

PD CAI 481

MEMORANDUM

October 25, 1984

TO: Distribution
FROM: ASIA/PD/EA, Lloyd Feinberg
SUBJECT: Burma Agriculture /Research and Development Project
Project Committee Meeting Change in Meeting Date

The Project Committee meeting, previously scheduled for Wednesday, October 31 at 10:30 a.m., will be held Friday, November 2, at 9:30 a.m. in the ASIA/PD Conference Room (enter at Rm. 3318).

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Project Paper

for

BURMA AGRICULTURE

RESEARCH AND

DEVELOPMENT PROJECT

(482-0012)

Preparation date: October 18, 1984

Rangoon, Socialist Republic of the Union of Burma

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PROJECT DATA SHEET

COUNTRY/ENTITY: BURMA

SUPPLY/OFFICE: Asia Bureau

FINANCIAL CODE

A - AGRICULTURE
C - COMMERCE
I - INDUSTRY

PROJECT NUMBER: 482-0012

PROJECT TITLE (maximum 40 characters):

Agriculture Research & Development

482

ESTIMATED DATE OF COMPLETION (MM/DD/YY)

10/9/90

START DATE (MM/DD/YY): 8/5

CLASSIFICATION: 2

COMPLETION DATE (MM/DD/YY): 8/8

COSTS (1000 OF EQUIVALENT \$) - K8.5

A. FUNDING SOURCE		B. FX	C. LIC	D. Total	E. FX	LIFE OF PROJECT	
AD Approved Total	(Grant)					Start	End
	(Loan)	2,920	80	3,000	10,700	600	11,300
Grant	1.						
U.S.	2.						
Host Country							
Grant Donor(s)		1,230		1,230			
TOTALS						6,610	6,610

9. SCHEDULE OF AID FUNDING (1000)

A. AGENCY/PRIMARY PRELATION PURPOSE	B. PRIMARY TECH CODE	C. COMPLETION TO DATE		E. AMOUNT APPROVED THIS ACTION		F. LIFE OF PROJECT	
		1. Grant	2. Loan	1. Grant	2. Loan	1. Grant	2. Loan
(1) FN 080	968			3,000		11,300	
(2)							
(3)							
(4)							
TOTALS				3,000		11,300	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

A. Code	B. Amount	C. Code	D. Code	E. Code	F. Code	G. Code	H. Code	I. SECONDARY PURPOSE CODE
210		072	076	020	312			211
		R/AG	TNG	BS	Nutr.	Tech.		
TOTALS				3,320				

15. PROJECT PURPOSE (maximum 480 characters)

To strengthen the capability of the Ministry of Agriculture and Forests, particularly the Agriculture Research Institute (ARI) to plan, organize and carry out production-oriented agriculture research.

14. SCHEDULED EVALUATIONS

Initial: 09/86 | Mid: 09/88 | Final: 01/89

15. SOURCE/ORGAN OF GOODS AND SERVICES

Don Gov Local Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (Number 1 of 8)

