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A. FUNDING SOURCE	FIRST FY			LIFE OF PROJECT		
	B. FX	C. L.C.	D. TOTAL	E. FX	F. L.C.	G. TOTAL
AID APPROPRIATED TOTAL	950	1550	2500	5724.9	3275.1	9000
GRANT	950	1550	2500	5724.9	3275.1	9000
LOAN						
OTHER U.S.						
HOST COUNTRY					1403.7	1403.7
OTHER DONOR(S)						
TOTALS	950	1550	2500	5724.9	4578.8	10403.7

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE		E. 1ST FY <u>79</u>		H. 2ND FY <u>80</u>		K. 3RD FY <u>81</u>	
		C. GRANT	D. LOAN	F. GRANT	G. LOAN	I. GRANT	J. LOAN	L. GRANT	M. LOAN
(1) F&N	B 111	080		2500		1700		3000	
(2)									
(3)									
(4)									
TOTALS				2500		1700		3000	

A. APPROPRIATION	N. 4TH FY		Q. 5TH FY		LIFE OF PROJECT		12. IN-DEPTH EVALUATION SCHEDULED
	O. GRANT	P. LOAN	R. GRANT	S. LOAN	T. GRANT	U. LOAN	
(1)			1800		9000		<input type="checkbox"/> MM <input type="checkbox"/> YY <input type="checkbox"/> 06 <input type="checkbox"/> 81
(2)							
(3)							
(4)							
TOTALS			1800		9000		

13. DATA CHANGE INDICATOR. WERE CHANGES MADE IN THE PID FACESHEET DATA, BLOCKS 12, 13, 14, OR 15 OR IN PRP FACESHEET DATA, BLOCK 12? IF YES, ATTACH CHANGED PID FACESHEET.

1 = NO
 2 = YES

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PROJECT PAPER
MALAWI AGRICULTURAL RESEARCH
(612-0202)

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I. SUMMARY

A. Problem

Malawi has a population of 6,000,000, which is growing at an annual rate of more than 2.6%, and is a relatively least developed country as determined by the United Nations Conference on Trade and Development and the Development Assistance Committee of the OECD. Based on its average per capita GNP in 1977 of \$140, it is the twelfth poorest nation in the world. Life expectancy at birth is about 41 years, and 175 infants die per 1,000 born during the first year of life. The adult literacy rate is less than 22%.

At least 85% of the population of Malawi is engaged in and dependent for its livelihood on smallholder agriculture. Smallholder yields are low and production from traditional agriculture has lagged significantly behind that of the estates.

Improved varieties, crop and livestock combinations and farming systems developed through agricultural research are essential if the conditions and quality of life for Malawi smallholders are to be improved. The Department of Agricultural Research (D.A.R.) within the Ministry of Agricultural and Natural Resources (MANR) has been unable to provide research packages in adequate quality and quantity to meet the needs of smallholders.

Most of the Professional Officers in the D.A.R. have only the B.Sc. degree, and there is a general lack of advanced specialization or specific research skills. The sub-professional Technical Officers and Assistants can only assist with physical operations and routine functions. The establishment, management and evaluation of scientific agricultural research and the utilization of essential research equipment require the high level of skill and specialization obtained at the advanced degree level. This lack of advanced specialization is an acute problem in the D.A.R.

The D.A.R. has also recognized the absolute shortage of professional and technical staff, generally, and in the research areas to be addressed by the Project and plans to increase the number of Professional Officers, Technical Officers and Technical Assistants. It is essential for the new personnel to have adequate working space, but housing must be provided on the research stations before they can be recruited.

The entire research effort, and particularly that of the few Professional Officers with advanced training, is restricted by inadequate research equipment and physical facilities and the resulting under-utilization of available trained personnel. The D.A.R. lacks proper equipment to perform a surprisingly large number of fairly routine plant and soil analyses. This affects all areas of agricultural research. In addition to inadequate equipment, the very limited laboratory, storage, and greenhouse space inhibits propagation, storage and preparation of samples and the organization of work, thereby restricting quantitative output.

Deficiencies in the recognition of problems of smallholders for research action and the planning and implementation of research projects are predictable results of an insufficient number of trained professional personnel.

The GCM is concerned about the relatively slow growth in smallholder production, combined with a rapidly increasing population, and is implementing a country-wide approach to rural development. This multilaterally assisted effort, the National Rural Development Program (NRDP), will be the primary means to improve smallholder conditions. The approach of the NRDP is to concentrate on providing farm inputs and extension services. Technical agricultural production and economic information is essential to NRDP success and must be available before other inputs, such as credit, and extension services, can be utilized effectively.

Crop input packages must be research-proven. Useful research results must be provided by the D.A.R. which are (a) relevant for the area where the package is to be recommended, (b) within the skill/sophistication level of the farmer, and (c) based on a realistic economic analysis of costs and of returns of production in terms of the limited resources available. In most NRDP areas the data, from which such recommendations can be developed, are still lacking. With the increase in agricultural development within the framework of NRDP, demands on the agricultural research service will increase markedly. Adaptive research will be required to provide crop and cultural practice base-line data for each of the 180 Extension Planning Areas (EPAs) of the NRDP.

Research staff at central stations provide the basic data and evaluation from which EPA farmer trials are designed. This activity needs expansion to cover ecological areas for which basic data have not yet been fully developed, (soil data, fertilizer response, variety adaptability). The research personnel at station level share responsibility for field trials. They must participate with the extension service to assure that farmer trials in the EPAs are properly done at the correct time and that the results are accurate.

To effectively meet NRDP needs it is necessary that research also include economic and social analysis of proposed programs to assure efficient use of funds, to make research consistent with GOM priorities and policy and to focus research on smallholder needs.

B. Summary Project Description

The Project goal to be achieved over the 15-20 year life span of the NRDP, is to improve smallholder productivity and per capita real income. The purpose of the Project is to strengthen the capability of the Department of Agricultural Research (D.A.R.) to provide socially acceptable and economically sound research recommendations to the extension service for smallholder crop and livestock production.

Project inputs will be coordinated to directly impact on existing research programs in the following areas particularly applicable to smallholder farmers:

- maize
- groundnuts
- beans
- wheat and sunflower
- fruits and vegetables
- livestock
- seed production
- soil fertility evaluation and improvement

These programs encompass 50% to 60% of the present research effort of the DAR, and Project emphasis here will provide greatest immediate benefits to smallholder production.

As a result of AID/W policy decisions reached during the PID approval process, the Project does not deal with research in tobacco and sugarcane. Assistance in coffee, tea and cotton research is not requested by the GOM. Moreover, tea and cotton are not smallholder crops, and effective research activities have been established with support from the private sector and, in the case of cotton, from the NRDP regional program in the Shire Valley.

Emphasis will be placed on assistance to improve and strengthen the systems for research coordination in the selection, implementation, and management of research projects of optimum value to smallholders. Special attention will be given to the needs for continuous liaison between research and extension functions to achieve transfers of research results to smallholders.

Research programs will be established in production economics and farming systems analysis to correlate other research with economic and sociological realities. Additionally, the Project will assist a smallholder appropriate technology program which, in its present context of farm mechanization research, has been unsuccessful in producing implements accepted by smallholders.

Technical assistance is to be provided by a U.S. Title XII institution. Other resources will be available through the backstopping capabilities of the institution, especially by short-term consultants.

The serious manpower problems of the DAR will be relieved by providing for the graduate education of 33 Malawian Professional Officers. In-service and short-term training of research personnel will also be furnished or arranged by the GOM and the Title XII team. The Project also will provide selected training for other DAR personnel for the concurrent improvement of research management and administrative capabilities in anticipation of the increased number of PO's with advanced skill levels who will be trained by the Project. Equipment purchases will support

the research programs assisted by the Project, and vehicles are to be supplied to permit access to research activities in scattered locations and on-station.

The Project will finance the construction of housing to be utilized by Malawian research officers. A sufficient number of these houses are to be available for U.S. technical assistance personnel. The provision of staff housing is a standard practice of the GOM and is essential if the D.A.R. staff is to be increased and the impact of a strengthened research program is to be extended to the rural population. Construction is also to include essential offices, laboratories, greenhouses, cold storage rooms and storerooms.

In general, the Project, through integrated inputs of technical assistance, training and construction, will substantially strengthen the D.A.R. research capability in pertinent technical areas, the ability for selection and management of priority research programs, and the production of research information for dissemination to smallholder producers. Substantive research programs also will have been maintained during the absence of Malawian investigators undergoing advanced education. Research will have been improved and expanded to provide a sound basis for recommendations on cropping systems and agronomic techniques for smallholder farmers. A more professional base will have been established on which future research can support Malawi's principal industry - agriculture.

GOM and AID inputs include;

AID

(Grant)	(\$9,000,000)
Technical Assistance	3,102,700
Training	1,581,900
Construction	2,000,000
Commodities (Research Equipment and Vehicles)	788,300
Incremental Recurrent Costs	872,800
Evaluation	50,000
Contingency (general)	304,300
(construction)	300,000

GOM

	(\$1,403,700)
Technical Assistance	100,000
Training Support	85,600
Construction Support	437,100
Incremental Recurrent Costs	<u>781,000</u>

TOTAL	<u>\$10,403,700</u>
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C. Summary of Findings

It has been concluded from the analysis herein that:

1. The agricultural research service in Malawi requires substantial strengthening and a smallholder focus, if the NRDP is to have adequate support and is to be successful in raising the productivity and real income of smallholders;

2. Achievement of the project goal will occur over the 15-20 year life span of the NRDP;

3. With the technical assistance, training, equipment and physical facilities to be provided, the GOM will be capable of effectively managing the Project and its smallholder research programs in terms of both staff and budgetary support;

4. The Project does not present any significant environmental issues;

5. The technical design and cost estimates are reasonable and adequately planned pursuant to FAA Sec. 611 and other applicable provisions;

6. Monitoring and evaluation of Project progress has been adequately planned; and

7. All statutory criteria have been satisfied.

D. Recommendations

Authorization of a Grant of \$9,000,000 to the Government of Malawi (GOM) over the life of Project is recommended. Waivers under the provisions of FAA Section 636(i) and of AID procurement policy are recommended to permit the AID-financed procurement of 15 four-wheel drive Landrovers and 15 motorcycles of Code 935 (Special Free World) manufacture.

It is also recommended that a formal decision be reached in the fourth year of the Project, based on external and internal evaluations and the views of AID field offices, on whether a second phase agricultural research project should be designed to correspond with progress and developments under the National Rural Development Program (NRDP).

Waiver of the 25% cost sharing requirement in Section 110(a) of the Foreign Assistance Act is recommended. Malawi is a relatively least developed country and is eligible for the waiver.

II. BACKGROUND

1. General

With a population of 6 million, a land area of about 36,000 square miles, and a total area of 46,000 square miles, Malawi is densely populated with 156 people per square mile. Its main assets are a hard working and industrious population, moderately fertile soils, good water resources and a climate favorable to agricultural production. Unlike its neighbors, Malawi does not have known substantial mineral resources. Although Malawi has a per capita GNP of about US \$140 and is listed by the United Nations among the world's 25 poorest countries, its progress since 1964, measured against its natural endowments, has been remarkable. Between 1964 and 1976, GDP at constant prices grew at an average annual rate of 6.5 percent.

2. Agricultural Sector

In 1975/76 agriculture employed some 85% of the population, contributed about 46% of GDP and accounted for 94% of export earnings. In 1976 smallholder agricultural production had a 31% share in the total domestic export earnings and estates 56%. Since 1973, the estate sub-sector has been a leader in growth, while the smallholder sub-sector has lagged behind. Therefore, although the GOM will continue to support the estate sub-sector, heavy emphasis will be concentrated on increasing production and income of smallholders.

a) Crop Production

Agronomic food crops of major economic importance in Malawi are: maize 1,000,000 ha, groundnuts 200,000 ha, and sorghum and millet 125,000 ha. The principal vegetable crops grown in Malawi are: potatoes, cassava, onions, tomatoes, and cabbage. Perennial crops include tea 18,000 ha, coffee 1,000 ha, oranges, grapefruit, avocados and a variety of tropical fruits and nuts. Fruit and vegetables are widely grown in gardens and small, scattered plots, and data on production acreages or yields are not available or are unreliable. Sugarcane, an estate crop, and tobacco, grown by estates and smallholders, are Malawi's principal foreign exchange earners. Tea and coffee are almost entirely estate crops.

Maize is the principal agricultural crop and in 1977, 44% of the arable land area was planted to maize. Between 1971 and 1977 the land area planted to maize declined 4%, yields increased 22% and overall production increased 17%. The introduction of improved varieties and the use of more fertilizer, as well as improved cultural practices, brought about the increased yields.

Groundnuts are the second most widely planted crop and in 1977, 9% of the arable land area was planted to groundnuts. Between 1971 and 1977 the land planted to groundnuts declined by 35% and yields increased only 16%. During

this six year period groundnut production decreased 45%. At one time, Malawi produced almost four times more groundnuts than were produced last year, and consequently has the capacity to increase groundnut production several fold, if yields per unit area of land can be increased.

b) Livestock Production

The livestock and poultry numbers for 1978 have been estimated to be 770,000 cattle, 763,000 goats, 210,000 pigs, 89,000 sheep and 8,480,000 chickens. Animal distribution is influenced by population density, availability of crop residues and permanent grazing, incidence of diseases, the social values attached to livestock and the availability of competitive alternatives. The national dipping program, requiring weekly treatments to control tick-borne East Coast Fever, has helped the cattle population to grow at about 5% per annum. However, reproductive rates of 45% to 55%, calf mortality of up to 40% in the first six months, seasonal grazing due to long dry periods and generally poor management practices result in yearly offtakes rates of only about 10%.

The most successful beef development has been the expansion of the stall-feeder scheme, whereby smallholders fatten steers with chopped forage, maize bran, peanut hulms and other crop by-products. Impressive progress has been made in the dairy sector in the last ten years. Dairy cattle are primarily the crossbred Friesian/Malawi Zebu. Milk collections now total 2,200 gallon/day from 1,000 producing units, the vast majority coming from smallholders. Combined with another 600 gallons from other sources, production is now equivalent to about 12.5% of total commercial imports.

c) Smallholders

Almost 92% of the population (1977 census) is rural, and most of these people depend directly on agriculture as smallholder producers or as hired labor for other smallholders or estates for their food and cash income. Only 37% of the land in Malawi is considered suitable for cultivation, and 86% of this already is in use (1977). Landholdings generally are small in size and average about 1.5 ha. with some slight regional differences. These smallholders account for over 85% of all agricultural production demonstrating the subsistence character of Malawi's agriculture.

GOM development policies place a high priority on improving the incomes and productivity of smallholders. There is an increasing smallholder emphasis and orientation by the MANR, evidenced by the Major Development Projects, the Statutory Authorities, and the NRDP.

It is difficult to estimate the impact on the rural standard of living of these smallholder-oriented programs due to a lack of data concerning the present standard or any measure of recent changes. There are no good nationwide baseline studies or current surveys.

Available statistics support the view that smallholder production has not kept pace with population increases. FAO statistics indicate a 17% increase in Malawi maize production from 1971 to 1977. The approximately 22% increase in population over that period, however, would imply a 5% lower per capita production of a basic food crop in 1977. Although GOM statistics show a 32% increase in the cash value of non-monetary (subsistence) agricultural production from 1971 to 1976, there is no real evidence that these figures reflect actual production increases, rather than increases in retail prices of food.

3. Agriculture and Rural Development - National Rural Development Program (NRDP)

The GOM has had experience with rural development programs, both prior to independence in 1964 and in the post independence era. The new National Rural Development Program (NRDP) is, in large part, based upon and draws from these experiences. To establish an overall perspective, the NRDP, when completed within an (currently) estimated time frame of 15-20 years, will have direct impact on essentially all of the rural population (now estimated at over 5 million and expected to grow to almost 7 million by 1989) and on most of the available land base of about 3.5 million hectares.

The GOM has developed the concept of the NRDP to provide most of the rural population with cost effective benefits of the four "Major Development Projects" which are now underway. These include the IDA - funded Lilongwe Land Development Program (LLDP), Karonga-Chitipa Rural Development Project (KRDP), and the Shire Valley Agricultural Development Project (SVADP). The Lakeshore Rural Development Project (LRDP), originally funded by the Federal Republic of Germany, is now assisted by the European Development Fund (EDF).

These projects, which have been incorporated into the NRDP, are generally recognized as successful, but expensive, rural development models, which have resulted in substantial increases in smallholder production and income. The newer projects, proposed in the NRDP, stress minimum capital investment and project elements which have more immediate development impact, as demonstrated in the earlier major projects.

The NRDP is basically a phased expansion of the original intensive area projects on a less intensive scale to cover the entire country. Emphasis is on providing improved high yielding crop varieties and related cultural practices, inputs and market services, extension education, rural credit and basic rural road network.

NRDP has three basic objectives:

- a) To increase Malawi smallholder production for domestic needs, import substitution and export.

b) To increase agricultural productivity and, consequently, smallholder incomes and welfare by assuring access to needed inputs and services.

c) To preserve Malawi's natural resources by encouraging conservation linked crop production, developing multi-use conservation programs, and developing forestry reserves on customary land.

To plan and implement NRDP, the country has been divided geographically into eight agricultural development divisions (ADDs), each with approximately 125,000 farm families and each administered by a management unit. Each ADD is subdivided into five rural development areas (RDAs) each with approximately 25,000 farm families. Each RDA will constitute a Rural Development Project (RDP). The rural development areas, and consequently projects, are each further subdivided into four to five Extension Planning Areas (EPAs) of about 5,000 families each. Each of the 180 EPAs are under the extension management of one technical officer (T.O.) who will supervise 12 technical assistants (T.A.) handling approximately 600 farm families each.

The NRDP is being developed in four phases:

a) Preparatory Phase - This two to three year program includes land resource and agro-economic surveys and the establishment of agronomy trials where necessary, followed by detailed physical and economic planning.

b) Extensive Phase - This phase is expected to take about five years and will involve investment in production related items such as improved extension and training, marketing, supply of inputs and credit and the construction of essential supporting infrastructure.

c) Intensive Phase - This five year phase will be more similar to the on-going major projects and will involve more attention to the introduction of new crops and processing technologies.

d) Consolidation Phase - This phase will involve a continuation of more intensive development, further improvements in social infrastructure and possibly the development of rural industries.

It is planned to start three Rural Development Projects (RDP) each year, shared evenly among the North, Central, and Southern regions of the country. The specific areas will be selected using the following criteria:

- a) Areas with high, but largely underdeveloped potential;
- b) Areas where considerable initiative is being shown;
- c) Areas of food deficit;
- d) Areas of ready accessibility; and
- e) The need to maintain an even balance in providing development assistance to all regions.

NRDP is a very ambitious undertaking requiring support for the expenses involved in preparing and managing the various projects and for the central government agencies that plan the overall projects and supply needed services. NRDP direct project costs are projected over the 15-20 year life of the program at \$90 million, while costs for central services are projected at \$50 million, a total of \$140 million.

The NRDP is now supported with \$66,000,000 committed by other donors. Of this amount the United Kingdom has provided funds for the construction of a well-equipped seed laboratory, and the IBRD loans include \$415,000 for field trials operated by the extension service in NRDP areas. These trials are supervised by main or branch station research staff. The IBRD also funds a Land Resource Survey which will link to research priorities and a Planning and Agro-Economic Survey. The meteorological data collection service is funded by West Germany. Initial cost estimates for the NRDP, which divides Malawi into 180 Ecological Planning Areas (EPAs), run about \$13.00 per acre or \$26,50 per person over 17 years.

4. Agricultural Research and NRDP

GOM policy is to assure that agricultural research will assist smallholders to diversify their production to include commercial crops, i.e., groundnuts, wheat, cotton, oil seeds, etc., together with maize and other traditional crops. This is desired to enhance the stability of produce available for home use and to effectively support agro-based industries.

The Department of Agricultural Research (D.A.R.) is directed and coordinated by the Chief Agricultural Research Officer in the Ministry of Agriculture and Natural Resources (MANR). The D.A.R., together with research activity in Forestry, Fisheries, Wildlife, Hydrology and Geology in the National Resources Section of the Ministry of Agriculture, is represented in the newly formed National Research Council of the Office of the President and Cabinet where it can provide information and advice to Government in policy areas.

The National Agricultural Research Program is organized on a project basis; there are presently forty-eight (48) projects. Some are substantial, with teams of workers,* while others are small or even temporarily shelved with one research officer responsible for three or four. Each project has a project coordinator who is expected to convene at least one project meeting per year where the past seasons' results are presented and future programs are discussed before a group of MOA and outside senior scientists, project workers and extension staff members.

*Professional and technical staff within the DAR and other GOM agencies, including the extension service, are divided into staff categories as follows: (a) Professional Officers (POs) hold a bachelor's or higher degree; (b) Technical Officers (TOs) hold a "Diploma" obtained after a three year course following secondary school; (c) Technical Assistants (T.A.s) hold a certificate obtained after a two year course following secondary school.

A research extension liaison committee chaired by the MANR Deputy Secretary for Agriculture was set up in early 1978 to facilitate research/extension linkages. The projects are executed both within the Research Stations and other agencies, such as Bunda College, depending on the availability of trained manpower and finance. The D.A.R. has three main research stations, including the largest at Chitedze. Several of these have sub-stations making a total of eleven country-wide. The major agro-ecological zones in Malawi are covered. Research, if properly developed and supported, will be able to serve the entire NRDP program without any additional main stations being established.

The following is a brief review of the principal research stations' functions:

Chitedze, near Lilongwe, in the central region, is the main research station in the country, and its activities include both crops and animal research. Major projects at the station involve research in maize, groundnuts, burley tobacco, western tobacco, finger millet, pastures, crop rotation, soil fertility, farm machinery and animal production. Chitedze produces foundation seed for western and burley tobacco, maize and groundnuts.

Bvumbwe, near Blantyre, is primarily a horticultural research station. Investments on various fruit crops, tree nuts and vegetables are conducted. Work on tung, coffee, essential oils, European potatoes, spice crops, pyrethrum, pharmaceutical crops, silk production and grain storage is carried out at Bvumbwe. In addition, Bvumbwe is the main base of the MOA Crop Protection Unit and has plant quarantine facilities. These are to be raised to the status of an International Regional Center under the auspices of the Inter-African Phytosanitary Commission of the Organization of American Unity (O.A.U.). Bvumbwe produces and distributes farmer planting material for a range of horticultural crops including macadamia, tung and potatoes.

Makoka, near Zomba, is the principal center for cotton research, the main activities are breeding, entomology and agronomy. It provides cotton seed for growers and tests spraying equipment, insecticides, and pesticides. The biometrics unit is also established here and provides advice to other research workers on experimental design and analysis as well as processing experimental data on research trials.

With assistance from the Project the D.A.R. will establish bean research and breeding programs at Bunda College, which will also serve as teaching methodologies.

These research stations have eight research sub-stations attached to them. In the past two seasons, work has started on siting district trials on farmers' fields in each of the 180 EPAs for NRDP sub-projects. This is expected to provide baseline data for planning purposes to develop appropriate crop packages. This requirement of the expanded NRDP program, however, is beyond the present capacity of the Department of Agricultural Research.

5. Project Development

The GOM has requested AID support for training research personnel, for technical assistance, for the construction of housing, laboratories and other facilities and for critical equipment and vehicle needs. After the GOM prepared an initial project proposal, AID Officers from OSARAC in Swaziland discussed the Project with GOM representatives in November 1977, when invited to attend a multi-donor appraisal mission of the NRDP. These discussions led to the preparation of a PID by OSARAC and REDSO/EA personnel in the first half of 1978 (PID approval telegram at Annex L).

The PID and the terms of its approval specify that the Title XII collaborative assistance approach will be applied to the Project. GOM representatives travelled to the U.S. and participated and concurred in the competitive selection of the University of Florida under Title XII procedures. This Project Paper was prepared by a design team consisting of six professors from the University of Florida, a DR/SA project officer and an engineer from REDSO/EA, with consultative advice from a USAID/Swaziland Agricultural Development Officer.

The Project goal, to increase the productivity and per capita real income of smallholders, is the same as the primary objective of the NRDP and will have to be achieved over the same 15-20 year life span. Successful institutional development of the D.A.R. should be geared to implementation progress under the multi-faceted NRDP and would substantially benefit from continued AID assistance over an 8-10 year period. It is proposed, therefore, that Project evaluations, particularly external evaluations in the second and fourth years, provide recommendations to be formally reviewed by AID on designing a reduced second phase of the Agricultural Research Project to begin in FY 85.

III. DETAILED PROJECT DESCRIPTION

A. Goal

The Project goal is to increase the per capita real income and the productivity of smallholders. The goal will be partially achieved at the end of the Project, but substantial nationwide improvements will correspond to the 15 to 20 year NRDP life span.

Goal achievement during the NRDP can be measured by the extent to which the following occur:

a) smallholder crop yields increased in maize from 1200 kg/ha to 1615 kg/ha, in groundnuts from 550 kg/ha to 740 kg/ha and beans from 450 kg/ha to 605 kg/ha,

b) calfhood mortality decreased from 40% to 20%,

c) national smallholder cattle herd increased from 700,000 to 1,000,000 and the annual offtake rate increased from 10% to 15%, and

d) smallholder per capita real income increased from \$154 to \$240.

The most significant assumption related to goal achievement, discussed in greater detail in the Major Assumptions subsection, is that the NRDP will continue to be successful in improving the effectiveness of the extension service.

B. PURPOSE

The purpose of the Project is to strengthen the capability of the DAR to provide economically sound and socially acceptable research for smallholder needs in satisfactory quantity and quality and in a form which is readily useable by the Technical Officers (T.O.s) who supervise and backstop extension agents.

The D.A.R. must be able to: (1) provide sound recommendations for crop and livestock production by smallholder farmers that are consistent with ecological, sociological, and economic realities of Malawi and (2) develop a body of research data essential for continuing development of the production-agricultural economy upon which the welfare of Malawi is dependent. Such an undertaking is beyond the present capability of the Department of Agricultural Research.

The continued responsiveness of the extension service in utilizing research information and in providing feedback will be necessary to achieve the Project purpose. Additionally, joint and collaborative action by D.A.R. management and the Title XII team in research coordination and research/extension liaison will be essential and is assumed.

End of Project Status

Achievement of the Project purpose can be measured by the following capabilities or programs anticipated to exist in the D.A.R. at the Project's end:

- a) Sound and coordinated programs in Project assisted research activities functioning at the research stations and trial centers in the major ecological regions;
- b) A functioning research coordination system under which programs will be selected based on objective procedures and feedback/response information from farmers and the extension service (1) to identify national needs emphasizing socially acceptable and economically feasible smallholder requirements (2) to evaluate research performance, and (3) to allocate and manage the use of research resources;
- c) the annual issuance of 10 to 20 research publications for technical officers (T.O.s) in the extension service dealing with production of the major smallholder crops and livestock;
- d) acquisition of base line and field trial data in 110 to 130 EPAs of sufficient quantity and quality to provide crop-systems recommendations for production of major smallholder crops and livestock applicable to each of the 180 Extension Planning Areas (EPAs).
- f) a functioning bean research program at Bunda College for the characterization of about 4,000 sources of germ plasm;
- g) functioning programs to measure smallholder performance and to recommend improvements in cattle production and stall feeding;
- h) a functioning program for providing foundation seed of maize, groundnuts and beans to meet the certified seed needs of the GOM.
- i) a functioning potato-seed certification program, and
- j) a functioning horticultural research program at Chitedze emphasizing vegetable production.

There are a number of fundamental specific analyses beyond the present capability of the D.A.R. which it will be able to perform at Project's end. The following illustrative list of these operations provides additional verifiable end-of-project indicators and exemplifies the present limited capacity of the D.A.R.:

- Spectrographic soils analysis,
- Chromatographic soils analysis,
- Plant growth analyses and measurement,
- Leaf area indices
- Determination of light interception by crop canopies,
- Solar radiation measurements,
- Diagnosis of less common plant diseases, including specific viruses,

- Detection and taxonomic classification of nematode infestation,
- Determination of protein, energy and mineral content of forages and crop residues,
- Determination of nutritive value of forages by in vitro techniques, and
- Determination of pasture productivity in terms of animal performance.

C. OUTPUTS

Long and short term technical assistance will have quantitatively and qualitatively strengthened research programs applicable to smallholders in maize, groundnuts, beans, wheat and sunflower, soil fertility evaluation and improvement, seed production, fruits and vegetables and livestock. The Title XII team will have introduced new research programs in farming systems analysis, production economics and smallholder appropriate technology and will have improved the capability of the D.A.R. in research coordination for the selection and implementation of research benefitting smallholders and in research/extension liaison. The research projects of participant trainees will have been carried on during their absence.

The D.A.R. will have an additional eight professional research personnel functioning at the PhD level of specialization and 25 at the MSc level in research programs relevant to smallholders. These programs will be supported by additional local staff recruited by the GOM as permitted by the AID-financed construction of 48 staff houses and will benefit from AID-financed research equipment. Approximately 15 Landrovers and 15 motorcycles will be in service to assure access to Project-assisted research programs. Additional staff, including 15 professional officers (P.O.s), 17 technical officers (T.O.s), 17 technical assistants (T.A.s) in Project-assisted research programs, as well as present staff, will have received necessary in-service training. The research programs addressed by the Project will be conducted in adequate physical facilities, including the following AID-financed structures: 2 cold storage rooms, 4 storerooms, 6 greenhouses, 3 laboratories, 1 drying shed and offices.

By the end of the Project the U.S. technical assistance team and its counterparts will have completed field trials in 110 to 130 EPA relevant to all EPAs and will be producing approximately 10 to 20 research publications per year on smallholder crop and livestock production. Annual meetings for extension officers, research field staff and technical personnel in each of the 8 ADDs or management units will have been held.

The Title XII institution during the fourth year of the Project will have completed a sample survey of 10 representative EPAs, agreed upon by the GOM and AID, to initially assess the level of smallholder acceptance and effectiveness of the research product generated by

Project-assisted research activities. It is recognized that this study, which will call for detailed investigations, analysis and reporting, will be preliminary in nature, as all Project inputs will not have been provided during the first 3 to 4 years of Project implementation. Moreover, ultimate benefits to smallholders flowing from the Project will coincide with the 15-20 year life span of the NRDP. The Title XII sample survey, which will be analyzed and verified in the external evaluation scheduled for June 1983, will be significant in assisting AID to determine whether a second phase of the Project should be authorized.

D. INPUTS

SUMMARY OF PROJECT INPUTS

Estimated Costs (\$)

A.I.D.

