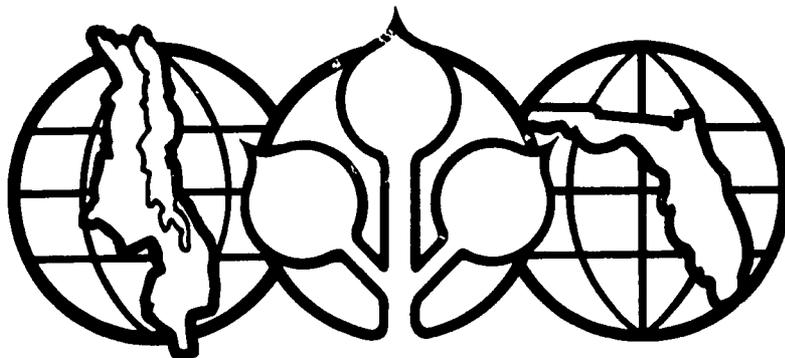


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ANNUAL REPORT
Malawi Government 1980-81
Fiscal Year
and
QUARTERLY REPORT
January 1 to March 31, 1981
P - 3

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

PDAAR 670

MALAWI AGRICULTURAL RESEARCH PROJECT

1An-41077

ANNUAL REPORT

Malawi Government 1980-81 Fiscal Year

and

QUARTERLY REPORT

January 1 to March 31, 1981

D.E. McCloud

E.M. Hodges

Art Hansen

USAID/UF/MANR

Project Number 612-0202

MP - 3

March 31, 1981

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HIGHLIGHTS

This report is a combined third quarterly report and an annual report to coincide with the closing of the Malawi Government Fiscal Year on March 31, 1981 for the Malawi Agricultural Research Project.

Dr. Art Hansen, Farming Systems Analyst arrived on January 30, 1981 to join the technical assistance team. In addition five short term personnel provided technical assistance in smallholder cuop/livestock research programs and production economics.

Training

The 1980 trainees arrived in the U.S. in late December and are now enrolled at the universities selected for their training. Detailed training plans have been completed for them and approved by the Ministry of Agriculture and by the USAID Mission in Malawi.

In-service training of the support staff remaining in Malawi is very important to the project purpose--strengthening the Department of Agricultural Research. A total of fourteen in-service trainees attended various workshops or conferences to improve support staff capability. During this quarter six in-service trainees received partial or full funding for various training courses.

Another aspect of improved support staff capability is on-the-job training of Malawians by the technical assistance team. During the quarter Dr. McCloud organized a course in Crop Ecology in which 14 students enrolled. He also continued informal on-the-job training in the elements of calculator programming. Dr. Hansen intensively tutored his assistant in social research interviewing technics and less intensive in-service training was provided to several research and extension staff who accompanied him on the surveys. Dr. Hodges also provided in-service training to his support staff.

Meetings

To reach the project goal of increased productivity and real income of Malawi smallholders; meetings of extension and research officers are necessary. Field Days are held annually by the Research Stations and Bunda College are attended by research and extension staffs. These Field Days increase the flow of information from research to extension and vice-versa. During the quarter, the total attendance at the nine field days of research, extension and farmers exceeded a thousand persons.

Travel

Delivery of all the USAID/UF project vehicles to be purchased during the first portion of the project was completed during the quarter. The project now has four station wagons, six Land Rovers and ten motorcycles. The total mileage driven on the station wagons and the Land Rovers during the quarter was 48,596, indicating a very heavy usage, primarily for the large number of out-lying field trials which were conducted by the Malawi support staff. The total miles travelled by the three technical assistance team members during the quarter was 12,419.

Research

An important project output is to establish selected new research operations. Dr. Hansen provided for the establishment of two new operations--farming systems and research/extension liaison. Dr. Hodges supervised the forage plot research and proposed a new research grazing trial and also recommended a national indigenous forage collection program. Dr. McCloud introduced computer simulation modeling to researchers as a tool for understanding plant yield responses of peanuts and other crops.

Research must be tested under actual smallholder conditions in various environments and on a variety of soils if it is to be accepted by the farmer. A considerable portion of the research department's budget was devoted to these national trials which were conducted at a very large number of sites by the Malawi support staff, in smallholder farmers' fields.

Short Term Technical Assistance

During the quarter five short term TA's provided technical assistance and training to the researchers in Malawi. The total short-term personnel coming to Malawi at full or partial cost to the contract since the program began has been six persons.

Construction

Building is nearly 100% completed for the Mbawa, Lunyangwa, Kasinthula and Makoka Research Stations, and nearly 50% at Bvumbwe, and plans for the laboratory at Bvumbwe will be ready shortly. The houses at Chitedze will soon go out for tender. It is expected that construction under the contract will nearly be completed by the end of the Malawi Government 1981-82 Fiscal Year.

Administrative and Financial

Malawi Government purchasing procedures have been finalized. Government stores will be utilized for available items and local purchase orders issued for other items. Payment vouchers will be prepared upon receipt of the vendors invoice certified both by the Chief of Party and the Chief Agricultural Research Officer and Receiving and Inspection Reports prepared for the USAID Mission in Malawi. After the Malawi Government makes payment to the vendors, it will bill the University of Florida Local Account, and payment will be made from the local account to the Malawi Government.

Since all payment vouchers for the local account are prepared in the office of the Chief of Party, they can be assembled and sent to the University of Florida for justification for transfer of funds to the local account, so that a few months later when payment is requested by the Malawi Government it can be made on a timely basis.

During the quarter the format for the Local Account and Recurrent Cost commitments ledger were developed. The total local account commitments since the project beginning, to March 31st 1981, was K56,895.90, and during this quarter commitments amounted to K15,554.81. The Bank balance in the local account on March 31, 1981 was K53,629.50.

Three administrative and financial aspects have hampered the project:

- 1) The initial project start-up date was delayed by USAID by four months and the USAID-University of Florida Contract was not signed until late May 1980. Thus, the official start-up date should be June 1, 1980, and the contract termination date May 31, 1985. Applying the four months lag to the scheduled arrival of the seven technical assistance team members the projected over-all delay by the University of Florida in staffing has been fourteen months.
- 2) We have as yet been unable to get established the posts which are on the Recurrent Cost Budget, to be provided by the Malawi Government; after eight months we still are operating with a skeleton, temporary staff.
- 3) A serious financial situation developed during the Malawi Government 1980-81 Fiscal Year which necessitated severe curtailing of the Department of Agricultural Research Programs. Without the USAID/UF funds it would have been impossible to travel to the experimental sites, and much of the Department's research would not have continued.

TRAINING

Participant Training

In the first group the 1980 trainees, twelve arrived at Gainesville, Florida on December 27, 1980 for orientation at the University of Florida where all except Clement Mzembe were enrolled during the winter quarter. All except Goodwin Mkamanga took the GRE and the average grade they achieved on the quantitative portion was 503 (the range was 560 to 450). Those at the University of Florida have now completed the winter quarter course-work and except for Felix Kisyombe, who has incompletes in two courses, the group-average GPA was 3.19 (the range was 3.71 to 2.83). Only Ben Dzowela and Felix Kisyombe were below the 3.0 which is required for University of Florida graduate school, the rest of the group were all above the minimum.

Training plans have been completed for each of the 1980 trainee group and are included in Appendix A. The following listing gives the degree, area of emphasis, along with the training facility for each of the trainees.

Godfrey Chapola is recommended for a Ph. D. in Plant Pathology at the University of Florida with some emphasis on virology. Mr. Chapola needs a broad training in Plant Pathology and related fields.

Eric Chilembwe is recommended for a M.S. in Horticulture at the University of Florida with emphasis on tropical fruits including citrus production. Mr. Chilembwe requires broad training in practical horticulture.

Rosie Chikwana is recommended for a M.S. in Agricultural Economics at the University of Florida with emphasis on production economics. Miss Chikwana requires broad training in Farm Management and practical methods for analyzing production and making recommendations based on cost-benefit analyses of current smallholder production practices and alternative technologies.

Evans Chipala is recommended for a Ph. D. in Agronomy at the University of Florida with emphasis on soybean breeding with a minor in Plant Pathology. Mr. Chipala requires training under a practical plant breeder who has experience with tropical soybeans.

Benson Dzewela is recommended for a Ph. D. in Agronomy at the University of Florida with emphasis on Pasture Management with a minor in Animal Science with emphasis on animal nutrition. Mr. Dzewela needs a broad background including related fields such as soil fertility.

Felix Kisyombe is recommended for a M.S. in Statistics at the University of Florida with emphasis on Experimental Design. He should take courses in Agronomy, Soils and Animal Science to gain a broad understanding of these fields. It is essential that Mr. Kisyombe be provided with both an HP-41 C and an HP-85 calculator so that he can be completely familiar with their use during his training program. These calculators will cost approximately \$3,500 and are to be a part of his training cost; they are to be property of the Malawi Department of Research, Biometrics Unit.