17. APPROVED BY

Signature: Charles D. Ward
Title: AID Representative

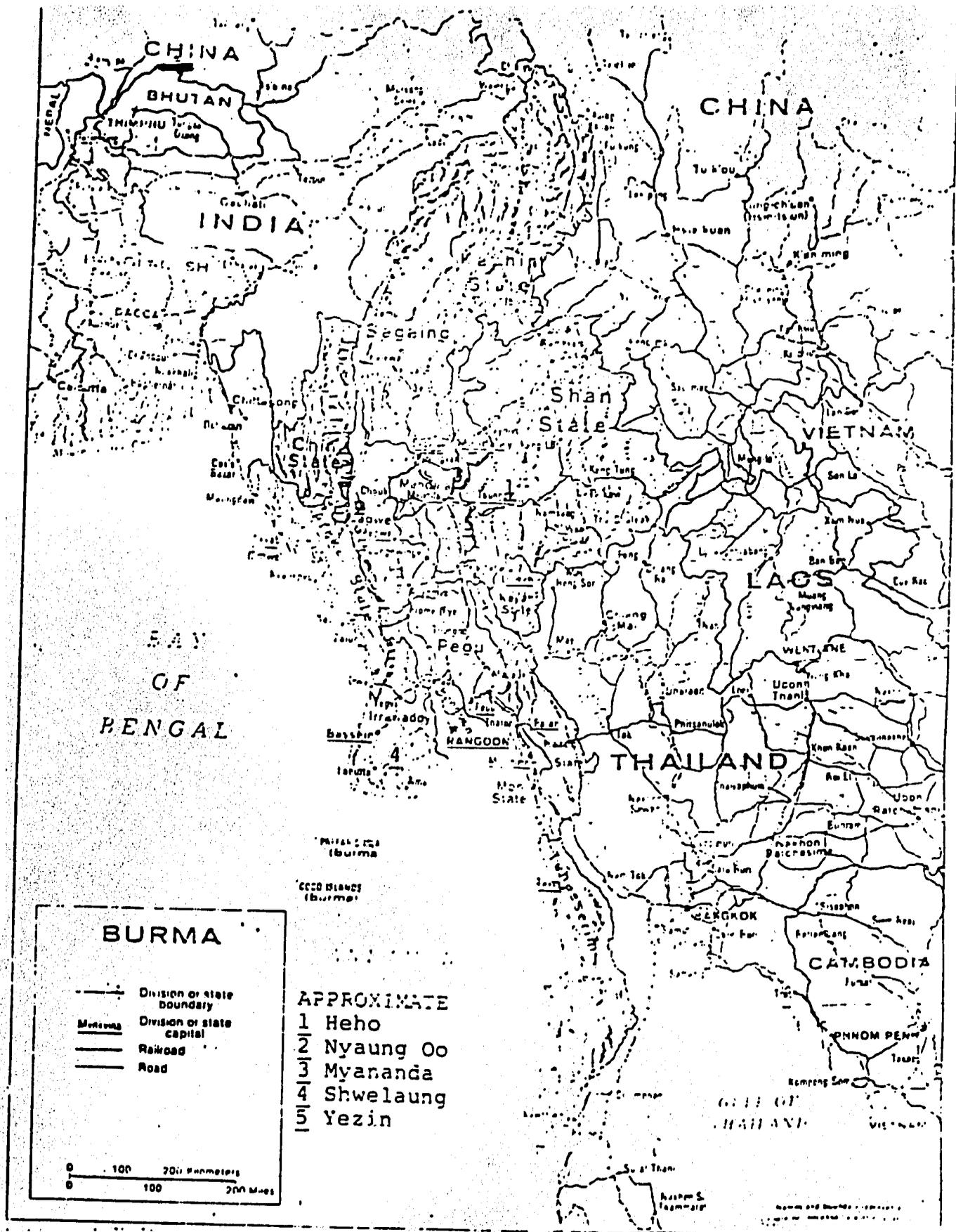
Date Signed: 11/01/84

18. DATE DOCUMENT PREPARED BY AID/W, OR FOR AID/W PREPARED, DATE OF DISTRIBUTION

ABBREVIATIONS AND ACRONYMS

AC	Agriculture Corporation
ACO	Area Contracting Officer
ADB	Asian Development Bank
ADO	Agriculture Development Officer
AID/Burma	Agency for International Development/Burma
AIDREP	AID Representative to Burma
AID/W	Agency for International Development/Washington
APAC	Asia Projects Advisory Committee
ARD	Applied Research Division
ARI	Agricultural Research Institute
BARD	Burma Agriculture Research and Development Project
BSPP	Burma Socialist Program Party
CAUTC	Central Agriculture Development Training Center
CBD	Commerce Business Daily
CGIAR	Consultative Group for International Agricultural Research
CN	Congressional Notification
CY	Calendar Year
FAO	Food and Agriculture Organization
FX	Foreign Exchange
FY	Fiscal Year
IA	Institute of Agriculture, Yezin
IARC	International Agricultural Research Centers
ICRISAT	International Center for Research in Semi-Arid Tropics, India
IEE	Initial Environmental Examination

IFL	<u>Institute of Foreign Languages, Rangoon</u>
IITA	International Institute for Tropical Agriculture
IPM	Integrated Pest Management
IQC	Indefinite Quantity Contract
IRR	Internal Rate of Return
LC	Local Costs
LOP	Life of Project
MAF	Ministry of Agriculture and Forests
PACD	Project Assistance Completion Date
PID	Project Identification Document
PIO/C	Project Implementation Order/Commodities
PIO/P	Project Implementation Order/Participants
PIO/T	Project Implementation Order/Technical Services
PP	Project Paper
ProAg	Project Grant Agreement
PSA	Procurement Services Agent
RCMO	Regional Commodity Management Officer
RFP	Request for Proposal
RFTP	Request for Technical Proposal
RLA	Regional Legal Advisor
SER/CM	AID/Washington Office of Contract Management
SER/COM	AID/Washington Office of Commodity Management
SRUB	Socialist Republic of the Union of Burma
TA	Technical Assistance
TOEFL	Teaching of English as a Foreign Language
UNDP	United Nations Development Program
USDH	United States Direct Hire
UPLB	University of the Philippines, Los Banos



I.0. SUMMARY AND RECOMMENDATIONS

I.1. Recommendations

I.1.1. Funding

This action will initiate a new project for which A.I.D. commitments over life of project will be \$11.3 million of which \$0.6 million is estimated to be spent in local currency. It is recommended that Development Assistance grant funds totalling \$ 3.0 million, of which \$ 0.08 million (\$80 thousand) is estimated to be spent in Burmese Kyat, be authorized for obligation in FY 1985 for the Burma Agriculture Research Development (BARD) project (482-0012).

I.1. 2. Life of Project

The project is planned to incur obligations in FY 1985 and continue through FY 1990. The PACD is set at September 30, 1990.

I.1.3. Geographic Code

The project authorization should specify that, except as A.I.D. may otherwise agree in writing:

I.1.3.1. Goods and services financed by A.I.D. under this project shall have their source and origin in countries included in A.I.D. geographic code 000 or Burma.

I.1.3.2. Ocean shipping financed by A.I.D. under this project should be only on flag vessels of the United States or Burma.

I.1.4. Waiver

It is recommended that a source/origin waiver from A.I.D. geographic code 000 to CODE 935 (selected free world, other than U.S. or Burma) be provided to permit the USAID/Burma to procure the following:

I.1.4.1. \$250,000 for spare parts for existing laboratory and field equipment.

I.1.4.2. \$50,000 for cement

I.1.4.3. \$15,000 for household furnishings

I.1.4.4. \$50,000 for seeds to be purchased from international sources

I.1.4.5. \$7,000 for Burmese Keyboard typewriters available only from Germany

9X

I.2.

Summary Project Description

The Burma Agriculture Research Development Project is designed to assist the Government of Burma's Agricultural Research Institute to increase its emphasis on maize and oilseeds research. The project will also support the development of the Institute, including new sub-stations, undertake staff development through long and short-term training and the provision of technical assistance, and improve the efficiency and capability of the Institute through the provision of field and laboratory equipment and supplies.

The project is designed to cover six years. This time-frame was chosen to assure completion of long-term graduate training, as well as adequate time for construction and facilities development.

The project will finance long-term training for 10 PhD's and 25 MSc's in U.S. Universities. An additional 57 participants will receive short-term specialty training in IARC's or other international centers, and 20 participants will be sent on study tours or will attend international meetings. Technical Assistance will be provided for 102 months long-term and 65 months short-term.

The total life of project budget is estimated at \$17.9 million of which A.I.D. will provide 65 percent (\$11.3 m) and the Government of Burma will provide 35 percent (\$6.6 m).

The project design has taken into account the need for a long-term commitment to agricultural research in Burma. This research will focus on applied research on food crops. Evaluations are planned so as to review progress made in reaching objectives and determine the direction for subsequent support to Burma's agricultural research program.

The project directly supports the present A.I.D. Maize and Oilseeds Production Project (MOPP #482-0005), and will lend support to a project now being planned in edible oil processing and distribution.

I.3.

Summary Findings

This project is considered technically, financially, socially and administratively sound. No major constraints to implementation have emerged during the design. It is believed that the project is ready for implementation.

I.4.

Project Checklists

The project meets all applicable statutory criteria. Checklists are included in the Annexes.

II.0. PROJECT BACKGROUND

II.1. Agriculture Sector: The Socialist Republic of the Union of Burma is a country richly endowed with natural resources. With the largest land area in mainland Southeast Asia (676,588 Kms²) and a current, relatively low population density (52/km²), the potential for national development is considerable. Less than 40% of the total area of arable land is presently under cultivation, only 2,000,000 out of a potential 13,300,000 acres are irrigated, and crop intensity is estimated at 120%. 75% of the total population of 35,300,000, is rural and approximately 64% are employed in agriculture.

In 1972, the Burmese government shifted from its earlier emphasis on industrial development to agriculture, and the current, Four Year Plan (1983-1986) allocates 20% of the national budget for that sector. The top priority has been production increases on existing, cultivated paddy land, with an emphasis on production intensification and double cropping wherever possible. In addition to rice, edible oil is a major ingredient in the Burmese diet, with an estimated per capita consumption level of 2.8 kg/year. In order to increase per capita consumption, eliminate importation of edible oil and increase exports of oil cake and related products, the Burmese government embarked on a program to expand, improve and increase the production and processing of oilseeds.