I. Technical Assistance

A. Long Term

Research Coordinator	4.7 (PY)	
Horticulturalist	4	
Farming Systems Analyst	2	
Plant Breeder	4	
Agronomist	4	
Livestock Specialist	4	
Agricultural Economist	4	
	26.7 (PY)	
		\$2,777,300

B. Short Term 325,400

II. Training

A. Long Term

8 M.Sc. Research Officers raised to PhD	24 (PY)	
25 B.Sc. Research Officers raised to M.Sc.	51	\$1,479,600

B. Short Term

Short courses, conferences, etc.		102,300
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III. Commodities

15 Landrovers	239,000
15 Motorcycles	12,200
Research Equipment	537,100

IV. Construction

Research Facilities and Housing	2,000,000
Contingency	300,000

V. Incremental Recurrent Cost Support	872,800
VI. Evaluation	50,000
VII. Contingency (general)	<u>304,300</u>
AID Total	<u>\$9,000,000</u>

GOM

I. Technical Assistance Support Administration	100,000
II. Training	
A. Long Term:	
Allowances and Administration	35,600
B. Short Term:	
Transportation, subsistence	50,000
III Construction	
Engineering Services	300,000
Utility and Road Access to Site	67,100
Land	70,000
IV. Incremental Recurrent Costs (including additional salaries, supplies, building maintenance, and vehicle operation/maintenance)	<u>781,000</u>
GOM Total (13.5%)	<u>\$1,403,700</u>

TECHNICAL ASSISTANCE

A Title XII institution will provide an integrated program of 26.7 person years of long term technical assistance through a seven person team. Provision is also made for 36 person months of short-term consultancies over the five year LOP. The estimated cost to AID of the technical assistance package is \$3,102,700.

The teams' most fundamental duty is to work within the existing D.A.R. divisions and technical research programs to improve the quality and quantity of research relevant to smallholders.

An agricultural economist and a farming systems analyst will develop new research programs in farming systems analysis, production economics and appropriate smallholder technology. The results of these programs will be closely synthesized and coordinated with those of the biological research programs.

The Research Coordinator will assist in developing and implementing systems of the selection and identification of research projects benefiting smallholders and for the preparation of research results and recommendations in a form useable by extension service T.O.s. Particular attention will be given to the needs of women involved in agriculture. He will serve as Chief of Party and direct and coordinate the work of the team.

All members of the team will be expected to improve the quality of research within their areas and to promote productivity and better administration in accordance with systems and concepts developed by the team and the D.A.R. Each member of the team within his area of emphasis will provide operational guidance and will assist with in-service training, with the presentation of short course and with instruction in the proper use and maintenance of research equipment. Each member of the team will assist the D.A.R. professional and technical staff to continue the research activities of participant trainees. The Title XII institution will participate in the selection of trainees, process enrollment in U.S. and third country institutions and provide administrative support for participant training.

The Project requires a package in which the three basic elements of agricultural research (production scientists, social scientists and research liaison and coordination) are represented. These basic elements complement each other, and the absence of one would substantially impair the effectiveness of the other two.

The Title XII institution will provide technical assistance and short-term consultants. The latter will substantially increase the productivity of the long-term personnel, particularly in view of the large number of crop and agricultural systems found in Malawi.

ESTIMATED SCHEDULING OF TECHNICAL ASSISTANCE PERSONNEL

Long Term

	1980	1981	1982	1983	1984	FY
Research Coordinator	<u>Feb.</u>				Sept.	4.7
<u>Aq. Economist</u>	<u>Feb.</u>				Jan.	4
Farm Systems Analyst		<u>Aug.</u>		July		2
Plant Breeder	<u>Oct.</u>				Sept.	4
Agronomist	<u>Oct.</u>				Sept.	4
Livestock Specialist	<u>Oct.</u>				Sept.	4
<u>Horticulturalist</u>	<u>Aug.</u>				July	4
						(26.7 FY)
		<u>Short Term (PM)</u>				(PM)
Soil Fertility		2		2		4
Horticulture	4	4	2	2		12
Livestock		2		2		4
Appropriate Technology		2	2	2		6
Farming Systems and Production Economics		2		2		4
Other		2	2	2		6
						(36 PM)

The long-term technical assistance personnel to be provided by the U.S. Title XII institution will be located at Chitedze or Bvumbwe. These locations, which conform to GOM requests, were selected after considering the research being conducted at the various stations, the availability of research facilities and the number of Malawian research personnel who would professionally benefit from daily contacts with U.S. technical assistance personnel.

The Research Coordinator will be housed at Chitedze where he will have greatest daily contact with Station Administrators and research professionals and will have a better opportunity for planning and supervising activities. He will be readily available, however, for conferences and discussions with senior GOM officials in Lilongwe. The Horticulturist will be located at Bvumbwe at the site of most horticultural research activities; although, one of his major responsibilities will be to develop a horticultural research program at Chitedze. All other personnel will be located at Chitedze, the main research station, where the on-going programs for which they will be responsible are conducted and where the majority of work immediately applicable to farming systems research will occur. Placing U.S. personnel at dispersed stations or at geographically separated stations where there is only a limited amount of supported research would be counter-productive. Chitedze is the center for all Project-assisted research programs except horticulture, although component activities in varying degrees are performed at scattered research sites. The existing facilities, counterpart personnel and the organizational structure are in place at Chitedze. Although U.S. technical assistance personnel will be located as indicated, each will be responsible for appropriate research in various agro-ecological regions.

TRAINING

A participant training program, at an estimated cost to AID of \$1,479,600, will address the fundamental skill and specialization constraint in the D.A.R. As summarized in the following table, eight Malawian research officers holding M.S. degrees will be sent to U.S. institutions for approximately three years to obtain Ph.D. degrees, and 25 research officers holding B.Sc. degrees will be sent to U.S. or third country institutions for approximately two years each to obtain M.S. degrees.

All of the training decisions were based on the specific needs of research components. For instance, the livestock component was analyzed and recommendations made for specific training of people to work with livestock and pastures. Each component was similarly analyzed, and the training program represents a summation of specific project needs for better trained professional researchers.

The eight Malawians recommended for Ph.D. training represent less than two percent of the Professional and Technical Staff, i.e., 9 of 436. In contrast to the M.S. level of training, the Ph.D. training of three additional

years provides the trainee with significantly greater skills, competencies, instrument knowledge and independent research training.

Selection of trainees to obtain Ph.D. training was based on existing research needs and capabilities in specific disciplines and the availability of qualified professional officers. Developing optimum research package recommendations for smallholder application requires a higher level of training, i.e., Ph. D. level, than the M.S. degree level. A high degree of competency, skills, modern equipment, knowledge, and originality is required in defining and identifying problems for study in the process of developing new approaches and methods and in interpreting and communicating the significance of results. The D.A.R. has no Ph.D.s in seven of the eight areas selected for strengthening. The exception is plant pathology, where adding an additional well-trained pathologist is needed to cope with existing and new disease problems. Past problems dealt with by entomologists are more complex today, because many chemical pesticides are no longer available for use on crops. Long-term costly projects, such as animal breeding, require several generations in order to complete experiments. Therefore, it is imperative that experiments be well planned for effective use of resources. The maize and groundnut breeding programs are both at advanced levels and require a sophistication beyond the M.S. level. No in-depth expertise exists in Malawi in the areas of plant physiology and range management for a better understanding of crop growth in relation to soils and climatic environments. The quality and productivity of the soil physicist will be enhanced by training at the Ph.D. level.

Short term consultants will provide training courses in administration and management for D.A.R. personnel. Provision is made, also, for participation of research program managers in specialized short courses at overseas institutions. Programs for participant trainees will be arranged to include some training in research administration whenever feasible and appropriate.

As with technical assistance, training is designed to improve the D.A.R. research divisions and programs dealing with smallholder problems and to develop the manpower needed to carry on the research programs developed by the T.A. team. At present, there are approximately 65 professional officers in the D.A.R. in the zone of consideration for long-term training, and an additional 15 P.O.s will be brought into Project-assisted programs within two to three years. The Title XII team, during field investigation for the PP and in consultation with D.A.R. officials, has preliminarily identified individuals for almost all scheduled training, except in the areas of agricultural economics and farming systems analysis. Emphasis was and will be placed on identifying women candidates for training. The identified individuals are already working in the D.A.R. and have demonstrated their capacity for further training.

Trainees will be enrolled in universities agreed to by AID and the GOM and offering the most appropriate programs in the various specialities. Third country long-term training, particularly in Africa, will be provided in recognition of the suitability of institutions and facilities with curriculum tailored to the problems of African agriculture. Such training for research officers can be of greater relevance for crop and livestock production in Malawi than U.S. training and will be arranged where feasible and where third country institutions offer acceptable programs. However, it is expected that third country training for M.Sc. candidates in selected disciplines will be appropriate, while third country Ph.D. training, generally, is less likely to be cost effective or of optimum benefit.

PARTICIPANT TRAINING

Ph.D. Candidates

<u>Number</u>	<u>Discipline</u>	<u>Months of Training</u>
One (1)	Maize breeder	36
One (1)	Groundnut breeder	36
One (1)	Maize physiologist	36
One (1)	Range management specialist	36
One (1)	Animal breeder	36
One (1)	Plant pathologist	36
One (1)	Entomologist	36
One (1)	Soil physicist	36
Total eight (8) trainees		288 person months (24 PY)

M.S. Candidates

One (1)	Seed technologist	24
Two (2)	Maize agronomists	48
One (1)	Groundnut physiologist	24
Two (2)	Groundnut agronomists	48
One (1)	Sunflowers agronomist	24
One (1)	Reproductive physiologist	30
One (1)	Animal production specialist	24
One (1)	Pasture agronomist	30
One (1)	Animal nutritionist	30
Two (2)	Horticulturalists	66
One (1)	Plant pathologist	24
One (1)	Virologist (Plant)	24
One (1)	Entomologist	24
One (1)	Soil physicist	24
Two (2)	Soil chemists	48
One (1)	Agricultural engineer	24
Three (3)	Agricultural economists	60
Two (2)	Applied anthropologists (Farming systems analysts)	36
Total twenty five (25) trainees		612 person months (51 PY)

Note: Estimated trainee years per fiscal year are presented in Annex C.

COMMODITIES (RESEARCH EQUIPMENT AND VEHICLES)

Equipment and vehicle purchases of approximately \$788,300 will support Project-assisted research programs. Included will be equipment for field trials and research plots and essential supporting laboratory equipment. A suggested commodity list appears in Annex F and a vehicle procurement waiver request is in Annex H.

Motor vehicle procurement has been reduced from the 30 Landrovers mentioned in the PID to 15 Landrovers and 15 motorcycles. This is considered the minimum needed to assure that U.S. technical assistance personnel, their counterparts and support staff equipped with field research equipment and tools, have access to experiment sites and research activities. Average vehicle life expectancy in Malawi is short, less than five years. At the suggestion of the D.A.R., the procurement of five Landrovers and five motorcycles will be delayed until the fourth year of the Project to assure transport in the later stages.

CONSTRUCTION

AID-financed construction costs are estimated at \$2,000,000.

The Title XII design team assessed the physical facilities existing for each Project research program and concluded that the following structures are essential for the performance of adequate research and the proper employment of other Project inputs:

Groundnuts: cold storage room - Chitedze
Maize: cold storage room - Chitedze
 greenhouse 300 sq. ft. - Chitedze
Horticulture: storeroom 100 sq. ft. - Chitedze
 greenhouse 300 sq. ft. - Chitedze
 storeroom 100 sq. ft. - Bvumbwe
 greenhouse 300 sq. ft. - Bvumbwe
Soil fertility: lab 1800 sq. ft. - Chitedze
 greenhouse 300 sq. ft. - Chitedze
 lab 1000 sq. ft. - Bvumbwe
 greenhouse 300 sq. ft. - Bvumbwe
Smallholder Appropriate
 Technology: storeroom 100 sq. ft. - Chitedze
 shed 300 sq. ft. - Chitedze
 storeroom 100 sq. ft. - Bvumbwe
 office 100 sq. ft. - Bvumbwe
Wheat: office 150 sq. ft. - Tsangano
Beans: greenhouse 300 sq. ft. - Bunda
 office lab - Bunda
Office Block: (general) 2000 sq. ft. - Chitedze

The D.A.R. plans to increase its professional and technical staff from 348 to 436 within the next two to three years. Fifty-six percent of the additional personnel are for the Project research programs and are essential for long-term institutional development. They are reflected in either long standing vacancies or new positions which have now been designated as "existing vacancies."

Under GOM and D.A.R. policies, however, recruitment and placement cannot occur until housing is available. Government housing of a designated type for each employee grade or level is a concomitant of a government job in Malawi. By necessity the D.A.R. adheres strictly to the proven policy of providing housing for professional and technical staff at research stations, since adequate local housing for individuals at this level is not available off-station.

Adequate housing for the U.S. technical assistance team is also critical, if recruitment and job performance are to be satisfactory. This need, which calls for a maximum of 7 houses in the third year of the Project, will be met through houses vacated by D.A.R. officers going on long term training, by the AID-financed housing construction and in the first year of the Project by the assignment of two existing GOM houses. The GOM has agreed to a condition precedent to initial disbursement that it provide assurance that satisfactory housing is available for the first two personnel (Research Coordinator and Agricultural Economist) estimated to arrive in February 1980 prior to the scheduled commencement of AID-financed construction. The GOM has also agreed that individual U.S. Technical Assistance personnel will not depart for Malawi without assurance that satisfactory housing is readily available and that AID-financed houses will be assigned to U.S. technical assistance personnel as directed by AID.

All AID-financed houses will be constructed in accordance with standard GOM plans and specifications, and types B3 and B2A, 5 and 6 room houses, respectively, would be adequate for the U.S. technical assistance personnel depending on family size. All of the AID-financed houses will fit in with the planned D.A.R. complement and will not at any time be excess to the internal needs of the D.A.R.

The housing construction is correlated directly with the numbers and levels of new personnel to be brought into the research programs addressed by the Project at each research station and also serves to assure adequate quarters for Title XII personnel.

Staff level or Category	Project related Estimated Staff Increment	Numbers of AID financed Houses	Type/Designation of Houses
Senior Research Officer or P-8	(4 by promotion of P.O.s)	4	B2A
Professional Officers	16	12	B3, CH10
Technical Officers	17	17	DH6
Technical Assistants	17	15	PH4 (Mod), EL2
	50	48	

The housing situation at the research stations is exacerbated by many professional and technical staff now having to live in quarters below that specified for their levels in GOM regulations. The Project, however, does not deal with that problem per se, but with increasing the amount of research station housing in order to accommodate the increased professional and technical staff for Project-assisted research programs while assuring housing for the Title XII team.

The additional Malawian staff should be brought into the D.A.R. as soon as housing is available, so that they can obtain maximum benefit from the technical assistance and training opportunities. AID will provide financing for 48 houses, a significant reduction from the 110 originally requested by the GOM and the 62 projected in the PID. The GOM is making a significant contribution to the Project (13.5%) and a major commitment to the construction input in terms of design, supervision of construction, land, and road and utility access to building sites, but funds are not available to meet actual construction costs. The D.A.R. Development Account, as distinguished from Revenue (current) Account, is essentially a function of external aid. The historical and unavoidable practice has been for donors, e.g., ODM, to provide funds for such capital improvements, including housing, as have occurred. In recent years, the GOM has been unable to allocate more than \$200,000 annually from its own funds to the D.A.R. Development Account.

INCREMENTAL RECURRENT COST SUPPORT

AID will assist in meeting recurrent costs generated over the life of Project by supplementing the revenue account of the D.A.R. by approximately \$872,800. AID will grant an amount equal to 100 percent of estimated incremental recurrent costs in the first year of the Project (FY 80) and will reduce this contribution by 20 percent each year thereafter based on estimates of incremental operating costs. Projected increases in the revenue account based on historical trends and proposed budget statistics from the D.A.R. will be sufficient to cover incremental recurrent costs at Project's end (after FY 84).

E. IMPORTANT ASSUMPTIONS

For the most part, the assumptions conditioning achievement of Project objectives are implementation issues common to most projects in southern Africa.

The provision of long-term technical assistance and the placement of additional local staff depends on the availability of housing which will require timely final design, tendering, engineering services and construction. The Ministry of Works (MOW), which will have primary responsibility for these actions, is well-staffed and recognized by AID field personnel as one of the best in Africa. It has demonstrated its efficiency and capacity in numerous activities, including several AID-financed road projects and the development of the new capital city in Lilongwe.

Successful participant training is dependent on joint action by the Title XII team and the D.A.R. in selecting and processing well qualified candidates. Similarly, the organization and implementation of in-service training will require joint and collaborative action by both institutions. The ultimate effectiveness of the training will depend on the assignment of the trained research personnel to positions, as agreed to by AID, in the Project-assisted research programs commensurate with their experience and academic attainments. In the design team's analysis of GOM commitment to the Project and in the preliminary selection of candidates for training, the MANR demonstrated a clear recognition of its shortage of trained research personnel and a strong desire to rectify the situation. The Title XII team and the D.A.R. have agreed on the appropriate operational assignments for trainees.

There is no apparent reason to doubt that the D.A.R. and the Title XII team will effectively implement the training program and take appropriate steps to fully utilize trained personnel.

The most fundamental assumption related to the achievement of the Project goal is that the extension service is sufficiently effective to disseminate and obtain farmer acceptance of socially and economically sound research recommendations when received in a form useable by extension service technical officers.

An affirmative assumption is considered valid. Over the past decade the extension service has steadily improved. For example, the total staff has increased over the past five years from approximately 1,200 to 2,071. Probably unique in Africa, all field agents are certificate-holding T.A.s. Reading University in the U.K. has had a long association with Malawi extension and provides short courses, long term training and technical assistance.

Direct assistance to extension is intentionally outside the designed scope of the Project and would be duplicative. The NRDP regional programs are aggressively dealing with extension. Approximately 30 expatriate technical assistance personnel are working in the extension service. The present average agent to farmer ratio in the three geographic programs in the intensive phase has attained the optimum 1:750 suggested by the IBRD for reasons of agent quality, cost effectiveness and coverage. Whereas, Agro-Economic Surveys covering different parts of the country between 1972 and 1976 showed a range from 1:350 to 1:1700 with the mean being greater than 1:1000. Using 1977 statistics, the agent to farm family ratio outside the Major Development Projects is estimated to have been 1:1020 for 1977. It is anticipated at the conclusion of the NRDP that Malawi will have a field extension staff of 1,333 who have completed a minimum four year program of 3 months training each year followed by nine months of field work. A new extension training institute at Lilongwe is scheduled to begin operation in September.

Officials of the IBRD, which is funding and managing three of the Major Development Projects incorporated into the NRDP, have commented that they consider research, rather than extension, to be the significantly greater constraint to agricultural development.

IV. PROJECT ANALYSES

A. Technical Analysis - Research Components

1. Agronomic Crops

Agronomic crops are grown on a large portion of the arable land in Malawi, and they furnish the bulk of the food for Malawians, as well as providing an important source of revenue from exports. Agronomic crops are grown in all ecological zones in Malawi.

Maize is a widely grown staple food of the people of Malawi. Over 90% of the crop is grown for domestic consumption while the rest is sold to ADMARC, the GOM agricultural marketing corporation, and through other marketing channels. GOM policy is to increase maize production through higher grain yields per unit of land, rather than by expanding acreage. Maize is largely grown by the smallholders. With the availability of fertilizer at reasonable prices which the smallholder can afford, Malawi will continue to produce large quantities of maize. Malawi has the potential to produce enough maize not only to remain self-sufficient, but for exports as well, if remunerative markets existed. Present maize yields average less than 1200 kg per hectare; with effective research this yield level can be raised 30%.

Maize research, mainly breeding and agronomy, is centered at Chitedze in the central region, Mbawa in the northern region and Ngabu in the southern region. Objectives of the maize research program include: (1) development of high-yielding maize varieties and hybrids which are fertilizer-responsive, and (2) determination of the best cultural practices for the newly developed maize varieties, and (3) evaluation of promising maize varieties and hybrids from local as well as international sources through the National Maize Trials which cover all the ecological areas of Malawi. One of the most promising of the new hybrids is a high lysine, high yielding variety introduced from South Africa which also has excellent quality. Human nutrition studies are planned to determine the dietary benefits from this new maize.

Presently no physiological research on maize is conducted in Malawi. Since maize yields in Malawi are already relatively high compared to most developing countries, it is difficult for maize breeders to raise yield potentials in this crop without the inputs of a maize physiologist. A maize physiologist will be trained at the Ph.D. level to assist maize breeders in achieving further improvements in maize yields; training for a maize agronomist and advanced training for a maize breeder is also required. An objective of the maize disease program is to obtain resistance to Puccinia polysova, Puccinia sorghi, Helminthosporium turcicum, and H. maydis.

In order for the maize breeding and agronomy program to be fully effective it is essential for personnel to cooperate with and travel to a number of foreign institutions and international organizations. This will facilitate evaluation of foreign maize materials to identify entries of promise to Malawi. Cooperation with EAAFR0, National Maize Program of Zaire, I.I.T.A., F.A.C., CIMMYT, SARMEIT, and OAU/STRCJP 26 Project is essential.

For seed production it is essential to maintain and multiply breeders seed and the necessary inbred lines for issue to commercial seed growers for production of hybrid seed.

Trials to determine the optimum time, plant density, and rates of fertilizers for all parts of Malawi need to be conducted and analyzed by a Production Agricultural Economist before sound recommendations can be made for Malawi farmers. Optimum levels of fertilizer for the different soil types throughout the country will be available to farmers. Soil fertility maps will be drawn based on soil fertility data.

By developing local composites or maize hybrids, foreign exchange which is used for importing hybrids can be saved and used for other national development needs. Low-cost, improved seed available locally will provide the incentive farmers need and result in increased maize production per unit of land. Hence, the maize acreage can be reduced and the surplus acreage can be used for cash crops such as tobacco, cotton, and groundnuts. More maize grain will be available for export after meeting the domestic demand.

Groundnuts now rank fourth in value among agricultural exports after tobacco, tea, and sugar. In Malawi the entire groundnut crop is produced by smallholders. Groundnut per acre yields in Malawi have always been relatively low, averaging only 500 kg per hectare in 1977. Groundnuts have not yet benefited from improved technology as has sugarcane and tobacco. However, at one time Malawi produced almost four times what it produced last year, largely by an increased acreage devoted to the crop. If the present groundnut acreage is not to be expanded then increases in production will have to come from increased yields per unit area of land. The economy's failure to produce enough groundnuts is disadvantageous, because it reduces the value of agricultural exports from Malawi and also leads to a drain on available foreign exchange, since groundnut oil has to be imported to meet domestic needs.

It is hoped that the recent increase in groundnut prices paid to growers from 10.5 tambala per pound to 15 tambala per pound will revive grower interest and stimulate groundnut production in Malawi, but higher per hectare yields also are needed to revive grower interest in this crop. Research is required for yield improvement in groundnuts, and there is a potential for a 30% yield increase in this crop.

The overall objectives of groundnut research in Malawi are to improve the yields and quality of groundnuts. A large number of collections, introductions and breeding lines are screened on the station before testing them widely throughout the country. However, disease resistance is not present in the currently recommended cultivars. Tests are conducted with a large number of fungicides to determine the most effective, least toxic and cheapest fungicide which will control both cercospora leafspots and rust. Recommended spraying regimes are being developed.

The Chalimbana variety which is in high demand for the confectionery trade overseas, a large kernel variety, is particularly susceptible to "pops" especially on light sandy soils. It is thought likely that pops mainly occur where there is a poor supply of calcium and/or magnesium, or an imbalance between the two nutrients. The economic quantity of the necessary fertilizers to be applied can only be determined by district agronomy trials.

In other areas, low yields may be due to insufficient or ineffective soil bacteria. Also there appears to be some symptoms of micro-nutrient deficiencies, and research is being conducted to determine if beneficial effects can be achieved with various forms of trace elements such as boron. The physiological and climatological aspects of low yields in groundnuts need to be determined. A groundnut breeder will be sent for advanced graduate training. A groundnut agronomist and physiologist also will be trained as well as a pathologist who will work on the aflatoxin problem, along with other plant diseases.

Wheat is produced in very limited quantities in Malawi. Local wheat is a mixture which gives low grain yields and is of poor quality. Nitrogen has been shown to be a limiting factor in wheat yields. However, Malawi does have land in ecological zones suitable for wheat production. Some exotic wheat varieties have been found which have good milling and baking qualities. There is a need for screening new materials for both irrigated and upland rainfed conditions, selection for disease resistance, earliness and high grain yields. The first triticale varieties were tried in Malawi in 1975, and their performance was quite good.

No wheat breeding work is recommended at the present; rather it is proposed that the D.A.R. participate in cooperative programs with the existing wheat-triticale projects at CIMMYT (Mexico), Njoro (Kenya) and other international research centers. Objectives of the wheat research program are to find wheat varieties of a higher grade and adaptable to Malawi growing conditions which may be used for bread making and to find suitable triticale varieties for livestock and poultry feed.

Large numbers of varieties need to be screened for adaptability to Malawi. Time of planting trials to establish the optimum planting need to be performed. Fertilizer and spacing trials need to be conducted to determine optimum fertilizer levels and seeding rates for the semi-dwarf and tall varieties.

A wheat sub-station should be established in the Tsangano area where investigations on wheat need to be conducted which are applicable to the Bembeke, Chinthembwe, and Tsangano areas. Research is required to develop a package of recommendations for release to farmers who will be planting new varieties. Graduate training of a wheat agronomist is provided for under the Project.

With the increased efforts on wheat research the whole Kirk Range in the NRDP Ntcheu Rural Development Project could be developed for wheat production. Presently wheat imports are about 20 thousand tons and this quantity can be grown locally. Local production could increase the earnings of the smallholders and lead to savings in foreign exchange.

Sunflower is a relatively new crop in most parts of Malawi. The sunflower is a drought resistant crop and can be produced under rainfed conditions; it is well adapted to large areas in Malawi. The Department of Agricultural Research has tested some 20 cultivars during the period 1968-74, and the Peridovik and VNII MK cultivars tentatively are now recommended for production.

The objective of the sunflower program will be to select high oil producing varieties by introducing and screening a large number of lines from sunflower breeding stations throughout the world for high yield, high oil content, disease resistance, short plant-type, and appropriate length of growth period.

The research program will also involve agronomic trials to find the best cultural practices for sunflower production. Factors to be studied will include time of planting and seed-bed preparation, seeding rate and spacing, weed control, fertilizer rates, and harvesting methods.

An agronomist to work on sunflowers will be trained at the M.Sc. level.

Malawi aims at self-sufficiency in oilseeds, and sunflower has a potential for expanded production. Research is required to adapt this crop to Malawi conditions. Presently it is grown as an ornamental by a number of smallholders, but yields are low. ADMARC buys very small quantities of sunflower seed for export as bird seed. Sunflower offers direct benefits to Malawi smallholders as an alternate oilseed crop to groundnuts and as an earner of foreign exchange through exports.

2. Beans

Beans and other pulses are important protein sources for Malawi. Until about 1970 Malawi produced enough beans (Phaseolus vulgaris L.) to supply a small export trade, but essentially all beans produced now are consumed within the country. Most of these are eaten by the producer's family as one of the principal relishes with nsima (maize) and in other forms; less than 25% of the crop is offered for sale by producers. A renewed export potential depends upon the ability to increase production beyond the basic needs of the country. Support for the bean research efforts of the D.A.R., centered at Bunda College of Agriculture, provides an opportunity to quickly improve the diet and general health of the rural population of Malawi and increase the supply of this important food crop to the urban population. The overall research organization also will be strengthened significantly by utilizing the research capabilities of the Bunda faculty.

The research faculty of Bunda College working with beans are well trained and have established strong professional relationships with bean researchers in other countries including the U.S. and with international programs such as those of CIAT. An interdisciplinary research team has been created to implement the program and includes an agronomist-crop physiologist, entomologist, plant pathologist and plant breeder. The research program is based to a great extent on the extensive heterogenous germplasm available in the 4,000 lines of locally produced beans from every area of Malawi. Emphasis will be placed on cataloging and characterizing these sources and integrating selections into best-adapted local cropping systems. Results of such research can be disseminated widely and rapidly to producers of beans.

In order to strengthen the relationship between the D.A.R. and Bunda College faculty and to assist bean research, support will be provided to the D.A.R. bean project at Bunda for constructing greenhouse facilities, a seed storage room, and a general purpose building that will serve as a laboratory and workroom for handling the several hundreds of plant and pod samples.

3. Seed Production

Responsibilities for breeder seeds and foundation seed stocks are designated within the D.A.R.. The responsibilities of ADMARC and the National Seed Company also have been delineated, and regions where seed crops may be produced have been identified. The ODM has financed a Seed Testing Laboratory at Chitedze.

For agronomic crops there is the need for the production of breeder's seed, foundation seed and ultimately a seed certification program. This is particularly true for hybrid maize and for the improved maize composites. Training of a Seed Technologist at the M.Sc. level is necessary for the development of a sound agronomic seed program.

The production of foundation seed for horticultural crops does not appear to be an area of general immediate need. Breeding of horticultural crops and selection of suitable cultivars and procurement of rights to increase seed stocks have not progressed to a point where additional resources are needed to produce foundation seed.

However, some support for a program for production of seed potatoes would be of benefit and training for a potato-seed production specialist at the Technical Officer level will be provided. One or more short-term consultants to assist in planning the seed-potato program will be needed during the second year of the Project. At later phases of a long-term assistance program, training for a potato breeder is indicated.

4. Fruits and Vegetables

Production of horticultural crops provides a means for a relatively rapid improvement in the general health and economic welfare of farmers and consumers in Malawi. Such crops are important sources of vitamins, minerals, proteins, and carbohydrates and may be high-value cash crops when distributed to the expanding urban centers and export markets. Horticultural crops of some kind are grown in all ecological areas of Malawi, and each of the Extension Planning Areas (EPAs) has an unexploited potential for expanding production of these crops to improve the nutritional levels of the rural population. There is a significant possibility that many, if not most, of the horticultural crops and products now imported into Malawi could be produced in-country. There are recognized ecological, sociological, and economic constraints on the production and distribution of horticultural crops, and research has been directed toward overcoming these limitations. The broad array of fruits and vegetables classified as horticultural crops generally is recognized, but research implications of this diversity may not always be fully understood. More than 30 vegetable crops and 25 or more fruit crops are currently being grown for sale, and others are produced only for home consumption. Since most horticultural crops are produced in small plots or scattered, isolated plantings, production data are lacking or unreliable.