Ted Munthali is recommended for a Ph. D. in Animal Science at the University of Florida with emphasis in animal nutrition and a minor in Agronomy with emphasis on pasture management. Mr. Munthali needs a broad background including related fields such as soil fertility.

Clement Mzembe is recommended for a Ph. D. in Agronomy at Colorado State University with emphasis on irrigation. Mr. Mzembe will require the M.S. Degree at Colorado State before he can obtain the Ph. D., he requires broad training in soils, agronomy and agricultural engineering.

Goodwin Mkamanga is recommended for a Ph. D. in Crop Science at Oregon State University with specialization in Crop Physiology and Herbicide Science with emphasis on wheat. Mr. Mkamanga needs broad training in agricultural administration.

Enoc Ntokotha is recommended for a Ph. D. in Soil Science at the University of Florida with emphasis on Soil Genesis and Classification. Mr. Ntokotha requires a broad background in Agronomy and crop production.

Alex Saka is recommended for a Ph. D. in Soil Science at the University of Florida with emphasis on Soil Physics. Mr. Saka should receive fairly specialized training in Soil Physics, but should take some courses in related fields such as Agronomy.

Pickford Sibale is recommended for a Ph. D. in Agronomy at the University of Florida with emphasis on Peanut Breeding and a minor in Plant Pathology. Mr. Sibale requires training under an experienced, practical plant breeder, he should obtain a broad background.

The second group of trainees for 1981 has been selected by the Department of Agricultural Research and their names have been sent to the Ministry and the Office of Training for approvals.

In-Service Training

Improved support staff capability for professional officers, technical officers and technical assistants is very important in strengthening the Department of Agricultural Research, which is the project's purpose. For 1981 a plan has been developed by DAR giving a schedule listing some 15 professional and technical officers and technical assistants who are proposed for specific courses at the various International Institutes (IITA, ICRISAT, BIT, and CIMMYT). Many of these courses are partially funded by the Institutes, the British Council, O.A.U. or other sources. USAID/UF funds will continue to be used to supplement these courses which are only partially funded or to provide full-funding for those which are not funded from other sources.

During this quarter six in-service trainees received partial or full funding for various training courses.

Y.P. Nyirongo attended a Farm Machinery Testing Workshop held at Nakuru, Kenya on January 19-23, 1981, organized by the Commonwealth Secretariat/Kenya Government. The objective of the Workshop was to standardize test and evaluation procedures for smallholder use in Eastern and Southern Africa in order to protect farmers from the purchase of un-suitable machinery. Malawi can benefit from the standardization of testing procedures which were developed at this workshop. Cost to the USAID/UF Contract was K250.00.

A.J. Chiyembekeza attended the Second International Seminar on Winged Bean, Psophocarpus tetragonolobus (L) DC. held at Colombo, Sri Lanka, January 19-24, 1981. The conference was sponsored by the International Council for the Development of Under-utilized Plants. Winged bean is a new tropical legume which has recently attracted world wide attention. The objectives of this conference were to evaluate the recent research on winged bean, and to make recommendations for future work to accelerate the commercialization of winged bean in various parts of the tropical world. As a result of this conference, Malawi will be able to participate in the second series of International Winged Bean Trials for the 1981-82 growing season. Cost to the USAID/UF Contract was K450.00.

L.D.M. Ngwira attended the workshop on Reduced Tillage Systems held at Ibadan, Nigeria on March 9-20, 1981. The workshop was sponsored by the International Institute of Tropical Agriculture (IITA). Minimum tillage, if found appropriate, in Malawi could reduce the land preparation costs for the smallholder thereby reducing expensive inputs of Power (Oxen or Tractor), labour or fuel. Attendance at this workshop will lead to more properly planned research on minimum tillage for Malawi. Cost to the USAID/UF Contract was K500.00.

V.W. Saka attended the 5th Symposium and General Meeting of the Nematological Society of Southern Africa held on March 17-18, 1981 at Mt. Edgecombe, South Africa. Nematologists working in Malawi in most cases have very little contact with other nematologists and consequently they lag behind in terms of the most recent developments in the field.

Dr. Saka joined the Nematological Society of South Africa to keep abreast of the field and to avoid expensive duplication of the research being conducted in South Africa.

The symposium was attended by 49 delegates from South Africa, Swaziland, Zimbabwe and Malawi. The scientific papers dealt with nematode survey, control, ecology and extraction techniques. Several of the nematodes found in sugar plantations in South Africa have been identified in Malawi though as yet the extent of damage in Malawi is unknown. Dr. Saka presented a research paper which he along with Mr. Makina conducted on the "Investigation of Nematicidal Activities of Aqueous Extracts of 'bitter' Cassava Peel and Tung Cake Against Meloidogyne javanica". The findings from this research are that both bitter cassava peels and tung cake can be incorporated into the soil to control rootknot nematodes. The cost to the USAID/UF Contract was K320.00 plus air fare K484.00.

C.J. Matabwa and P.H. Mnyenyembe attended the Wheat Workshop for Workers in South, Central and East Africa held March 9-13, 1981 at the Mt. Makulu Research Station, Chilanga, Zambia. This workshop was sponsored by the Agricultural Science Association of Zambia, CIDA and CIMMYT. Wheat researchers and extension workers from six countries (Zambia, Kenya, Tanzania, Zimbabwe, Malawi and Malagasy) were represented. Of the countries represented only two, Malawi and Malagasy grow most of their wheat under smallholder production. In Zimbabwe, Kenya, Zambia and Tanzania most wheat production is large-scale and is mechanized. Kenya and Zimbabwe are self-sufficient in wheat while Tanzania and Zambia produce about half of their requirements. The goal of most of the countries represented was to produce all of their requirements and to have some wheat for export. Malawi presently produces only about 700 tons of wheat while they consume 26,000 tons, thus Malawi produces only 1/37th of their wheat needs. Both the yield per hectare and the area planted of wheat will need to be increased markedly if Malawi approaches self-sufficiency in wheat. Many valuable insights were obtained on the problems in wheat production from this workshop. Cost of the workshop was fully funded by USAID/UF and was K900.00 expenses plus K464.00 air fare.

On the Job Training

Another aspect of improved support staff capability is on the job training for Malawi professional and technical staffs.

During the quarter Dr. McCloud organized and started a formal course "Crop Ecology, AGR 6511". The primary focus of this course is on the dynamics of crop yield and crop adaptation. The objectives are: to understand the ecological factors as they affect crop adaptation and yield; to know agro-climatic classifications and crop geography and their relation to crop production and to appreciate the newer concepts of the theoretical aspects of crop yield and their practical applications. This course will have 20 one-hour lectures, 7 two-hour laboratories, and 2 two-hour tests for a total of 38 hours of classroom and laboratory instruction. The detailed course outline is given in Appendix A. Fourteen students enrolled in the class, there were three Senior Professional Officers and eleven Professional Officers. Of the group five are scheduled to go to the U.S. in December under the USAID/UF training program.

In-formal on the job training in the elements of calculator programming was continued by Dr. McCloud. HP-41 C calculators were introduced and made available for the Biometrics Unit at Makoka, for the Bvumbwe Research Station, and for the Chitedze Research Station. These are to be the standard calculators for the Professional Officers, and the TI-55's will be standard for the Technical Assistants in the Department of Agricultural Research.

On the job training concentrated on the single staff member Dr. Hansen inherited on his arrival. She was tutored through a set of readings and then introduced during the Lilongwe survey to social research interviewing. By the end of the survey she was interviewing by herself, and afterwards she was trained in the careful writing up of interview data. This staff member and an agronomist were selected from research and two staff were selected by the development department to attend an April course in Nairobi (sponsored by CIMMYT) on adaptive technology. Less intensive in-service training in farming systems research was provided to the various research and extension staff who accompanied Dr. Hansen on his surveys.

MEETINGS

To reach the project goal of increased productivity and real income of Malawi smallholders annual meetings of extension officers, and research staff will be necessary.

Field Days

During the quarter nine field days were held:

- (1) Bvumbwe Research Station held March 24, 1981. The field day included the following aspects of interest to Agricultural Research and Extension personnel. Maize variety and fertility trials, farming systems, cassava trials, weed control, sunflower investigations and unit farms were shown.
- (2) Bunda College Field Day held March 14, 1981. This was a very large field day with attendance estimated in the thousands. There were three major sections: General Farm Crops, Home Economics, and the Agricultural Experiments. The Bunda Field Day covered several farm equipment items of interest to Agricultural Research Project Personnel: a simple maize sheller, a bicycle grinder, a solar heater, various types of oxen equipment, mud-house construction, ultra-low volume sprayers. Field studies included zero tillage, interplanting various minor grain legumes bean trials, maize weeding, and forest tree-crops interplanting.
- (3) Chitedze Field Day held March 16, 1981. This too was a large field day. Attendance was estimated at somewhat less than a thousand extension, research and industry personnel. Drs. McCloud, Hodges and Hansen participated in the Planning and Presentations at the Chitedze field Day. Topics covered included: Maize Breeding and Agronomy, Groundnut Breeding, Agronomy and Pathology, Promising New Legumes, Farming Systems, Multiple-cropping, Soil Fertility, Unit Farms and Minimum Tillage.