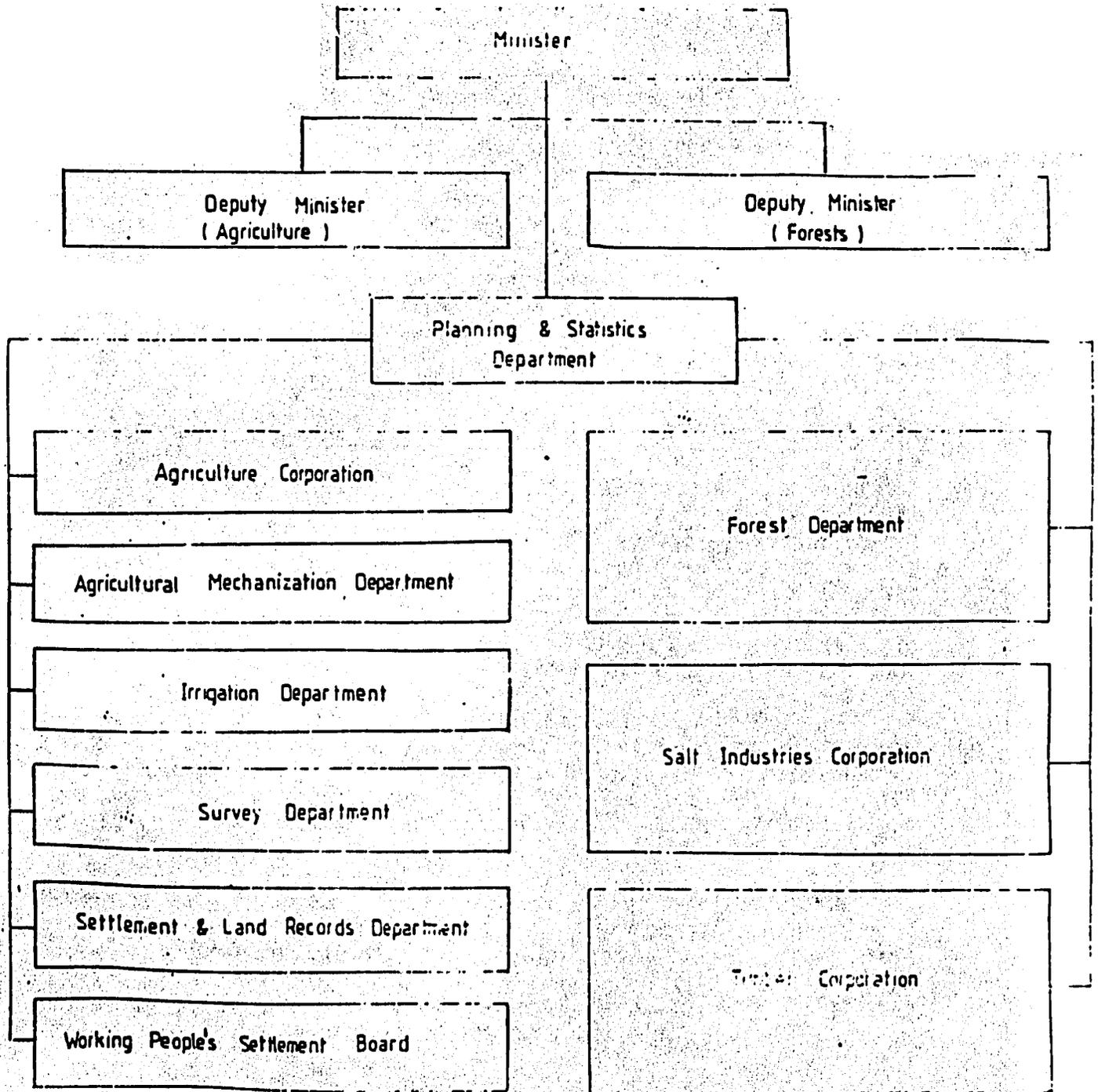
I.2. AID Agricultural Development Assistance Strategy: In 1981, in response to a request for assistance, AID signed an agreement with the Burmese government for the Maize and Oilseeds Production Project (MOPP). The project is being implemented under the Ministry of Agriculture and Forests with the Agriculture Corporation. This is part of a national program to increase maize and oilseed production and was designed to cover 1.2 million acres in 40 townships. AID, through the MOPP, is providing US\$ 30,000,000 including the provision of fertilizer (\$15,000,000) equipment (\$5,000,000), training (\$3,000,000) and technical assistance (\$2,400,000).