Approximately 4,000 ha of land are used for the production of potatoes (European) making this one of the major crops of Malawi. Other root and tuber crops, i.e., sweet potato and cassava are important food crops for many farmers, and cassava may at times be a cash crop. An extensive analysis of the export market for cassava appears to be in order before substantial research on cassava production for that market is implemented. Research programs on these crops, including that necessary for the development of a potato-seed production capability, will continue as part of the horticultural research programs.

Research with horticultural crops has been centered at the Bvumbwe station near Blantyre with some testing and field trials in other regions. The ability to take advantage of the benefits provided by horticultural crops have been severely handicapped by limitations on facilities, supplies, equipment, and trained personnel.

Training for Technical Officers and Technical Assistants, the sub-professionals who significantly expand the research capability of the POs, will be provided in-country, at the international centers, or in some instances in the U.S. At present there are only three Professional Officers responsible for the entire horticultural research effort. All of the POs have had only minimal horticultural training, and none has more than two years experience. Two of the POs will be supported for M.Sc. programs in the U.S.

Equipment and facilities essential for a minimal-level research program, support for the major horticultural research at Bvumbwe and establishment of a research capability in horticulture at Chitedze will be provided. Some laboratory and greenhouse space and refrigerated storage facilities will be constructed at Bvumbwe and Chitedze. Irrigation facilities and production equipment also is provided for selected research locations. Research needed as a basis for EPA recommendations will center around selection of most suitable cultivars and most appropriate production technology such as spacing, fertilization, time of planting, plant protection, etc. Coordination with other crop and economic research to establish regionally adapted cropping systems will be initiated and developed. Because of the increasing importance of horticultural products as cash crops, some attention must be given to market-garden and multiple production-unit research to include introductory level technology, grading and quality evaluation, and economic analysis.

Results of horticultural research generally are of rapid benefit to producers and consumers. Many such crops are annuals with relatively short production cycles during which change can be effected. Reasonably rapid responses can occur with changing market conditions. The relatively high value of many horticultural crops indicates the rapid adoption of beneficial research results.

5. Soil Fertility Evaluation and Improvement

Despite reasonably fertile soils, the mountainous nature of Malawi precludes constant mono-cropping without special conservation measures in all but the most favorable areas. Great emphasis is attached by government to land conservation, the maintenance and enhancement of soil fertility and correct land usage. Maintaining the fertility of the soil, thus, future agricultural production becomes increasingly more difficult with encroachment on lands that are more liable to severe erosion. Encroachment itself is stimulated by a decline in the fertility of existing cultivated lands,

making the introduction of better techniques of cultivation more urgent and more costly. With existing cultivation techniques, crop yields and loss of fertility, parts of the Southern Region could be faced with an insufficiency of land to meet food requirements within 10 years.

The importance of increased and efficient use of fertilizers lies not in fertilizers being a useful input factor per se but also in their being a catalyst in the promotion of other improved agricultural practices which have to be introduced simultaneously to get the best results from the use of fertilizers. The decision to use a given rate or kind of fertilizer must also be based upon economic research which shows the relative income benefits to the farmer. Without a fertilization program based upon a soil test, a farmer may be applying too much of a little needed plant food element and too little of another essential element which is actually the principal factor limiting plant growth. This not only means an uneconomic use of fertilizers, but in some cases, crop yields and income actually may be reduced because of use of the wrong kinds or amounts or improper use of fertilizer.

Few farmers in Malawi are aware of the necessity to have soil samples analyzed for indices of soil fertility and to have applications of fertilizer based upon soil tests. The effectiveness of soil testing service, however, depends in large measure on the ability of the soil testing laboratories to analyze accurately and report promptly on incoming samples. The soil testing laboratories at Bvumbwe and Chitedze are now not able to handle the incoming samples within reasonable time limits. In several instances during the past year samples were in the laboratory for three months before analyses were completed because of antiquated and inoperable equipment, shortages of chemicals, and shortages of personnel. The credibility and effectiveness of the laboratory are directly related to time required to get results back to the farmer. It is envisaged with the expanded implementation of the NRDP that more soil samples will be submitted for analyses making it impossible for the laboratories to handle the incoming soils within reasonable time limits (e.g., ten days). Implementation of the Project will eliminate constraints of staffing, equipment, and facilities in the Soil and Plant Analytical Laboratories.

The two soil chemists, one at Bvumbwe and one at Chitedze, have doctoral degrees and are very competent young scientists. Each conducts soil and plant nutrition research and makes fertilizer recommendations. Meeting the needs of the NRDP will require, however, both intensive and extensive correlation and calibration studies, aimed at obtaining data on different crops under varying conditions; this cannot be effectively conducted by the already burdened soil chemists. Therefore, the D.A.R. plans to recruit additional graduates (B.S.) who will share existing and anticipated future responsibilities in the Soil and Plant Analytical Laboratories. It is further proposed by the D.A.R. to recruit more technical officers to whom the soil research officers will delegate some of their more routine tasks.

The Project provides short term technical assistance in soil fertility and training in soils (M.S. and Ph.D. levels). Specialized training in maintenance of laboratory equipment is included for technical officers. This support will increase the capability of the soils unit to serve the crop/horticultural/livestock production researchers in the NRDP effort. Marked improvements in analytical techniques in the laboratory have become available in recent years. Many of these techniques cannot be used effectively in the laboratories at Chitedze and Bvumbwe, until antiquated equipment is replaced by modern instruments such as atomic absorption spectro-photometers, gas chromatographs, PH meters, colorimeters, fume hoods, etc.

There is an urgent need for a building large enough to accommodate the required instrumentation and to allow adequate working space for the technicians, as well as storage and receiving of chemicals and samples. Also needed are items such as electrostatic air cleaners to minimize contamination, adequate air conditioning and heating systems to maintain uniform temperature and humidity conditions to avoid malfunction of instruments, and soil sterilization facilities for research in nematology. The Project includes construction of general laboratories containing 2,000 square feet of floor space to effectively use the equipment at both Bvumbwe and Chitedze.

6. Livestock

In Malawi, livestock convert pasture, herbage, browse, maize stover, maize bran, groundnut hulms, cottonseed, canetops, molasses and other crop by-products into nutritious meat, milk and eggs. In addition, ox power is widely used for plowing and hauling, manure from animals is an important source of crop nutrients (nitrogen, phosphorus and potassium) while hides and skins are valuable by-products from livestock. Moreover, livestock are an integral part of the smallholder farming systems.

Traditionally, with an abundance of wild game for food and a low population density, cattle were kept mainly as a status symbol and for dowry payments. Unfortunately, many planners and policy makers both in and out of Malawi continue to cite these as major non-economic reasons for keeping cattle. However, the realization of their true economic value is steadily increasing in light of recent developments, while there is still considerable social importance placed on cattle ownership.

The feasible potential for increased income from stall feeding beef cattle by smallholders is apparent from recent feeding schemes under the Lilongwe Land Development Program (LLDP). During 1978, an average profit of 42 kwacha (U.S.\$51.66) per steer fattened was made by 500 smallholder cooperators, each feeding two steers with their crop residues and green chop forage for an average of 157 days. The 1979 demand for feeder cattle with which to utilize crop residues, within only the LLDP is expected to be 3000 head. An increase in numbers of cattle slaughtered from 55,248 in

1972 to 75,000 in 1978 along with increased carcass weights reduced beef imports from 861,749 lbs in 1972 to only 46,841 lbs in 1978. Milk production and processing increased markedly as indicated by the milk through-put at the Blantyre, Lilongwe and Mzuzu dairy plants which increased from 392,828 gallons in 1974 to 715,000 gallons in 1978 for an 82% increase (GOM Economic Report, 1979). Both of these examples reflect the increased meat and milk outputs of the smallholder during the past few years and their response to economic incentives.

Smallholders obtain considerable nutritional and economic benefit from livestock. A Sample Survey, Agricultural Smallholdings (SASH survey) of one village in each of two zones in the central plateau area indicated that 39% of the households had cattle herds which averaged 7 head, 1% had an average of 5 goats, 8% had an average of 4 pigs and 80% had an average of 8 chickens (NSO, 1976). From a subsequent study of smallholder subsistence farmers in a nearby region it was found that 75% of the milk, 89% of the eggs, 91% of the chickens and 68% of the pigeons produced were consumed by the producing smallholder family. The dietary contribution per person per annum was 44 quarts of milk, 13 eggs, 2 chickens and 3 pigeons, (Beals and Kochoka, UNDP/MLW/75/020, Working Paper No. 6). The protein, essential amino acids, vitamins and minerals of these animal products make a substantial contribution to the smallholders' traditional white maize diet.

Some excellent research studies, but short term and limited in scope, have been conducted at the Chitedze Agricultural Research Station on (1) the adaptation of indigenous and exogenous grasses and legumes, (2) production and nutritive value of tropical forages, (3) alternative economic fattening systems for both pasture and stall feeding, (4) evaluation of Malawi Zebu and breed crosses for milk and meat production, (5) feeding and management systems for dairy production and calf rearing and (6) utilization of crop by-products (maize stover, pearl millet, molasses, peanut hulms, maize bran, etc.) for both meat and milk production. A few related studies have been carried out at other locations. Some additional livestock research has been conducted at the Bunda Agricultural College, and at the Mbawa, Lunyangwa and Kasinthula Research stations.

Historically, Malawian livestock production research priorities did not reflect the economic, labor-saving and nutritional contribution of livestock to the smallholder nor to the Malawian economy. Research emphasizing crop and livestock production systems as used by the smallholder are non-existent except for a few unit farms. Livestock research has only 4% of the D.A.R. professional research staff and 7% of the technical staff. Currently, the D.A.R. administration has expressed a strong desire to place greater emphasis on livestock research.

The livestock component of this Project will focus on the professional training of three Agricultural Research Officers from the Master of Science to the Ph.D. in the areas of Pasture and Range Management, Animal Breeding and Animal Nutrition. Three additional professionals will be trained from the B.Sc. to the M.Sc. in the areas of Reproductive Physiology, Pasture and Forage, and Animal Production. In addition, specialized short term on-the-job training will be given to six technical officers and twelve technical assistants.

Research programs and facilities will be improved and increased at the Chitedze Research Station (Lilongwe), the Mbawa Research Station (Mzimba) and the Lunyangwa Research Station (Mzuzu). This will include facilities and equipment in support of adaptive and applied research in the areas of pasture and forage production and utilization, animal breeding, animal nutrition to improve feed efficiency through utilization of crop by-products, and animal production and management practices designed to impact on smallholders.

Economic analysis of the role and importance of the different species of livestock to the Malawian economy is greatly needed. In addition, livestock research needs to be designed to subject results to economic analysis to help select appropriate breeding, feeding and management practices for the smallholder.

An experienced livestock research officer, supplemented by short term specialists, will be provided by the Title XII institution for resident service in Malawi.

7. Smallholder Appropriate Technology

To strengthen institutional research an integrated approach will be followed under which information regarding the economic and social desirability of mechanization will be generated by the social and production scientists while appropriate technologies are undergoing engineering research.

Some degree of mechanization probably is desirable, but much information is needed regarding the variables associated with the adoption and effects of mechanization and the type of technologies that would be appropriate to local conditions.

At present, there is an almost absolute lack of economic studies comparing different mechanization alternatives or comparing mechanization to hand labor. There is a similar absence of research on the social impact of mechanization. The only study found in the literature (Gemmill, G.T. "The Economics of Farm Mechanization in Malawi" Lilongwe, University of Malawi, Bunda College of Agriculture, 1971) concluded that the private

profitability of ox power in the region studied was very low. According to the study, in a densely populated country like Malawi ox power did not lead to increased crop acreage and, therefore, was not important in development. The private and social benefits may have changed and may vary from region to region; considerable work is necessary to generate information to support the case for mechanization and the policies used to achieve it.

Borrowing from the basic work plan for village studies adopted by the Rural Economic Research Unit of Ahmadu Bello University in Nigeria, four phases would be involved in approaching the farm mechanization problem -- (a) Positive phase: determining what farmers are doing; (b) Hypothesis testing phase: determining why farmers do things the way they do; (c) Normative phase: determining what farmers ought to do; and (d) Policy phase: determining what has to be done in order to bring about the changes needed.

At the present time the only information available is that implied in the positive phase. Information regarding phase (b) can be generated in the early stages of the Project by the research economist working together with Malawian counterparts and using the services of a farm systems analyst and some short-term consultants. This phase would involve gathering information on social values and attitudes as well as economic data on costs, prices, credit availability, cost-benefit, etc.

The normative phase would involve the combined efforts of the economist, the production scientists and an agricultural engineer trained in appropriate technology. In addition to the engineering and crop-related aspects of mechanization, this phase would involve economic studies at the small-holder level (private cost-benefit) as well as the national level (considering aspects such as the impact of mechanization on employment, on rural-urban migration, etc.).

The training of a Malawian in agricultural engineering/appropriate technology will be at the M.S. level or equivalent and should take place as early as possible in order to maximize the time in which he will be able to interact with the Title XII team.

8. Production Economics Research

The complete lack of a production economics component is evident in the agricultural research organization in Malawi. A high priority should be assigned to filling this gap, if improved research efforts are to have an impact on smallholders' real incomes.

Production economics research should take place in close collaboration with the other production scientists and with the applied anthropologist. The mechanics of this collaborative effort is described in the following section on "Farming Systems Analysis."

Agronomic research has taken place in Malawi for a number of years. This research has generated information from which physical response surfaces for different crops can be obtained. The amount of this information should substantially increase after the U.S. technical assistance team starts working in Malawi. Analyzing this information and translating it into economic response surfaces, by taking into account the relevant prices, will be of the highest priority. Also of high priority will be the economic analysis of the different production systems, and the recommendation of those systems (input and enterprise contributions) that are economically sound given the social and physical constraints that smallholders face.

Another area in which smallholder production economics research can be of great value is appropriate technology. Some efforts have been made by the research institution in Malawi to develop tools that will increase the productivity of labor. These efforts, however, have concentrated on the engineering and operational aspects without attention to economic implications at the smallholder level (comparative profitability) or at the regional level (employment and labor displacement).

There are two other activities in which the production economist will assist the research program. The first is participation in the periodic reviews of the research programs for assigning research priorities and assuring that they are consistent with overall GOM policy. The second is development of a methodology to evaluate the impact that the Project has on smallholders.

9. Farming Systems Analysis Research

There is a critical need for a farming systems component in the agricultural research program. The present program is organized on the basis of separate crops, livestock and technical specialities (entomology, plant pathology, etc.). Research conducted along these lines is not by itself directly applicable to the smallholder. A farming systems analysis component permits the more immediate utilization by agricultural extension personnel and smallholders of the agricultural research that is now being conducted and which will be expanded under the Project.

Agronomists and support technical specialists are primarily concerned with increasing yields per hectare. Agronomic and other technical information must be processed into a form that makes sense to smallholders for that information to be put to use in improving Malawi's agriculture. Farming

systems research (1) studies how cropping, livestock, social and economic systems interact to form a total system and (2) produces recommendations for optimum mixtures of crops, livestock and agricultural practices that are based upon an understanding of the existing systems.

The smallholder farm is a decision-making system in which a set of possible resources and inputs (land, capital and credit, various crops and animals, fertilizer, pesticides, applications of labor, etc.) are available, and the manager (the farmer or husband and wife team) makes decisions about how to combine which resources and inputs in order to reach desired results. The primary motivation of Malawi smallholders is "subsistence plus". They orient their farm and off-farm activities toward achieving their own food supply plus cash income in order to buy other commodities. Smallholder farm production, thus, is based on growing crops and raising animals that: (1) will be eaten and exploited for food by the farm family and (2) may be sold or locally processed into saleable products (beer, for instance).

Another way of understanding smallholder decision-making is that small farm managers make decisions based on a wide range of alternatives to select combinations that will satisfy the farm families' needs and desires. Some of those alternatives are not agricultural but are off-farm, such as fishing, working in trade or artisan activities, or rural-urban migration. Some alternatives are agricultural but not on the smallholder's own land, such as working on estates or for other farmers.

One extremely important criterion for the smallholder is self-subsistence in the basic food crops, including the staple grain (principally maize) for nsima (the porridge that is the foundation of each meal) and the relish crops (primarily horticultural) that accompany nsima in most meals (since meat and fish are often too expensive). Another important criterion is cash income. If fishing during certain months produces more cash than growing crops, then fishing will tend to pull labor away from agriculture. In agriculture, itself, the farm manager is less concerned with yield than with profitability and risk. If the profit and security are better with an application of one hundred kilograms of nitrogen fertilizer per hectare than with two hundred, farmers will tend toward applying only one hundred kilograms, even if yield is higher with two hundred.

It is also important to realize that the farm management may be split internally with different members having different interests and opportunities that influence their decisions concerning agricultural and off-farm activities. This internal division is most apparent between husband and wife. Each of them controls different resources and has different commitments. The wife receives a direct personal income from any sales of beer, whereas she may or may not be given money by the husband when he sells crops, so the wife has a vested interest in converting crops into beer. Similarly, if the wife is uncertain of receiving anything from the sales of crops, she is less likely to willingly contribute her labor to commercial production in excess of subsistence levels. If there are crops or plots which the wife

directly controls and from which she directly benefits, then she, rather than the husband, should be directly contacted by extension personnel, and agricultural research about those crops or plot types should include information about women's role in agricultural production. The husband may work on the tea estate during the rainy season when the estates have a high demand for labor. The rainy season is also the primary agricultural period, so the wife may be supplying all of the on-farm labor while the husband is working on the estate. The women's role in agricultural production is thus critically important and must be appreciated. This sort of socio-economic information needs to be fed into the agricultural research program.

The GOM is developing several data collection systems that collect some farming systems information. The three major data collection systems already functioning are the following: The National Sample Survey of Agriculture (NSSA) in 1968/69 which will be conducted again in the near future; the Agro-Economic Survey (AES) that performs pre-project one year surveys in order to provide baseline data for the NRD2; and the evaluation section of the Planning Division of MANR that conducts continual surveys of smallholders in Major Development Project areas to monitor hectareage and yield data. All of these are essentially flow-through data collection systems in which data on smallholder agriculture will be collected and transmitted up to national planners who base projects and project funding proposals on the data.

Unfortunately, there is little provision for analysis of the data except for planning or monitoring purposes. The farming systems unit would utilize this existing data (plus collecting more from the same samples) to put it to immediate use in the agricultural research program. A high priority would be the collaborative efforts of farming systems scientists and other scientists to analyze the different research results and release recommendations regarding the combinations of inputs and enterprises that would contribute to increased incomes of smallholders and would be appropriate to the different ecological and socio-economic conditions. Assistance in the design and analysis of the experiments carried out in the unit farms will be an integral part of this research.

The present means of communicating agricultural research results is primarily by technical annual reports, which is unsatisfactory. Research results need to be assembled by the D.A.R. into package recommendations that may be communicated by extension workers to smallholders and directly applied by them. It is the responsibility of each research staff member (P.O.) to communicate research results in a form that is utilizable by extension personnel at the Technical Officer (T.O.) level. The farming systems component will not be in charge of translating agricultural research results into communicable form, but the farming systems staff will assist other research staff in deciding how best to accomplish this.

The services of the farming systems research scientists could also be used effectively to increase the level of technology in small farms. This would be done through the economic comparison of different alternatives in the context of relevant variables (such as costs, credit availability, organization and recruitment of labor, characteristics of land ownership and others) that affect farmer willingness or capability to adopt mechanization.

Besides fulfilling the need for economic and systematic analysis of individual research results and generation of extension packages, an economic and farming systems analysis input is needed in order to review present programs and analyze proposed new ones to assure that they are consistent with government policies.

The technical assistance program will provide one agricultural economist and one applied anthropologist. These two people will work directly with research staff and administration at the research stations and the Ministry in setting up the farming systems analysis component.

Because of the great variety of production systems in Malawi, it is thought that one Malawian research economist and one farming systems analyst (applied anthropologist) should be located at each of the three main research stations. The economist located at Chitedze should have broad training in development as well as production economics. The training of the other two should emphasize production economics and farm management. The farming systems analysts should all receive training in a university with an agriculture and anthropology program in which their study program would include general agricultural production and economics courses.

Between six and eight candidates for post-graduate training in each of the two fields (agricultural economics and applied anthropology) should be selected during the first three years of the Project. These candidates will do research in Malawi under the supervision of the research economist and the farming systems analyst. Three of the candidates in economics and two in anthropology will be sent for post-graduate training at the M.Sc. level.

10. Research Coordination

The coordination and selection of projects is a critical element in effective agricultural research. This is particularly true in Malawi where there is a present need to orient research to the problems of smallholders. The task is complicated in Malawi by the diverse ecological regions, the variety of essential crops, the inadequate reserve of research information, the scarcity of research professionals and limited resources.

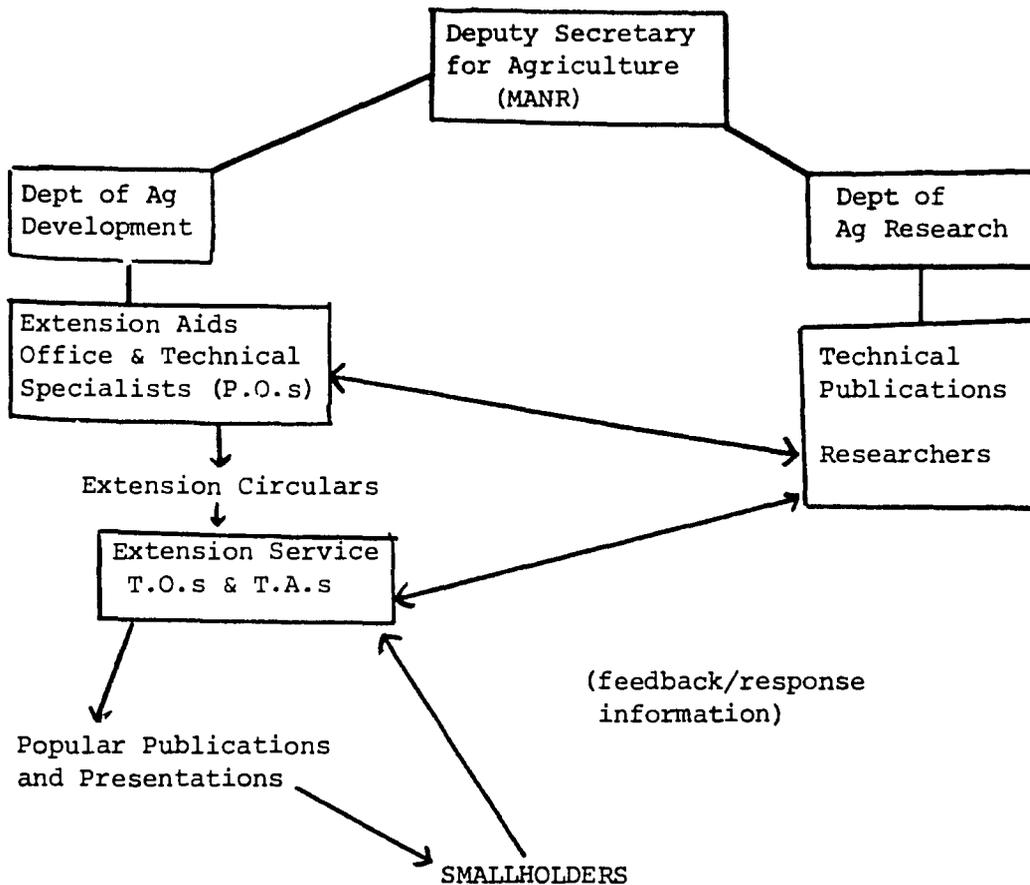
All elements of this Project will impact on research coordination, but the most immediate results will be achieved by providing a senior U.S. agricul-

tural scientist experienced in the selection and administration of multi-discipline, field-oriented research programs. This outside expertise can provide an objective perspective for the development of procedures to identify smallholder research needs, analyze and evaluate available resources, and establish sound priorities for the employment of resources. The Research Coordinator will assist in the development of project selection criteria and procedures and will participate in selection and review meetings and in the activities of research planning committees. Selection of properly focused and cost-effective research projects to benefit smallholders calls for fairly constant attention to evaluation of D.A.R. project performance and results and to analysis of feedback information from the extension service and smallholders. Accordingly, the Research Coordinator will maintain frequent contact with extension personnel, NRDP and D.A.R. management officers, project leaders and other Title XII personnel and utilize the information in reports produced by these officers. Emphasis will be placed on selecting and implementing research activities to address the needs of women involved in smallholder agriculture.

11. Research/Extension Liaison

There are two major sides of liaison between the D.A.R. and the extension service. First, there is the dissemination of the results of the experimental program in a timely and meaningful manner. Secondly, there is the reverse flow of information from the smallholder farmer, the extension service, and other departments in the MANR, and organizations, such as ADMARC, to the D.A.R. to ensure that the research program is practical and pertinent to the problems of smallholders. The MANR attempted to bridge the research-extension gap when a Research Liaison post was created and filled in September 1977. The concept has been tried for about one and one-half years but has not produced the expected results. The Research Liaison Officer concept is unrealistic because it puts the major burden of an effective research-liaison linkage on one person or a few persons in a National Research Program containing 48 projects, 11 Station Officers, and hundreds of research and extension workers. One operationally united research-extension program should begin at the top of administration and end with improved varieties and practices by farmers. Research feedback information must flow up, down and laterally within the organization. Farmers, extension workers and researchers should intermix at every opportunity.

The principal proposed working relationships between researchers and the extension service for generating popular publications are illustrated in the following chart.



An effective cooperative working relationship is required between professional officers in extension and research during the preparation of popular publications. The Research Coordinator will provide leadership to assure that completed research results are published in a form useable for recommendations to smallholder farmers.

The Research Coordinator making full use of the inputs of other Title XII team members will assist the D.A.R. in developing and implementing research/extension liaison. He will also assist the D.A.R. to develop and implement demonstrations, field days and other extension-type activities for dissemination of research results on smallholder crops and livestock for T.O.s and T.A.s in the extension service and will serve on the Research-Extension Liaison Committee within the MANR. Emphasis will be given to promoting research publications and extension activities which are responsive to the needs of women engaged in smallholder agriculture.

In many instances where information has been generated by researchers and translated for transfer by extension to smallholders, experience has shown that only a small percentage of smallholder farmers have accepted improved practices. Is it because the recommended practices are deficient or inappropriate, or is it because of a lack of understanding of strengths, weaknesses, attitudes, values, behavior and decision making abilities of smallholder farmers? Accepting an improved practice by farmers requires them to change their behavior patterns. Do we understand how and why Malawian smallholders change their behavior patterns? The Project addresses this aspect of providing sound and acceptable research recommendations, in part, by including a farming systems research component. The input of this component will become an integral part of the research program in the planning, evaluating and publishing process. Studies and activities of the farming systems research program will improve understanding of the research-extension linkage and provide an additional feedback mechanism from smallholder farmers to research and extension workers.

B. TECHNICAL ANALYSIS (CONSTRUCTION)

Description:

All proposed construction is to be sited at the existing Agricultural Research Stations in Malawi. The major portion of the proposed construction is to be at the main research center, the Chitedze Research Station located about 20 miles from Lilongwe. The description and kind of construction proposed for the different agricultural activities at the various sites is described in Annex F.

As discussed in the Project Description (PP, Part III) it is essential that housing be provided to allow for the additional professional and technical staff to be recruited by the D.A.R. for the project-assisted research programs. AID will finance the construction of 48 moderate to low level housing units. The present estimated cost of the 4 most expensive houses (B2A) is \$52,460*each, and by U.S. standards they constitute very moderate six room bungalows.

It is proposed to build 16 houses to accommodate additional senior and professional officers, which would also be available for AID-financed technical assistance personnel, 17 houses for additional technical officers, and 15 houses for additional technical assistants. All staff housing will be constructed in accordance with standard Malawi Government plans and drawings. In addition to the housing facilities, construction of offices, storerooms, a drying area, cold storage rooms, greenhouses, laboratories, and livestock facilities will be completed.

REDSO engineers have visited sites at Chitedze and Bvumbwe Research Stations. The sites for the proposed construction at both the centers are fairly flat. Alternative plot locations for various construction activities were also examined by a REDSO engineer. Presently these plots are free of any crops, and wild grass is growing in these areas. Electricity and water are available, provided by the city of Lilongwe, and both are adequate for the proposed facilities at Chitedze. There are four bore holes at the Chitedze site which are available for emergency situations. Similarly, electricity and water at Bvumbwe Research Station are provided by the township of Blantyre. For sewage and waste disposal septic tanks and soak pits are to be constructed for each of the proposed facilities.

The Buildings Division of the Ministry of Works and Supplies (MOW) will prepare a site plan for the proposed construction activities at the Chitedze Agricultural Research Station which is consistent with the existing facilities. For all housing at various sites, the standard housing plans prepared by the Ministry of Works will be utilized. The GOM will fund preparation up to construction sites at an estimated cost of \$67,100 which will include short extensions to existing roads and utility lines.

*Includes site work, hard furnishings, and servants quarters.

For construction of a drying bay, laboratories and offices, separate plans will be prepared by the Ministry of Works and Supplies.

Engineering Planning

Standard housing plans, specifications and contract documents will be used for proposed residential facilities for various categories of officers. The following implementation method has been agreed upon by GOM officials:

Major construction work at two sites, Chitedze and Bvumbwe, is to be done by a competitively selected private contractor under GOM established IFB and contract procedures, consistent with Handbook 11, with payment to be effected under a Cost Reimbursement Method established by AID. The civil works at the remaining various sites, due to remoteness and the small quantity of work, is to be performed under MOW Force Account with reimbursement of cost to be under the FAR system.

The Ministry of Works and Supplies has very substantial experience and capacity to prepare plans and IFB documents and has supervisory experience for civil works of this nature. MOW will be responsible for the preparation of site plans, bills of quantities, final drawings, invitation of tenders, analysing tender documents and preparation of monthly progress payments to the contractor and supervision of the construction works. The MOW will provide design and construction supervision services at an estimated cost of \$300,000.

The MOW also has some construction crews and capacity to carry out the limited amount of force account construction proposed. All construction materials are locally available; qualified private contractors are available in the country.

The estimated time frame for construction after satisfaction of conditions precedent to disbursement is as follows:

Notice and issuance of IFB package	1 month
Award contract and possession of site	3 months
Construction	<u>12-18</u> months
Total	16-22 months

The MOW has indicated that a sufficient portion of the professional level housing at Chitedze should be completed by October 1980 and possibly earlier to assure housing for U.S. technical assistance personnel.