- (4) Chitala Research Station Field Day held March 17, 1981, which was attended by research and extension personnel from the Salima ADD as well as other ADD's. Topics covered included maize, groundnuts, pigeon pea, sorghums, sunflower, mango, cashew, citrus, farming systems and livestock breeding.
- (5) Baka Research Station Field Day held March 19, 1981, was well attended by research and extension personnel from the Karonga ADD as well as other ADD's. Topics covered included maize and groundnut agronomy and breeding, mixed cropping of maize and beans, and various horticultural crops.
- (6) Meru Research Station Field Day held March 20, 1981 was well attended by research and extension personnel from the Karonga ADD as well as other ADD's in the Northern Region. Topics covered include maize and groundnut agronomy and breeding, mixed cropping and various horticultural crops.
- (7) Mbawa Research Station Field Day held March 23, 1981 was well attended by extension and research personnel. Topics covered include a variety of crops for the region including rice, various horticultural crops including bananas, interplanting techniques and livestock production.
- (8) Lunyangwa Research Station Field Day held March 24, 1981 was well attended by extension and research personnel from the Mzuzu ADD as well as other ADD's. Topics of interest to the agricultural research project include sweetpotato and cassava trials, liming experiments and at the Mkondezi site rice, cassava and black pepper.
- (9) National Seed Company Field Day held March 26, 1981 was a large field day well attended by estate seed growers, research and extension personnel. Topics covered included hybrid seed maize, soybean seed,

hybrid sunflower seed, groundnut seed and hybrid sorgham seed.

Special Meetings

The special, organized meetings attended by the technical assistance team members during the quarter include:

- January 8 Attend a meeting of the Northern Regional Research-Extension Advisory Committee - - Hodges
- February 11 Meeting with CARO to discuss the Department of Agricultural Research Program on Livestock and Pastures - - Kasowanjete, Msiska, Hodges, Mtukuso, Conrad, McCloud
- February 26-27 Attend a National meeting of the evaluation officers at the Ministry of Agriculture and Natural Resources - - Hansen
- March 9-13 Attend a Wheat Workshop of Workers in East and Southern Africa - - McCloud, Matabwa, and Mnyenyembe.

TRAVEL

During January 1981 the Malawi Government took delivery of three new Peugeot 504 Family Estate Wagons and six new 10-seat Land Rovers, and ten new Yamaha 100 motorcycles purchased with USAID Agricultural Research Contract Funds. These vehicles provided access to the experimental sites and other travel necessary to conduct project activities. The miles driven during the quarter for each of the vehicles is shown in Table 1.

Table 1. Mileage Driven on USAID Project Vehicles During the first Quarter of 1981.

Vehicle	Location	Miles During the Quarter	Total Miles
Peugeots			
542 D	Chitedze	1,547	8,640
716 D	Chitedze	3,364	3,364
754 D	Chitedze	2,157	2,157
715 D	Bvumbwe	2,861	2,861
Land Rovers			
689 D	Lunyangwa	4,194	4,194
690 D	Chitedze	7,145	7,145
692 D	Chitedze	5,813	5,813
691 D	Makanga	5,509	5,509
694 D	Bvumbwe	2,297	2,297
653 D	Kasinthula	6,616	6,616

The total mileage driven during the quarter was 48,596. This mileage reflects the heavy usage of project vehicles during the major portion of the 1981 cropping season.

Technical Assistance Staff Travel

- January 6-9 Orientation travel to Mbawa, Lunyangwa, Baka Research Stations - - Hodges
- January 19-21 Inspection of construction sites at Makoka and Bvumbwe Research Stations - - McCloud
- January 29 Discuss the cattle-forage program at Dzalanyama Ranch - - Hodges and Conrad

- February 4 Inspect the residual forage plots for seed harvest, see the cattle and discuss research program with staff - - Hodges
- February 5-6 Chancellor College to talk with personnel at the Center for Social Research in the Department of Economics - - Hansen
- February 7-16 Travel to the Northern Region to orient the Farming Systems Analyst and to briefly survey the Karonga lakeshore and Chitipa areas - - Hansen
- February 16 Visit the Horticultural Plots at Bunda College - - McCloud and O'hair
- February 18 Inspect the pellet mill at the Central Veterinary Laboratory for possible continuation of the research on pelleting of leucanena meal - - Hodges
- February 18-20 Travel to Makoka and Bvumbwe Research Stations to train research personnel at Makoka on calculator programming, to introduce the HP-41 C to personnel at Bvumbwe and to interview Dr. James Deusch for the Horticultural Position at Bvumbwe and to inspect houses at Makoka and Bvumbwe - - McCloud and Maynard
- March 7-8 To Chancellor College to interview and to select socio-economic research staff trainees from Senior-Year Economics Students - - Hansen
- March 7-14 Travel to Lusaka, Zambia to attend the Wheat Workshop - - McCloud, Mnyenyembe and Matabwa

- March 8-14 Southern Region orientation travel for the Pasture Agronomist to Shire Valley, Kasinthula and Ngabu, the Phalombe, Mikolongwe, and Mulanje areas, Nasawa Young Pioneers Training Base, Makoka and Tuchila Research Stations, Training Center and Experimental Plantings near Zomba, Liwonde, Balaka, Mangochi and Namwera districts - - Hodges
- March 9-12 Lilongwe Land Development Project and North East Lilongwe areas to briefly survey farmer practices - - Hansen, Momezulu and Msiska
- March 20-22 Orientation visit to the Bvumbwe Research Station and to Chancellor College to discuss social research with college personnel - - Hansen
- March 21 Orientation visit to the Tsangano Research Station and inspection of building sites - - McCloud

The total road miles travelled by Technical Assistance Team members during the quarter was: Hansen 5,470, Hodges 3,648 and McCloud 3,301.

RESEARCH

New Operations

An important project output is the technical assistance team to establish selected new research operations in the Department of Agricultural Research. The arrival of Dr. Art Hansen on January 30, 1981 provided for the establishment of two new operations -- the farming systems research program and the research/extension liaison system. His work plan (Appendix B) was formulated in coordination with key officials of the research, development (includes extension), planning and evaluation departments of the Ministry of Agriculture and Natural Resources. The three highest priority sites (Lilongwe plain, Karonga/Chitipa, and Phalombe) for farming systems research were selected in coordination with those same officials, and approval was given to the program by the Chief Officers of each department in a series of meetings at the Ministry.

A ten day tour of Northern Region was conducted to familiarize Dr. Hansen with that region, and specifically with the Karonga/Chitipa area. Extension, research, and veterinary staff were contacted throughout the region. Research and extension personnel accompanied him during the survey of the Karonga lakeshore and highland Chitipa areas, while he explained the farming systems research principles and methods and interviewed a sample of farmers. A four day survey of the Lilongwe area was also conducted by Dr. Hansen, who was accompanied by research, extension, and evaluation staff who interviewed a sample of farmers. Reports on these surveys have been submitted to various Ministry officials.

Dr. Hansen attended the National Meeting of Evaluation Officers at the Ministry where he described the USAID Program and farming systems research. These officers are key elements in spreading this program to all the Agricultural Development Divisions (ADD's) throughout Malawi,

and they invited him back to their next meeting at the end of April to give another presentation on his work. After the meeting he contacted the evaluation officers for Lilongwe, Karonga/Chitipa, and Phalombe and advanced plans for research in those areas.

After several discussions with economics faculty at Chancellor College, Dr. Hansen interviewed the top senior year economics students and selected two to be hired by the farming systems and production economics programs upon their graduation in July. Another staff member was recruited who will graduate from Bunda College in July. Preliminary discussions were held with research officials about the recruitment of additional staff for the programs.

At Chitedze Dr. Hodges supervised the following forage-plot research:

- a) *Setaria* local accession and promising grass variety with different growth intervals. 1980-81 is the first harvest year.
- b) Grass variety-legume variety combinations grazed at two different growth intervals to measure forage yield and consumption and species response to grazing. No animal data, 1980-81 is the first year.
- c) Legume-buffel grass compatibility trial-forage yield and legume survival measurements. 1980-81 2nd year harvest.
- d) Legume-guinea grass compatibility trial-forage yield and legume survival measurements.
- e) *Leucaena* stubble height and harvest frequency effect on forage yield and quality. 1980-81 is third and final year.

- f) Maintained purity of grass and legume nursery blocks and initiated seed harvest for supply of future research needs.
- g) Harvested leucaena leaf for quality assay and pelleting research and to provide data on labour required per kilo.