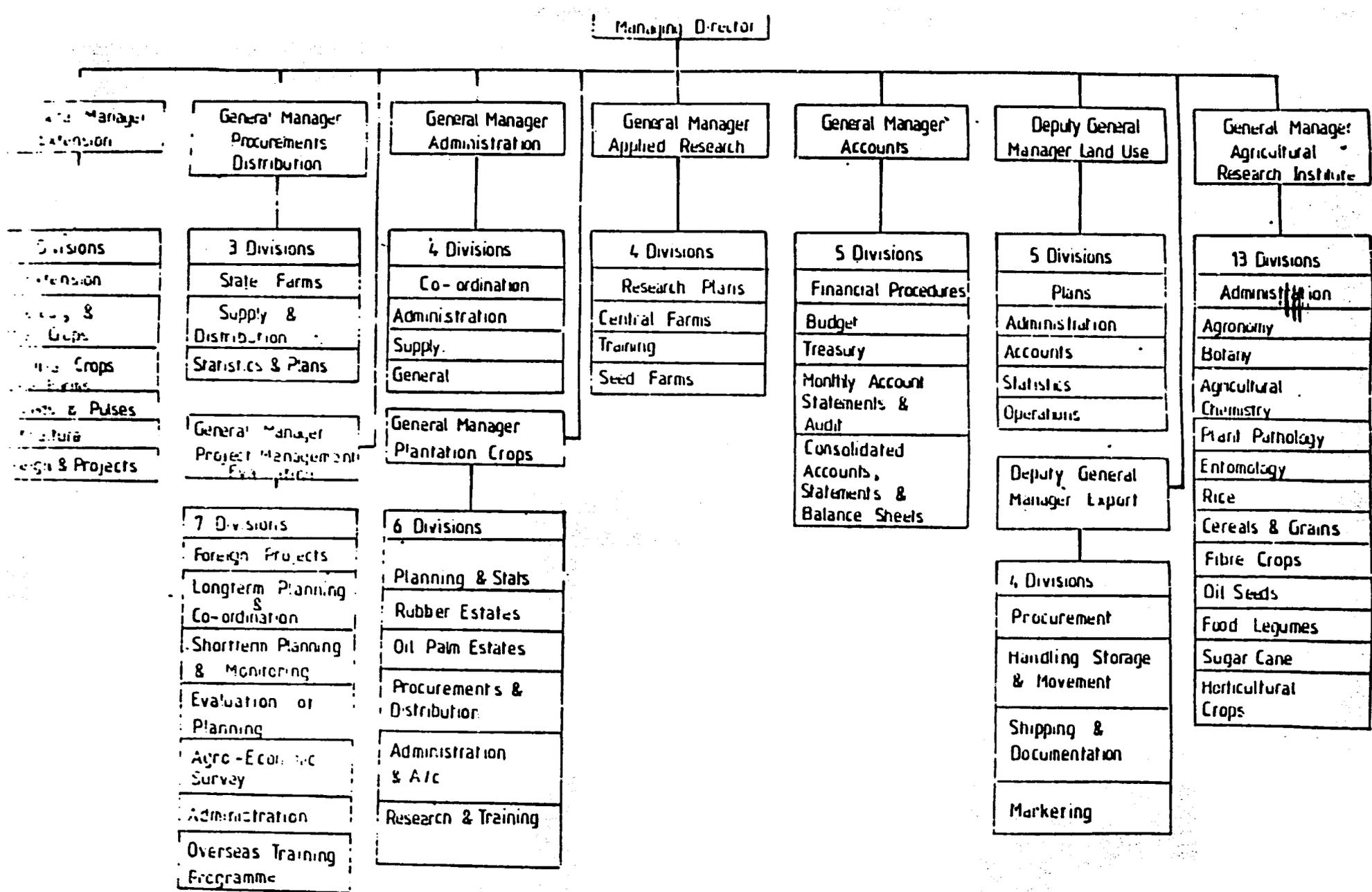
The MOPP funds are now approximately half expended, and the project is scheduled to be completed in 1986. A mid-term evaluation is scheduled for the second quarter of FY 85. Concurrent with that evaluation, the feasibility of a follow-on MOPP II will be assessed. Additionally, an Agricultural Strategy Sector Review will be implemented in early FY 85.

Burma is also placing emphasis on increased and improved processing activities in the oilseeds sector. It is recognized that production alone will not solve the problem of adequate edible oil supply unless existing expellers are improved and new processing facilities added. The Ministry of Cooperatives has been given the mandate for all edible oil processing activities and AID is working

Figure 1

ORGANISATION
OF
THE MINISTRY OF AGRICULTURE & FORESTS





ORGANISATION OF AGRICULTURE CORPORATION

Figure 2

111

with the Cooperative and Cottage Industries Departments under the Ministry in developing a project to upgrade 16 mills throughout Central Burma. The \$10,000,000 project is anticipated to assist in increasing oil processing efficiency of these selected mills by reducing residual oil content from 12-15 percent to 8 percent in oil cake, thereby increasing edible oil in Burma as well as improving the quality and export potential for oilcake by-products.

In December, 1983, in response to an expression of interest by the Burmese government and recommendations from UNDP, FAO and USAID Staff in Rangoon, a study team was despatched from AID/W to assess the current status of agricultural research in Burma. Based upon recommendations emanating from that study, a PID was prepared and approved by the Asia Project Advisory Committee (APAC) on May 9, 1984.

II.3.0. Burma's Agricultural Development Strategy: Burma is composed of seven states and seven divisions, which include 314 townships (27 urban and 287 rural). Agricultural production can be divided into two regions, Upper Burma and Lower Burma. Upper Burma, a flood plain created by the Chindwin and Irrawaddy rivers, include the Divisions of Mandalay, Sagaing and Magwe. South of Mandalay, the flood plain narrows for about two hundred miles before it opens again into a second major flood plain known as Lower Burma. While Upper Burma averages only 30 inches of rainfall annually, Lower Burma normally receives 100 inches per year.

Agricultural policy, including research, is laid down by the Burma Socialist Program Party and Council of State and then translated into strategic plans by the Agriculture Study Group under the chairmanship of the Minister of Agriculture and Forests. The research plans are prepared by the Agricultural Science Research Committee of the Agricultural Science Research Division. On this Committee sit representatives of the Agriculture Corporation, the Universities of Rangoon and Mandalay, and the university level Institutes of Agriculture and Forests.

Overall responsibility for managing and implementing agricultural activities rests with the Ministry of Agriculture and Forests, which consists of seven Departments and three Corporations (Figure 1). The Agriculture Corporation (AC), under its Managing Director, is responsible for all aspects of crop research, development and production. Forestry activities fall under separate departments or corporations.

The organizational structure of the Agriculture Corporation is depicted in Figure 2.

The problem confronted is to upgrade applied agricultural research capability in Burma, especially for maize, oilseeds and other selected crops, which will result in increased agricultural productivity. Crop yields in Burma are low compared to other Asian Countries (Table 1).

Table 1

COMPARATIVE CROP YIELDS IN SELECTED ASIAN COUNTRIES (KG/HA, 1982)

	<u>Maize</u>	<u>Sorghum</u>	<u>Soybean</u>	<u>Groundnut</u>	<u>Sesame</u>
Japan	3000	2500	1459	1818	1000
China	2999	1407	1053	1431	726
Thailand	2156	1000	1000	1200	540
Pakistan	1381	917	842	987	430
Sri Lanka	1292	719	833	933	411
India	1207	575	700	800	213
Burma	1087	467	404	572	200

Source: FAO Production Yearbook, 1981; Production Statistics Ministry of Agriculture and Forests, Burma.

Despite increased agricultural exports in recent years--primarily rice and rice products--which accounted for 57 percent of foreign exchange earnings in the 1981-82 fiscal year, Burma faces substantial trade deficits. Significant increases in foreign exchange earnings and savings are required to finance development in general, and to increase agricultural output for domestic and export markets, in particular.

The poor nutritional status of infants, children and women in the urban areas of Burma has been identified as a growing problem. In Rangoon Division for example, surveys indicate that only 79 percent of the daily recommended caloric intake is being provided to this group. Increased domestic agricultural production is essential to meet the nutritional requirements of growing population.