Technical Soundness:

The design, type and sizes of the proposed housing, office space and other construction activities were determined after examination of the existing facilities and the requirements for additional staff. Housing types are established by GOM based on the particular levels and grades of the officers to be assigned to the several stations.

The design, specifications and contract documents are standard MOW documents. A REDSO engineer has examined all the basic housing plans and specifications. All meet REDSO engineering approval.

The construction will consist of load bearing fired clay brick walls and timber roof trusses supported by brick columns. Floors are to be constructed of concrete with sand cement finish. Outside walls are designed to be finished with brick pointing. Inside walls are plastered and painted. Corrugated galvanized iron sheets covered with clay tiles will be used for roofing. Senior staff houses will be provided with a false ceiling, but junior staff (technical assistants) houses will not.

A REDSO engineer has visited sites at Chitedze and Bvumbwe Agricultural Research stations and is satisfied with site conditions and the proposed building layout.

Prior AID experience with similar construction in Malawi has recently included construction of facilities at Bunda College near Lilongwe. This project and earlier construction at Chancellor College has shown that:

1. there are competent local contractors available in the country to perform this kind of construction work, and the work quality is good;
2. all building materials are locally available. Cement, roof-tiles and bricks are locally manufactured. Ironmongeries, sanitary appliances and other building hardware are imported from the U.K. or South Africa, but are readily available and qualify as shelf item procurement.

Cost Estimate:

The proposed staff houses (types B2A, B3, CH10, DH6, PH4, EL2) include solid furniture with electric cooker (approximately \$1,400) and a servant's quarters (approximately 400 square feet). The construction cost of residential quarters as of April 1979 is estimated at \$27.00 per square foot. Cost varies with remoteness and transportation costs. The difference in unit cost at various sites reflects this. Assuming that the competitively awarded portion of the construction will not commence until April 1980 an additional 15 percent for inflation is added to the cost estimates shown in the following table and in Annex F.

1 MK - \$1.22

SUMMARY OF COSTS ESTIMATED--CONSTRUCTION PER SITE

<u>Site Location</u>	<u>Type and Number of Houses</u>	<u>Other Facilities</u>	<u>Total Cost in U.S. \$</u>
Chitedze Research Station	3 B2A, 5 B3, 10 DH6, 5 PH 4 (Mod)	2 cold storage, 3 greenhouses, 1 lab block, small stores, office block	925,094
Bvumbwe Research Station	1 B2A, 3 B3, 3 DH6 3 PH4 (mod)	2 greenhouses, 1 lab block, small office and store.	410,590
Makhanga Research Station (Nsanje)	1 EL2	--	11,834
Tsangano Research Sta.	2 CH10, 1 DH6, 3 PH4	1 office (small)	146,766
Mbawa Research Station (Mzimba)	1 DH6, 1 PH4 (Mod)		40,992
Kasinthula Research Station	1 DH6, 1 PH4 (Mod)	--	40,382
Kawalazi Research Center	1 PH4 (Mod)	--	10,980
Makoka Research Sta.	2 CH10	--	78,080
Bunda Agr. College	-	1 greenhouse, 1 field lab	42,568
Lunyangwa	1 DH6	--	<u>27,572</u>
		GRANT TOTAL	1,734,858
		15% inflation	1,995,087
			rounded \$2,000,000

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(An additional \$300,000 is allocated as a contingency fund for construction)

C. Economic Analysis

This Project is not a revenue producing project and therefore it does not lend itself to traditional tools of economic analysis. The main thrust of the Project is upon institution building by strengthening agricultural research services in Malawi. Cost benefit analysis cannot be used at this early stage for the following reasons:

1. Although the costs associated with the Project can be estimated, the benefits of it accrue to different groups of smallholders in different regions and with different crop and livestock systems. Indirect benefits will also accrue to commercial farmers, estates and consumers. The gains obtained by these groups from a public good such as research would be extremely difficult to estimate "a priori" with any degree of accuracy.
2. There is usually a lag between the occurrence of research expenditures or cost phase and the increase in yields, improvements in quality of products, declines in prices, and other benefits from agricultural research. It would be practically impossible to estimate this lag accurately.
3. In order for agricultural research to have a significant impact on productivity and thus produce its ultimate benefits, other factors such as an efficient extension service, education, credit facilities, input availability, market development, etc. must be present. At this stage it would be impossible to separate the effects of the different factors on projected benefits.

In spite of the above, it is highly probable that strengthening the agricultural research institutions in Malawi will have a high pay-off in the medium and long-run. The high productivity of agricultural research is well documented in both developed and less developed countries as illustrated in the table shown in this analysis; internal rates of return to public expenditure in agricultural research in the United States varied from 34 percent for the period 1967-72 to 51 percent for the period 1947-52. In India the internal rate of return for the period 1960-73 was estimated at 63 percent.

Although there is wide variation in the productivity of research by commodity and country, in general it is very high; internal rates of return have been as high as 90 percent for wheat research in Mexico; for rice research, rates of 71 percent in Colombia and 74 percent in Japan have been found. Cotton research in Brazil returned 77 percent. If comparable returns can be achieved in Malawi, there would be little doubt as to the fact that few investments, if any, would compare favorably with agricultural research.

INTERNAL RATES OF RETURN TO AGRICULTURAL RESEARCH IN DIFFERENT COUNTRIES

Author	Country	Research	Time Period	Average Internal Rate of Return %
Peterson & Fitzharris	U.S.	All Public Agriculture	1937-42	50
Peterson & Fitzharris	U.S.	All Public Agriculture	1947-52	51
Peterson & Fitzharris	U.S.	All Public Agriculture	1957-62	49
Peterson & Fitzharris	U.S.	All Public Agriculture	1967-72	34
Kahlon, et. al.	India	All Public Agriculture	1960-73	63
Hayami & Akino	Japan	Rice Breeding	1927-61	74
Heltford et. al.	Colombia	Rice	1957-72	71
Heltford et. al.	Colombia	Wheat	1927-76	11
Heltford et. al.	Colombia	Soybeans	1960-71	88
Adito-Barletta	Mexico	Maize	1943-63	35
Adito-Barletta	Mexico	Wheat	1943-63	90
Ayer	Brazil	Cotton	1924-67	77

Source: From several articles in "Resource Allocation and Productivity in National Agricultural Research" Ed. by T.M. Arndt, D.G. Dalrymple and V.N. Ruttan. University of Minnesota Press.

In order to determine the productivity of agricultural research with any degree of accuracy as in the cases mentioned above, several years of data are required. After this Project has been in operation for several years, the precise benefits of its components will be identified; at that time it will be possible to do an "ex-post" analysis of cost-benefit ratios and to calculate a tentative internal rate of return. Such an analysis at this time, however, would be meaningless.

The cost-effectiveness of the Project can be argued with respect to the expected Project outputs. Direct outputs will be research results that can be attributed to the technical assistance team and to the Malawian personnel that will benefit from the different Project inputs (training, technical assistance, facilities, etc.). The only alternative available for producing adequate research would be the hiring of foreign researchers on a continuous basis. It would seem obvious that it is more cost-effective by far to train Malawians to carry out research than to hire this research from outside.

Ultimate achievements of the Project will be increased agricultural production, increased food availability and increased per capita real income for smallholders. Agricultural production can only be increased by increasing productivity or by augmenting the land under cultivation. The only alternative way to increase productivity without generating technology through in-country research would be the adoption of technological packages generated outside the country; this alternative involves high risks. Packages designed for other systems, and for areas having different ecological and socio-economic conditions are less likely to succeed than those designed for the country or region in which they are to be applied. Attempts to increase the land base, on the other hand, will face severe physical limitations given the present conditions of high population density in the productive areas of Malawi.

The only other alternative for increasing food availability would be to increase the import-export gap. Given that agriculture is the main source of foreign exchange and that the trade balance already presents a deficit, this alternative faces severe economic limitations.

Insofar as the particular research approach is concerned, it is felt that a farming systems approach is the best available alternative; it is considered to be superior to complete reliance on the present commodity approach in that it will more accurately simulate the actual conditions under which smallholders in Malawi operate. Although, this approach is not aimed at substituting for research in different commodities, its results would be more readily applicable and extended among farmers. GOM officials are in agreement with this approach.

Given the fact that yields in Malawi are low even by developing country's standards, a well structured research program should result in substantial increases, comparable to those achieved in other low income countries; wheat yield increases in the last 15 years have been in the order of 80 percent in India and Pakistan.

In Florida, where climatic conditions are comparable to those in Malawi, yields of maize and groundnuts, the two main crops grown in Malawi, increased by 55 percent and 160 percent respectively over the last 15 years. Although the same conditions for mechanization and adoption of technology that prevail in Florida will not exist in Malawi in the foreseeable future, it is not unreasonable to expect that technical assistance in improved breeding and agronomic practices will produce substantial increase in yields.

The potential for increasing yields for all present crops exists in Malawi. The Ministry of Agriculture and Natural Resources has estimated that by shifting from traditional to improved farming techniques it would be possible to achieve yield increases of 67 percent for rain-fed rice, 96 percent for cotton, 98 percent for groundnuts, 117 percent for pulses, 150 percent for maize and 222 percent for cassava. Smallholder marketing receipts from ADMARC for these crops reached \$22.8 million in 1978. Since it is estimated that only one third of total smallholder production is marketed through ADMARC, total smallholder production was around \$68.4 million in 1978; this figure does not include animal products. Thus, by achieving even a small portion of the potential productivity, substantial benefits would accrue to smallholders.

The substantial lack of readily available farm survey data presently precludes developing farm budgets and analyzing the possible impact of the Project on individual smallholders. This lack of data and analysis is one of the constraints that this Project will correct.

The multidisciplinary approach suggested for the Project is believed to be the best available alternative to achieve the GOM and A.I.D. objectives of strengthening the agricultural research institution and increasing agricultural production because:

1. The technical assistance, coupled with the training component will provide the D.A.R. with the continuity and levels of technical expertise needed to have a research system that will be effective and produce a high payoff in the long run.

2. An integrated effort on the part of the production and social scientists is the best way to identify the many constraints that limit productivity and adoption of new technologies in the different farming systems.
3. Only thorough multidisciplinary research can these constraints be eliminated and the appropriate technological packages that take into account physical, social and economic conditions be generated.

This Project, as designed, will maximize the effectiveness of U.S. technical assistance. The Project seeks the same goals as the National Rural Development Program and will contribute to the effectiveness of the resources used in the NRDP. It should result in many unquantifiable benefits such as improved quality of rural life, greater financial security for smallholders, integration of smallholders to the market economy, etc. The Project is considered to be economically sound by reason of its cost-effectiveness and the return it will provide in terms of stronger research institution and increased agricultural production and income.

D. Financial Analysis

Over the life of the Project AID will provide a Grant of \$9,000,000 in support of a total estimated Project cost of \$10,403,700. The GOM contributions, in cash or in kind, will total an estimated \$1,403,700 or 13.5% of Project costs. 6.7% of the Grant has been allocated as a contingency fund.

SUMMARY COST ESTIMATES AND FINANCIAL PLAN (000 U.S. Dollars)

SOURCE <u>USE</u>	USAID		GOM	TOTAL/PROJECT		
	<u>FX</u>	<u>LC</u>	<u>LC (only)</u>	<u>SOURCE</u>	<u>\$</u>	<u>USE</u>
Technical Ass't.	3102.7		100	3%	3202.7	31%
Training	1479.6	102.3	85.6	5%	1667.5	16%
Construction	-	2000	437.1	18%	2437.1	23%
Commodities	788.3	-	-	-	788.3	8%
Incremental Recurrent Costs	-	872.8	781	47%	1653.8	16%
Evaluation	50	-	-	-	50	-
Contingency (construction)	-	300	-	-	300	3%
(general)	304.3	-	-	-	304.3	3%
Total	5724.9	3275.1	1403.7	13.5%	10403.7	100%

Successful implementation of the Project will require the services of 7 long term technical assistance personnel from the Title XII institution at an estimated cost to AID of \$2,777,300. Periods of assignment will range from 2 years to 4.7 years. Short term consultants for 36 person months at an estimated cost of \$325,400 are also proposed over the life of Project. The D.A.R. estimates that it will incur administrative costs of approximately \$20,000 per year in connection with technical assistance.

Thirty-three (33) Malawian professional research officers will receive long term training. This will require an estimated AID contribution of \$1,479,600 and a GOM contribution of \$35,000 for allowances and administration. In-service training of D.A.R. personnel administered by the Title XII team in Malawi and including short courses and visitations in other countries calls for an estimated AID contribution of \$102,300 and for \$50,000 from the GOM for allowances and in-country transportation.

AID will finance the procurement of 15 Landrovers and 15 motorcycles (see Waiver Justification at Annex H) for an estimated \$251,000 and research equipment for an estimated \$537,100 (Equipment List at Annex F).

The estimated AID contribution of \$2,000,000 toward construction of housing and research facilities represents 19 percent of Project costs and should be entirely disbursed in FY 80 and FY 81.

Allowing for satisfaction of conditions precedent to initial disbursement and for initial contracting actions, the first Project expenditures should be incurred by AID early in FY 80. Primarily, these would consist of any advance for construction, the FY 80 incremental recurrent cost support and first expenditures under the technical assistance contract and for vehicle procurement.

ESTIMATED PROJECT EXPENSES AS INCURRED BY FISCAL YEAR (\$000s)

<u>AID</u>	80	81	82	83	84	Totals
Long term T.A.	127.6	571	707	751.7	620	2777.3
Short term T.A.	30.8	117.6	55.2	100	21.8	325.4
Participant Training		242.2	463.5	471.5	302.4	1479.6
In-Service Training		14.2	38	29	21.1	102.3
Construction	1158	842				2000
Commodities	498.7	149.5		140.1		788.3
Incremental Recurrent Costs	130.5	290.2	209.6	160.6	81.9	872.8
Evaluation		25		25		50
Contingency (general)			14.6	147	142.7	304.3
(construction)		300				300
FY AID Total	1945.6	2551.7	1487.9	1824.9	1189.9	9000

GOM

Technical Assistance Admins.	20	20	20	20	20	100
Training	.4	18.3	24.1	23.6	19.2	85.6
Construction	287.1	150				437.1
Incremental Recurrent Costs		72.6	139.7	240.9	327.8	781
GOM FY totals	307.5	260.9	183.8	284.5	367	1403.7

The financial plans and estimates are not intended to restrict normal flexibility in realigning uncommitted funds within the budget over the life of Project.

The initial obligation will be \$2,500,000 in FY 79. To avoid the administrative burden of mandatory amendments to the Project Agreement in every year, it is proposed that subsequent incremental obligations be made in fiscal year 80, 81, and 83. Amendments for substantive Project concerns, of course, could be entered into at any time.

AID OBLIGATION SCHEDULE (000s U.S. DOLLARS)

	FY 79	FY 80	FY 81	FY 82	FY 83	FY 84	SUB Totals
Technical Assistance	350	450	1303.8		998.9		3102.7
Training	50	350	740		441.9		1581.9
Construction	1400	600					2000
Commodities	550		258.3				788.3
Incremental Recurrent Costs	150	300	360		62.8		872.8
Contingency and Evaluation			337.9		296.4		654.3
Totals	2500	1700	3000		1800		9000

The D.A.R. Revenue (current) Account for the 78/79 budgetary year, which ended on March 31, 1979, was MK 1,553,000 or \$1,895,000. The MANR and Ministry of Finance, based on budget estimates and historical experience, plan on annual Revenue Account increases at a rate of 10% to 12%. Using the more conservative rate, the Revenue Account is estimated over the life of Project and is correlated with implementation years, which correspond to U.S. fiscal years, as follows:

D.A.R. Revenue Account Projection at 10% p.a. by
GOM Budgetary Year (\$000s)

78/80	80/81	81/82	82/83	83/84
2085	2294	2523	2775	3053

Adjusted to Project Implementation Years

1 (FY 80)	2 (FY 81)	3 (FY 82)	4 (FY 83)	5 (FY 84)	Total
2180	2408	2649	2914	3205	13356

Estimated incremental recurrent costs (detailed estimates at Annex D) totalling \$1,653,800 represent 10 percent of LOP costs and average \$330,000 annually. These are the estimated additional recurrent operating costs which will be generated for the D.A.R. by the Project. Corresponding to the phasing of implementation and the resultant institutional development, additional operating costs are lowest in the first year (8%) and increase thereafter. The largest portion of such costs (47%) is for salaries of additional professional and technical staff in the D.A.R. for Project-assisted programs.

AID will assist the D.A.R. to meet the incremental costs generated by the Project on a declining basis, so that the GOM, a relatively least developed country, can make an orderly and gradual assumption of this increased burden.

AID will fund 100% of the estimated increment in the first year (FY 80), 80% in the second year and will continue to reduce this support by 20% of the estimated increment in each year thereafter. The GOM has concluded that it will be able to meet its share of the estimated additional operating costs during and after the Project. The following table, which assumes that increases in the D.A.R. Revenue Account at 10% p.a. are needed to meet inflated recurrent costs of existing programs, indicates that Revenue Account increases at 12% p.a., which are within the GOM planning range, will be adequate to deal with estimated incremental recurrent costs. In the event that operating cost annual inflation is less than 10% or savings can be achieved otherwise, Revenue Account increases could be reduced below the 12% p.a. rate.

IMPLEMENTATION YEARS

	1	2	3	4	5	Post	Project
(\$000s)	(FY 80)	(FY 81)	(FY 82)	(FY 83)	(FY 84)		
Revenue Account increased at 10% p.a.	2180	2408	2649	2914	3205	3526	3879
Estimated D.A.R. Incremental Cost Contrib.		72	140	241	327	449	494
Totals	2180	2480	2789	3155	3532	3975	4373
Revenue Account increased at 12% p.a.	2250	2520	2822	3160	3540	3965	4440
(GOM budget years adjusted to AID fiscal years)							
Estimated AID Incremental Recurrent Cost Support	130.5	290.2	209.6	160.6	81.9		

E. Administrative Analysis

1. Organization and Administrative Structure.

His Excellency the Life President serves as Minister of Agriculture and Natural Resources acting through a Permanent Secretary and two Deputy Secretaries, one for Agriculture and one for Natural Resources.

The Department of Agricultural Research (D.A.R.) and the Department of Agricultural Development, the latter including the extension service, are under the over-all direction of the Deputy Secretary for Agriculture (see organizational charts). A Planning Division has been created within the MANR at the suggestion of the IBRD to deal with development matters.

The DAR has 66 Professional Staff and 286 Technical Staff. Plans have been approved to increase such staff to 436 in 1981. The educational background of Professional Officers ranges from B.S. degrees from Bunda College to B.S., M.S./or Ph.D. degrees from British, Indian, or American universities. The Technical Staff, consisting of Technical Officers (T.O.s) and Technical Assistants (T.A.s) assist the Professional Officers.

The National Agricultural Research Program is directed and coordinated by the Chief Agricultural Research Officer (CARO). This program, together with research activity in Forestry, Wildlife, Hydrology and and Geology in the Natural Resources section of the Ministry, is represented in the newly formed National Research Council of the Office of the President and Cabinet which provides information and advice to Government in policy areas.

The D.A.R. has three main research stations and eight sub-stations, each representing a main agro-ecological zone. (See Part II, Background Section for details). Each station is headed by an Officer in Charge. This geographically decentralized research system has built-in responsiveness to a wide range of local problems. In general, research at the Chitedze Research Station is more heavily concentrated on problems of national and regional significance, but not exclusively. Theoretically, the annual project coordinator meetings provide an opportunity to pool ideas in order to insure a coordinated attack on problems common to several regions.

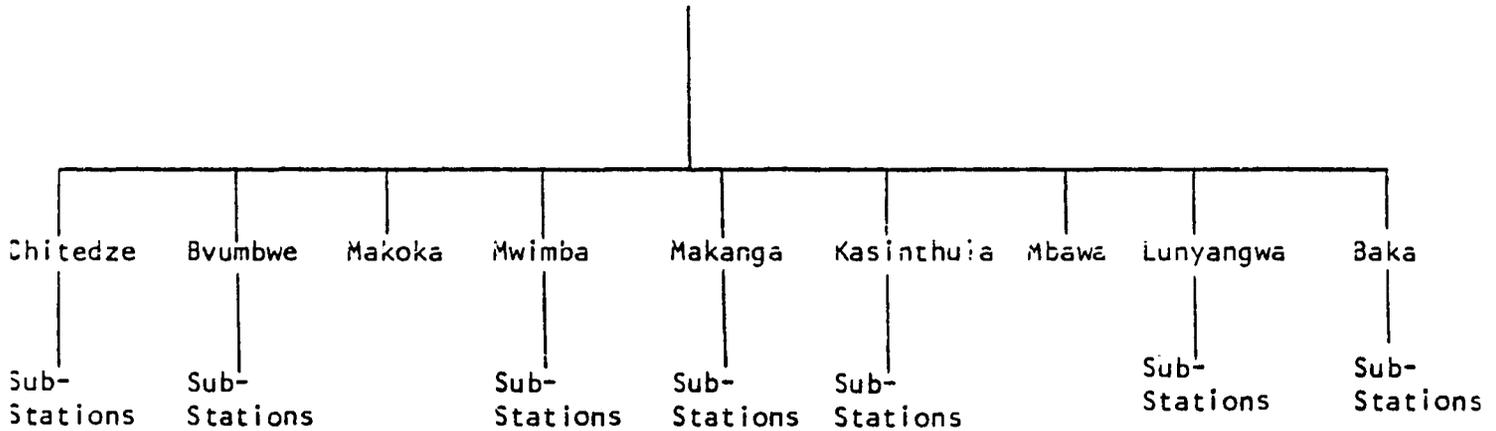
The National Research Council includes the D.A.R. for informational and advisory purposes regarding research priorities and gaps. At the MANR level, a Research Extension Liaison Committee was set up to facilitate research-extension linkage, monitor research progress, and advise on research priorities. The membership of the latter Committee consists of senior staff in the Departments of Agricultural Research and Development. The Committee plans to hold its second annual meeting in June 1979

to develop policies and set priorities for implementation at the project coordinators meeting in August. The Committee's recommendations will be used for budget allocations to projects based on potential returns, costs, time frame and appropriateness to the NRDP needs.

PRESENT ORGANIZATION

DEPARTMENT OF AGRICULTURAL RESEARCH

C.A.R.O. (HQ.)
ASST. C.A.R.O. (HQ.)
OTHER STAFF (HQ.)

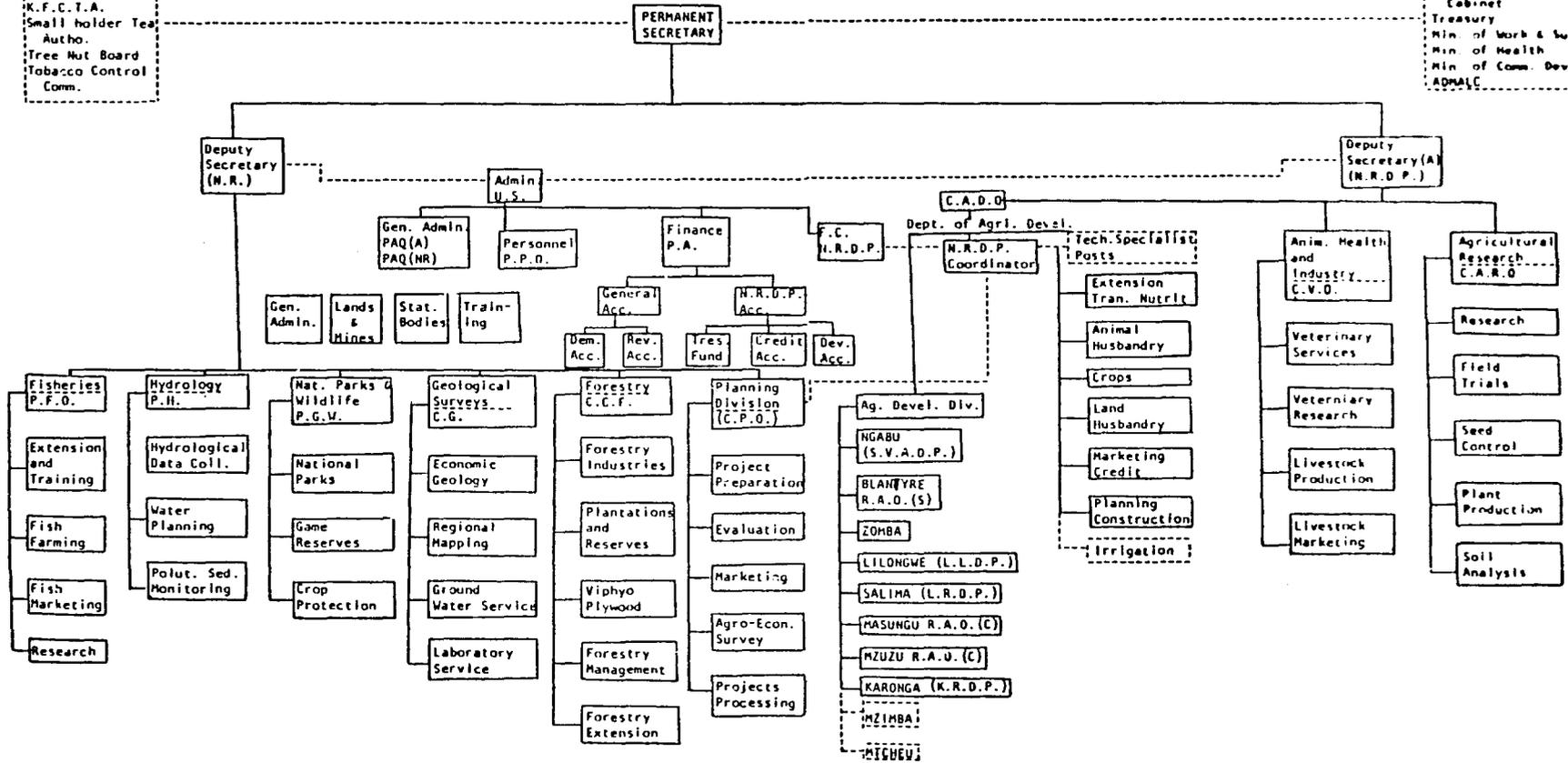


MINISTRY OF AGRICULTURE AND NATURAL RESOURCES
ORGANIZATION UNDER THE N.R.D.P.

MINISTRY OF AGRICULTURE AND NATURAL RESOURCES
ORGANIZATION UNDER THE N.R.D.P.

Statutory Bodies
ADMARC
K.F.C.T.A.
Small holder Tea Autho.
Tree Nut Board
Tobacco Control Comm.

N.R.D.P. Liaison Comm.
Sec. for Agr. (Chrm.)
Office of the Pres. & Cabinet
Treasury
Min. of Work & Supp.
Min. of Health
Min. of Comm. Devel.
ADMARC



2. Role and Commitment

The policy of the DAR is to conduct applied research which will be of immediate use to the farmer and related user. In keeping with the national policy of fast agricultural development, agricultural research in Malawi is carefully oriented towards immediate application. There is no pure or academic research or research for the sake of research and the D.A.R. is committed to supporting the NRDP in terms of providing research results to address the needs of smallholders.

3. Administrative Capability and Resources

The MANR has adequate and competent managerial capability to operate the National Rural Development Program (NRDP). Evidence of confidence in management has been demonstrated by other donors who have committed support of \$66,000,000 for all facets of NRDP.

The administrators of the D.A.R. are drawn from the professional officer category. The D.A.R. is to be headed by the Chief Agricultural Research Officer (CARO), an Assistant CARO, and two Principal Agricultural Research Officers in Headquarters at Lilongwe. The CARO and Assistant CARO posts are vacant, but the CARO position is due to be filled in the near future. Duties of these posts are handled now by the two Principal Agricultural Research Officers who have many other duties.

General Administration of the D.A.R. is good in terms of financial management, evaluating and assigning personnel, utilization of available materials, etc., but assistance is needed in the administration of research oriented to the needs of smallholders. The Research Coordinator will assist D.A.R. management in the selection and implementation of research projects of optimum value to smallholders. Strengthening will occur in research planning and documenting, reporting and reviewing projects. Technical assistance will be helpful in decisions to initiate, terminate or redirect research activities. Short-term technical assistance consultants will provide training courses in administration and management for D.A.R. personnel. Provision is made, also, for participation of research program managers in specialized short courses at overseas institutions. Programs for participant trainees will be arranged to include some training in research administration whenever feasible and appropriate.

The Research Coordinator will also assist in the administration of research benefitting smallholders by participating in meetings of the National Research Council, Research-Extension Liaison Committee, and Research Project Coordinator Committees.

Perhaps the greatest problem in administering research is Malawi has been the shortage of research scientists both in number and caliber. Until a few years ago there has been too much reliance on expatriate staff and this resulted in lack of continuity of work, frequent changes of objectives and occasional loss of results. Only a relatively few Malawian scientists have adequate training and experience to make a quick impact on the work. The salary, status and other inducements in the Civil Service system are competitive with the private sector to retain and attract competent personnel. This was not true a few years ago.

Effective administration of D.A.R. adaptive research programs will require improved technical libraries for which the Project will fund \$30,000 of new acquisitions.

F. Social Analysis

1. Social Feasibility

The Department of Agricultural Research (D.A.R.) is the immediate social environment within which the Project will be implemented. The Project seems very feasible. It is essentially a training and technical assistance Project with supplemental material support. The D.A.R. is administratively lean, and all of its central office and research station administrators are professional research people who strongly encourage the professional upgrading of the staff; accordingly, there is no intra-agency administrative resistance or misunderstanding. The Professional Officers (P.O.s) of the research staff are young and generally eager. There is a high level of anticipation among the P.O.s with B.Sc., and M.S. degrees. The Government itself desires the training.

A potential problem is that training may take out too many P.O.s at one time and thereby diminish on-going research. Careful attention has been paid to this aspect in phasing the training, but the technical assistance team and D.A.R. administrators will have to continually monitor the training schedule.

Another potential problem area is the proposed farming systems research component that would involve the services of agricultural economists and applied anthropologists. D.A.R. personnel associate economists with planning rather than production functions and have little or no experience with applied social research. Technical assistance personnel have to be carefully chosen for these two positions, because they will be establishing a new component that will help to link agricultural research with the smallholder and extension.

2. Spread Effects: Diffusion Beyond D.A.R.

The underlying justification for this institution-building Project is the assumption that the Project will strengthen research and contribute to improvements in the standards and conditions of living for the smallholder population of Malawi. It is indisputable that the Project will strengthen agricultural research through D.A.R. The extent to which a strengthened D.A.R. will contribute to a better life for the country's smallholders requires closer scrutiny.