At Mbawa Grass-legume combination plots were harvested during the 1980-81 season.

A new grazing trial-forage research program was proposed by Dr. Hodges:

- a) A replicated trial including twelve units of 1.6 ha each. Four treatments will be included in randomized block design. All input and animal production measurements will be recorded for economic and management evaluation. Utilization emphasis will be on maximum beef production during growing season by grazing cattle. Intensity of management will be established with consideration for visible and projected cost and supply factors.
- b) Forage Research Program: The same treatments will be established in plots at Chitedze and one or two different locations. These will be harvested for conventional yield and quality measurements and will be used to relate between grazing trial and harvest results at Chitedze, as well as between harvest results at Chitedze and other locations. It is expected that indirectly this will enhance the value of the grazing trial data for locations other than Chitedze.

Dr. Hodges recommended a national indigenous forage collection to be initiated and appropriate personnel to be allocated annually for collecting a specific area, beginning in a Northern site in 1981. This overall effort should be continued by forage workers at every opportunity.

Dr. McCloud continued to assist in the research on the physiology of peanut yields. During the quarter a total of 26 harvests were taken at weekly intervals on the two experiments, POPY-80 and DOPY-80. By late January it became apparent that the method used last year to measure ground cover resulted in an over-estimation. After appropriate corrections were made it became possible to increase the photosynthesis to dry matter factor in the PNUTS simulation model to that which we obtained in Florida. We now believe that the over-estimation in ground cover had made necessary a compensating reduction in the photosynthesis to dry matter factor. However, we are still puzzled by the low crop Growth Rates in Malawi. We need to confirm this aspect with researchers in Zimbabwe and South Africa before the next planting season.

Field Trials

Research must be tested under actual smallholder conditions if it is to be accepted by the small farmer. It must be tested under various soils and environmental conditions if the results are to be applicable to all of Malawi. A considerable portion of the research budget was devoted to these national trials which were conducted by counterpart staff, research and extension, at a very large number of sites in smallholder farmers' fields. A listing of those for maize and groundnuts follows:

Maize Variety Trials: 1980-81

1. Blantyre ADD
 - Kanduku (Mwanza District)
 - Saimoni (Mwanza District)
 - Mpatamanga (Mwanza District)
 - Thumbwe (Chiradzulu District)
 - Nsondole (Zomba District)
 - Chilinga (Mulanje District)--Phalombe
 - Nkhulambe (Mulanje District)--Phalombe
 - Naminjiwa (Mulanje District)--Phalombe

1. **Blantyre ADD (Continued)**
 - Khalinde (Mulanje District)--Phalombe
 - Nambazo (Mulanje District)--Phalombe
 - Kasongo (Mulanje District)--Phalombe
 - Tamani (Mulanje District)--Phalombe

2. **Liwonde ADD**
 - Khole (Machinga District)
 - Katuli (Machinga District)

3. **Lilongwe ADD**
 - Macheleza (Ntcheu District)
 - Nsipe (Ntcheu District)
 - Manjawila (Ntcheu District)
 - Lizulu (Ntcheu District)
 - Bawi (Ntcheu District)
 - Mpata (Dedza District)

4. **Kasungu ADD**
 - Kapiri (Mchinji District)
 - Chulu (Kasungu District)
 - Madisi (Dowa District)
 - Chisepo (Dowa District)
 - Bumphula (Ntchisi District)

5. **Lakeshore ADD (Salima)**
 - Sesani (Nkhotakota District)
 - Liwalazi (Nkhotakota District)
 - Kasinje (Ntcheu District)
 - Golomoti (Dedza District)

6. **Mzuzu ADD**
 - Ekwendeni (Mzimba District)
 - Ng'onga (Rumphi District)
 - Bolero (Rumphi District)
 - Nkhwale (Nkhata Bay District)
 - Mpamba (Nkhata Bay District)

7. **Karonga/Chitipa ADD**
 - Lupembe (Karonga District)

Maize Agronomy Trials: 1980-81

1. Maize Variety Fertilizer Spacing Trial

Design:- Split-plot. Main plots as 4 (varieties) X 3 (Spacing) factorial and 3 Sub-plots (fertilizer)--3 Replications.

Treatments:

Varieties	Fertilizer (N)
V ₁ = SR 52	F ₁ = 50 kg N/ha
V ₂ = UCA	F ₂ = 100 kg N/ha
V ₃ = MH 12	F ₃ = 150 kg N/ha
V ₄ = MH 13	

Spacing:

- S₁ = 90 cm between ridges, 40 cm between single plant stations.
- S₂ = 90 cm between ridges, 30 cm between single plant stations.
- S₃ = 90 cm between ridges, 20 cm between single plant stations.

Plot Size:

Gross = 4 ridges X 6 m long X 0.9 m between ridges.

Nett = 2 ridges X 5.4 m long X 0.9 m between ridges.

Sites:

Lilongwe ADD:- Lizulu

Mzuzu ADD :- Ekwendeni

2. Maize Variety Fertilizer Trial

Aim:- To investigate the responses of new varieties to nitrogen fertilizer.

Design:- 6 X 3 factorial laid out as RBD--replicates.

Treatments:

Varieties	Fertilizer (N)
V ₁ = SR 52	F ₁ = 0 kg N/ha
V ₂ = PNR 353	F ₂ = 84 kg N/ha
V ₃ = CCA	F ₃ = 168 kg N/ha
V ₄ = UCA	
V ₅ = MH 12	
V ₆ = MH 13	

Plot Size:

Gross = 4 ridges X 6 m long X 0.9 m between ridges.

Nett = 2 ridges X 5.4 m long X 0.9 m between ridges.

Sites:

1) Karonga ADD

Karonga District = Mpata, Lupembe, Mlale, Nyungwe and Vinthukutu.

Chitipa District = Nkhwangwa, Bugulira, Wenga and Kavukuku.

2) Mzuzu ADD

Rumphi District = Nkhoz, Thuluwe, and Ng'onga

Mzimba District = Emanyaleni, Ekwendeni, Eutini, Madede, Bulala, Chisasa, Mjinge, Jenda, Bapani, Khosolo, Emfeni, Msese, Phazi and Mafu-ndeya.

Nkhata Bay District = Mpamba and Chintheche.

3) Kasungu ADD

Kasungu District = Chulu and Nkhamenya

Ntchisi District = Malomo and Kalumo

Dowa District = Ngala, Mponela, Dzaleka and Chinsepo

Mchinji District = Matutu, Komwendo and Kapiri

Sites: (Continued)

4) Lilongwe ADD

Lilongwe District = Unit 11, 12, 15, 40
and 41

Dedza District = Mpita, Asafu and
Maonde

Ntcheu District = Kabekere and Kambi-
lonjo

5) Salima ADD

Nkhotakota District = Benga

Salima District = Area 2 and Chipoka

6) Liwonde ADD

Mangochi District = Ntiya, Masuku and
Katuli

Machinga District = Balaka, Mlomba and
Machinga

Zomba District = Dzaone

7) Blantyre ADD

Mwanza District = Chiwembu and Thambani

Blantyre District = Lirangwe

Mlanje District = Naminjiwa and Kasongo

Chiradzulu District = Njuli and Thumbwe

3. Tuxpeno Spacing Fertilizer Trial

Aim:- To examine the yield response of Tuxpeno Variety to plant populations and nitrogen fertilizer inputs. Tuxpeno I is a variety bred at CIMMYT, and had given high yields in Variety Trials in Malawi.

Design:- 3 X 4 factorial laid out as RBD--
3 Replicates

Treatments:-

Plant Spacing (Within Row Spacing)

S₁ = 30 cm between single plant stations
90 cm between ridges

S₂ 20 cm between single plant stations
90 cm between ridges

S₃ 15 cm between single plant stations
90 cm between ridges

Fertilizer (N)

F₁ = 0 kg/ha N.

F₂ = 50 kg/ha N.

F₃ = 100 kg/ha N.

F₄ = 150 kg/ha N.

Plot Size:

Gross = 4 ridges X 6 m long X 0.9 m between
ridges

Nett = 2 ridges X 5.4 long X 0.9 m between
ridges

Sites:

- 1) Karonga ADD
Karonga District = Lupembe, Mpata and
Nyungwe
- 2) Mzuzu ADD
Nkhata Bay District = Maula and Bandawe
- 3) Salima ADD
Nkhotakota District = Benga
Salima District = Area 2, Chipoka and
Kasinje
- 4) Lilongwe ADD
Ntcheu District = Senzani, Manjawila
and Bawi
- 5) Liwonde ADD
Mangochi District = Mangochi Lakeshore
and Namalaka
- 6) Blantyre ADD
Mwanza District = Saimoni
Blantyre District = Lirangwe
Mulanje District = Naminjiwa and
Kasongo
- 7) Ngabu ADD
Chikwawa District = Ngabu and Tomali
Nsanje District = Maperere and Ledza

4. Maize Variety Nitrogen Trial

Aim:- To examine the response of 7 early maturing maize varieties in areas of short and erratic rainy season to nitrogen fertilizer application.