Burma's rich natural resource base has the potential for contributing to a major part of the overall solution of these problems. Burma's agriculture and forest sector accounts for 45 percent of gross domestic product and employs an estimated 64 percent of the labor force. Of the total land area of 676,588 square km, one-half is under forest and about 27 percent is considered suitable for cultivation. But only 40 percent of this is under cultivation due to limited availability of water. Burma has vast irrigation potential but only 12.5 percent of the area under cropping receives irrigation, one of the lowest ratios in Asia, and only 15 percent of this irrigated area is double cropped. Because of the apparent low population density of 193 people per square km of arable land, there has been little pressure for expansion of cultivation into new land areas.

Rice is the most important crop in Burma's agriculture sector and accounts for approximately 60 percent of total net sown acreage. A variety of subsidiary crops such as maize, oilseeds, pulses and beans are grown in non-irrigated areas. Increased domestic demand for food, coupled with a decreasing amount of new land available for production, has led to more double-cropping of crops after paddy. Yet, cropping intensity stands at a relatively stable (120 percent) level due to a lack of irrigation.

Increasing crop yield is the main objective of agricultural research. To date, rice has received the most attention. As a result, substantial rice production increases have occurred during the past decade. The Burmese Government has demonstrated in the Whole Township High-Yield Paddy Production program that existing agricultural research from institutions like IRRI can be adapted to fit local conditions and result in increased national production and net farm income. The varietal improvement program started in the mid-seventies has led to the release of many high-yielding rice varieties adapted to local conditions, which along with an effective extension service as well as increased use of fertilizers and other inputs, have combined to double total rice production during the 10 year period from 1972-82. The same Whole Township strategy is being followed for other crops such as maize and oilseeds.

Certain agronomic problems, however, are yet to be solved before Burma's crop intensification program can be expanded throughout the country. Adaptive research beyond the scope of existing projects and activities is needed in order to bring about productivity gains similar to those in rice.

The lack of qualified researchers has been identified as the most serious problem at Burma's agricultural research institutions. Funds budgeted for research are reaching a level where further production advances will depend on a large-scale manpower training program. Most of Burma's advanced degree research professionals have been trained abroad, but they are too few in number. Consequently, graduates with B.Sc. degrees are often assigned to design and carry out complicated agricultural research activities. Qualified research professionals are in great demand and therefore they are spread thinly through the system. In addition, management of the human and capital base should be coordinated.

Other needed improvements at Burma's agriculture research institutions include library and laboratory facilities and equipment for seedbed preparation, planting, weed control, harvesting and water management.

II.4.0. Coordination and Cooperation with other Donor Programs

To date, UNDP has been the most active donor in the field of agricultural research in Burma. Its major role has been institution building, with production-oriented projects as secondary activities. The purpose of a UNDP \$1.75 million five year project started in 1974 was to strengthen the ARI in Yezin. The project made considerable progress in upgrading national staff through training and fellowship programs. The training of 16 Burmese researchers abroad represents a major success and reflects the importance that the Burmese government places on training. A second major UNDP project concentrated on crop production and provided \$2.9 million in 1979 to assist in the introduction of new and high yielding varieties of selected crops. A 1983 evaluation concluded that future emphasis should be placed on

training in research and recommended the establishment of a full scale, long-term post-graduate training project in agricultural research.

Another significant project is the joint CIDA/IRRI/Burma Cooperative Rice Research Program. Major aspects are rice based cropping systems, rice varietal improvement, and the introduction of prototype small farm rice production machinery. A closely related venture is the Japanese financed Training Project at the newly established Central Agricultural Development Training Center in Hlegu where an estimated 1,300 Agriculture Corporation Staff will be trained each year in technical subject matter, extension, administration, management, procurement, evaluation, and project development.

West German Aid (GTZ) is considering providing assistance for a Plant Protection Programme which may include an Early Warning Surveillance System and applied research on the use of predators as natural pest control.

II.5.0.

ISSUES:

II.5.1.

Issues Raised in Asia Project Advisory Committee (APAC) Review of Project Identification Document (PID)

FM SECSTATE WASHDC
TO AMEMBASSY RANGOON PRIORITY

UNCLAS SECTION 01 of 02 STATE 169799

June 9, 1984

SUBJECT: Burma Agricultural Research Project (482-0012): Asia Project Advisory Committee (APAC) Review of PID

APAC approved Ag Research PID May 22 with guidance for project paper (PP) design as follows:

Issues:

Institutional Development:

AA/ASIA expressed concern about the current organizational structure of the Agriculture Corporation and the apparent overlapping and/or duplication, in some instances, of the research roles of the ARI and ARD. AA/ASIA requests design team clarify the separation/definition of their roles and responsibilities vis a vis the new project and address any issues or implications of a perceived need for organizational restructuring.

AA/ASIA expressed concern over the implications of AID's support for ARI if there is doubt about their having the primary responsibility for adaptive/applied agricultural research within the Ag Corporation.

The proposed five-year project will not be sufficient to fully institutionalize a Burmese research capability in maize and oilseed production. It will take 12-15 years of AID assistance -- well beyond the present project -- to establish a self-sustaining, quality research institution.

Because of this, APAC recommended that the PP place the current project in this longer-term context and set intermediate project goals and objectives. The evaluation plan should set a conceptual framework for review of those goals and objectives with the Burmese at key stages in institutional development.

Project Purpose:

Project purpose should emphasize the strengthening of agriculture research institutional capacity as a means to increase non-rice food crop production.

Project should seek to enhance linkages between research and extension, and also strengthen the two-way flow of information between farmers and the research establishment via the extension service.

External Aid criteria of Burmese Government

APAC expressed concern that project design quality should not be compromised by Burmese Government's preference that all donor-assisted projects include at least 60 percent commodity assistance.

Technical assistance:

Given that the Burmese Government apparently prefers short-term as opposed to long-term consultants, and is very particular about the qualifications and experience of the T.A. it will accept, PP design should weigh carefully the types of contractual approaches to be provided. To this end, the design team might consider such alternatives as the utilization of short-term consultants (should that be deemed manageable) or a contract with an international research institution.

In light of the agency-wide commitment to comply with Gray Amendment provisions wherever possible, AA/ASIA strongly urges mission to consider minority TA sources. Therefore, a contractual mode such as a joint enterprise approach, possibly involving Title XII institutions (including 1890 universities and again, International Research Institutions) might also be considered.

A description of living and working conditions under which consultants will be required to operate and a delineation of all responsibilities to be borne by the Burmese Government, USAID and the contractor should be included within the RFP and contract.

Concerns:

Research orientation:

AID assistance should focus on adapting available technology to Burma's needs.

Efforts should be made during the design exercise to encourage the Burmese Government and the ARI to request and incorporate management planning and economic analysis as well as biological and physical research within the project scope.