Agricultural research and the D.A.R. fit into the development structure in two ways. In one way, research information goes up in the GOM structure to affect smallholders indirectly through influencing GOM policies. Research results guide GOM in its choice of: (1) NRDP projects and project areas, (2) crops and inputs to encourage through ADMARC marketing policies, (3) recommendations or requirements that accompany the provision of credit, and (4) what seeds to distribute through their seed certification and production program. In these ways research has tremendous influence on the development of agriculture. The other way that agricultural research affects smallholder production is more direct, through extension personnel

and direct observation by smallholders of field and farmer trials, demonstrations, etc. There is little data to show the extent to which these avenues of influence are effective now. It is doubtful that most trials are directly applicable to smallholders (see the Farming Systems Analysis section). For research results to reach smallholders in a way that encourages voluntary innovation, there must be more attention paid within the D.A.R. to its communication of meaningful recommendations, and a major effort must be continued to strengthen extension.

Similarly, a major condition for upgrading extension must be a prior or concurrent upgrading of D.A.R. Without sound testing research recommendations, extension has nothing to offer farmers. The Project will greatly improve the quality of D.A.R.'s research and will improve the relevance of that research to the smallholder. This research capability is essential to any improved extension program.

This Project is designed to strengthen the D.A.R. The D.A.R. has the responsibility to communicate its results to extension, but the direct responsibility for communication with smallholders rests with extension. The D.A.R. has the primary responsibility to discover which crops and animals work best together in farming systems, how to increase smallholder production and profits, and how to combat pests, diseases and inclement weather. That in itself is a big job that needs to be done before anyone tries to extend incorrect information to the smallholders. The extent to which D.A.R. is better able to fulfill its primary responsibility of research is the most appropriate criterion for the evaluation of the Project's success.

3. Role of Women

Women play very important roles in Malawi's smallholder agriculture. Women do most of the work in producing subsistence crops and all of the work involved in processing crops into meals. As is true in most African societies which used to practice shifting cultivation, the hoe is considered a women's tool, as the axe is a man's. Clearing woodland with an axe is hard labor but, as woodland has diminished and agriculture stabilized so that the same fields are used year after year, man's work with the axe has diminished. At the same time, woman's work with the hoe has increased due to increasing weeding. The result is that today women provide most of the labor for subsistence production.

Production of commercial crops has a different history. Women and men have each had in the past certain income-generating pastimes that were reserved for their sex. As an example, only women used to grow groundnuts for sale while only men herded cattle. Only women brewed and sold beer made from various grains or cassava, while only men were carpenters or hunters. In general, men received more of their income from non-crop sources while women received more from the sales of crops and crop-derived beer.

This has changed, because men were the one who worked with foreigners (Arabs, Indians and Europeans) and, therefore, men have been the channel through which new commercial crops were introduced. Accentuating this was the European idea that the husband was the farmer and was the appropriate person to approach with agricultural innovations. Today most commercial crop production is controlled and sold by men. This male control partially conceals the fact that most of the labor on commercial crops is still put in by the wives of those men.

The best evidence for this comes from agricultural labor statistics collected by the Agro-Economic Survey in 1970 and 1971. Women spent as much time working in the fields as they did on all domestic activities (child and house care, meal preparation, shopping and bringing firewood and water). Of the five survey sites that were covered, women did more agricultural work than men in three places; men and women labored equally in one; and men worked more hours than women in one. In most of the sites women put in more labor than men on every crop, whether subsistence or commercial.

The significance of women's labor in the production of both subsistence and commercial crops means that research into changing cropping systems and labor input patterns must take into account women's motivations and conflicting demands and rewards for women's labor. Malawi farm families are not structurally identical to North American and European farm families. The ties between brother and sister are generally stronger than those uniting husband and wife, and divorce and remarriage are frequent. Husbands and wives almost always maintain their separate incomes rather than joining them as common property. The frequency of divorce, the separation between husbands and wives in terms of their sources of income, and the existence of separate incomes and wealth -- all these strengthen the motivation for wives to work in ways that benefit them directly.

4. Beneficiaries

The ultimate beneficiaries of the Project are Malawi's millions of small farmers (men and women) whose agricultural decisions will be based on more accurate information and supported by a stronger and more responsive agricultural research organization.

The Project is designed to support the NRDP in reaching all smallholders in Malawi. Judging from past performance and the well-organized (by LDC standards) but under-staffed D.A.R., the Project's contribution of training, technical assistance and professional support facilities will definitely strengthen the D.A.R. and sustain the NRDP. Smallholders throughout Malawi will definitely benefit from the Project, although it is difficult to estimate the precise effect because of the intermediate agencies and policies that are involved.

People other than smallholders will also benefit from the Project. Immediate career benefits of the Project will accrue to the men and women on the D.A.R. staff who receive training, laboratory equipment, office space or housing, to the people who sell construction materials and the supplies noted above, and to construction workers. The Project will have a dramatic effect on the D.A.R. itself and its capabilities for research with the anticipated effect of increasing the quantity and quality of research and improving the applicability of that research to smallholders. Fairly rapid benefits should be realized by the estates since, even without any extension assistance, they are equipped to understand and utilize the type of on-station research this Project emphasizes.

The benefit to smallholders will come in several ways. First, if the extension program continues to improve, smallholders will be drawn into more productive and profitable agricultural practices. Second, GOM policies related to credit requirements (inputs and practices) and marketing (ADMARC) will be based on more accurate and more smallholder-oriented research results. These policies should serve as a better guide to smallholders. Third, the trickle-down benefits from estates will continue as they open new markets and experiment with new practices and crops.

The smallholders of Malawi are poor people, and any program that benefits any of them addresses basic human needs of the rural poor. Gradual improvements are necessary to sustain and continue the steady annual growth that will continue to improve their lives. Except for the occasional drama of a Green Revolution, the presence of good research is not as noticeable as its absence. The absence of good research means that pests, plagues and bad weather can overwhelm and wipe out crops, regions and the farmers who used to live there.

This Project will not affect all poor smallholders in the same way because of regional and smallholder differences.

The GOM attempts to distribute project benefits evenly around the three regions, but Northern Region is more isolated (bad roads and sparser population) and receives less attention in general. The major D.A.R. research stations are in Southern and Central Regions, where the bulk of Malawi's population lives. Most research field trials are conducted in these two regions, and research recommendations will be more applicable to the localities where more of the adaptive trials have taken place.

There are significant differences within each region in terms of localized climatic and agronomic conditions, appropriate cropping and livestock systems, and opportunities for off-farm employment and for irrigation. These variations affect the degree to which national research objectives and recommendations are locally appropriate and profitable to adopt.

In addition, there are important differences among smallholders in each sub-region (and, in fact, in each village). Some households control more land and labor and have more accumulated capital and productive skills. Often these are positively correlated with local social and political respect and position and with greater age, since wealth, influence and age generally reinforce each other in village society. The youngest and poorest are generally the least influential and least trusted. This means that, although all of Malawi's smallholders are materially poor, some are poorer than others.

These local socioeconomic differences affect the extent to which various smallholder households within the same village will respond to research recommendations and will be able to receive credit to help them adopt new practices. The Government is now offering credit only to groups and not to individuals. If any member of the group defaults, the entire group loses its access to credit. This acts as a goad to make each group carefully police its membership and, in effect, means that local groups only accept the most trustworthy smallholders as members. These farmers who are better risks to the group will then become eligible to receive credit and will be better able to take advantage of the innovations proposed by D.A.R. research.

The Government's credit policy makes sense in that the Government has only limited credit to extend and wants to utilize that credit to increase smallholder productivity and in that group credit is less expensive to administer. An unfortunate consequence of this interplay of socioeconomic differences and credit policy is that the poorest smallholders will receive less credit which will result to some extent in an increasing economic differentiation between the poor and the poorest.

Experience with agricultural development indicates that this increasing differential almost always occurs along with economic growth. Policies that are designed to stop the differential generally also stop or slow growth. Policies that focus only on increasing production without regard for the special problems and conditions of the smallholder often result in tremendous disparities between a few wealthy farmers and the poverty-stricken majority. GOM policies continue to emphasize improvements in smallholder production and productivity, that is, GOM continues to emphasize both production and equitable distribution among the majority of the population.

The Project will be successful in helping to bring about an improvement in the standard of living of Malawi's smallholder. Some of the smallholders will benefit more than others, but the increasing general level of wealth in rural areas will benefit almost everyone. All of the cash crops that are being promoted by the D.A.R. are labor-intensive, and increases in

production imply increased rural employment opportunities. Land rights cannot under the present legal system be sold or used as security for a loan, so there is no reason to fear the accumulation of land rights in the hands of a few rich farmers. Displacement of the poorest is not anticipated, therefore, and, as long as tight governmental control over urban wages continues, there will be no unusual increase in urbanization or rural unemployment.

V. IMPLEMENTATION ARRANGEMENTS

A. Plan

AID policy is to promote host government project implementation to the maximum extent feasible, particularly to provide the foundation for Project initiated activities to be carried on after the Project Assistance Completion Date (PACD). In this Project the Government of Malawi, primarily in collaboration with the Title XII implementing institution, will have over-all implementation responsibility. Day-to-day operational responsibilities for the various input categories will be divided among GOM organizations and the Title XII contractor. In general, the AID implementation role will be to monitor, to evaluate and to provide approvals for critical actions and advice on AID requirements.

The AID officer having project implementation authority for Malawi will provide formal AID approvals and communications to the GOM through serially numbered implementation letters. Information copies of these letters should be furnished to the Title XII institution whenever feasible and appropriate.

Except as otherwise specified, goods and services of local and Code 941 source and origin will be eligible for financing under the Grant.

Technical Assistance

Day-to-day responsibility for providing technical assistance and the manpower to carry on the research activities of Malawian staff who have departed for training rests with the Title XII institution. These services, to be performed in close collaboration with the GOM, will be procured under a direct AID contract as soon as possible after satisfaction of initial conditions precedent to disbursement. It is estimated that the Project will provide approximately 26.7 person years of long term technical assistance and approximately 36 person months of short term assistance. Advance approval by the GOM and AID of actual nominees and T.A. assignments will be required. The Research Coordinator will serve as Chief of Party.

Advance assurance of the availability of satisfactory housing for long term personnel scheduled to arrive in Malawi is critical. To some extent technical assistance personnel will occupy existing houses which will be made available by the GOM. Several additional satisfactory dwellings will become vacant when senior research officers depart for training. AID, however, as a fallback position will reserve the right to require the GOM to assign AID-financed housing to technical assistance personnel as necessary. A sufficient portion of this housing construction should be completed between August and October 1980 to assure that TA personnel can be assigned substantially on schedule.

Training

Participant training will be administered and implemented consistent with AID Handbook 10. The GOM will provide timely nominations of candidates for training with the participation of the Title XII institution. The latter organization will develop selection procedures and criteria, prepare the necessary training documentation and be responsible for the processing and enrollment of the participants. It is expected that a substantial number of the participants will pursue courses at the Title XII implementing institution. However, the TA contractor will be required to prepare and arrange training at other U.S. or third world institutions where it is more relevant or appropriate for the Project or when so directed by the GOM and AID.

Training request documentation and PIO/Ps will be submitted to the authorized AID representative for advance approval, who will furnish copies to cognizant AID/W offices, e.g., AFR/DR/SA.

Proposals for short-term and in-country training activities developed by the GOM and the Title XII contractor will require the advance approval of the authorized AID representative.

Construction

Operational responsibility for construction rests with the Ministry of Works to be carried out in accordance with AID Handbook 11. REDSO/EA will be responsible for monitoring construction and assuring the application of AID requirements and providing prompt decisions on requested approvals.

The Title XII contract will require the Chief of Party or his designee to keep informed of the status of construction, to visit all sites as needed and to consult regularly with the MOW and MANR on construction needs, progress and problems.

Local and Code 941 firms will be eligible for the AID-financed construction contract.

Research Equipment and Vehicles

The AID-financed procurement of research equipment will be limited to commodities of Code 941 source and origin and performed in accordance with AID Handbook 11 and other AID rules concerning host government procurement. Except as AID may otherwise agree, the Title XII institution will carry out this procurement as agent for, in consultation with and subject to procurement approvals of the GOM (MANR).

Procurement approvals will be provided by the authorized AID representative. REDSO/EA, primarily by its commodity procurement advisor, will consult and assist in the preparation of documents.

A justification for a waiver to permit the AID-financed purchase of 15 motorcycles and 15 off-road type vehicles of Code 935 manufacture is contained in Annex B. This procurement would be carried out by the Ministry of Works, subject to AID approval of procedures, and with the assistance of the REDSO/EA commodity procurement advisor.

B. Coordination

The Department of Agricultural Research (D.A.R.) and, hence, the Agricultural Research Project provide a central service function for the NRDP. It is important for the Title XII technical assistance team and NRDP management (and donors) to consult and coordinate regularly on complementary activities and to jointly pursue common initiatives. Such consultation and coordination would also offer another mechanism for NRDP management to be informed of specific benefits which research can furnish.

The Chief of Party (C.O.P.) will receive through the NRDP Coordinator copies of all quarterly and annual reports prepared by each of the eight ADDs, including reports on the twice yearly Branch Conferences on extension and reports on reviews of research. Similarly the Chief Agricultural Research Officer (CARO) will furnish the C.O.P. with copies of all quarterly and annual reports prepared by the D.A.R.

The GOM will arrange for the NRDP Coordinator to keep the A.I.D. representative and the C.O.P. informed of NRDP activities and to give them timely notice of and an opportunity to participate in donor supervision and coordination activities. Since many of these activities will not be directly pertinent to agricultural research, the C.O.P. will have to select those in which his participation would be productive. The NRDP Coordinator will furnish copies of donors' supervision and evaluation reports to the C.O.P.

As indicated in the Administrative Analysis the C.O.P. will serve as a member of GOM research policy and coordination committees. The C.O.P. and other members of the technical assistance team within their specialties will participate in D.A.R. research project reviews and in the process of selecting future smallholder research activities.

Formal or official communications and relationships between A.I.D. and other donors, as well as with the GOM, will be the responsibility of the authorized AID representative.

C. Evaluation

Internal AID evaluation studies and reports are scheduled to be completed in November of 1980 and 1982, and an internal end of Project evaluation will be completed in November 1984.

External evaluations, which should be conducted by an organization engaged in LDC agricultural research and rural development, are planned for November 1981 and June 1983. The progress and direction of all implementation components could be assessed in late 1981 for the first time after significant Project experience. Several months would be needed to analyze the recommendations of the external evaluation leading to such adjustments, as considered necessary, during the remaining 2 ½ years of the Project.

The second external evaluation in June 1983 would report and substantiate its recommendations on whether a second phase of the agricultural research project should be designed and should be of considerable value to any PID team fielded. This evaluation will include analysis and investigation of the Title XII institution's sample survey of research effectiveness and smallholder acceptance in approximately 10 EPAs.

D. Conditions, Covenants and Negotiating Status

Aside from the standard conditions precedent to disbursement concerning a legal opinion and the designation of official representatives, the GOM will be required to provide adequate assurance prior to any disbursement that satisfactory housing will be available for the initial two technical assistance personnel upon their arrival in Malawi.

AID approval of plans, specifications, schedules, force account procedures, IFBs, contracts and contractors will be required as a condition to disbursement for construction.

AID approval of commodity lists, specifications, IFBs, contracts and contractors will be required as a condition to disbursement for commodity procurement.

These conditions precedent may be modified or waived as appropriate by the authorized AID official.

The GOM has agreed in substance to covenants concerning the following:

1. that it will assign housing and vehicles financed by AID for the use of technical assistance personnel as may be specified by AID;
2. that it will nominate candidates on a timely basis and, upon successful completion of training, such persons will be assigned to Project-related positions agreed to by AID and which are commensurate with their experience and academic qualifications;

3. that no technical assistance personnel will be assigned until adequate arrangements have been made for satisfactory housing to be available upon their arrival in Malawi;
4. that it will carry on programs to actively improve the extension service, consistent with its agreements with other donors for the NRDP; and
5. that it will hold at least annual field days and instruction on all major crops and that all extension agents concerned with those crops will be required to attend the sessions.

LONG TERM TECHNICAL ASSISTANCE JOB DESCRIPTIONS

Research Coordinator

Qualifications:

Ph.D. in an applied agricultural science and a minimum of 7 years research experience with agricultural crops, soils, or livestock. Experience in management of multidisciplinary research programs and in research/extension liaison is essential. Field experience should include significant assignments in developing countries, preferably in Africa, and special consideration will be given to persons with leadership or management experience with assistance teams. A demonstrated ability to work effectively with staff colleagues, administrators, host government officials and local farmers is essential. An interest and ability to teach and train host country scientists are required.

Duties:

Serve as leader of a team of U.S. agricultural scientists in Malawi, to include administrative management and relationships with the GOM and AIO;

Provide assistance and improved systems to D.A.R. officials for the selection, coordination, development, and management of smallholder research projects and programs;

Develop and implement effective two-way liaison between research and extension functions and organizations and participate in liaison meetings and activities;

Assure issuance to technical officers in the extension service of 10 to 20 socially acceptable and economically sound research publications for smallholder crop and livestock production per year;

Arrange and assist with short courses and other in-service training for D.A.R. in Malawi and other countries;

Assure proper use and maintenance of research equipment;

Coordinate recommendations for short-term consultants providing back-stopping support to on-site U.S. team members;

Assure team's active assistance in selection of well qualified candidates for long term training and in selection of training institutions, and assure Title XII institution's timely processing of candidates;

Continue and implement current research projects in a specific discipline during the absence from Malawi of Professional Officers in overseas training;

Take all reasonable action to assure integration of inputs and coordination of Project implementation with D.A.R., extension service, NRDP management, MOW and AID;

Keep informed of status of Project construction and visit all sites, as appropriate, and consult with D.A.R. and MOW on construction needs and progress.

Direct and coordinate Title XII institution's commodity procurement services for project-funded research equipment;

Arrange for and assure completion of Title XII institution's sample survey in fourth year of Project of approximately 10 EPAs to initially assess level of smallholder acceptance and effectiveness of research product generated by Project-assisted research activities.

Approximate Duration:

4.7 years

Agronomist

Qualifications:

Ph.D in Agronomy and a minimum of 7 years research experience in crop production in a tropical or sub-tropical region. A degree in soil science may be considered if there has been long term responsibility for research with agronomic crops. Research project planning, management, and execution experience are essential. Field experience should include significant assignments in developing countries. Demonstrated ability and willingness to develop and implement interdisciplinary research and to work effectively with other project staff members, host government officials, extension officers and local farmers are essential.

Duties:

Continue and implement current research projects during the absence from Malawi of Professional officers in Agronomy who are in graduate training;

Evaluate available experimental data and conduct field trials to develop recommendations for local smallholder production practices for agronomic crops and cropping systems based on appropriate production economic analysis in liaison with appropriate extension personnel;

Prepare agronomic portion of research publications;

Assure proper use and maintenance of research equipment;

Assist in the development and improvement of D.A.R. agronomic research programs;

Provide assistance to D.A.R. Officers for the allocation of resources and establishment of smallholder research priorities and evaluation of the research;

Provide liaison between the special short-term consultants and the professional and administrative officers;

Assist in the selection and processing of Malawi agronomists for participant training and for in-country or other short-term training and assist in the selection of training institution;

Assist with short courses and other in-service training for counterparts and other D.A.R. personnel in agronomy, to include development of syllabi and course materials and course presentation where GOM resources not available;

Identify other smallholder agronomic research needs and recommend appropriate measures to the proper research administrators.

Approximate Duration:

Four years.

Horticulturist

Qualifications:

Ph.D in Horticultural Science and a minimum of 7 years research experience in vegetable or fruit production in a tropical or sub-tropical region. A degree in other applied plant sciences or crop production speciality may be considered if there has been a long-term responsibility for research with horticultural crops. Research project planning, management, and execution experience are essential. Field experience should include significant assignments in developing countries. Demonstrated ability and willingness to develop and implement interdisciplinary research and to work effectively with other project staff, host government officials and local farmers are essential.

Duties:

Continue and implement current research projects during the absence from Malawi of Horticultural Professional Officers in graduate training;

Evaluate available experimental data and conduct field trials to develop recommendations for local smallholder production practices for horticultural crops and cropping systems in liaison with appropriate extension personnel;

Prepare horticultural portion of research publications;

Assure proper use and maintenance of research equipment;

Assist in the establishment, development and improvement of D.A.R. horticultural research programs;

Provide assistance to D.A.R. Officers for the allocation of resources and establishment of smallholder research priorities and evaluation;

Provide liaison between special short-term consultants and the professional and administrative officers concerned;

Assist in the selection and processing of Malawian horticulturists for participant training and for in-country or other short-term training and assist in the selection of training institutions;

Assist with short courses and other in-service training for counterparts and other D.A.R. personnel in horticulture, to include development of syllabi and course materials and course presentation where GOM resources not available;

Identify other smallholder horticultural research needs and recommend appropriate measures to research administration.

Approximate Duration:

Four years.

Plant Breeder

Qualifications:

Ph.D with a major in plant breeding and a minimum of 5 years of plant breeding experience on agronomic crops. Field experience should include demonstrated ability to plan and execute a significant plant breeding program. Research project planning, management and execution experience are essential. Demonstrated ability and willingness to develop and implement interdisciplinary research and to work effectively with other project staff, host government officials and local farmers are essential.

Duties:

Continue and implement current research during the absence from Malawi of Plant Breeding Professional Officers who are in graduate training;

Evaluate germ plasm and conduct variety trials and recommend varieties for release to smallholders in Malawi, in liaison with appropriate extension personnel;

Prepare portion of research publications dependent on plant breeding research;

Assure proper use and maintenance of research equipment;

Develop D.A.R. capability to produce breeder's seed for National Seed Co. for varieties which are to be or have been released;

Serve as maize, groundnuts, wheat and sunflower coordinator in the absence of the Malawi coordinators who are away in graduate training;

Assist in the establishment, development and improvement of D.A.R. plant breeding programs;

Provide assistance to D.A.R. officers for the allocation of resources and establishment of smallholder research priorities and evaluation of plant breeding research;

Provide liaison between the special short-term consultants and the professional and administrative officers concerned;

Assist in the selection and processing of Malawian plant breeders for participant training and for in-country or other short-term training and assist in the selection of training institutions;

Assist with short courses and other in-service training for counterparts and other D.A.R. personnel in plant breeding, to include development of syllabi and course materials and course presentation where GOM resources not available;

Identify other smallholder plant breeding needs and recommend appropriate measures to the proper research administrators.

Approximate Duration:

Four years

Livestock Research Officer

Qualifications:

An Animal Scientist with a Ph.D in Animal Breeding, Animal Physiology or Animal Nutrition with a minimum of 7 years experience in animal science research in a tropical or sub-tropical region. Research project planning, management and execution experience are essential. Field experience should include significant assignments in developing countries in tropical and sub-tropical areas. Demonstrated ability and willingness to develop and implement research within the several animal science specialities, pasture agronomy and animal science and interdisciplinary research as required for smallholder crop-livestock production systems are essential. The capacity to work effectively as a team member with host government officials and research officers, livestock producers and other project staff is of utmost importance.

Duties:

Continue and implement current research projects during the absence from Malawi of Livestock Professional Officers (Pasture and Range Management, Animal Breeding and Animal Nutrition) in graduate training;

Evaluate available experimental data and conduct experiments to develop recommendations for local smallholder livestock production and management practices for different livestock production systems in the various regions;

Prepare livestock portion of research publications;

Assure proper use and maintenance of research equipment;

Assist in the establishment, development and improvement of D.A.R. livestock research programs;

Provide assistance to D.A.R. officers for the allocation of resources and establishment of smallholder research priorities and evaluation, and provide liaison between short-term consultants and the professional and administrative officers concerned;

Assist in the selection and processing of Malawi livestock research officers for participant training and for in-country or other training and assist in the selection of training institutions;

Assist with short courses and other in-service training for counterparts and other D.A.R. personnel in livestock, to include development of syllabi and course materials and course presentation where GQM resources not available;

Identify other smallholder livestock research needs and priorities and recommend appropriate measures to the proper research administrators.

Approximate Duration:

Four years.

Farming Systems Analyst

Qualifications:

Ph.D in sociology or anthropology with substantial knowledge of agricultural production and experience with agricultural change in Africa. Should have some administrative experience and good personal communication skills. Must be experienced in dealing with agricultural development at local and national levels. Must be experienced in the application of anthropological skills to policy issues and program development.

Duties:

Develop farming systems analysis research program;

Describe and analyze typical smallholder farming units in the various regions and areas of Malawi to clarify the socio-economic factors in smallholder production, distribution and consumption patterns;

Analyze the socio-economic factors affecting allocation of land, labor, and capital to the production of subsistence and commercial crops and livestock and the acceptability of innovations and practices recommended by research and extension;

Assist the Research Coordinator and research officers in the selection and evaluation of smallholder research projects to ensure adequate incorporation of local smallholder farming systems data into research planning;

Make substantial contribution to all research publications, particularly to assure their social acceptability;

Assist in development and implementation of research/extension liaison procedures and systems;

Analyze accumulated research data and feedback to assist other research and extension staff to develop smallholder farming systems recommendations on the optimum mix, combination, and types of crops, livestock and agricultural practices applicable to various regions and EPAs.

Select and train a team of Malawians with general agricultural degrees for socio-economic data collection and analysis in coordination with the agricultural economics research program to ensure long-term availability of trained personnel and continuation of farming systems research;

Assist in the selection and processing of Malawian students for postgraduate education in applied anthropology or development sociology and in the selection of training institutions;

Assure proper use and maintenance of research equipment;

Assist with short courses and other in-service training for counterparts and other D.A.R. personnel in farming systems analysis, to include development of syllabi and course materials and course presentation where GOM resources not available.

Approximate Duration:

Two years or longer.

Research Economist

Qualifications:

Ph.D in agricultural economics with a minimum of five years of research experience in Production Economics - farm management and substantial knowledge of smallholder mechanization. Field experience must include a long-term assignment (one year or more) in a developing country. Ability and willingness to carry on interdisciplinary research and to work effectively with host country personnel.

Duties:

Develop smallholder production economics research program;

Conduct economic analysis of research results, and make substantial contributions with other disciplines to all smallholder research packages regarding production practices (use of inputs, enterprise combination, rotations, etc.) that will increase incomes of small farmers;

Assist in the design of and carry on the economic analysis component of field trials in the unit farms;

Develop research program in smallholder appropriate technology, comparing different alternatives and identifying possible bottlenecks or economic factors that inhibit adoption such as credit, cost, land characteristics, etc.;

Assist research administrators in the selection of criteria for determining smallholder research priorities and in the periodic revisions of those priorities to fit overall Government development policy and work with all team members in selecting smallholder research projects and collecting/analyzing feedback;

Assist in development and implementation of research/extension liaison procedures and systems;

Assist in selection and processing of personnel for training in production economics research and in the selection of training institutions and in the design of training programs and follow up progress;

Prepare trainees and counterparts to take over the responsibilities of production economics and smallholder appropriate technology programs;

Assist with short courses and other in-service training for counterparts and other D.A.R. personnel in production economics research and smallholder appropriate technology research, to include development of syllabi and course materials and course presentation where GOM resources not available;

Assure proper use and maintenance of research equipment;

Identify other areas of necessary research and communicate them to the research administrators.

Approximate Duration:

Four years.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

(INSTRUCTION: THIS IS AN OPTIONAL FORM WHICH CAN BE USED AS AN AID TO ORGANIZING DATA FOR THE PAR REPORT. IT NEED NOT BE RETAINED OR SUBMITTED.)