Design:- 7 (Varieties) X 3 (Nitrogen) levels factorial laid out as RBD--3 Replicates.

Treatments:-

Varieties (V)

V₁ = PNR 95

V₂ = PNR 651

V₃ = R 201

V₄ = Tuxpeno I

V₅ = Katumani Composite B

V₆ = MH 12

V₇ = CCA

Nitrogen (N)

N₁ = 0 kg N/ha

N₂ = 50 kg N/ha

N₃ = 100 kg N/ha

Plot Size:-

Gross = 4 ridges X 6 m long X 0.9 m
between ridges

Nett = 2 ridges X 5.4 m long X 0.9 m
between ridges

Sites:

- 1) Karonga ADD
Karonga District = Lupembe, Mlale and Nyungwe
- 2) Mzuzu ADD
Rumphi District = Nkhozho and Thulwe
- 3) Salima ADD
Nkhotakota District = Benga and Liwalazi
Salima District = Area 2, Chipoka and Kasinje

Sites (Continued)

- 4) Lilongwe ADD
Ntcheu District = Bawi, Senzani, Nsipe
and Manjawila
- 5) Blantyre ADD
Blantyre District = Lirangwe
Mlanje District = Naminjiwa and Kasongo
Mwanza District = Saimoni
- 6) Ngabu ADD
Chikwawa District = Tomali and Ngabu
Nsanje District = Maperera

5. District Maize Fertilizer Trial

Aim:- To test the response of Local farmers maize to nitrogen and phosphate fertilizer as well as interaction between N and P in Dowa West Project.

Sites:- Madisi, Mponela and Chinsepo in Dowa District (Kasungu ADD)

Variety (Maize):- Local farmers maize (Supplied by the farmers on whose gardens the the trials are conducted).

Treatments:-

Nitrogen

$N_1 = 0 \text{ kg N/ha}$

$N_2 = 20 \text{ kg N/ha}$

$N_3 = 40 \text{ kg N/ha}$

$N_4 = 60 \text{ kg N/ha}$

$N_5 = 80 \text{ kg N/ha}$

Phosphate (P_2O_5)

$P_1 = 0 \text{ kg } P_2O_5/\text{ha}$

$P_2 = 20 \text{ kg } P_2O_5/\text{ha}$

$P_3 = 40 \text{ kg } P_2O_5/\text{ha}$

Design:- 5 X 3 factorial laid out as RBD--
2 Replicates

Plot Size:- Same as in other trials

Groundnut Variety Trials: 1980-81

1. Blantyre ADD
 - Phalombe RDP - Kasongo, Tamani and Kamwendo
 - Chiradzulu RDP - Thumbwe and Site 2
 - Mwanza RDP - Phete, Chiwembu and Thambani
2. Ngabu ADD
 - Kasinthula, Makhanga, Ngabu, Nsanje South and Phokera
3. Liwonde ADD
 - Kawinga RDP - Khole, Mlomba and Chikweo
 - Namwera RDP - Sites 1, 2 and 3
 - Balaka RDP - Toleza and Ulongwe
 - Zomba RDP - Chingale, Msondole and Dzaone
 - Mangochi Lakeshore - Makanjira
4. Lilongwe ADD
 - Ntcheu RDP - Ntonda, Bawi, Senzani and Gowa
 - LLDP Units - 4, 12, 15 and 30
 - Thiwi/Lizidzi - Labi and Kabwazi
 - Chinsapo Dairy Farm - Lilongwe
5. Kasungu ADD
 - Dowa RDP - Mponela, Chisepo and Madisi
 - Ntchisi RDP - Kasongo and Malomo
 - Mchinji RDP - Chikoti and Kamwendo
 - Mwimba Research Station
6. Salima ADD
 - Chitala Research Station, Benga, Mwimba, Area 2, Ngolowindo, Mtakataka and Kasinje.
 - N.B. There are no groundnut variety trials in the Northern Region.

Groundnut Agronomy Trials

1. Ngabu ADD - Ngabu } Variety X Spacing
Nsanje South } (Spancross and Malimba)
2. Thuchila - Variety X Spacing (RG₁)
3. Nasawa - MYP Base Lime X Gypsum
4. Thiwi/Lizidzi - Lime X Gypsum X Daconil X Inoculant
5. Ntchisi - Lime X Gypsum X Daconil X Inoculant
6. Bzanzi MYP Base - Lime X Gypsum X Phosphorus
7. Lisasadzi - G X I X N, G X V

8. Mwimba Research Station - Spacing
9. Mbawa - L X G X P X Boron
L X G X I X Boron (I = Inoculation)
10. Manyamula - L X G X P X Variety, L X G
11. Euthini - L X G X I X Boron
12. Bapani - L X G X I X Daconil
13. Meru - L X G X I X Boron and (ABP Trials)
14. Nkhwangwa - L X G X D X Variety and (ABP Trials)
15. Wenga - ABP Trial (Agronomy-Pathology-Breeding)

SHORT TERM TECHNICAL ASSISTANCE

During the quarter five short term T.A's provided technical assistance in smallholder crop/livestock research programs and production economics.

Dr. S.K. O'Hair, Horticulturist at the University of Florida, who was in Malawi January 23-29, 1981, provided horticultural inputs--at no cost to the contract, see Appendix B. His primary recommendations on

- 1) the potential for a vegetable seed industry for Malawi,
- 2) the need for a virus-indexing system for potato seed stocks,
- 3) the need to bring in new potato cultivars,
- 4) the need for importation of new tomato cultivars are being held for the arrival of the new Horticulturist who is expected early July.

Dr. J.H. Conrad, Professor of Animal Nutrition and Coordinator of the Tropical Animal Science Program at the University of Florida, came to Malawi January 24-February 14, 1981. He prepared an excellent assessment of the Animal Husbandry research program, Appendix B. The primary recommendations are:

- 1) Maize stover is one of the most under-utilized crop residue in Malawi with a potential for conversion into a reasonable feed.
- 2) Cattle and poultry feces can be utilized for feed.
- 3) Most of the research trials to date do not permit valid conclusions.
- 4) The economics of various feeding programs have not been studied, however with milk prices at 8-10 tambala a pint and beef at 80 tambala per pound (dressed carcass),

it is not necessary to run a large number of expensive feeding trials nor is it necessary to repeat the trials already conducted unless new feeds, combinations or treatments are introduced.

Again little action can be taken on Dr. Conrad's recommendations until the arrival of the Animal Scientist of the T.A. Team.

Dr. D.L. Maynard, Chairman of the Vegetable Crops Department at the University of Florida came to Malawi February 13-20, 1981. The primary purpose of his trip was to interview a candidate for the Horticultural position at Bvumbwe. Also, he gave an excellent Seminar on Commercial Vegetable Production in Florida, as well as giving advice on Horticultural training in the U.S. for prospective trainees.

Dr. Max Langham, Professor of Agricultural Economics at the University of Florida was in Malawi February 13-21, 1981. He came to Malawi primarily to provide an economic input to the farming systems program of Dr. Hansen. Dr. Langham gave some excellent on-the-job training to a large group of Chitedze Staff members.

Dr. A.J. Norden, Professor and Peanut Breeder at the University of Florida came to Malawi March 16-23, 1981. His primary purpose was to evaluate the Malawi groundnut breeding program. He prepared an excellent report, Appendix B. His primary recommendations are:

- 1) Expand the introduction and testing of the newer cultivars which may have potential for Malawi.
- 2) Improve the verbal and written communication with scientists outside of Malawi, especially in other African countries.
- 3) In the rust resistance breeding program only the agronomically acceptable types should be maintained.
- 4) The pathologist should participate with the breeder in innoculating and evaluating breeding lines.

In addition to the short-term technical assistance visitors from outside of Malawi such as Dr. David Cummins and Dr. Wheelock of the Peanut CRSPP provided additional stimulus to the Chitedze Research Staff.

CONSTRUCTION

At Bvumbwe the plans for the Soils Laboratory are still not completed, but they are expected to be finished shortly. At Bunda construction has not yet started on the bean research unit.

At Chitedze the water and electrical requirements have been met and the housing contract will soon go out for tender. The existing Soils Laboratory has been treated for termites and the Ministry of Works has been contacted to ascertain the degree of damage to the root structure. Most of the houses at the other stations are completed or well along toward completion; see below:

Research Station	Type of House	Completion Progress %
Mbawa	1 PH-4 and 1 DH-6	100
Lunyangwa	1 DH 6	Nearly 100
Kasinthula	1 DL 2 and 1 PH 4	Nearly 100
Makoka	2 CH 10	Nearly 100
Makhanga	No Progress	0
Bvumbwe	1 B2 A	50
	3 B3	50
	3 DH 6	50
	3 PH 4	50

ADMINISTRATIVE AND FINANCIAL

During the quarter Dr. Art Hansen, Farming Systems Analyst arrived in Malawi on January 30, 1981 to initiate a new Farming Systems Research Operation. In addition five short term technical assistance personnel provided improved support staff capability through seminars and informal training.