Incentives (salary, bonuses, publicity, participation in international professional exchanges, etc.) for attracting highly qualified personnel to the agricultural research field should be examined.

Environment/Natural Resources Management:

While approving a negative determination as requested in the IEE, APAC recommended that AID-assisted research examine integrated pest management as an alternative to imported pesticides. Research should also consider agro-ecosystems approaches such as those currently being used in Agriculture Research Projects in Indonesia and Thailand, in addition to intensification methods using fertilizers.

FYI. This P.I.D. was the first project document in the Asia Bureau to be reviewed with the new, revised procedure evolved from the Asia Bureau experiment. In this new format, the final APAC consists of the Assistant Administrator/Asia, Deputy Assistant Administrator/Asia and one representative each from Development Planning, Project Development, Technical Resources, General Council, The Desk, Program and Policy Coordination, and Science and Technology. A representative from AID/Burma would also be invited to attend if available.

It was felt that the limited attendance allowed the AA/ASIA to gain a deeper understanding of project issues. Also, it provided incentive for the participants of the preliminary project committee to identify and more fully articulate their concerns and positions for the issues paper.

II.5.2

Response to Issues Raised in the Asia Project Advisory Committee (APAC) Review of the PID

II.5.2.1.

Institutional Development and the Project Purpose: The potential for overlapping of responsibilities has been posed as a problem for maize and oilseed development research. Initially there was the problem of which institution to choose as the counterpart organization. The P.I.D. Team correctly chose ARI on the basis of its facilities at Yezin and its having been given the mandate from the Ministry of Agriculture to conduct the type of research envisioned; i.e. the adaptation of available, and development of new technologies to fit Burmese conditions for maize, oilseeds and other selected crops. It was further deemed desirable to strengthen coordination with ARD and the Extension Division so that new technologies could be tested on farmers' fields, and to ensure that applicable research results are made available for farmer use. This dissemination activity is considerable in Burma when one considers the 4.1 million small farmers and the wide range of farm enterprises involved. It is doubtful that any one or even two organizations could fully accomplish the target tasks. The three organizations have been highly successful in adapting IRRI rice technology to their paddy rice conditions. Maize and oilseed technology will be much more complicated. With IRRI rice, it was primarily a matter of adapting breeding lines, choosing the right varieties, and then using proven cultural practices on these varieties. With maize and oilseeds, not only varieties

but new packages of cultural practices will need to be developed for the four different agro-ecological zones. The development of the basic packages will be one major task and the site specific adaptation and application of this technology to farmers' fields will be another. The final job of training and motivating farmers by the Extension Division will be a third major endeavor.

Discussions on coordination and cooperation between the ARI and Agriculture Institute indicate that cooperative activity mainly exists on an informal basis, although formal relations are improving. Library and laboratory facilities, lectures and publications are exchanged among scientists and students. Negotiations are underway between the Ministries of Education and Agriculture for more formalized relationships that would provide for affiliated status for ARI scientists at the Institute and for ARI staff to take advanced degree course work at the Institute. Shared community facilities also will lead to improved collegial relationships. A committee of scientists and professors from both institutions is active in promoting community betterment in Yezin.

The life of project will be six as opposed to the originally proposed five years. The evaluation arrangements are designed to focus on the development of the research program, facilities and human resources, all within a long-range context.

The Ministry of Agriculture and Forests, the Agriculture Corporation and its Divisions are aware of, and are taking into consideration the recommendations to consolidate their research activities. They are aware of duplications of effort in some cases, which, with their limited resources, is a luxury they cannot afford. However, they are aware of the magnitude of the task involved in maize and oilseed research, its adaptation, application and dissemination. Indications are that ARI will be given more research responsibility and ARD more seed farm and research application responsibility. The design team saw numerous instances of cooperation and shared use of facilities when we visited ARI, ARD and Extension facilities. For this reason neither duplication nor lack of cooperation is seen as a major issue with maize and oilseed research.

The emphasis on training in the initial project is indicative of the institution building nature of the project. \$3 million or 28.0% of foreign exchange cost is designated for long and short-term training. The project includes 102 person months of long-term and 65 person months of short-term TA. The long-term advisors will provide guidance and supervision for the specialized short-term assistance. To provide continuity, it is planned that to the extent possible, the same short-term advisors will be used for the recurrent consultancies.

II.5.2.2. External Aid Criteria of the Burmese Government: At the initial meeting with the Managing Director of the Agriculture Corporation, the design team was advised not to include unnecessary machinery or equipment in the project. The illustrative lists and budgets comprising \$3.5 million or 32.7% of foreign exchange costs, are reasonable, necessary and do not compromise the quality of the project design. The exact items will be determined after an inventory of the Yezin resources and an assessment of required repairs and spare parts is made by the TA team.

II.5.2.3. Technical Assistance

Due to the very broad and complicated nature of the project involving research on four crops in four agro-ecological regions, and based upon previous experience and recommendations from the World Bank, UNDP and FAO, it was determined that open bidding would be the most logical means of contracting. 8A firms and Title XII institutions (including 1890 universities) should be encouraged to propose innovative technical approaches and qualified personnel, either independently or as joint partners in a consortium.

A brief description of the living and working conditions and recommendations concerning the recruitment of personnel is included in this paper and should be expanded in the RFTP and TA contract.

II.5.2.4. Research Orientation

The incorporation of management and economic analysis training has been enthusiastically received by the AC and the ARI. Long-term training for a PhD agricultural economist is planned and the possibility of establishing an agricultural economics division at ARI Yezin was discussed. Short-term training will be provided in computer analysis and research management. Also, courses are planned to be held in-country on research management and small computer use.

II.5.2.5. Environmental/Natural Resources Management

Two areas have been identified as being of environmental concern. These are pest management and soil conservation. Recommendations have been made that a team of U.S. and Burmese experts in each of these fields perform an assessment of these two areas to provide technical and policy guidance in order to minimize potential problems. As these are areas of real concern within the Burmese and international scientific communities, an annex on this subject is included with the project paper. This especially relates to the need for proper land management and soil conservation policies and practices. Integrated Pest Management (IPM) is addressed in depth in the Crop Protection Section of the Technical Analysis.

II.5.3. Other Issues

II.5.3.1. Training

There is a lack of Agriculture Corporation staff who are sufficiently proficient in English to pass the TOEFL test after six months of intensive English training at the Institute of Foreign Languages (IFL). Experience has shown that 30% of the A.C. staff selected for degree training score less than 425, 60% score between 425 to 500 and 10% score 500 and above. Those that score below 425 are not accepted for entry into U.S. institutions. A majority of the candidates with a score of 450 require 9 months of training at IFL to reach the 500 level. For this reason the project has limited the number of start-up degree candidates to 5 PhD and 9 MSc for the second year, 5 PhD and 9 MSc for the third year, and 7 MSc for the fourth year. This is the maximum number of candidates both ARI and AID/Burma believe they can select and train in English per year.