ANNEX B
Life of Project: _____
From FY 1979 to FY 1984
Total U. S. Funding 8,000,000
Date Prepared: May 24, 1979

Project Title & Number: Malawi Agricultural Research (612-0202)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS									
<p>Program or Sector Goal: The broader objective to which this project contributes:</p> <p>Increased productivity and real income of smallholders within the 15-20 year NRDP.</p>	<p>Measures of Goal Achievement:</p> <p>National smallholder cattle herd increased to 1,000,000 and annual offtake rate increased to 15%.</p> <p>Reduction of calfhood mortality to 20%.</p> <p>Major smallholder crop yields increased to:</p> <table data-bbox="596 539 932 611"> <tr> <td>maize</td> <td>1615</td> <td>Kg/ha</td> </tr> <tr> <td>groundnuts</td> <td>740</td> <td>"</td> </tr> <tr> <td>beans</td> <td>605</td> <td>"</td> </tr> </table> <p>Per capita real income increased to \$240.</p>	maize	1615	Kg/ha	groundnuts	740	"	beans	605	"	<p>MANR, MOF, ADMARC, and NRDP statistics.</p>	<p>Assumptions for achieving goal targets:</p> <p>GOM remains committed to improving quality of life of smallholders.</p> <p>Effectiveness of extension service corresponding to NRDP undertakings.</p> <p>Provision of necessary smallholder physical inputs through NRDP.</p>
maize	1615	Kg/ha										
groundnuts	740	"										
beans	605	"										

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 1979 to FY 1984
Total U.S. Funding \$ 8,000,000
Date Prepared:

Project Title & Number: Malawi Agricultural Research (612-0202)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Project Purpose:</p> <p>Strengthen capability of D.A.R. to provide socially acceptable and economically sound research for smallholder needs in satisfactory quality and quantity and in form useable by extension service.</p>	<p>Conditions that will indicate purpose has been achieved: End of project status.</p> <p>Research programs in Project-assisted activities functioning at stations and trial centers in the major ecological regions.</p> <p>Annual issuance of 10 to 20 research publications per year for T.O.s in extension service dealing with smallholder livestock production and the major smallholder crops.</p> <p>Each extension worker attends at least one training session or field day per year on all major crops in his area.</p> <p>Baseline data and field trials for 110 to 130 EPAs.</p> <p>Production of foundation seed of maize, groundnut and beans to meet certified seed requirements of GOM.</p> <p>D.A.R. ability to perform common analyses listed in Part III of PP which are now beyond present capabilities.</p> <p>Smallholder crop-systems recommendations applicable to each of 180 EPAs.</p> <p>Bean research program at Bunda College for characterization of about 4000 sources of germ plasm.</p> <p>Program to measure smallholder performance and recommend improvements in stall feeding of cattle.</p> <p>Potato seed certification program.</p> <p>Horticultural research program at Chitedze.</p> <p>Research coordination system based on objective procedures and farmer feedback with annual project selection meetings.</p>	<p>Contractor, program and evaluation reports and D.A.R. and Extension Service records.</p> <p>Inspections</p>	<p>Assumptions for achieving purpose:</p> <p>Joint action by D.A.R. management and Title XII team on coordination of substantive research operations, project selection and research publication.</p> <p>Continued responsiveness and effectiveness of extension service.</p>

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 1979 to FY 1984
Total U.S. Funding \$ 8,000,000
Date Prepared:

Project Title & Number: Malawi Agricultural Research (612-0202)

PAGE 3

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Outputs:</p> <p>TA team and D.A.R. establish selected new operations.</p> <p>Professional research personnel functioning at MSc and PhD levels in project research activities.</p> <p>Adequate facilities and housing for expanded operations and staff permitting research activities at improved skill levels.</p> <p>Adequate research equipment and vehicles permitting effective performance of duties and access to experiment sites.</p> <p>Improved support staff capability.</p> <p>Field trials completed by T.A. team and counterpart staff.</p> <p>Qualitatively and quantitatively strengthened research programs in selected crop, livestock and technical areas relevant to smallholders and corresponding research activities of participant trainees carried on over LOP.</p>	<p>Magnitude of Outputs:</p> <p>Farming systems, production economics and appropriate technology research smallholder programs, research coordination system and research/extension liaison system.</p> <p>Approximately 33 research personnel at MSc and PhD skills levels in areas of smallholder emphasis.</p> <p>48 staff houses, 2 cold storage room, 4 storerooms, 6 greenhouses, 3 labs, 1 drying shed, offices.</p> <p>Research equipment (see PP list) and 15 Landrovers and 15 motorcycles in service.</p> <p>On the job training and average one week training per year for approximately 300 staff members, including approximately 50 new professional and technical staffs, and selected overseas short courses.</p> <p>110-130 EPAs.</p> <p>Maize, groundnuts, beans, wheat and sunflower, soil fertility, seed production, fruits and vegetables and livestock.</p>	<p>Inspections, program and evaluation reports, D.A.R. personnel records.</p>	<p>Assumptions for achieving outputs:</p> <p>Coordinated and joint action by D.A.R. management and Title XII team in providing inputs.</p> <p>Assignment of returned participants to project-relevant positions agreed to by AID.</p> <p>Successful completion of contractor and force account construction.</p> <p>Proper operation and maintenance of equipment and vehicles.</p> <p>D.A.R. scheduling of training.</p>

**PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK**

AID 1020-26 (2-71)
SUPPLEMENT I

Life of Project: _____
From FY 1979 to FY 1984
Total U.S. Funding 8,000,000
Date Prepared: _____

Project Title & Number: Malawi Agricultural Research (612-0202)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Outputs:</p> <p>Annual meetings of extension officers, research field staff, research coordinator and technical research personnel.</p> <p>Research packages developed by T.A. team and counterpart staff.</p> <p>Title XII institution survey of small-holder acceptance of research product.</p>	<p>Magnitude of Outputs:</p> <p>In each of 8 management units.</p> <p>10 to 20 per year by and of Project.</p> <p>Sample survey of 10 representative EPAs in fourth year of Project.</p>	<p>D.A.R. records and contractor reports.</p> <p>Contractor report.</p>	<p>Assumptions for achieving outputs:</p> <p>D.A.R. scheduling of meetings and field days.</p>

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project
From FY 1972 to FY 1984
Total U.S. Funding \$ (XXX,XXX)
Date Prepared: _____

Project Title & Number: Malawi Agricultural Research (612-0202)

PAGE 5

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Inputs:</p> <p>Technical assistance in smallholder crop/livestock research programs, in appropriate technology, in farming systems and production economics research and in research coordination and research/extension liaison.</p> <p>Training of professional Malawian research personnel to MSc and PhD level of specialization in smallholder areas corresponding to IA program</p> <p>In-service training, short courses and international conferences and visitations.</p> <p>Construction of research facilities and housing to accommodate expanded research establishment.</p>	<p>Implementation Target (Type and Quantity)</p> <p>16 PY long term IA in critical technical areas (horticulture, soils, beans, maize, groundnuts, plant breeding, agronomy, wheat and sunflower, livestock) integrated with 11 PY in research coordination/liaison, appropriate technology, farming systems and production research and 36 PM of short term IA.</p> <p>8 persons raised to PhD level from MSc and 25 raised to MSc from BSc in 75 PY for long term training.</p> <p>On the job training and average one week training annually per D.A.R. technical staff member and 3 one-month international courses per year.</p> <p>Approximately \$2,000,000 for financing construction.</p>	<p>Inspection Evaluation Reports Audits Fiscal Actions and Reports</p> <p>PIO/Ps and Training Documents Academic Reports Contractors Reports</p>	<p>Assumptions for providing inputs:</p> <p>Title XII institution recruitment of competent and effective IA personnel.</p> <p>Housing available for IA personnel.</p> <p>Timely GOM nomination of qualified trainees</p> <p>Timely contractor processing of enrollment</p> <p>Satisfactory academic performance</p> <p>Contractor implementation and quickwork for training activities.</p> <p>Timely initiation and implementation of final design, force account procedures and tendering by MOW.</p>

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Life of Project:
From FY 1979 to FY 1984
Total U.S. Funding \$ (MM), (MM)
Date Prepared: _____

Project Title & Number: Malawi Agricultural Research (612-0202)

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
<p>Inputs:</p> <p>Procurement of research equipment and vehicles.</p> <p>Additional project-related professional and technical staff.</p> <p>Incremental recurrent cost support</p>	<p>Implementation Target (Type and Quantity)</p> <p>Approx. \$537,100 for research equipment corresponding to Title XII analyses of needs in each small-holder research component (see PP list). Approx. \$250,000 for 15 Landrovers and 15 motorcycles.</p> <p>Approx. (over 3 years) 16 P.O.s 17 T.O.s 17 T.A.s</p> <p>Approx. \$873,000 by AID phased over LOP and representing</p> <p>100% FY 80 80% FY 81 60% FY 82 40% FY 83 20% FY 84</p> <p>Approx. \$781,000 by GOM over LOP</p>	<p>Inspection Procurement Documentation Program and evaluation reports Fiscal actions and reports</p> <p>DAR personnel records Contractor reports</p>	<p>Assumptions for providing inputs:</p> <p>Timely procurement.</p> <p>Timely recruitment and availability of housing.</p> <p>Projected increases to D.A.R. Revenue Account.</p>

TECHNICAL ASSISTANCE AND TRAINING PROJECTED BY FISCAL YEARA-LONG TERM T.A. (PERSON MONTHS PER FISCAL YEAR)

	<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>TOTALS</u>
Technical Assistance Research Coordinator	8	12	12	12	12	56
Agricultural Economist	8	12	12	12	4	48
Farm Systems Analyst		2	12	10		24
Plant Breeder		12	12	12	12	48
Agronomist		12	12	12	12	48
Livestock Specialist		12	12	12	12	48
Horticulturalist	2	12	12	12	10	48
Totals	18	74	84	82	62	320 pm (26.7 p.y.)

B-SHORT TERM T.A. (PERSON MONTHS PER FISCAL YEAR)

Soil Fertility		2		2		4
Horticulture	4	4	2	2		12
Livestock		2		2		4
Smallholder Approp- riate Technology		2	2		2	6
Farming Systems and Production Economics		2		2		4
Other		2	2	2		6
Totals	4	14	6	10	2	36 pm

C-LONG TERM PARTICIPANT TRAINING (TRAINEE YEARS PER FISCAL YEAR)

Horticulture and Supporting Disciplines	3	5	6	3.5	17.5
Ag Econ & Farm Sys.		3	3	2	8

C-LONG TERM PARTICIPANT TRAINING (Cont.)

	<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>TOTALS</u>
Soil Fertility		2	4	2	1	9
Farm Mechanization			1	1		2
Seed Technology			1	1		2
Maize		2	3	3	2	10
Groundnuts		1	2	3	3	9
Wheat & Sunflower		1	1			2
Livestock		5	4.5	4	2	15.5
Totals		14	24.5	23	13.5	75.0 p.y.

ANNEX D

EXPLANATORY NOTES FOR COST ESTIMATES

1. The estimate of the average cost of one person year of long-term technical assistance assumes an average assignment of 3 years and an average family size of 2 adults and 1 child with the total children being equally divided between primary and secondary school ages.

Average Annual Cost FY 79

salary	\$ 32,500
transportation of personnel, 1 RT/year for PCS, HL or R&R \$1700 x 2.5	4,250
HHE transportation (RT + 3) surface	5,094
air	1,088
Automobile transportation (3000 lbs. RT + 3)	1,135
U.S. Storage	180
Post Differential (10%)	3,250
One time soft furnishings allowance (\$1800 + 3)	600
Educational Travel and Educational Allowance $\frac{850 + 8850}{2} \times 1$	4,850
Transfer allowances :	
wardrobe	175
temporary lodging	200
zone change and misc.	100
Fringe Benefits 20% x Salary	6,500
Overhead @45% x Salary and Fringe Benefits	17,550
Miscellaneous	500
	<hr/>
	\$ 77,792
	<hr/>

The average annual cost for each subsequent fiscal year was determined by applying an average annual inflation rate of 9%, as follows:

<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>
84989	92638	100975	110063	119969

2. The estimate of the average cost of one person month of short-term technical assistance assumes an average consultancy of two months.

Average Cost Per Person Month FY 79

Salary	\$ 2,708
Per Diem 28 x \$42 2 x \$ 6	1,188
Transportation (\$1800 + 2)	900
In-country transportation	200
Fringe Benefits @20% x Salary	541
Overhead @45% x Salaries & Fringe Benefits	1,463
Miscellaneous	100
	<hr/>
	7,100

The estimated average cost per person month for each subsequent fiscal year was determined by applying an average annual inflation rate of 9%, as follows:

<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>
7739	8436	9195	10023	10925

3. The average cost of one year of long-term training in the U.S. in FY 80 was estimated at \$16,000 by the University of Florida team, as follows:

ESTIMATED COST OF GRADUATE TRAINING

AT THE M.S. LEVEL (2 yr).

	U.S. \$
Tuition (8 Quarters at 1850)	\$ 6,800
Books (8 Quarters at 80) (rounded)	640
Insurance	2,400
Contractor Fee (2 yr. @ 2000)	4,000
Research Costs (computer, materials, etc.)	1,000
Typing of Thesis, papers	400
Living Allowance (24 @ 400)	9,600
Initial Advance and Allowance	600
Travel to and from the U.S.	2,000
U.S. Travel, meetings, etc.	800
Per diem	800
	<hr/>
Sub-Total	29,040
Contingencies and Misc. (incl. thesis prep. in Malawi)	2,700
	<hr/>
TOTAL	\$ 31,740

$$31740 + 2 = 15870 \text{ (FY 80) per year}$$

The estimated average annual cost for subsequent fiscal years was determined by applying an average annual inflation rate of 9%, as follows:

<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>
17298	18855	20551	22400

4. Construction cost estimates prepared by a REDSO/EA engineer and the Ministry of Works are contained in Annex G. Estimates of incremental recurrent costs generated by the Project during LOP are contained in this Annex D. Based on NRDP planning figures used by all donors, the MANR Planning Unit estimated the average annual cost of operating and maintaining a long wheel base Land Rover to be \$7000 for FY 80, which includes gasoline, oil, spare parts, repairs, driver's salary, etc. The corresponding estimate for a Yamaha 1000 motorcycle is \$850. These estimates were increased by an average annual inflation rate of 6% for each fiscal year. The MOW and the REDSO/EA engineer estimated annual building maintenance costs to average 2½% of acquisition cost over the life of Project.

ESTIMATED AID PROJECT EXPENSES AS INCURRED BY FISCAL YEAR (000'S U.S. DOLLARS)

<u>LONG TERM</u> <u>TECHNICAL ASSISTANCE</u>	<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>SUB</u> <u>TOTALS</u>	<u>TOTALS</u>
Research Coordinator	56.7	92.6	101.0	110.0	120.0	480.3	
Horticulturalist	14.2	92.6	101.0	110.0	100.0	417.8	
Farm Systems Analyst		15.4	101.0	91.7		208.1	
Plant Breeder		92.6	101.0	110.0	120.0	423.6	
Agronomist		92.6	101.0	110.0	120.0	423.6	
Livestock Specialist		92.6	101.0	110.0	120.0	423.6	
Research Economist	56.7	92.6	101.0	110.0	40.0	400.3	
 SUB TOTALS	 127.6	 571.0	 707.0	 751.7	 620.0	 2777.3	
 <u>SHORT TERM</u> <u>TECHNICAL ASSISTANCE</u>							
Soil Fertility		16.8		20.0		36.8	
Horticulture	30.8	33.6	18.4	20.0		102.8	
Livestock		16.8		20.0		36.8	
Farm Mechanization		16.8	18.4		21.8	57.0	
Ag. Econ. Farm Systems		16.8		20.0		36.8	
Other		16.8	18.4	20.0		55.2	
 SUB TOTALS	 30.8	 117.6	 55.2	 100.0	 21.8	 325.4	
 FY T.A. TOTALS	 <u>158.4</u>	 <u>688.6</u>	 <u>762.2</u>	 <u>851.7</u>	 <u>641.8</u>		 <u>3102.7</u>

<u>PARTICIPANT TRAINING BY RESEARCH COMPONENT</u>	<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>SUB TOTALS</u>	<u>TOTALS</u>
Fruit and Vegetables		51.9	94.5	123.0	78.4	347.8	
Ag. Econ. & Farm Systems			56.7	61.5	44.8	163.0	
Soil Fertility		34.6	75.6	41.0	22.4	173.6	
Farm Mechanization			18.9	20.5		39.4	
Seed Technology			18.9	20.5		39.4	
Maize		34.6	56.7	61.5	44.8	197.6	
Groundnuts		17.3	37.8	61.5	67.2	183.8	
Wheat and Sunflower		17.3	18.9			36.2	
Livestock		86.5	85.5	82.0	44.8	298.8	
 SUB TOTALS		 242.2	 463.5	 471.5	 302.4	 1479.6	
 <u>Short Courses and Misc. Training Activities</u>		 14.2	 38.0	 29.0	 21.1	 102.3	
 FY TRAINING TOTALS		 <u>256.4</u>	 <u>501.5</u>	 <u>500.5</u>	 <u>323.5</u>		 <u>1581.9</u>
 <u>CONSTRUCTION</u>							
competitively awarded (Chitedze & Bvumbwe)	951.0	635.0				1586.0	
Force Account (MOW)	207.0	207.0				414.0	
 FY CONSTRUCTION TOTALS	 <u>1158.0</u>	 <u>842.0</u>					 <u>2000.0</u>

<u>COMMODITIES</u>	<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	SUB <u>TOTALS</u>	<u>TOTALS</u>
15 Landrovers	150.0			89.0		239.0	
15 Motorcycles	7.9			4.3		12.2	
Research Equipment	340.8	149.5		46.8		537.1	
	<u> </u>	<u> </u>		<u> </u>		<u> </u>	
FY COMMODITY TOTALS	<u>498.7</u>	<u>149.5</u>		<u>140.1</u>			<u>788.3</u>
FY Totals AID Incremental Recurrent Cost Contribution	(100%) 130.5	(80%) 290.2	(60%) 209.6	(40%) 160.6	(20%) 81.9		872.8
Evaluation		25.0		25.0			50.0
Contingency (General)			14.6	147.0	142.7		304.3
Contingency (Construction)		<u>300.0</u>					<u>300.0</u>
FY GRAND TOTALS	<u>1945.6</u>	<u>2551.7</u>	<u>1487.9</u>	<u>1824.9</u>	<u>1189.9</u>		
						TOTAL AID GRANT	<u>9000.0</u>

GOM PROJECT EXPENSES/LOCAL COST CONTRIBUTION AS INCURRED BY U.S. FISCAL YEAR (000'S DOLLARS)

	<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>SUB TOTALS</u>	<u>TOTALS</u>
<u>Technical Assistance Admin.</u>	<u>20.0</u>	<u>20.0</u>	<u>20.0</u>	<u>20.0</u>	<u>20.0</u>		<u>100.0</u>
 <u>TRAINING</u>							
Allowances @ \$396/PY	.4	5.1	10.1	9.5	5.7	30.8	
Administration @ \$61/PY		.8	1.6	1.5	.9	4.8	
In-country training (transportation and subsistence)		12.4	12.4	12.6	12.6	50.0	
	-----	-----	-----	-----	-----	-----	
TRAINING TOTAL	<u>.4</u>	<u>18.3</u>	<u>24.1</u>	<u>23.6</u>	<u>19.2</u>		<u>85.6</u>
 <u>CONSTRUCTION</u>							
Land	70.0					70.0	
Preparation to Site	67.1					67.1	
Design and Supervision @ 15%	150.0	150.0				300.0	
	-----	-----				-----	
Construction Total	<u>287.1</u>	<u>150.0</u>					<u>437.1</u>
 Incremental recurrent costs		72.6	139.7	240.9	327.8		781.0
	-----	-----	-----	-----	-----		-----
FY TOTALS	<u>307.5</u>	<u>260.9</u>	<u>183.8</u>	<u>284.5</u>	<u>367.0</u>		<u>1403.7</u>

TABLE A
TOTAL ESTIMATED INCREMENTAL RECURRENT COSTS
(\$ 000's)

	<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>TOTALS</u>
Building Maintenance		50.0	50.0	50.0	50.0	200.0
Vehicle Operation and Maintenance	58.9	83.3	88.2	140.3	148.5	519.2
Salaries and Miscell. from Table B	71.6	229.5	211.2	211.2	211.2	934.6
	-----	-----	-----	-----	-----	-----
Total Incremental Recurrent Costs	130.5	362.8	349.4	401.5	409.7	1653.8
	(100%)	(80%)	(60%)	(40%)	(20%)	
AID Contribution	130.5	290.2	209.6	160.6	81.9	872.8
GOM Contribution		72.6	139.7	240.9	327.8	781.0

ESTIMATED SALARY AND MISCELLANEOUS INCREMENTAL RECURRENT COSTS
(MK 000's)

TABLE B

<u>RESEARCH COMPONENT</u>	<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>TOTAL</u>
Seed Production Materials	25.0	25.0	10.0	10.0	10.0	80.0
<hr/>						
Maize						
Salaries - 2PO + 2TO		11.2	11.2	11.2	11.2	44.8
<hr/>						
Groundnuts						
Salaries - 2TO		3.8	3.8	3.8	3.8	15.2
Materials	1.1	1.1	1.1	1.1	1.1	5.5
Conferences	2.0	2.0	2.0	2.0	2.0	10.0
<hr/>						
Wheat						
Salaries - 1PO, 1TO, 2TA		7.1	7.1	7.1	7.1	28.4
<hr/>						
Sunflower						
Salaries - 1PO, 1TO, 2TA	5.2	6.5	6.5	6.5	6.5	31.2
<hr/>						
Livestock						
Salaries - 1TO, 6TA		6.4	6.4	6.4	6.4	25.6
Recording Service	3.0	3.0	3.0	3.0	3.0	12.0
2 Laborers	.2	.5	.5	.5	.5	1.7
<hr/>						
Fruits and Vegetables						
Salaries - 2PO, 4TO, 7TA	12.0	24.0	24.0	24.0	24.0	108.0
10 Laborers	1.2	2.5	2.5	2.5	2.5	11.2
Materials	1.0	1.0	1.0	1.0	1.0	5.0
Conferences	1.0	1.0	1.0	1.0	1.0	5.0
Materials	1.0	1.0	1.0	1.0	1.0	5.0
<hr/>						
Soil Fertility						
Salaries - 3PO, 2TO		18.7	18.7	18.7	18.7	74.8
<hr/>						

TABLE B continued

<u>RESEARCH COMPONENT</u>	<u>FY 80</u>	<u>FY 81</u>	<u>FY 82</u>	<u>FY 83</u>	<u>FY 84</u>	<u>TOTAL</u>
Smallholder Appropriate Technology						
Salaries - 1T0		1.9	1.9	1.9	1.9	7.6
<hr/>						
Farming System Analysis and Economics Research						
Salaries - 6P0, 3T0		27.9	27.9	27.9	27.9	111.6
<hr/>						
20 Clerical and Support	6.0	24.0	24.0	24.0	24.0	102.0
<hr/>						
TOTALS - (MK-000's)	58.7	188.1	173.1	173.1	173.1	766.1
<hr/>						
Conversion (U.S. \$000's)						
(MK1 = \$1.22)	71.6	229.5	211.2	211.2	211.2	934.6
<hr/>						

Environmental Review

A determination of negative environmental impact, as recommended in the Initial Environmental Examination submitted with the PID, has been approved and a formal Environmental Assessment is not required. This statement is presented to review certain agricultural research activities which relate to environmental concerns.

Small

experimental quantities of pesticides may be introduced under the Project only for research purposes. A provision is proposed for the contract with the Title XII implementing institution under which technical assistance personnel, who are expected to hold EPA or state licenses, would be required to adhere to the standards, restrictions and safeguards prevailing in the U.S. in the event that they have any involvement with pesticides or agricultural chemicals in Malawi.

The design team has concluded that there is likely to be an overall increase in the presently minimal use of fertilizer and pesticides in Malawi as research results are adopted by smallholders. The GOM, however, is implementing procedures, including integrated pest management systems, which will limit use of chemicals and preclude any significantly adverse effects.

Procedures have been instituted for the registration and evaluation of agricultural chemicals in terms of health and safety during manufacture, handling and use. Programs exist to monitor environmental systems to detect any accumulation of pollutants, including any of agricultural origin. An Act governing the use and importation of fertilizers and pesticides has been passed by the Parliament and will be implemented during the next six months. The Malawi Government has officially banned the use of chlorinated hydro-carbons and certain other toxic materials. The only exception is hand-dusting with DDT for the control of American bollworm on cotton, a crop which is not addressed by the Project, and experiments are in progress to replace DDT with less toxic insecticides. In view of the GOM's awareness of potential environmental problems and its control procedures, it has been concluded that any negative environmental effects from the limited increased use of pesticides would be minimal or non-existent.

The Project proposes to provide small irrigation facilities at Chitedze, Bvumbwe, Kasinthula, and Makhanga to support horticultural crops research. The results of these research programs will be brought to smallholders through extension workers, seminars and demonstrations. The GOM is aware that irrigation water from most sources in Malawi can result in a rise in the prevalence of bilharzia, although bilharzia is already endemic in most parts of the country. The GOM is also aware of the factors which enhance the establishment of vectors in the irrigation systems. The small research plots will not be a factor in the spread of bilharzia. Recommendations from research on irrigated plots will be in accord with modern bilharzia control methods.

INITIAL ENVIRONMENTAL EXAMINATION

Project Location: Malawi
Project Title: Agricultural Research
Funding: \$ 7,500,000
Life of Project: 5 years
IEE prepared by: OSARAC and REDSO/EA April '78
Environmental action recommended: Negative determination

Concurrence: 
Ted Morse
Acting Director OSARAC

Date: _____

Assistant Administrator's Decision: _____

DATE: _____

I. Project Description

The project will provide assistance to the Government of Malawi Agricultural Research Department to enhance its capacity to provide essential research support to the government's new National Rural Development Program (NRDP). The NRDP is designed to extend to small holders throughout Malawi the benefits of the four so-called "Major Development Projects" which are being implemented in the Lilongwe, Karonga, Shire Valley and Central Region Lakeshore regions with donor assistance. These rural development projects are characterized by (a) provision of infra-structure, (b) land improvements, (c) strengthening of extension, marketing, research and public health services, and (d) establishment of credit facilities for agricultural inputs. These projects are generally recognized as successful but expensive rural development models which have resulted in substantial increases in small holder income and agricultural productivity. However the "Major Development Project" model is too expensive to be repeated over Malawi generally. The newer projects proposed in the NRDP include minimum capital investments and stress project elements which have more immediate development impact, as demonstrated in the Major Products.

The Agriculture Research Department of the MCA has provided essential services to the major projects in adaptive research, soil testing, field trial planning and monitoring, production of foundation and certified seed, recommendation of improved crop packages and cultural packages, etc. These are services which must be expanded to meet the increased needs of the nationwide NRDP program.

This AID project is proposed to assist the Agriculture Research Department to provide these services. The purpose of the project is to assure the availability of research-tested, technically accurate, economically sound and socially acceptable recommendations to the GOM for use in the implementation of the agricultural component of the NRDP. Project assistance will focus on four major end-of-project objectives:

1. Baseline and field-trial data available for planning and implementation of programs in 180 Extension Planning Areas (EPAs).
2. Research carried out at main research stations outlined to national agriculture policy requirements, and which can provide research results capable of inducing increased productivity by small holders in seven basic crop categories.
3. Improved research-extension linkages and increased sensitivity to small holder acceptability which can contribute to increased small holder adoption of research recommendation.

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4. Research Department producing foundation seed adequate for Malawian requirements in limited numbers of coops.

The project will provide approximately 26 man years in technical assistance for adaptive research for certain, yet unspecified, crop research, economic analysis, and research extension liaison. It will provide overseas training for approximately 32 Malawi citizens in selected disciplines and in-country training for field research personnel. It will construct approximately 61 staff houses of various categories, modestly expand certain research facilities (soil laboratory, greenhouses, cold store rooms, etc.) and provide essential equipment for these and other facilities (e.g. exhaust fan, de-humidifier, etc.). (See Annex "B" for the type and site location of these facilities.) Approximately 21 vehicles will be furnished. AID will also provide recurrent cost financing on a declining scale to cover incremental costs of the expanded program.

The National Agriculture Research program is organized on a project basis, each headed by a project coordinator. Of the 48 research projects now being carried out in Malawi, the GOM has asked AID to support 11 to varying degrees. These are maize, groundnuts, wheat, sunflower, livestock, sugar cane, vegetables and fruit, farm machinery, seed production and soil fertility evaluation and improvement.

In most cases, AID assistance would be limited to funding training, initial recurrent costs, additional staff, staff housing, transport and occasionally one U. S. research specialist. AID involvement in this program will be strengthening the on-going research activities in the various fields of agriculture described above. AID will not procure fertilizers, pesticides or herbicides. However, many of the AID-suggested research activities will use them. The project specifically will address issues of relating the use of the various pesticides. The test results of various research activities will enable GOM officials to establish in-country programs for pest management and in improving or starting regulatory programs to insure proper selection, storage, application and disposal of pesticides. Through the assistance of agricultural extension workers, these test results will be brought to the attention of individual farmers. Only sugar cane research will involve irrigation with the potential for spreading water-borne diseases such as bilharzia.

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II. Discussion of Impacts

A. Land Use Impacts

(i) Training/Agriculture Research

As a result of the program supported under this project, there will be beneficial impacts on land resources. Rural farmers will be instructed by extension workers and junior technical officers in management of land resources so as to minimize mining of the soil, improve the management, application and disposal of pesticides, and discourage exploitation of additional land while maximizing agricultural production with improved varieties of seed and improved farm techniques.

(ii) Construction

The proposed construction activities are intended to take place at 16 existing research stations. Two stations (Chitedze and Bvumbe) will have a major portion of the construction activities (about 70%). The remaining 14 stations will each have minor construction activities. See Annex "B". REDSO Engineer visited the two major sites located at Chitedze and Bvumbe Research Stations for the purpose of determining suitability of individual sites for construction, availability of utilities and its potential impacts on environment. The sites for the proposed construction are located within the zones of the research stations allocated for housing and research facilities and are environmentally sound. The remaining sites spread throughout the country were not visited by REDSO engineer; however, the engineer was advised by GOM officials that the sites and utilities are available within the boundaries of each research station and no negative environmental impact is anticipated from these proposed construction activities. Given the limited nature and size of this construction, it can be determined with a reasonable degree of certainty that construction of housing and office units on sites not visited by AID engineers will not be environmentally harmful.

B. Public Health Impacts

(i) Bilharzia and Sugar Cane Research

The proposed research program will be conducted on an existing 14-acre plot at Livulezi Research Station in Bwanje Valley. The research work will cover sugar cane variety trials, fertilizer, time of planting and purity control. The results of these research programs will be brought to the rural population through Agriculture Extension workers and seminars

conducted at research stations for prospective sugar cane farmers.

The GOM is aware that irrigation schemes can result in a rise in the prevalence of bilharzia among the local population, although bilharzia is already endemic in most parts of the country. The GOM is also aware of the factors which enhance the establishment of snail colonies in irrigation schemes. The small research plot at Livulezi will not, itself, be of sufficient size to spread shistosomiasis. Research staff will be small and adequately protected. Irrigation systems used at the research station will utilize the most appropriate features for disease control so that MOA-recommended cane production packages for farmer use will be compatible with modern bilharzia control methods.

The project in its research stage utilizes different pesticides and fertilizers. A full discussion of this issue appears in Annex "A". The use of pesticides is controlled and all pesticides are stored and handled strictly per the prescribed manufacturer's instructions. A bill governing the use and importation of fertilizers and pesticides has already been submitted to the Parliament of the Malawi. It is anticipated that the bill will pass during the July session. Government has officially banned the use of chlorinated hydrocarbons and other toxic materials. The only exception is DDT for the control of American bollworm on cotton. However, experiments are underway to replace DDT with other less toxic insecticides. (See the attached letter from GOM on the policy of use of insecticide in the country.) AID-project funds will not be used to support research on cotton or the purchase of pesticides.

C. Socio-Economic Impacts

The impact of AID research activities on current patterns of economic growth and employment will be relatively insignificant. ~~A number of individuals~~ already committed to careers in agriculture, and more specifically to careers in agricultural research, will have additional training. Extension workers and farmers will be affected by AID-sponsored activities, as the application of research findings are tested in the field. This process, however, will be gradual and closely monitored for significant effects. Eventually, the results of the research could lead to important changes in how certain families make a living; such changes, however, will only occur as the application side of the National Rural Development Program incorporates the locally tested research findings in extension activities.

Agricultural research is organized administratively under stations which represent main-agro-ecological zones and scientifically under research projects representing crops and disciplines. The movements of people related to research activities within the scope of the project will be related to their specialities and professional training. No systematic resettlement of communities or families is anticipated as a consequence of USAID project activities.

An output of the project will be baseline and field trial data available for planning and implementation of agriculturally related programs aimed at increasing small farm productivity. The data itself will be adapted for application in 180 different Extension Planning Areas (EPAs). The development of a number of appropriate packages adapted to the local settings of 180 Planning Areas should minimize disruptive changes in farming patterns and promote practices which will lead to improved productivity. In sum, while the long-term goal of the National Rural Development Program is to achieve agricultural change among small holders throughout the country, the steps to achieve this goal are carefully geared to the locally-conditioned needs of the people. USAID's activities on the research end of this process can be characterized as having slight socio-economic impact on the rural population.