The Malawi Government Fiscal Year ends March 31st, and begins April 1st, 2nd on this date the Ministry of Agriculture and Natural Resources will be split into two ministries: Ministry of Agriculture and, Ministry of Natural Resources..

During the quarter book-keeping procedures for the University of Florida-IFAS Local Account were refined, and a commitment ledger developed. In this ledger all commitments will be entered by Malawi Government Payment Voucher date soon after they are prepared from invoices received from the vendors. These will be categorized and entered under headings corresponding to those in the Work Plan and Budget as follows:

- | | |
|-------------------------|--------------------------|
| 1) Participant Training | 2) In-Service Training |
| 3) Equipment | 4) Expendable Supplies |
| 5) Travel | 6) Household Furnishings |

Photocopies of the Malawi Government Payment Vouchers will be accumulated and sent to the University of Florida as justification for transfers of funds to the Local Account then as billings are made to the Local Account, a few months later, payment to the Malawi Government can be made on a timely basis.

The Bank balance for the University of Florida Local Account as of March 31, 1981 along with the transactions for the quarter is shown below:

UNIVERSITY OF FLORIDA I.F.A.S. LOCAL ACCOUNT			
January 2 to March 31, 1981			
Date	Details	K t	K t
January 2	Balance Brought Forward		16,749.55
6	GOM Folio 077/005/47 of 17th December, 1980	10,722.36	
9	SRI LANKA TRIP, Chiyembekeza	450.00	
13	KENYA TRIP, Y.P. Nyirongo	250.00	
15	Carpet and Furnishing Centre		4.00
20	Deposit \$30,000 (R.E. 1.2031)		24,935.58
March 2	GHANA TRIP, L.D.M. Ngwira	500.00	
2	R.S.A. TRIP, Dr. V.W. Saka	320.00	
6	LUSAKA TRIP, D.E. McCloud	500.00	
6	LUSAKA TRIP, C.J. Matabwa	500.00	
6	LUSAKA TRIP, P.H. Mnyenyembe	500.00	
12	DEPOSIT \$30,000 (R.E. 1.1610)		<u>25,682.73</u>
		<u>13,742.86</u>	<u>67,371.86</u>
31	Balance Carried Down		53,629.50
31	Balance as per Bank Statement		53,629.50

The Local Account Commitments Ledger Summary for the Malawi Government 1980-81 Fiscal Year is shown on the following page.

**LOCAL ACCOUNT COMMITMENTS SUMMARY AND BUDGETED AMOUNTS
FOR 1980-81 MALAWI GOVERNMENT FISCAL YEAR**

	1980 July-September		1980 October-December		1981 January- March		Grand Total		Budgeted*	
	K	t	K	t	K	t	K	t	K	t
PARTICIPANT TRAINING	-		6,720.00		-		6,720.00		130,000.00	
IN-SERVICE TRAINING	3,899.66		5,483.00		3,468.20		12,851.57		24,000.00	
EQUIPMENT	10,914.57		899.43		4,334.37		16,148.37		135,000.00	
EXPENDABLE SUPPLIES	45.75		360.73		2,169.09		2,575.57		12,000.00	
TRAVEL	343.09		1,679.36		1,304.52		3,326.97		6,000.00	
HOUSEHOLD FURNISHINGS	6,086.96		4,908.83		4,278.63		15,274.42		36,000.00	
	<u>21,290.03</u>		<u>20,052.06</u>		<u>15,554.81</u>		<u>56,896.90</u>		<u>343,000.00</u>	

From 1980-81 Work Plan and Budget

APPENDIX A

T R A I N I N G P L A N

Godfrey Chapola

Recommended for a Ph. D. in Plant Pathology including some emphasis on virology. Mr. Chapola needs a broad training in plant pathology and related areas.

Suggested courses in Bacterial Plant Pathogens, Fungal Plant Pathogens, Tropical Plant Pathology, Plant Virology, Plant Disease Diagnosis, and Pathogen Variability and Host Resistance as well as Courses in Tropical Entomology, Tropical Soils and Tropical Nematology will be essential for the broad training necessary when Mr. Chapola returns to Malawi.

An ordinary TI-55 calculator should be provided for plant pathology training.

Attendance at the annual meetings of the American Phytopathological Society and the Southern Association of Phytopathologists are recommended to provide the latest scientific information and wider contacts with researchers working in Mr. Chapola's field of study.

T R A I N I N G P L A N

Rosie Chikwana

Recommended for an M.S. in Agricultural Economics with emphasis on production economics. Miss Chikwana requires broad training in farm management and practical methods for analyzing production and making recommendations based on cost-benefit analyses of current smallholder production practices and alternative technologies. Malawi currently has no production economist doing this work, so Miss Chikwana will be on her own much of the time.

Suggested Courses inside the Department: the course sequence in Economics of Agricultural Production, Management of Farms in the Tropics, Foundations of Agricultural Policies, Consumption Economics and Agricultural Marketing, Consumption and Demand, Nonstochastic Models, an introduction to Econometric Methods, and Economic Development and Agriculture. Outside the Department of Food and Resource Economics, suggested courses include: (in Anthropology) Human Organization and Change, Peasant Society and Culture, Quantitative Methods, and Ethnographic Field. Methods; (in Agronomy and in Animal Science) a basic production course in each. (and in Soil Science) Tropical Soils.

An ordinary TI-55 calculator should be provided for economics training.

Miss Chikwana should attend two or three conferences a year to establish contacts with other people in her field and broaden her exposure to the range of research methodologies. Drs. MacPherson, Langham, and Hilderbrand should decide on the appropriate conference, and suggested conferences include any on farming systems research, the annual meetings of the national society of Agricultural Economists, any on smallholder production research, and at least one annual meeting of the Society for Applied Anthropology.

It is recognized that the M.S. program recommended for Miss Chikwana will take somewhat longer than the usual M.S. program.

The thesis research should concern Malawian smallholders. Clearance is now being sought to send evaluation records from Malawi to serve as the basis for Miss Chikwana's research

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T R A I N I N G P L A N

Eric Chilembwe

Recommended for a M.S. in Horticulture with emphasis on tropical fruits including citrus production. Mr. Chilembwe requires broad training in practical horticulture. Malawi is in the initial stages of horticultural production with emphasis on small-holder production.

Suggested Courses: Current Citrus Research in Florida, Citriculture, Advanced Tropical Fruit Crops, Tropical Fruit Production and Research in Florida, Post Harvest Physiology, Rootstock-Scion Relationships, Nutrition of Horticultural Crops, Tropical Entomology, Tropical Plant Nematology and Tropical Soils.

An ordinary TI-55 calculator should be provided for horticultural training.

Attendance at the annual meetings of the Horticultural Society of America and the Florida Horticultural Society are recommended to provide the latest scientific information and contacts with outstanding researchers working in Mr. Chilembwe's field of study. The two summer courses will necessitate a period of residence at Lake Alfred and Homestead.

It is recognized that the M.S. Program recommended for Mr. Chilembwe will take somewhat longer than the usual M.S. Program.

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T R A I N I N G P L A N

Evans Chipala

Recommended for a Ph. D. in Agronomy with emphasis on Soybean breeding, with a minor in Plant Pathology. Mr. Chipala requires training under a practical plant breeder who has experience with tropical soybeans.

Suggested Courses: Advanced Genetics, Population Genetics, Cytogenetics, Advanced Plant Breeding, Crop Nutrition, Crop Ecology, Herbicide Technology, Pathogen Variability and Host Resistance, Insect Resistance in Host Plants, Tropical Nematology and Tropical Soils.

An ordinary TI-55 calculator should be provided for training in plant breeding.

Attendance at annual meetings of the Crop Science Society of America and at least one meeting of the American Soybean Association are recommended to provide the latest research information and to provide contacts with outstanding soybean researchers. A brief study period at INSOY should be included in Mr. Chipala's Program.

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T R A I N I N G P L A N

Benson Dzewela

Recommended for a Ph. D. in Agronomy with emphasis on pasture management with a minor in Animal Science with emphasis on animal nutrition. Mr. Dzewela heads the pasture and forage program in Malawi.

Suggested Courses: Tropical Pasture and Forage Science, Agronomic Methods of Forage Evaluation, Crop Ecology, Herbicide Technology, Animal Nutrition, Ruminant Nutrition and Digestive Physiology, Mineral Nutrition and Metabolism, Soil Fertility, Tropical Soils.

An ordinary TI-55 calculator should be provided for training in pasture management.