II.5.3.2. Fuel and Electricity

There is a drastic shortage of diesel and gasoline in Burma. These fuels are rationed among the various ministries and within the departments and projects of each ministry. The Agriculture Corporation has given ARI and this project top priority for fuel. In spite of this high priority, the project design team has attempted to keep to a minimum the amount of diesel-powered equipment purchased for the project. It should be added that wherever possible, gasoline engines should be used as opposed to diesel, since that fuel is more available.

None of the proposed research sub-stations now have electricity, but three have 11 KVA lines close by. Transformers will be purchased to electrify each of the three sub-stations and an additional transformer for Yezin to provide for the contract consultant housing and the cold storage units being purchased. The Electric Power Corporation has at least a one year backlog of work which means that the stations will not be electrified until the third year of the project. The project will provide portable generators to compensate for this delay.

II.5.3.3. AID/Burma Staff Requirements

The AID office in Rangoon has at present a six person USDH staff: the AID Representative, a Program Officer, a Health Development Officer, an Executive Assistant to the AID Representative, an Agriculture Development Officer, and an Assistant Agriculture Development Officer. The controller, contracting and procurement services are supplied from USAID/Bangkok. Legal services are currently provided by the RLA in Colombo. AID/Rangoon has requested two additional positions, a Project Development Officer and a combination Management/Financial Officer. The former has been approved and a new staff member is expected by mid-1985.

AID/Rangoon has three projects in the implementation stage and three in the design stage. A list of the projects and the project management officer for each of these is as follows:

<u>PROJECT</u>	<u>AID Project Management Officer</u>
Primary Health Care I & II	Health Development Officer
Edible Oil Processing & Distribution	Project Development Officer
Maize and Oilseeds Production I	Agriculture Development Officer
Maize and Oilseeds Production II	Agriculture Development Officer
Agricultural Research and Development	Agriculture Development Officer

The project design team recommends that the financial position requested by AID/Rangoon be granted by AID/W as soon as possible. The projects, including contracts will be mission-managed and the need for a Controller-trained person to advise on project financial matters is justified.

Level and Schedule of AID Grant Obligations

In order to meet the preferred schedule of expenditures (commitments) in the fiscal years in which funds are needed, AID/ Burma recommends a revised schedule as follows:

(\$ millions)	<u>Total</u>	<u>FY 85</u>	<u>FY 86</u>	<u>FY 87</u>	<u>FY 88</u>
Previously planned	10.0	2.5	2.5	2.5	2.5
Recommended	11.3	3.0	3.0	3.0	2.3

The increase in the level of obligations from the originally planned \$10.0 million to the new, recommended \$11.3 reflects the additional year of the originally planned five year project. The project design team recommends a six year activity in order to accommodate the maximum effort in long-term degree training. Lack of trained scientists is seen as the major research constraint in Burma.

III. 0. DETAILED PROJECT DESCRIPTION

III.1.0. Project Goal: The goal of the Burma Agriculture Research and Development (BARD) Project is to increase agricultural productivity in terms of per acre yields and total national production. This requires more intensive use of existing cultivated land through the development and adaptation of a continuous stream of improved technologies and their adoption by farmers.

III.2.0. Project Purpose: The purpose of the project will be to strengthen the capability of the Agricultural Research Institute (ARI) to plan, organize and carry out production-oriented research in maize, oilseed and other selected crops which will be done at the ARI station in Yezin and at satellite stations which will be developed in the four distinct, agro-climatic zones in which those crops are grown in Burma.

III.3.0. Project Outputs: The Project is designed to increase:
1) the number of successful, production-oriented research experiments and trials; 2) the number of trained research personnel working on maize and oilseeds; 3) the number of active cooperative programs and linkages between the ARI and International Agricultural Research Centers (IARCs); 4) the number of volumes of reference materials at the ARI library at Yezin; 5) the number of physical structures and acres of appropriately engineered research land at Yezin and the satellite stations; and 6) the number of improved maize and oilseed varieties.

Also, the project will improve the capacity of the field stations and laboratories to conduct field trials and laboratory analysis, which in turn will result in the identification of specific agronomic practices suitable for each of the four different agro-climatic zones in which these crops are grown.

III.4.0. Project Inputs: The project will provide 102 person-months of long-term and 65 person-months of short-term technical assistance to the ARI in order to: 1) increase its capacity to develop and manage a national, production-oriented research program; 2) develop in-service training programs through which the technical capacity of research staff can be improved; 3) assist in the planning and improvement of the lands on which research trials will be carried out in Yezin and at the four satellite stations; 4) assist in the selection and provide training in the utilization and maintenance of facilities, equipment and machinery for laboratories and field stations; and 5) assist in the selection of appropriate degree and non-degree study programs in the U.S. and at IARCs, and in the preparation of participants for those programs.

AID will also provide funds for the physical up-grading, including materials, spare parts, equipment and machinery for laboratories, field research facilities and the ARI library. Long and short-term training, study tours and attendance at regional and international conferences will also be funded under the project.

III.5.0.

Project Narrative:

The major thrust of the project will be to strengthen the capability of the ARI in Burma to plan, organize and carry out production-oriented research in the fields of maize and oilseed production. For the most part, the staff and main activities of the project will be centered at Yezin, the national agriculture research institute of Burma. Additionally, efforts will be made to strengthen the agriculture research capabilities by the establishment of satellite field stations in four different agro-climatic zones. A qualified U.S. private firm, university, or an international agricultural research institution will be contracted to provide research professionals and to assist ARI to (1) increase its capacity to plan, develop and coordinate a national production-oriented research program (2) to develop an in-service training program to improve the professional capacity of the research staff; (3) provide special assistance in the development of research facilities at Yezin and the four satellite stations, and (4) provide research expertise in the execution of field and laboratory investigations. The major elements of the assistance to be provided are as follows:

III.5.1.

Long-Term Assistance in Research Development

The project will provide under contract a long-term (48 months) senior scientist to work with the research and training programs of the research staff in ARI. He will provide assistance in the evaluation of needs, research programming, and in the adaptation of modern techniques of research in the fields of maize and oilseeds production. The scientist, a PhD, will have had at least 5 years overseas experience in production research. He will serve as Team Leader.

III.5.2.