D. Impacts on Natural and Community Resources

1. Water

Major portion of the proposed construction activities are located at Chitedze Research Station, located about 10 miles on Lilongwe-Mchingi highway and at Bvumbe Research Station, located about 12 miles from Blantyre. Both sites have been visited by REDSO engineer; water supply for proposed facilities at Chitedze Station is from Municipal Water Supply from city of Lilongwe and a water-well at the station is used as a standby water source. The proposed facilities will not overload the existing system. The water supply at Bvumbe Station is from Blantyre City Supply. The proposed facilities will not overload the existing facilities.

2. Power

At both stations, electricity is supplied by the cities of Lilongwe and Blantyre to Chitedze Research Station and Bvumbe Research Station, respectively. No difficulties are foreseen for supply of electricity to the proposed facilities.

3. Waste Water Deposit

All present facilities have septic tanks/soak pits for the

waste water disposal. Additional septic tanks/soak pits will be constructed for the new buildings. The absorption capacity of the soil at both sites is good; no problems are anticipated from installation of the additional facilities.

4. Housing

The proposed housing facilities are based on additional staff requirements for each project sub-activity. The proposed housing is in conformity with the existing GOM housing standards and will be adequate and suitable for the proposed personnel under the project. Majority of the houses will be constructed on the two major sites located at Chitedze and Evumbe stations.

E. Short-Term Impacts

Associated with the construction activities, there are short-term environmental impacts, such as dust and noise pollution. Such impacts are unavoidable but will be minimized, to the extent possible, during the construction phase.

F. Long-Term Effects

The proposed experimental irrigation scheme for sugar cane research will be on a 14-acre plot located at Livulezi Research Station in Bwanje Valley. It is anticipated that the scheme may have an initial significant negative impact on environment resulting from experimental irrigation work. However, the research will, hopefully, devise a controlled and planned irrigation scheme which will result in reduction of bilharzia. The farmers presently engaged in irrigated farming will learn to effectively utilize the techniques of correct irrigation schemes, which will enable them to reduce or control prevalence of bilharzia. The secondary effects will have long-term positive impact on environment.

III. Recommendation

The use of pesticides and fertilizers for experimental purposes only will have some limited negative impacts on land use and public health. Proposed construction activities and small irrigation activity will have no major negative environmental impacts, the most significant impact being those related to short-term nature. A negative determination is, therefore, recommended for this project.

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Annex "A"
to IEE

Use of Pesticides for Research Agricultural Activities Proposed
Under This Project

A memo from AA/TA to Administrator Giligan, dated April 20, 1977, states "There is AID consensus that since we provide such a small percentage of pesticides used by developing countries (1.6%) we should strengthen and expand our current assistance to insure that countries are capable of managing both pests and pesticides regardless of who may be financing the latter." It further states "It is important that AID give assistance in establishing essential in-country programs for pest management and in improving or starting regulatory program to insure proper selection, storage, application and disposal of pesticides. We recognize the need to provide additional training to farmers, health officials and pesticide applicators. We will need to increase support to regional or problem-specific training centers or educational institutions to insure an adequate future supply of multi-disciplinary teams necessary to design and conduct appropriate integrated pest management programs in the LDCs."

The Agricultural Research Project is consistent with this AID policy. The strengthening of Malawi's on-going agriculture research activities is so designed that the management, application and disposal of pesticides is an integral part of the AID project.

The project will, in part, assist the GCM's present research to identify acceptable pesticides and fertilizers. AID inputs will be primarily in the form of technical assistance, personnel and training. AID will not finance the procurement of pesticides. The project will assist the GCM to:

- (1) identify particular hazards in the use of certain pesticides and particular measures required to off-set these hazards;
- (2) identify, for different crops and ecological zones, the most beneficial and environmentally sound pesticide usage;
- (3) identify alternatives to pesticide use;
- (4) devise safe methods for application of pesticides and best ways of transmitting this information to the farmer.

In general, then, the project will with respect to that component of the project which will involve research into pesticide application, assist Malawi to perform risk/benefit analyses and testing on pesticides to determine their economic and environmental feasibility in the Malawi context. Attached herewith is a list of pesticides presently being examined at existing research facilities in Malawi.

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PESTICIDES IN COMMON USE IN MALAWI

Malawi, like any other agricultural country, makes wide use of pesticides for various agricultural pests and diseases.

Rice Blast Disease	- Hinosan
Rice Stalk Borer	- Carbaryl
Maize Stalk Borer	- Dipterex 2½ granules
Maize Grain Storage	- Actellic
Maize Large Scale Storage	- Fumigation with Methyl Bromide Phostoxin tablets
Maize Herbicides	- Alachlor, Blades plus and Atrazine
Tobacco Nurseries	- Methyl Bromide Copper Oxychloride
Tobacco Fields	- Acephate (orthene) for leaf eaters and aphids. Dimethoate for aphids. Azodrin for Budworm Chloropyrifos for cutworms.
Potato, Tomato and Vegetables	- Diathane M-45
Groundnuts	- Supphur dust
Animals	- Altick cattle dip
Household	- For the control of flies, fleas, cockroaches and mosquitoes. Vapona strips, Doom, Kical and all these are based on Dicklorovcs.
Cotton	- Aphids ---- Dimethoate Stainers -- Carbaryl Mites ----- Dimethoate Bollworms - Red Bollworm - carbaryl American Bollworm - DDT Pink Bollworm -carbaryl

Attachment to
Annex "A" - (2)

Malawi is introducing Pesticide Registration for all chemicals and has officially banned the use of Chlorinated Hydrocarbons and other toxic materials. The only exception is DDT for the control of American bollworm on cotton. Even this is being replaced soon with either Pyrethrins or UC 5172, NTA 9306 and SAN 97. All these chemicals are very safe and the final choice will depend on price.

Annex "B"
to IEE

Types of proposed housing and other construction activities to be constructed at the various research stations are described below:

<u>Type</u>	<u>Brief Description</u>	<u>Approx. Square Feet of the Unit</u>
CH 15	3 BR Project Manager's house w/garage and servant's quarters	1577
CH 10	3 BR Senior Staff house	1217
DH 6	2 BR Junior Staff house	885
PH 6	1 BR Rest house	504
PH 4	2 room quarters for technical officers	477
DL 3	2 BR Junior Staff house	871
Labour House	One room, low cost quarters	150

Other teaching and storing facilities include a laboratory block (1800 sq. ft.); office block (small offices for various disciplines - about 150 sq. ft.); a cold storage unit, drying sheds, small stores, fencing, paddocks and animal pens.

The distribution and numbers of each of the activities per site is described below:

<u>Site Location</u>	<u>Type & No. of Units</u>
Chitedze Research Station	1 CH 15, 3 CH 10, 12 DH 6, 12 PH 4, 22 low-cost houses, 1 laboratory block, 13 offices, 1 cold storage unit, 2 green- houses, 2 drying sheds, 2 stores, fencing and animal pens.
Bvumbe Research Station	1 CH 10, 3 DH 6, 5 PH 4, 2 stores, 1 drying shed, 2 offices and fencing
Lunyanwa Research Station	1 DH 6, 1 CH 15, 1 PH 4, an office, fencing and paddocks
Makhanga Research Station (Nsanje)	1 DL 3, 1 PH 4 and an office

<u>Site Location</u>	<u>Type & No. of Units</u>
Tsangano Research Station	1 DH 6, 3 PH 4, 1 EG 6 and a rest house
Mbawa Research Station	2 DH 6, 2 PH 4, 1 shed, an office and fencing
Lilongwe Research Station	1 CH 15 and an office
Meru Research Station (Chitipa)	1 PH 4
Mozu Research Station	2 PH 4
Blantyre Research Station	2 PH 4
Kasinthula Research Station	1 DH 6, 3 PH 4, an office, fencing and animal pens
T. A. Symon Research Center	1 EL 2 and an animal center
Kawalazi Research Center	1 PH 4
Chitala Research Center	1 EL 2
Dzalanyana Research Center	an animal center
Phalombe Research Station	an animal center

IMPACT IDENTIFICATION AND EVALUATION FORM

<u>Impact Areas and Sub-areas</u>	<u>Impact Identification and Evaluation</u>
A. LAND USE	
1. Changing the character of the land through:	
a. Increasing the population _____	N
b. Extracting natural resources _____	N
c. Land clearing _____	L
d. Changing soil character _____	L
2. Altering natural defenses _____	N
3. Foreclosing important uses _____	N
4. Jeopardizing man or his works _____	N
5. Traffic access _____	N
6. Land use planning _____	L
7. Squatter, other development _____	N
B. WATER QUALITY	
1. Physical state of water _____	N
2. Chemical and biological states _____	L
3. Ecological balance _____	L
C. ATMOSPHERIC	
1. Air additives _____	L
2. Air pollution _____	L
3. Noise pollution _____	L

D. NATURAL RESOURCES

- | | |
|--|---|
| 1. Diversion, altered use of water _____ | L |
| 2. Irreversible, inefficient commitments _____ | N |
| 3. Wildlife _____ | N |

E. CULTURAL

- | | |
|--|---|
| 1. Altering physical symbols _____ | N |
| 2. Dilution of cultural traditions _____ | N |

F. SOCIOECONOMIC

- | | |
|---|---|
| 1. Changes in economic/employment patterns _____ | L |
| 2. Changes in population _____ | N |
| 3. Changes in cultural patterns _____ | N |
| 4. Dislocation and relocation of area residents _____ | N |
| 5. Support facilities _____ | N |

G. HEALTH

- | | |
|---|---|
| 1. Changing a natural environment _____ | L |
| 2. Eliminating an ecosystem element _____ | N |
| 3. New pathways for disease vectors _____ | L |
| 4. Safety provisions _____ | N |

RESEARCH EQUIPMENT BY FISCAL YEAR OF ACQUISITION
(Estimated Price, CIF Blantyre)

PROGRAM AND ITEM	FISCAL YEAR OF ACQUISITION					TOTAL
	FY 80	FY 81	FY 82	FY 83	FY 84	
<u>MAIZE</u>						
Cold Room (seed storage)	20,000					20,000
Greenhouse	5,000					5,000
4 Calculators	100	100				200
4 Field Scales	100	100				200
1 Mettler Balance		2,000				2,000
Expendable Supplies	3,000	6,000		6,000		15,000
<u>GROUNDNUT</u>						
Cold Room (seed storage)		20,000				20,000
2 Calculators	100	100				200
2 Field Scales	100	100				200
Expendable Supplies	3,000	6,000		6,000		15,000
<u>PHYSIOLOGY</u>						
2 Calculators	100	100				200
2 Printing Calculators	700			700		1,400
2 Field Scales	100			100		200
1 Mettler Lab Balance	2,000					2,000
Moisture Meter		2,000				2,000
Leaf Area Meter		6,000				6,000
Light Meter	800					800
Solar Radiation integrator	5,000					5,000
Expendable Supplies	3,000	6,000		6,000		15,000
<u>FRUITS AND VEGETABLES</u>						
Scales	2,500					2,500
2 Analytical Balances	4,000	4,000				8,000
Drying Oven	2,000					2,000
2 PH Meters	2,000					2,000
2 Colorimeters	2,000	2,000				4,000
2 Microscopes	5,000	5,000				10,000
2 Binocular Scopes	2,500	2,500				5,000
2 Centrifuges	2,000	2,000				4,000
Expendable Supplies	7,000	5,000				12,000
Chemicals	7,500					7,500
Greenhouses (3)	15,000					15,000

RESEARCH EQUIPMENT BY FISCAL YEAR OF ACQUISITION (Con't.)

PROGRAM AND ITEM	FISCAL YEAR OF ACQUISITION					TOTALS
	FY 80	FY 81	FY 82	FY 83	FY 84	
<u>IRRIGATION SYSTEMS</u>						
Pumps	13,000	6,500				19,500
Filters	8,000	4,500				12,500
Pipe	8,000	4,000				12,000
Risers and Heads	6,000	3,000				9,000
Drip Tubing	5,000	2,500				7,500
<u>GENERAL FARMING TOOLS</u>						
Sprayers	3,000	6,000				9,000
Cultivators	3,000	6,000				9,000
Fencing	5,000	10,000				15,000
Wheelbarrows	2,000	4,000				6,000
Garden Tools	5,000	10,000				15,000
Expendable Supplies	2,000	4,000				6,000
<u>SOIL FERTILITY</u>						
Grinding Room equipped with grinder, exhaust fan, fume hood	11,000					11,000
Soil Sterilizer		2,400				2,400
2 Balances accurate to 0.00g @ 1700	1,700	1,700				3,400
2 Muffle Furnaces 3700	3,700	3,700				7,400
Fume Hoods @ 3600	10,800					10,800
Atomic Absorption Spectrophotometers 1300	13,000			13,000		26,000
Greenhouses (2)	10,000					10,000
Air Compressors 1,200	2,400					2,400
Vacuum pumps @ 2,100	4,200					4,200
pH Meters @ 1,200	1,200			1,200		2,400
Colorimeters @ 1,000				2,000		2,000
Gas Chromatograph	18,000					18,000
Soil Salinity Sensor				1,000		1,000
Soil Moisture Measuring Equip. (Neutron)	18,000					18,000
Small Lab Equip Item	400	200		300		900
Glassware	300			200		500
Chemicals	300			300		600

RESEARCH EQUIPMENT BY FISCAL YEAR OF ACQUISITION (Con't.)

PROGRAM AND ITEM	FISCAL YEAR OF ACQUISITION					TOTAL
	FY 80	FY 81	FY 82	FY 83	FY 84	
<u>ECONOMICS & FARM SYSTEMS</u>						
Calculators	5,000	2,000				7,000
TOTALS	254,600	139,500	--	36,800	--	4 0,900
<u>LIVESTOCK</u>						
<u>Nutrition/Pasture and Forages</u>						
<u>Laboratory (In vitro organic matter digestibility)</u>						
Mettler Lab Balance	2000					2000
Incubator	1000					1000
Water bath	500					500
Oven	800					800
Muffle furnace	2000					2000
Distillation apparatus	1500					1500
Fume hood	1500					1500
Kjeldahl, Nitrogen	8000					8000
Mill, wiley	2000					2000
Miscellaneous equip.	2000					2000
Expendable laboratory supplies	5000					5000
Chemicals	2500					2500
Colorimeter	1000					1000
<u>Field and Barn, Chitedze</u>						
Digestion crates and apparatus	5000					5000
Feeding barn pens and equip.	8500					8500
Field scales	200					200
Animal scales, portable	2000					2000
Fencing and pens	15000					15000
Harvesting and drying equip.	2500					2500
<u>Field and Barn, Mbawa</u>						
Animal scales, portable	2000					2000
Field scales	200					200
Feeding pens and equip.	4000					4000
Fencing and pens	5000					5000
Harvesting and drying equip.	2000					2000
<u>LIBRARY ACQUISITIONS</u>	10,000	10,000		10,000		30,000
<u>GRAND TOTALS</u>	340,800	149,500		46,800		537,100

CONSTRUCTION DETAILS-COST ESTIMATES (TECHNICAL ANALYSIS-NRDP)

Site Location	Project Sub Activity	Type of Construction	Area of Each Unit in Sq.Ft.	Extension	Unit Price in Kwacha	Extension	Cost in U.S.\$	Sub Total in U.S.\$ Per Element
Chitedze Research Station	Maize	2 B3 Hse.	1262	2524	37,500	75,000	91,500	152,140
		2 D16 Hses.	885	1670	22,000	44,000	53,680	
		1 cold strg.	100c.ft	100c.ft	18,000	18,000	21,960	
		1 greenhouse	300	300	20,490	20,490	25,000	
	Groundnut	1 D16 Hse.	885	885	22,000	22,000	26,400	48,360
		1 cold strg.	100 c.ft.	100 c.ft	18,000	18,000	21,960	
	Vegetable & Fruit (Horticulture)	2 D16 Hse.	885	1670	22,000	44,000	53,680	118,086
		4 PH 4 (Mod)	477	1908	7,700	30,800	37,500	
		Storage	100	100	15MK/Sq. ft	1,500	1,830	
		1 Greenhouse	300	300	20,490	20,490	25,000	
	Soil Fertility	2 B3 Hse.	1262	2524	37,500	75,000	91,500	245,332
		3 D16 Hses.	885	2655	22,000	66,000	80,520	
		1 Lab block	1800	1800	22MK/Sq. ft	39,600	48,312	
		1 greenhouse	300	300	20,490	20,490	25,000	
	Farm System	1 D16 Hse.	885	885	22,000	22,000	26,840	85,532
		1 B2A Hse.	1559	1559	43,000	43,000	52,460	
		1 Store	100	100	15MK/Sq. ft	1,500	1,830	
		1 Shed	300	300	12MK/Sq. ft	3,600	4,392	
	Livestock	1 D16 Hse	885	885	22,000	22,000	26,840	81,934
		1 PH4 (Mod)	477		7,700	7,700	9,394	
		1 B3 Hse.	1262	1262	37,500	37,500	45,700	

CONSTRUCTION DETAILS-COST DETAILS-COST ESTIMATES (TECHNICAL ANALYSIS-NRDP)

Site Location	Project Sub Activity	Type of Construction	Area of Each Unit in Sq. Ft.	Extension	Unit Price in MK	Extension	Cost in U.S.\$	Sub Total in U.S.\$ Per Element
Chitedze Research Station	Research Coordinator	1 B2A Hse.	1559	1559	43,000	43,000	52,460	
	Ag. Economist	1 B2A Hse.	1559	1559	43,000	43,000	52,460	104,920
	For all above Activities	Office Block	2000	2000	20MK/Sq.ft	40,000	48,800	48,800
	SUB TOTAL		(Chitedze \$95,004)					
Brumbwe Research Station	Vegetable & Fruit Research	1 B2A Hse	1559	1559	44,000	44,000	53,680	
		2 D116 Hse	885	1770	22,500	44,000	54,900	
		3 PH4 (Mod)	477	1431	8,000	2,400	29,280	
		1 Store	100	100	15MK/Sq.ft	1,500	1,830	
		1 Greenhouse	300	300	20,490	20,490	25,000	104,690
	Farm System	1 B3 Hse	1262	1262	37,500	37,500	45,750	
		1 Store	100	100	15MK/Sq.ft	1,500	1,830	
		1 Office	100	100	20MK/Sq.ft	2,000	2,440	50,020
	Soil Fertility	1 Lab block	2000	2000	22MK/Sq.ft	44,000	53,680	
		1 B3	1262	1262	37,500	44,000	44,000	
1 D116		885	885	22,500	22,500	22,450		
1 greenhouse		300	300	20,490	20,490	25,000		
Ag. Economist	1 B3	1262	1262	37,500	37,500	45,750	195,880	
	SUB TOTAL		(Brumbwe \$410,590)					

CONSTRUCTION DETAILS-COST ESTIMATES (TECHNICAL ANALYSIS-NRDP)

Site Location	Project Sub Activity	Type of Construction	Area of		Unit Price in MK	Extension	Cost in U.S.\$	Sub Total in U.S.\$ Per Element
			Each Unit in Sq.Ft.	Extension				
Makhanga Research Station (Nsanga)	Vegetable and Fruit	1 EL2 Hse.	478	478	9,700	9,700	11,834	11,834
Tsangano Research Station	Wheat and Sunflower	2 CH10 Hse.	1093	2186	32,000	64,000	78,000	135,000
		1 DH6 Hse.	885	885	26,000	26,000	31,720	
		2 PH4 (Mod)	477	954	9,100	18,200	22,204	
		1 Office	150	150	20MK/Sq.ft	3,000	3,660	
	Vegetable and Fruit	1 PH4 (Mod) Hse	477	477	9,100	9,100	11,102	11,102
Mbawa Research Station (Mzimba)	Livestock	1 PH4 (Mod)	477	477	8,800	8,800	10,736	40,000
		1 DH6 Hse	885	885	24,800	24,800	30,256	
Kasinthula Research Stn.	Vegetable and Fruit	1 DH6 Hse.	885	885	24,500	24,500	29,890	40,382
		1 PH4 (Mod)	477	477	8,600	8,600	10,492	
		SUB TOTAL						
Kavalazi Research Stn.	Vegetable and Fruit	1 PH4 (Mod)	477	477	9,000	9,000	10,980	10,980
		SUB TOTAL						

CONSTRUCTION DETAILS-COST ESTIMATES (TECHNICAL ANALYSIS-NRDP)

Site Location	Project Sub Activity	Type of Construction	Area of Each Unit In Sq.Ft.	Extension	Unit Price in MK	Extension	Cost in U.S.\$	Sub Total In U.S.\$ Per Element
Makoka Research Station	Ag.Economist	2 CM10 Hse	1093	2186	32,000	64,000	78,000	78,000
		SUB TOTAL						
Bunda Ag. College	Bean Research	1 Greenhouse	Lumpsum	-	20,490	20,490	25,000	42,568
		1 Field lab (Bean separation Bldg)	800	800	18MK/Sq.ft	14,400	17,568	
		SUB TOTAL						
Lunyangwa Research Stn. (Mzuzu)	Seed Production	1 DHO Hse	855	855	22,000	22,600	27,572	27,572
		SUB TOTAL						

GRAND TOTAL \$1,734,858
 + 15% inflation 1,995,087
 rounded to \$2,000,000

WAIVER JUSTIFICATIONS

I. Vehicle Procurement

The Project includes AID-financed procurement of 15 Landrovers (long wheel base) and 15 motorcycles of Code 935 manufacture. A waiver of the provisions of FAA Section 636(i) is required.

There are literally no U.S. made vehicles in Malawi except for the half dozen operated by the U.S. Embassy and its personnel and a few remaining in the fleet of the U.S. construction firm finishing the AID-financed Lilongwe-Mchingi Road. There is no organized spare parts supply or maintenance capability for U.S. vehicles.

Moreover, U.S. four-wheel drive vehicles, more or less comparable to the Landrover, are made with the steering wheel on the left side which is not safe in the left side traffic flow of Malawi.

The Ministry of Works (MOW) generally administers vehicle procurement for all GOM ministries, including the MANR, and provides vehicle maintenance either through its "plant hire organization", which "leases" vehicles to Government agencies, or through a reimbursable maintenance system. For four-wheel drive vehicles the MOW and the MANR, have historically standardized on Landrovers and, for motorcycles, have standardized on the Yamaha. This is to enable the GOM with its limited resources and vehicle fleet to establish a nation-wide spare parts and maintenance network for the particular types of vehicles. It would be counterproductive and unrealistic to expect the GOM to establish this capability for vehicles of varied manufacture in each category, particularly for the small number of vehicles being financed by AID.

Motor vehicles will be procured duty free through the MOW.

II. Host Country Contribution

Malawi is one of the world's 31 poorest countries (RLDCs) as determined by UNCTAD and the Development Assistance Committee of the OECD. Based on 1977 per capita GNP it is the twelfth poorest nation in the world. Despite its limited resources, it has shown a high degree of fiscal responsibility and commitment to development.

In this instance, it is making a 13.5% contribution to new Project inputs, mainly in the form of expenditures for incremental recurrent costs generated by the Project and other cash outlays.

As indicated in the Financial Analysis, the overall Revenue Account for continuing operations of the D.A.R. is estimated to total more than \$13,356,000 over the life of project. These funds do not represent new Project inputs and are not included in the 13.5% COM Project contribution. They will be used to meet the costs of salaries, vehicle operation and maintenance, building maintenance, materials, etc. incident to the existing and on-going D.A.R. activities.

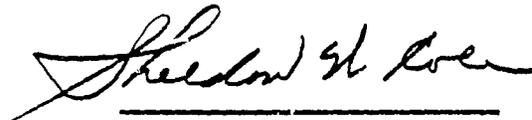
A conservative estimate is that at least 50% of the LOP Revenue Account (\$6,678,000) will be used to operate and support those existing commodity programs which the Project will address. For example, the AID Project will work with 31 (64%) of the present 48 specific research projects in the D.A.R. 67% of the present professional staff, excluding those in purely management positions, are assigned to commodity programs directly assisted by the Project and, as an additional indicator, 56% of the additional staff to be brought into the D.A.R. during the life of Project will be assigned to AID-assisted on-going programs. Housing costs, salaries and allowances, the major recurrent costs in support of D.A.R. research programs, are in direct proportion to the numbers of assigned personnel, and costs of expendable supplies, vehicle operation and maintenance, etc., for the AID-assisted programs are not expected to account for less than a pro rata share.

In view of the very substantial GOM financial commitment to the national agricultural research program, in general and connected with the Project, its significant Project-specific contribution and its status as an RLDC, a waiver of the cost-sharing requirement under FAA, Section 110(a), for a project specific 25% host country contribution is justified.

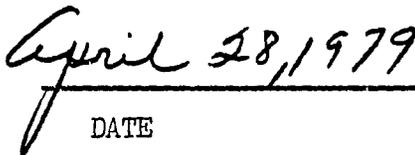
FOREIGN ASSISTANCE ACT
SECTION 611(e)

CERTIFICATION

As the officer serving as principal representative of the Agency for International Development in Malawi, having taken into account the maintenance and utilization of projects in Malawi previously financed or assisted by the United States, particularly the Chikwawa - Bangula Road, the Lilongwe - Mchinji Road and the Bunda College projects, and the performance of the Ministry of Agriculture and Natural Resources and Ministry of Works with regard to previous and on-going AID projects in Malawi, I hereby certify that in my judgement the Government of Malawi has the financial and human resource capabilities to effectively maintain and utilize the capital assistance to be carried out under this Project.



SHELDON W. COLE



DATE

5C(1) - COUNTRY CHECKLIST

Listed below are, first, statutory criteria applicable generally to FAA funds, and then criteria applicable to individual fund sources: Development Assistance and Security Supporting Assistance

A. GENERAL CRITERIA FOR COUNTRY

- | | |
|---|-----|
| 1. <u>FAA Sec. 116</u> . Can it be demonstrated that contemplated assistance will directly benefit the needy? If not, has the Department of State determined that this government has engaged in consistent pattern of gross violations of internationally recognized human rights? | YES |
| 2. <u>FAA Sec. 481</u> . Has it been determined that the government of recipient country has failed to take adequate steps to prevent narcotics drugs and other controlled substances (as defined by the Comprehensive Drug Abuse Prevention and Control Act of 1970) produced or processed, in whole or in part, in such country, or transported through such country, from being sold illegally within the jurisdiction of such country to U.S. Government personnel or their dependents, or from entering the U.S. unlawfully? | NO |
| 3. <u>FAA Sec. 620(a)</u> . Does recipient country furnish assistance to Cuba or fail to take appropriate steps to prevent ships or aircraft under its flag from carrying cargoes to or from Cuba? | NO |
| 4. <u>FAA Sec. 620(b)</u> . If assistance is to a government, has the Secretary of State determined that it is not controlled by the international Communist movement? | YES |
| 5. <u>FAA Sec. 620(c)</u> . If assistance is to government, is the government liable as debtor or unconditional guarantor on any debt to a U.S. citizen for goods or services furnished or ordered where (a) such citizen has exhausted available legal remedies and (b) debt is not denied or contested by such government? | NO |
| 6. <u>FAA Sec. 620(e) (1)</u> . If assistance is to a government, has it (including government agencies or subdivisions) taken any action which has the effect of nationalizing, expropriating, or otherwise seizing ownership or control of property of U.S. citizens or entities beneficially owned by them without taking steps to discharge its obligations toward such citizens or entities? | NO |

A

7. FAA Sec. 620(f); App. Sec. 108. Is recipient country a Communist country? Will assistance be provided to the Democratic Republic of Vietnam (North Vietnam), South Vietnam, Cambodia or Laos? NO
8. FAA Sec. 620(i). Is recipient country in any way involved in (a) subversion of, or military aggression against, the United States or any country receiving U.S. assistance, or (b) the planning of such subversion or aggression? NO
9. FAA Sec. 620(j). Has the country permitted, or failed to take adequate measures to prevent, the damage or destruction, by mob action, of U.S. property? NO
10. FAA Sec. 620(l). If the country has failed to institute the investment guaranty program for the specific risks of expropriation, inconvertibility or confiscation, has the AID Administrator within the past year considered denying assistance to such government for this reason? NO
11. FAA Sec. 620(o); Fishermen's Protective Act, Sec. 5. If country has seized, or imposed any penalty or sanction against, any U.S. fishing activities in international waters, NO such action
- a. has any deduction required by Fishermen's Protective Act been made?
- b. has complete denial of assistance been considered by AID Administrator?
12. FAA Sec. 620(q); App. Sec. 504. (a) Is the government of the recipient country in default on interest or principal of any AID loan to the country? (b) Is country in default exceeding one year on interest or principal on U.S. loan under program for which App. Act appropriates funds, unless debt was earlier disputed, or appropriate steps taken to cure default? NO
NO
- * 13. FAA Sec. 620(s). "If contemplated assistance is development loan (including Alliance loan) or security supporting assistance, has the Administrator taken into account the percentage of the country's budget which is for military expenditures, the amount of foreign exchange spent on military equipment and the amount spent for the purchase of sophisticated weapons systems?" (An affirmative answer may refer to the record of the taking into account, e.g.: "Yes as reported in annual report on implementation of Sec. 620(s)." This report is prepared at the time of approval by the Administrator of the Operational Year Budget.* YES

* Revised

* Upward changes in the Sec. 620(s) factors occurring in the course of the year, of sufficient significance to indicate that an affirmative answer might need review should still be reported, but the statutory checklist will not normally be the preferred vehicle to do so.) *

14. FAA Sec. 620(t). Has the country severed diplomatic relations with the United States? If so, have they been resumed and have new bilateral assistance agreements been negotiated and entered into since such resumption? NO
15. FAA Sec. 620(u). What is the payment status of the country's U.N. obligations? If the country is in arrears, were such arrearages taken into account by the AID Administrator in determining the current AID Operational Year Budget? Not in arrears
16. FAA Sec. 620A. Has the country granted sanctuary from prosecution to any individual or group which has committed an act of international terrorism? NO
17. FAA Sec. 666. Does the country object, on basis of race, religion, national origin or sex, to the presence of any officer or employee of the U.S. there to carry out economic development program under FAA? NO
18. FAA Sec. 669. Has the country delivered or received nuclear reprocessing or enrichment equipment, materials or technology, without specified arrangements on safeguards, etc.? NO
19. FAA Sec. 901. Has the country denied its citizens the right or opportunity to emigrate? NO

B. FUNDING CRITERIA FOR COUNTRY

1. Development Assistance Country Criteria

a. FAA Sec. 102(c), (d). Have criteria been established, and taken into account, to assess commitment and progress of country in effectively involving the poor in development, on such indexes as: (1) small-farm labor intensive agriculture, (2) reduced infant mortality, (3) population growth, (4) equality of income distribution, and (5) unemployment. YES

b. FAA Sec. 201(b)(5), (7) & (8); Sec. 208; 211(a)(4), (7). Describe extent to which country is:

(1) Making appropriate efforts to increase food production and improve means for food storage and distribution.