Attendance at the annual meetings of the American Society of Agronomy and the Southern Pasture Workers Conference are recommended to provide the latest research information as well as contacts with outstanding scientists in the field of pasture management.

T R A I N I N G P L A N

Felix Kisyombe

Recommended for a M.S. in Statistics with emphasis on design of Agricultural Experiments. Mr. Kisyombe requires a broad training in biometrics, he will return to Malawi to serve as a Statistical Consultant to all agricultural researchers in Malawi.

Suggested courses to include: Computer Programs in Statistical Analysis, Statistical Methods in Research, Biostatistics, Design and Analysis of Experiments. He should also take courses in Agronomy, Soils and Animal Science, to gain a working knowledge in these fields which will be important in communication with plant and animal researchers, when he returns to Malawi. It is expected that this broad training will require somewhat longer than the usual M.S. training in statistics.

Special calculating equipment will be required: An HP-41 C which will be the standard calculator for the research scientists in Malawi. It is essential that Mr. Kisyombe becomes completely familiar with this calculator during his training period.

Secondly, the biometrics unit in Malawi will be getting an HP-85 calculator, this is the standard calculator which will be used in Malawi. Since the calculator uses BASIC language it is essential that Mr. Kisyombe should learn to use this calculator as a part of his training program. These calculators are to be property of the Malawi Biometrics Unit. The cost of these two calculators is estimated at \$3,500.

Attendance at annual Professional Statistical meetings is recommended to provide the latest scientific information and contacts with other outstanding researchers in the biometrics field.

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T R A I N I N G P L A N

Goodwin Mkamanga

Recommended for a Ph. D. in Crop Science with specialization in Crop Physiology and herbicide science, and emphasis on wheat. He needs broad training since quite likely he will return to Malawi to serve as a Research Administrator.

Suggested courses in Physiology of Crop Yield, Field Plot Technique, Herbicide Science, Concepts of Crop Science, Seed Production and Crop Seed Physiology, International Extension, Soil Fertility, and Computer Science (Software Systems).

Special research equipment: a HP-41 C calculator will be required for simulation modeling and for statistical analysis of research data.

Attendance at the American Society of Agronomy annual meetings and the Western Society of Crop Science annual meetings are recommended to provide the latest information as well as contacts with a large number of researchers in the field of crop physiology.

T R A I N I N G P L A N

Ted Munthali

Recommended for a Ph. D. in Animal Science with emphasis in animal nutrition and a minor in Agronomy with emphasis in Pasture management. Mr. Munthali will quite likely head the research on animal nutrition when he returns to Malawi.

Suggested Courses: Animal Nutrition, Nitrogen and Energy in Animal Nutrition, Advance Methods in Nutrition Technology, Vitamins, Ruminant Nutrition and Metabolism, Tropical Pasture and Forage Science, Agronomic Methods of Forage Evaluation and Soil Fertility.

An ordinary TI-55 calculator should be provided for training in animal nutrition.

Attendance at the annual meetings of the American Society of Animal Science and the Southern Forage and Pasture Workers Conference are recommended to provide the latest research information and to provide contacts with outstanding scientists in animal nutrition.

T R A I N I N G P L A N

Clement Mzembe

Recommended for a Ph. D. in Agronomy with emphasis on irrigation. Mr. Mzembe requires broad training in soils and agronomy. He heads the irrigation research station at Kasinthula.

Suggested Courses: Soil Fertility, Tropical Soils, Crop Water Relations, Soil Physics Saline Soils, Physical Properties of Soils, Irrigation and Drainage, Planning and Management of Irrigation Systems.

Special Research Equipment: a HP-41 C calculator will be required for graduate studies in irrigation agronomy.

Attendance at the annual meetings of the American Society of Agronomy and the Western Section of the Soil Science Society of America are recommended to provide the latest research information as well as contacts with outstanding scientists in the field of irrigation agronomy.

T R A I N I N G P L A N

Enoc Ntokotha

Recommended for a Ph. D. in Soil Science with emphasis on soil genesis and classification. Mr. Ntokotha will likely head the soil survey unit when he returns to Malawi, and he should get a broad spectrum of training.

Suggested Courses: Tropical Soils, Soil Physics, Soil and Plant Analysis, Soil Chemistry, Soil Microbiology, Soil Fertility, Soil Morphology, Genesis and Classification, Soil Mineralogy, Advanced Soil Management, Animal Nutrition, Physiological Aspects of Crop Production.

An ordinary TI-55 calculator should be provided for training in soil genesis and classification.

Attendance at the annual meetings of the American Society of Agronomy and the Southern Agricultural Workers Association are recommended to provide the latest research information and to provide contacts with outstanding scientists in Mr. Ntokotha's field of study.

T R A I N I N G P L A N

Alex Saka

Recommended for a Ph. D. in Soil Science with emphasis on soil physics. Mr. Saka will likely lead the Soil Physics group upon his return to Malawi.

Suggested Courses: Tropical Soils, Soil Fertility, Soil Physics, Colloidal and Physical Chemistry of Soils, Soil Mineralogy, Soil Genesis and Classification, Plant Nutrition, Crop Ecology, Mineralogical Analysis by X-Ray Methods, Mineralogy of Clays.

After the elements of programming have been mastered on the TI-55 calculator an HP-41 C should be substituted since this more sophisticated calculator will be needed upon Mr. Saka's return to Malawi and he should become familiar with its use during his training program.

Attendance at the annual meetings of the American Society of Agronomy and the Southern Association of Agricultural Workers are recommended to provide the latest research information and to provide contacts with outstanding soil physics research scientists.

T R A I N I N G P L A N

Pickford Sibale

Recommended for a Ph. D. in Agronomy with emphasis on peanut breeding, and a minor in Plant Pathology. Mr. Sibale requires training under an experienced, practical peanut breeder.

Suggested Courses should include: Advanced Genetics, Population Genetics, Cytogenetics, Advanced Plant Breeding Crop Nutrition, Crop Ecology, Herbicide Technology, Pathogen Variability and Host Resistance, Insect Resistance in Host Plants, Tropical Nematology and Tropical Soils.

An ordinary TI-55 calculator should be provided for training in plant breeding

Attendance at the annual meetings of the Crop Science Society of America and the American Peanut Research and Education Association are recommended to provide the latest research information and contacts with outstanding peanut researchers.

CROP ECOLOGY
AGR 6511

The Primary focus of this course will be on dynamics of crop yield and crop adaptation. Topics include: primitive to modern agro-ecosystems; agroclimatic classifications and indicator vegetation; climatic factors; theoretical aspects of crop yield; the relationships of ecological factors to crop adaptation and crop geography.

There are three 50 minute lectures and one 110 minute laboratory per week for 7 weeks, the lectures will be held in the Chitedze Library from 9:00 to 9:50 each Tuesday, Thursday and Saturday, and the laboratories will be held on Tuesday from 1:30 to 3:20 p.m. Classes will start March 24, 1981.

OBJECTIVES

To understand ecological factors as they affect crop adaptation and yield.

To understand agro-climatic classifications, indicator vegetation, and crop geography and its relation to crop production.

To appreciate the newer concepts of the theoretical aspects of crop yield.

COURSE OUTLINE

- 0.0 INTRODUCTION
- 1.0 CROP PRODUCTIVITY OF AGRO-ECOSYSTEMS
 - 1.1 Shifting Cultivation
 - 1.2 Sedentary Subsistence Farming
 - 1.3 Livestock Farming
 - 1.4 Industrialized Agriculture
 - 1.5 Productivity of Agro-Ecosystems
 - 1.6 Agricultural Technology (Slides)
- 2.0 AGROCLIMATIC CLASSIFICATION
 - 2.1 Thornthwaite
 - 2.2 Weather Station Climatological Data
 - 2.3 Crop Climatology (Slides)
- 3.0 ECOLOGICAL FACTORS
 - 3.1 Solar Radiation
 - 3.2 Temperature
 - 3.3 Water
 - 3.4 Plant Nutrients
- 4.0 THEORETICAL ASPECTS OF CROP YIELD
 - 4.1 Canopy Architecture
 - 4.2 Crop Growth vs. Development
 - 4.3 Yield Adjustment Strategies
 - 4.4 Growth Analysis
 - 4.5 Simulation Modeling
- 5.0 CROP YIELD DYNAMICS
 - 5.1 Rice
 - 5.2 Wheat
 - 5.3 Maize
 - 5.4 Soybean
 - 5.5 Potato
 - 5.6 Cassava
 - 5.7 Sugarbeet
 - 5.8 Sugarcane
 - 5.9 Forages
 - 5.10 Cotton

- 6.0 AGRO-BIO-GEOGRAPHY
 - 6.1 Land Resources
 - 6.2 People and their Land (Slides)
 - 6.3 Absolute Maximum Food Production
 - 6.4 Crop Belts
 - 6.5 World Crops (Slides)

LABORATORY

- 1.0 DATA INTERPRETATION
- 2.0 ENVIRONMENTAL MEASUREMENTS
- 3.0 CLIMATIC INDICES
- 4.0 GROWTH ANALYSIS
- 5.0 COMPUTER SIMULATION MODELING
- 6.0 CROP YIELD VARIABILITY
- 7.0 CROP ADAPTATION

GRADING SYSTEM

Grades will be based on two tests (400 points) and laboratory reports (350 points).

First Test - 200 Points
Second Test - 200 Points
Laboratory Reports - 350 Points

PROFESSOR

D.E. McCloud, Chitedze Research Station

TEXT McCloud, D.E. 1979. MAN'S FOOD CROP RESOURCES. University of Florida.

SUPPLEMENTARY REFERENCES

The following may be useful; they will be held on reserve in the Library.

Cox, George W., and Michael E. Atkins. 1979. AGRICULTURAL ECOLOGY: AN ANALYSIS OF WORLD FOOD PRODUCTION SYSTEMS. W.H. Freeman and Co., San Francisco.

Evans, L.T. 1975. CROP PHYSIOLOGY. Cambridge University Press (Paperback)

Leopold, A. Carl, and Paul E. Kriedeman. 1975. PLANT GROWTH AND DEVELOPMENT 2nd Edition, McGraw Hill.

GOODE'S WORLD ATLAS. 1974. 14th Edition, Rand McNally.

CALCULATOR

A small, programable calculator, such as Texas Instruments TI-55, which will compute means, linear regression functions, standard deviation, standard error of the estimate, and correlation coefficient, will be essential in this course.

APPENDIX B

WORK PLAN FOR DR. ART HANSEN
FARM SYSTEMS ANALYST IN AGRICULTURAL RESEARCH
DEPARTMENT OF MINISTRY OF AGRICULTURE

30th January 1981 - January 1983

Dual Responsibility

The position of farm systems analyst has two primary responsibilities - organizing an adaptive farming systems research program and organizing and conducting applied social science research on smallholders.

A. Farming Systems Research

Farming systems research is designed to adapt already-existing research information to make rapidly available extension recommendations that will be rapidly accepted by farmers because they make sense under farmer conditions. This research under Malawi conditions would use a multidisciplinary approach that integrates the skills and experience of agronomic and socio-economic research staff and evaluation and extension staff to rapidly appraise the farming systems of an area and the niches where available research information and farmers' resources could be combined for quickly accepted innovations to improve productivity and smallholder income, and then to set up on-farm trials under smallholder management to test the actual advantages of these supposedly profitable innovations in the field. This approach results in locality-specific recommendations that extension may act upon with a high degree of confidence. In the initial stages of assessing the available secondary data on an area and conducting a rapid survey (approximately 7 - 10 days), one or two staff members from the local offices of extension and from evaluation should work with the agricultural research staff to contribute their insights and skills. Setting up and supervising the on-farm trials will be the responsibility of agricultural research staff, although the participation of extension is welcomed. Obviously, the continued interaction of research and extension in analyzing local systems, planning, and administering on-farm trials results in a more effective flow of information among farmers, research, and extension staff. During the two years that the farm systems analyst is in Malawi, he will set up and help coordinate a series of these surveys and resultant on-farm trials in various areas. The restraint is that the surveys should be run during the cropping season when the fields may be observed, and research personnel must assume the responsibility for administering the on-farm trials. If there is sufficient research staff and funds for on-farm trials, then this process may be rapidly initiated in a series of areas. Probably a month per area is necessary to run through the following phases:

- 1) review secondary data and tentatively select a homogenous agro-ecological area (7 - 10 days).
- 2) prepare and pre-test arenas of questions to be answered.

- 3) arrange for survey staff and transportation and living arrangements during the survey.
- 4) survey the area with a multidisciplinary team (7 - 10 days).
- 5) analyze the survey results while verifying the survey conclusions by interviewing the existent or an earlier evaluation on NSSA sample of farmers (2 weeks).

The specific set of on-farm trials to be run in a locality would be decided by the end of step 5, and the research staff could more leisurely make the necessary arrangements.

Choice of where to start is a function of national priorities and the need to train staff. Probably the first run-through will reveal some interdepartmental or logistical difficulties, so it might be more ragged than succeeding exercises. The Lilongwe area appears to be an appropriate choice for where to begin, since the logistical problems are reduced while the potential to train staff is very high - MANR and Chitedze are adjacent, so staff may participate more easily. In discussions with CARO, Mike Wales, and Gilbert Chirwa, they all suggested KRADD as the second priority area. Tony Standen also suggested Phalombe as high priority. Accordingly, at the present moment the choices of areas in which to work are (in order) Lilongwe, Karonga/Chitipa, and Phalombe. Next year more areas may be started through this process. Perhaps up to six areas could be started during the next two years.

Attached to this work plan is a copy of a CIMMYT report with a more detailed background on farming systems research. The CIMMYT approach must be modified in Malawi to take advantage of the already-existing data from the Evaluation Section and Agro-Economic Surveys.

B. Applied Social Science Research

The other major responsibility of the farm systems analyst's work is to establish longitudinal studies of farmer innovativeness and decision-making to complement the production economic studies of the agricultural economist and the evaluation/agro-economic survey information. These longitudinal studies will begin in the same areas where the on-farm trials are being conducted and will involve long-term study of a subset of an earlier evaluation sample or the NSSA sample. Personnel for these social science studies will be the farm systems analyst himself, trainees from agricultural research, and any other appropriately trained researchers in Malawi (University of Malawi faculty, for instance) whose research interests are found by CARO to be appropriate. In most instances the longitudinal studies will require consistent re-visiting of the same smallholder households and villages over a period of several years to establish farmer trust in the interviewers, patterns of innovativeness, beliefs and practices affecting agricultural decision-making, and responses to local trials and recommendations. The shortage of well-trained social science staff means that the extent of these studies will be more severely limited than the extent of farming systems on-farm trial research. Probably no more than three sites (one in each region) will be initiated for longitudinal studies during the next two years.

C. Training of Malawian Professionals

The farm systems analyst is establishing a component of the complete agricultural research effort that should be turned over to Malawian personnel as soon as there are sufficient (and adequately trained)

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staff. The USAID project calls for the training to a Masters level of three P.O.s in agricultural economics and two P.O.s in applied anthropology. One person has already been sent off (Miss. R. Chikwana in economics), so four remain to be selected and trained. In addition, there will be a staff of P.O.s who remain at the first degree level and a support staff of T.O.s and T.A.s to assist in data collection and analysis. In the beginning and for some considerable time data collection will be directly carried out by the top professional, accompanied (for training purposes) but not replaced by the P.O.s and T.O.s on the staff. Through on-the-job training (tutorial of guided readings, short courses, and observation of the professional social scientist), the staff will learn the purpose and techniques of farming systems research and longitudinal social science research. In January 1982 two more P.O.s should be sent off for a Masters program, one in economics and the other in anthropology. The two new staff with economics degrees hired in June 1981 should go for Masters training at that time. The final two may go in August 1982 or January 1983. These will probably be Bunda College graduates, P.O.s who have shifted into the socioeconomic research unit from other areas of ARD, or upgraded P.O.s.

WORK PLAN FOR 30TH JANUARY THROUGH 30TH JUNE 1981

The farm systems analyst arrived in Malawi 30th January, 1981.

February

Ten days were spent travelling through the Northern Region to familiarize himself with that region, especially since the Karonga/Chitipa area had been suggested as the second site. The rest of the month was spent in talking with MANR officials, collecting secondary data, setting up the recruitment and training of staff, and planning where and how to start field studies.

March

During this month the Lilongwe project should be set up and the survey and beginning of analysis carried out. This entails reviewing secondary data, choosing a survey team from research, extension and evaluation, making all of the arrangements for the survey and data analysis, selecting the general area to survey, and conducting the initial survey as well as the verification survey (in whole or in part) of the existing representative sample chosen previously by evaluation (for an established baseline). This same sample or a subsample will be used for the beginning of a longitudinal study.

April

The final analysis of the Lilongwe data should be completed during the first week. April 12 - 17 the farm systems analyst is scheduled to attend the annual conference in Edinburgh of the Society for Applied Anthropology, after which he will attend to the revisiting of the longitudinal sample in the Lilongwe area. April 21 - 29 a set of ARD and ADD staff will attend a CIMMYT training course in Nairobi on adaptive research.

May

During this month the KRADD project should be set up and the survey carried out. The same activities as in Lilongwe in March, with the analysis being completed by the end of May or early June, and a longitudinal study initiated.

June

Finish the KRADD survey analysis. Continue longitudinal studies in Lilongwe and KRADD areas. Two new staff are hired from Chancellor College with degrees in economics, with perhaps one or two upgraded staff coming in from Bunda. A lot of training activity, as well as advancing the final plans for on-farm trials in both LADD and KRADD.