Large National Rural Development Project making substantial progress toward these ends.

- (2) Creating a favorable climate for foreign and domestic private enterprise and investment. private foreign and domestic investment strongly encouraged and supported, e.g., Viphya pulp mill
- (3) Increasing the public's role in the developmental process. local groups involved in NRDP decisions.
- (4) (a) Allocating available budgetary resources to development. GOM continues to maximize development budget with fiscal responsibility.
- (b) Diverting such resources for unnecessary military expenditure and intervention in affairs of other free and independent nations. No such diversion
- (5) Making economic, social, and political reforms such as tax collection improvements and changes in land tenure arrangements, and making progress toward respect for the rule of law, freedom of expression and of the press, and recognizing the importance of individual freedom, initiative, and private enterprise. land tenure initiatives addressed by NRDP.
Significant respect for and liberalization of personal freedoms.
- (6) Otherwise responding to the vital economic, political, and social concerns of its people, and demonstrating a clear determination to take effective self-help measures. Development Policy Statement, Long range development plans, and specific projects.
- c. FAA Sec. 201(b), 211(a). Is the country among the 20 countries in which development assistance loans may be made in this fiscal year, or among the 40 in which development assistance grants (other than for self-help projects) may be made? YES
- d. FAA Sec. 115. Will country be furnished, in same fiscal year, either security supporting assistance, or Middle East peace funds? If so, is assistance for population programs, humanitarian aid through international organizations, or regional programs? NO
2. Security Supporting Assistance Country Criteria N/A
- a. FAA Sec. 502B. Has the country engaged in a consistent pattern of gross violations of internationally recognized human rights? Is program in accordance with policy of this Section?
- b. FAA Sec. 531. Is the Assistance to be furnished to a friendly country, organization, or body eligible to receive assistance?
- c. FAA Sec. 609. If commodities are to be granted so that sale proceeds will accrue to the recipient country, have Special Account (counterpart) arrangements been made?

5C(2) - PROJECT CHECKLIST

Listed below are, first, statutory criteria applicable generally to projects with FAA funds, and then project criteria applicable to individual fund sources: Development Assistance (with a sub-category for criteria applicable only to loans); and Security Supporting Assistance funds.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? IDENTIFY. HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT.

1. App. Unnumbered; FAA Sec. 653(b)

(a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project;
(b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than \$1 million over that figure plus 10%)?

FY80 Congressional Presentation

YES

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

YES

3. FAA Sec. 611(a)(2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?

None required

4. FAA Sec. 611(b); App. Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per Memorandum of the President dated Sept. 5, 1973 (replaces Memorandum of May 15, 1962; see Fed. Register, Vol 38, No. 174, Part III, Sept. 10, 1973)?

Not water or water-related

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed \$1 million, has Mission Director certified the country's capability effectively to maintain and utilize the project?

YES

A.

6. FAA Sec. 209, 619. Is project susceptible of execution as part of regional or multi-lateral project? If so why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. If assistance is for newly independent country, is it furnished through multi-lateral organizations or plans to the maximum extent appropriate?

provides central service function for NRDLP and ag. sector

not newly independent

7. FAA Sec. 601(a); (and Sec. 201(f) for development loans). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.

- a) promote ag. exports
- b) promote small holder production
- c) N/A
- d) N/A
- e) improve agriculture
- f) N/A

8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

U.S. research equipment
U.S. Title XII institution will implement possible U.S. construction firm

9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.

substantial 18 percent contribution to project by RLDC

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency and, if so, what arrangements have been made for its release?

NO

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(c); Sec. 111; Sec. 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production, spreading investment out from cities to small towns and rural areas; and (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions?

- a) small holder farmers are direct primary beneficiaries through improved agriculture
- b) N/A

b. F/A Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available: [Include only applicable paragraph -- e.g., a, b, etc. -- which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source.]

- | | |
|---|--|
| <p>(1) [103] for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; [103A] if for agricultural research, is full account taken of needs of small farmers;</p> | <p>productivity and income of rural poor through improved small holder agriculture is primary goal</p> |
| <p>(2) [104] for population planning or health; if so, extent to which activity extends low-cost, integrated delivery systems to provide health and family planning services, especially to rural areas and poor;</p> | <p>N/A</p> |
| <p>(3) [105] for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;</p> | <p>education of professional agricultural research personnel</p> |
| <p>(4) [106] for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:</p> <p>(a) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;</p> <p>(b) to help alleviate energy problem;</p> <p>(c) research into, and evaluation of, economic development processes and techniques;</p> <p>(d) reconstruction after natural or manmade disaster;</p> <p>(e) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;</p> <p>(f) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.</p> | <p>N/A</p> |

(5) [107] by grants for coordinated private effort to develop and disseminate intermediate technologies appropriate for developing countries.

c. FAA Sec. 110(a); Sec. 208(e). Is the recipient country willing to contribute funds to the project, and in what manner has or will it provide assurances that it will provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

Malawi is RLDC and making 18 percent contribution

d. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing?

NO

e. FAA Sec. 207; Sec. 113. Extent to which assistance reflects appropriate emphasis on; (1) encouraging development of democratic, economic, political, and social institutions; (2) self-help in meeting the country's food needs; (3) improving availability of trained worker-power in the country; (4) programs designed to meet the country's health needs; (5) other important areas of economic, political, and social development, including industry; free labor unions, cooperatives, and Voluntary Agencies; transportation and communication; planning and public administration; urban development, and modernization of existing laws; or (6) integrating women into the recipient country's national economy.

improved agricultural productivity of small holders and trained manpower for agriculture research

f. FAA Sec. 281(b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civic education and training in skills required for effective participation in governmental and political processes essential to self-government.

recognizes most critical need of Malawi, which is overwhelmingly comprised of smallholders (85%-90% of population), for improved smallholder agriculture. utilizes Malawian professional research personnel and develops Department of Agricultural Research.

- g. FAA Sec. 201(b)(2)-(4) and -(8); Sec. 201(e); Sec. 211(a)(1)-(3) and -(8). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth; or of educational or other institutions directed toward social progress? Is it related to and consistent with other development activities, and will it contribute to realizable long-range objectives? And does project paper provide information and conclusion on an activity's economic and technical soundness?
- YES
- YES
- YES
- h. FAA Sec. 201(b)(6); Sec. 211(a)(5), (6). Information and conclusion on possible effects of the assistance on U.S. economy, with special reference to areas of substantial labor surplus, and extent to which U.S. commodities and assistance are furnished in a manner consistent with improving or safeguarding the U.S. balance-of-payments position.
- likely follow-on demand for private U.S. expertise in agricultural development and for goods and services related to food processing.
2. Development Assistance Project Criteria (Loans only)
- N/A
- a. FAA Sec. 201(b)(1). Information and conclusion on availability of financing from other free-world sources, including private sources within U.S.
- b. FAA Sec. 201(b)(2); 201(d). Information and conclusion on (1) capacity of the country to repay the loan, including reasonableness of repayment prospects, and (2) reasonableness and legality (under laws of country and U.S.) of lending and relending terms of the loan.
- c. FAA Sec. 201(e). If loan is not made pursuant to a multilateral plan, and the amount of the loan exceeds \$100,000, has country submitted to AID an application for such funds together with assurances to indicate that funds will be used in an economically and technically sound manner?
- d. FAA Sec. 201(f). Does project paper describe how project will promote the country's economic development taking into account the country's human and material resources requirements and relationship between ultimate objectives of the project and overall economic development?

e. FAA Sec. 202(a). Total amount of money under loan which is going directly to private enterprise, is going to intermediate credit institutions or other borrowers for use by private enterprise, is being used to finance imports from private sources, or is otherwise being used to finance procurements from private sources?

f. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

3. Project Criteria Solely for Security Supporting Assistance

N/A

FAA Sec. 531. How will this assistance support promote economic or political stability?

4. Additional Criteria for Alliance for Progress

N/A

[Note: Alliance for Progress projects should add the following two items to a project checklist.]

a. FAA Sec. 251(b)(1), -(8). Does assistance take into account principles of the Act of Bogota and the Charter of Punta del Este; and to what extent will the activity contribute to the economic or political integration of Latin America?

b. FAA Sec. 251(b)(8); 251(h). For loans, has there been taken into account the effort made by recipient nation to repatriate capital invested in other countries by their own citizens? Is loan consistent with the findings and recommendations of the Inter-American Committee for the Alliance for Progress (now "CEPCIES," the Permanent Executive Committee of the OAS) in its annual review of national development activities?

5C(3) - STANDARD ITEM CHECKLIST

Listed below are statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by exclusion (as where certain uses of funds are permitted, but other uses not)..

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

- 1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed? YES
- 2. FAA Sec. 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him? YES
- 3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the U.S. on commodities financed? No discrimination
- 4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity? No such financing
- 5. FAA Sec. 602(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items? YES
- 6. MMA Sec. 901(b). (a) Compliance with requirement that at least 50 per centum of the gross tonnage of commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates. will be applied
- 7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the facilities of other Federal agencies will be utilized, U.S. Title XII institution

A/

are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs?

8. International Air Transport. Fair Competitive Practices Act, 1974

If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available?

YES

B. Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest?

YES (GOM contributing engineering services)

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable?

YES

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed \$100 million?

will not exceed \$100,000,000

C. Other Restrictions

1. FAA Sec. 201(d). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?

N/A

2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights?

N/A

3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-Bloc countries, contrary to the best interests of the U.S.?

YES

4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the U.S. or guaranty of such transaction?

NO

5. Will arrangements preclude use of financing:

- a. FAA Sec. 114. to pay for performance of abortions or to motivate or coerce persons to practice abortions? YES
- b. FAA Sec. 620(g). to compensate owners for expropriated nationalized property? YES
- c. FAA Sec. 660. to finance police training or other law enforcement assistance, except for narcotics programs? YES
- d. FAA Sec. 662. for CIA activities? YES
- e. App. Sec. 103. to pay pensions, etc., for military personnel? YES
- f. App. Sec. 106. to pay U.N. assessments? YES
- g. App. Sec. 107. to carry out provisions of FAA Sections 209(d) and 251(h)? (transfer to multilateral organization for lending). YES
- h. App. Sec. 501. to be used for publicity or propaganda purposes within U.S. not authorized by Congress? YES

ESTIMATED IMPLEMENTATION SCHEDULE

<u>DATE</u>	<u>MAJOR ACTION</u>	<u>PRIMARY RESPONSIBILITY</u>
June 15, 1979	Submission of PP to AID/W	AID/Malawi
August 1, 1979	Project Authorization and CN completed	AID/W
August 20, 1979	Project Agreement	AID/Malawi
August 25, 1979	Implementation Letter No. 1 issued	AID/Malawi
November 15, 1979	PIO/T for Title XII TA Contract completed	AID/Malawi
	Construction IFB completed	MOW
	Preparations for Force Account Construction and Vehicle Procurement completed	MOW
	C.P.s to initial disbursement satisfied, including availability of housing for 2 TA personnel	GOM
November 25, 1979	PIO/T for Title XII TA Contract issued	AID/W
	Approval of Construction IFB, Force Account and Vehicle Procurement Procedures	REDSO/EA

ESTIMATED IMPLEMENTATION SCHEDULE (Con't.)

<u>DATE</u>	<u>MAJOR ACTION</u>	<u>PRIMARY RESPONSIBILITY</u>
November 30, 1979	Notice Published of Construction IFB	MOW
December 20, 1979	Construction IFB issued to interested firms and Vehicle Orders placed	MOW
January 5, 1980	TA Contract Executed*	AID/W
January 10, 1980	Force Account Construction begins	MOW
February 10, 1980	2 TA personnel arrive in Malawi	TA Contractor
	Construction Bids received	MOW
February 28, 1980	Proposed Construction Award approved	REDSO/EA
March 5, 1980	Contract(s) awarded for Chitedze and Bvumbwe Construction	MOW
April 1, 1980	Initial Research Equipment Procurement Documentation completed and approved by REDSO/EA	TA Contractor
	Construction begins at Chitedze and Bvumbwe	MOW
June 1, 1980	Selection/processing completed for 14 participant Trainees	TA Contractor
	Vehicle Shipment arrives in Malawi	MOW

*Assumes non-competitive selection under Title XII procedures

ESTIMATED IMPLEMENTATION SCHEDULE (Con't.)

<u>DATE</u>	<u>MAJOR ACTION</u>	<u>PRIMARY RESPONSIBILITY</u>
June 30, 1980	Contracts Awarded/ Orders placed for Initial Research Equipment Procurement	TA Contractor
Sept/Oct 1980	T.A. Housing Construc- tion completed at Chitedze and Bvumbwe	MOW
	Force Account Construc- tion completed	MOW
	5 TA personnel arrive in Malawi	TA Contractor
	14 Trainees depart for U.S.	
November 1980	Initial Research Equip- ment shipped by surface arrives in Malawi	TA Contractor
	Internal (AID) Evaluation Report	AID/Malawi
	Documentation approved for Second Research Equipment Procurement	AID/Malawi
January 1981	Contracts Awarded and Orders Placed for Second Research Equipment Procurement	TA Contractor
April 1981	Remainder of Construction Completed	MOW
June 1981	Surface Shipment of Second Research Equipment Package Arrives	TA Contractor
	Selection/Processing Completed for 10 Participant Trainees	TA Contractor

ESTIMATED IMPLEMENTATION SCHEDULE (Con't.)

<u>DATE</u>	<u>MAJOR ACTION</u>	<u>PRIMARY RESPONSIBILITY</u>
August 1981	10 Trainees depart for U.S.	TA Contractor
November 1981	Project Funded External Evaluation Report Completed	Evaluation Contractor
May 1982	Selection/Processing Completed for 9 Participant Trainees	TA Contractor
August 1982	9 Trainees depart for US	TA Contractor
November 1982	AID Internal Evaluation Report	AID/Malawi
December 1982	Documentation Prepared and Approved for 3rd and Final Research Equipment	TA Contractor
March 1983	Contracts Awarded/Orders Placed for 3rd and final Commodity Procurement Package	TA Contractor
May 1983	Selection Processing Completed for remainder of participant trainees	TA Contractor
June 1983	External Evaluation	Evaluation Contractor
August 1983	9 Trainees depart for US	TA Contractor
	Surface Shipment of 3rd (final) Research Equipment arrives	TA Contractor
October 1983	PID Completed for Possible Second Phase	AID/Malawi
December 1983	PID Approval/Disapproval	AID/W

ESTIMATED IMPLEMENTATION SCHEDULE (Con't.)

<u>DATE</u>	<u>MAJOR ACTION</u>	<u>PRIMARY RESPONSIBILITY</u>
April 1984 to August 1984	PP Design, Authorization and Obligation of Possible Second Phase, if approved	
September 30, 1984	Project Assistance Completion Date (PACD)	
November 1984	Internal End of Project Evaluation	AID/Malawi

SMALLHOLDER SOCIAL BACKGROUND

1. Demographic and Nutritional Background

Malawi is one of the most densely populated countries in Africa. Only 37% of the land is considered suitable for cultivation, and 86% of this was already in use by 1977. Customary tenure prevails over approximately 82% of the total land area, with 2% held by freehold lease and the remaining 16% as public land controlled by the Government. The average size of smallholdings under customary tenure rules is 1.5 hectares per household.

In terms of nutrition, a fundamental measure of standards of living, there are no good nationwide baseline studies nor current surveys. In the absence of such concrete data, inferences must be made from the scattered studies that have been made. A 1970 study in the lower Shire River Valley, a poor area of Southern Region, showed 44% of the children being seriously underweight (below 80% of the accepted standard weight for their age). The study alluded that under-five clinics throughout Malawi also reported similar proportions of underweight children. Although these clinics are all for children under five years of age, most of the attending children are less than 18 months old. Ministry of Health records for those clinics in 1971 showed a nationwide mean of 32% of under-fives being seriously underweight with a high of 36% in Central Region and a low of 30% in Southern.

By 1975, Ministry records noted a slight improvement, since only 30% of under-fives nationwide were underweight with a marked improvement in Southern (down to 24%). Northern Region was worse in 1975 (37%) than in 1971 (31%). The most recent statistics (1978) give a nationwide mean of 24% of under-five children being seriously underweight, ranging from 19% in Southern through 26% in Central to 34% in Northern Region.

These underweight statistics for young children suggest rather strongly that there have been important gains in personal nutritional levels. The under-five clinic records for 1978 are considered good indicators of the national population of children under one year of age, because more than half of that age category go to a clinic at least once and are weighed. Even though there has been this improvement, one fourth of these young children (24%) were still under 80% of standard weight in 1978 and this accompanies an officially acknowledged 14% infant mortality rate (14% of children die before the age of one year). This official estimate is optimistic and most of the infants who die are never weighed, so probably 40% of all children born either die or are seriously underweight one year later.

A national nutrition survey is planned as part of the next National Sample Survey of Agriculture that will be run in 1980 or 1981. That nutrition survey will essentially be anthropometric and give national underweight statistics. A small pilot study of 24 families has already been conducted that included weighing all food that was consumed. Preliminary analysis shows a balanced but inadequate diet with people at the best time of year (after the harvest) only receiving 70% of their energy requirements and 40% of the children being underweight. In summary then, the nutritional evidence that is available shows a continuing problem of undernutrition with some improvement during the decade of the 1970s.

2. Regional Variation

Regional differences radically affect the real impact of the population density. Southern Region has more than half of the people and one third of the land area (229 people per square mile and 2.8 million people overall), and 96% of the arable land is already in use. This is the region where agricultural estates were well-established during the colonial period. Many are still in operation today. Their labor intensive cultivation of tea, coffee and tobacco provides a major employment source while aggravating the regional land shortage. Central Region approximates the national mean but has been rapidly increasing in density during the 1970s because of Government of Malawi (GOM) development policies and programs, including the transfer of the capital to Lilongwe. Northern Region has 12% of the people and 29% of the land with only 68% of its arable land in production. In many aspects this region is the least developed and most isolated of the three.

The regional differences in population are due to ecological and historical factors. There are three major ecological zones with the variation being due to altitude, rainfall and temperature: 1) a lower altitude and warmer zone with less rainfall in the lower Shire River Valley and along the coast of Lake Malawi; 2) a higher altitude plateau zone including much of Central Region and the Blantyre to Zomba area (Shire Highlands); and 3) the highest altitude and rainfall zone including mountainous areas scattered throughout the country. European settlement was concentrated on the southern plateau, and it led to much denser African population around those sources of employment.

3. Sociocultural Variation

There are a number of different ethnic identities in Malawi, and these are correlated with linguistic, and sometimes religious, differences. By far the largest ethnic unit is the Chewa, and most or all of the people throughout the country speak the Chewa language (Chichewa), which has been designated as the national language. English is also taught in the schools

as the administrative or official language. Ethnic differences are not emphasized in Malawi and do not seem to be politically significant. There seems to be a strong feeling of national unity and consciousness with little regional or ethnic emphasis.

Matrilineality is practiced in the more populous Central and Southern Regions while patrilineality is common in the Northern. These rules for determining family membership and inheritance are significant for smallholder agriculture because, together with the rules for where couples live after marriage, they underlie the access to land, the organization of labor and the division of production.

4. Smallholder Agriculture: Land, Labor and Authority

Small farmers in Malawi live in villages under the social control of family heads, village headmen and chiefs. Land for farming is allocated from chiefs to headmen to family heads on a semi-permanent basis. The family head is then responsible for dividing the farmland among family members.

Customary land tenure does not, however, mean equal distribution. Although this allocation of land generally means that each household has some land to farm, differences in individual social and economic importance within the family or village mean that some people control much more land than others.

The working unit in smallholder agriculture is the household of the husband, wife and any unmarried children. This unit makes decisions about when and what to plant, and this unit provides most of the labor, though some labor may be hired. Although this is the operational unit, the two adults have their own interests and belong to different kinship groups. The husband and wife, thus, have responsibilities to each other and other responsibilities to their own kinship groups.

The tie between brother and sister is considered stronger than that between husband and wife. Divorce is fairly common, and the husband and wife may be perhaps best thought of as temporary partners, each with other more permanent ties and responsibilities. The farm family, thus, is not a single unit that may be assumed to have one common shared economic interest. Instead, the husband and wife are members of two different families who are presently married. The woman's role in agricultural production is not simply being a dependent wife who supports her husband's interests. She makes independent decisions and has her own interests, resources and important contribution to make to Malawi's development.

Many of the Malawi people follow the rule that a newly married couple stay in the bride's village, at least for a few years, and this means that the land the couple will cultivate is under the control of the bride's family head. The groom has much less power and authority in this situation. If or when the couple go to live with the husband's family, then the farmland is controlled by his family and the husband has more authority.

Investment in joint (husband and wife) endeavors is inherently risky because the partnership is unstable and, upon divorce, one or the other of the partners will have to leave the village and relinquish rights to use the farmland that was provided through the family of the other partner. Other production-related aspects of household organization are noted in the Farming Systems Analysis section.

Little capital is available. The major resources at the smallholders' disposal are their own labor and rights to cultivate land that comes from either the wife's or the husband's family head. There is a basic production orientation toward "subsistence plus," that is, toward providing the basic dietary foodstuffs and other materials for construction, tools, etc., plus producing something(s) that may be sold for cash income. The most secure way to provide subsistence and cash income is to sell a surplus of a major food crop. A less secure, more risky procedure is to allocate some land and labor to a cash crop. If the market fails, that crop cannot be eaten to absorb the loss.

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ANNEX M

INFO OCT-81 AF-18 SS-15 PHD-01 IS-08 /297 R

DRAFTED BY AFR/SA:RWRM/AFR/DR/SAP:ELWITTE:NMB
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AIDAC, GABORONE FOR P00; NAIROBI FOR REDSO; MASERU FOR RED

E.O. 11652: N/A

TAGS:

SUBJECT: AGRICULTURE RESEARCH PROJECT (512-0212) MALAWI
1. SUBJECT PID IS APPROVED WITH THE DELETION OF TWO OF THE ELEVEN CATEGORIES OF RESEARCH.

2. THE TWO CATEGORIES WHICH ARE NOT APPROVED FOR INCLUSION IN THE PP ARE SUGAR CANE RESEARCH AND TOBACCO RESEARCH. IF OSARAC/GOM WANT AID/VN TO RECONSIDER SUPPORT OF SUGAR CANE RESEARCH OSARAC SHOULD SUPPLY DATA ON RESULTANT EXPORT POTENTIAL, LIKELY EXPORT MARKETS, MAGNITUDE OF PRODUCTION RESULTING FROM THE PROJECT AND LOCALLY AVAILABLE DATA ON MALAWI'S RELATIVE SHARE OF THE WORLD MARKET AND/OR U.S. IMPORT MARKET. (REF TO AID HANDBOOK 1, SUP. A., PD-71). AFR WILL NOT BE RECEPTIVE TO SUPPORT OF TOBACCO RELATED ACTIVITIES BECAUSE OF THE ADVERSE HEALTH EFFECTS RESULTING FROM END USE OF THE PRODUCT, AS WELL AS ADVERSE NUTRITIONAL IMPLICATIONS OF ENTRY OF SUBSISTENCE FARMERS INTO A NONFOOD CASH CROP.

3. IN THE DEVELOPMENT OF THE PP, CONSIDERATION SHOULD BE GIVEN TO THE FOLLOWING SPECIAL CONCERNS OF THE PROJECT COMMITTEE:

A) SINCE THE PROPOSED PROJECT IS AN INTEGRAL PART OF THE COMPREHENSIVE NATIONAL RURAL DEVELOPMENT PROGRAM, A MASSIVE MULTIDONOR EFFORT, THE MECHANISM FOR INTERDONOR COORDINATION SHOULD BE EXPLICITLY DELINEATED.

B) SPECIFIC PROJECT BENEFITS IN TERMS OF EXPECTED INCREASED PRODUCTION AND INCOME SHOULD BE ENUMERATED.

C) NUMBER OF HOUSES TO BE BUILT SHOULD BE HELD TO MINIMUM ESSENTIAL FOR PROJECT IMPLEMENTATION. THERE IS CONCERN IN AID/VN REGARDING THE MAGNITUDE AND PRECEDENT OF HOUSING

CONSTRUCTION PROPOSED UNDER THIS PROJECT (62 UNITS AFTER DEDUCTING TOBACCO AND SUGAR CANE RESEARCH ELEMENTS). THEREFORE THE REQUIRED NUMBER OF HOUSES FOR EACH SITE MUST BE SPECIFICALLY JUSTIFIED.

D) ASSUMING THAT REQUIREMENT FOR AID PROVISION OF RECURRENT COSTS WITHSTANDS FURTHER ANALYSIS, CONSIDERATION COULD BE GIVEN TO PHASING OUT SUCH SUPPORT BY THE END OF FOURTH YEAR OF PROJECT.

4. APPLICABLE ENVIRONMENTAL PROCEDURES FOLLOW: REGULATION 16, AS REVISED MAY 12, 1978, (FEDERAL REGISTER, VOL. 43, NO. 93) MAKE AN EXCEPTION TO PESTICIDE ASSISTANCE FOR PROCUREMENT OR USE, OR BOTH, OF PESTICIDES FOR RESEARCH OR LIMITED FIELD EVALUATION PURPOSES BY OR UNDER THE SUPERVISION OF PROJECT PERSONNEL. IN SUCH INSTANCES, HOWEVER, AID WILL ENSURE THAT THE MANUFACTURERS OF THE PESTICIDES PROVIDE TOXICOLOGICAL AND ENVIRONMENTAL DATA NECESSARY TO SAFEGUARD THE HEALTH OF RESEARCH PERSONNEL AND THE QUALITY OF THE LOCAL ENVIRONMENT IN WHICH THE PESTICIDES WILL BE USED. FURTHERMORE, TREATED CROPS WILL NOT BE USED FOR HUMAN OR ANIMAL CONSUMPTION UNLESS APPROPRIATE TOLERANCES HAVE BEEN ESTABLISHED BY EPA OR RECOMMENDED BY FAO/WMO, AND THE RATES AND FREQUENCY OF APPLICATION, TOGETHER WITH THE PRESCRIBED PREHARVEST INTERVALS, DO NOT RESULT IN RESIDUES EXCEEDING SUCH TOLERANCES. THIS PROHIBITION DOES NOT APPLY TO THE FEEDING OF SUCH CROPS TO ANIMALS FOR RESEARCH PURPOSES.

5. EXPECTATION OF LOCATING FOR DESIGN EFFORT AGRICULTURAL ECONOMIST WHO IS ALSO SMALL SCALE MECHANIZATION EXPERT MAY NOT BE REALISTIC.

6. PROJECT IS TO BE DESIGNED AND IMPLEMENTED USING THE COLLABORATIVE APPROACH UNDER TITLE XII. A BRIEF SUMMARY OF THE TITLE XII PROCESS FOLLOWS: SELECTION OF A CONTRACTOR WILL BE CONDUCTED IN ACCORDANCE WITH AIDPR-7-4.5524 WHICH DESCRIBES PROCEDURES FOR CONTRACTOR SELECTION WHEN IT HAS BEEN DETERMINED THAT THE ACTIVITY SHOULD BE CARRIED OUT AS A COLLABORATIVE ASSISTANCE PROJECT. ELIGIBLE TITLE XII INSTITUTIONS WILL BE CONTACTED BASED ON THE EVALUATION AND SELECTION CRITERIA EXTRACTED FROM THE PID. THE MOST CAPABLE INSTITUTIONS WILL BE INVITED TO SUBMIT PROPOSALS FOR PROJECT IMPLEMENTATION. GOM REPRESENTATIVES MAY BE INVITED TO MAKE RECOMMENDATIONS TO THE PROJECT PANEL, CONCERNING THE CHOICE OF CONTRACTOR WHEN ALL PROPOSALS HAVE BEEN RECEIVED. ON-SITE (UNIVERSITY) EVALUATIONS BY THE GOM AND PROJECT PANEL REPRESENTATIVES (OSARAC IF DESIRED) MAY BE MADE AT THE DISCRETION OF THIS GROUP.

THE GOM SHOULD CLEARLY UNDERSTAND THAT NORMALLY THE PROJECT DESIGN TEAM IS PROVIDED BY THE INSTITUTION SELECTED TO IMPLEMENT THE PROJECT. WHEN POSSIBLE THE PROPOSED CHIEF OF PARTY IS INCLUDED AS A MEMBER OF THE DESIGN TEAM. THIS GREATLY FACILITATES PROJECT DESIGN AND IMPLEMENTATION AND ALSO PROVIDES SOME ASSURANCE THAT THE ACTIVITIES UNDER THE PROJECT WILL INDEED BE CARRIED OUT AS PLANNED. PROCESS OF DESIGN SHOULD ENSURE THAT SYSTEMS APPROACH TO PROBLEMS OF SMALLHOLDERS ARE INCORPORATED INTO PROJECT. CHRISTOPHER

30202

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ANNEX N

In reply please quote No. 31/1/28/4

ograms: FINANCE, Lilongwe
lephone: Lilongwe 31311
ommunications should be addressed to:
e Secretary to the Treasury



MINISTRY OF FINANCE
P.O. BOX 30049
LILONGWE
MALAWI

24th May 1979

His Excellency the Ambassador,
Embassy of the United States of America,
LILONGWE 3.

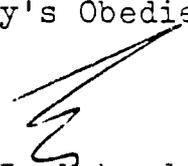
Your Excellency,

NATIONAL RURAL DEVELOPMENT PROGRAMME:
RESEARCH COMPONENT

During the past two months, officials of the Government have been having discussions with officials from Your Excellency's Government and recently, a draft project paper was completed with the help of a team from the University of Florida. The draft project paper was discussed with officials of the Government and in my letter of even reference dated 4th May 1979, I indicated Government confirmation that the programme of Crop Research, which is part of the National Rural Development Programme as envisaged in the project paper, could be developed further and that therefore the paper could be completed as proposed.

I would now like to formally request Your Excellency's Government to help with the financing of this component of the National Rural Development Programme on the basis of the findings contained in the project paper.

I am Your Excellency,
Your Excellency's Obedient Servant,


C. L. Mphande
for SECRETARY TO THE TREASURY