Long-Term Technical Assistance in Station Development

As soon as possible after project start-up, a station development specialist will be placed at Yezin for a 54 month period. He will plan, coordinate and supervise the activities of the short-term specialists in farm machinery, drainage, irrigation, and land leveling. The physical environment in which the research will be conducted at the Yezin station and the four satellite stations will be upgraded.

III.5.3.

Short-Term Technical Assistance

The project will provide a total of 65 man-months in selected areas as follows:

<u>Discipline</u>	<u>Person Months</u>
Station Development (irrigation, drainage, machineries, leveling)	24
Library Science	3
Maize and Oilseeds Research	16
Pest Management	14
Other	8

The short-term specialists will be contracted on a long-term basis but will serve in Burma one to three months a year. Short term contracts of this nature will make it possible to obtain the services of outstanding scientists over a long period and will lend continuity to the research development program. A major effort will be made to obtain staff from the International Agricultural Research Centers (IARC's) thereby strengthening the direct linkages with these centers which have much to offer Burma in the way of new material and research techniques.

Professionals financed under this program will work with Burmese scientists and staff in ARI in giving the following assistance:

- (1) Provide new technology in maize and oilseed crop production research.
- (2) Provide in-service training in their field of specialty.
- (3) Assist Burmese scientists in planning and conducting crop research.
- (4) Assist Burmese scientists in obtaining new and improved crop varieties and breeding materials.
- (5) Assist in preparation of specifications for equipment and commodities to be utilized in research programs.
- (6) Provide assistance in their specialities throughout the country, as requested by ARI or the Agriculture Corporation.
- (7) Assist in the preparation of candidates for advanced training in U.S. or other countries.
- (8) Assist in long-range planning for crop production research in their specialities.

III.5.4. Training

In order to develop within ARI the necessary level of research expertise in the maize and oilseeds sector the following training will be financed under the project:

- (1) Masters of Science training in the U.S. or other countries of (25) researchers
- (2) PhD level training in the U.S. of (10) researchers
- (3) Training of (67) technician researchers in other countries through short courses and seminars in selected research subjects.

It is anticipated that many of the short courses and seminars attended by the participants will be at the IARCs IRRI, IITA, CIMMYT and ICRISAT. The TA contract will also include provision for an English language specialist, familiar and experienced in teaching English as a foreign language.

III.5.5. Development of Satellite Research Stations:

Experience has shown that crop plants as living organisms are affected by their total environment. Within Burma there are many environmental differences in soil and climate conditions, in cropping systems and the distribution of pests and pathogens. Optimum results in crop production can be obtained only by using materials and methods that are specifically adapted to their environment. Therefore, there is a need for strengthening the facilities and capabilities of ARI for conducting research outside Yezin.

The project will assist in the development of crop production and cropping systems research capabilities for maize and oilseed crops in four (4) main agro-climatic zones:

<u>Zones</u>	<u>Average Annual Rainfall</u>	<u>Satellite Station</u>
Deltaic	1000-2000 mm	Shwelaung
Semi-arid, rainfed	250-500 mm	Nyaung Oo
Semi-arid, irrigated	250-500 mm	Myananda
Upland, rainfed	500-1000 mm	Aung Ban

These satellite research stations have been selected to carry out crop production research on maize and oilseed crops during the appropriate seasons. Research staff from Yezin will conduct field trials at these stations to determine the suitability of plant materials and innovative technologies under the different soil and weather conditions. A detailed description of each of these stations, facilities to be constructed, and priority research can be found in the technical analysis.

III.5.6. Development of Library

The availability of new, up-to-date reference books and professional journals is essential to all scientists conducting research. It not only furnishes them with up-to-date knowledge in their field of speciality, but often saves much time and labor in avoiding the repetition of work already completed.

An allocation of \$500,000 will be used for books, journals, equipment and materials needed to update the library already established in Yezin. Technical assistance will be supplied through a short-term consultant. Library science training will be offered to the staff of the library.

IV.0. PROJECT ANALYSIS

IV.1.0. Technical Analysis

IV.1.1. Research Capability Analysis

The Agricultural Research Institute (ARI) of the Agriculture Corporation (AC) has the mandate to plan, coordinate and implement agricultural research for the Ministry of Agriculture and Forests. In the past both the ARI and the Applied Research Division (ARD) of the AC have conducted regional verification and adaptation trials on ARD and Extension Division stations. ARI has recently acquired 13 regional stations (4 of which will be supported by this project) in addition to their main station at Yezin.

With regard to the BARD project, the ARI research program in oilseeds and maize will include selection and manipulation of native and exotic lines of maize, groundnuts, sesame and sunflowers. Selection criteria will include: yield potential, early maturation within specific rotations, drought tolerances, and disease resistance. Adaptive research is planned on such cultural practices as seedbed preparation, fertilizer trials, seed rate and spacing, and pest and weed control.

The research land area at Yezin requires major irrigation and drainage development, and these improvements will be provided early in the project. Adequate laboratory and office space exist at Yezin but not at the substations. ARI will construct additional screen houses for pest management research, crop drying facilities, housing at Yezin and other required buildings on the substations.

Research laboratories are fairly well equipped. However, much of the equipment is inoperable due to a need for spare parts and/or repair. The project will provide funds and technical assistance to repair the equipment, train the staff in the proper use and maintenance of the equipment and advise on additional parts, equipment and material requirements.

There is an abundance of field equipment at Yezin, much of it idle, again due to a lack of spare parts, or adequate tractor power and traction. The project will address this problem by providing funds for spare parts and technical assistance to effect the repairs. Additional farm equipment will be purchased, but in most cases, only after an inventory of existing equipment has been made by the TA team.

Another major constraint to increasing agricultural productivity is the lack of trained, senior researchers and scientists. Therefore, the project provides long-term, advanced

degree study in U.S. universities and research centers. In addition, short-term courses, study tours and participation in regional and international conferences is included in the design.

IV.1.2. Field Station Development

Burma has wide variations in soils and climatic conditions, cultural cropping systems and incidence of pests and pathogens. Under this project, research trials and experiments in crop production will be expanded to ensure a steady flow of improved crop varieties and recommendations of improved cultivation techniques to farmers. To facilitate this planned expansion, the project will upgrade research facilities at ARI/Yezin and assist in the establishment or upgrading of four satellite research stations representing the major agro-environments in which maize and oilseeds are being grown. The Project Design Team visited a number of potential sites proposed for consideration by ARI, and has recommended that site development assistance be provided to the following satellite research stations:

<u>Representative Agro-Environment</u>	<u>Satellite Station</u>
Deltaic	Shwelaung
Semi-arid, rainfed	Nyaung Oo
Semi-arid, irrigated	Myananda
Upland, rainfed	Aung Ban

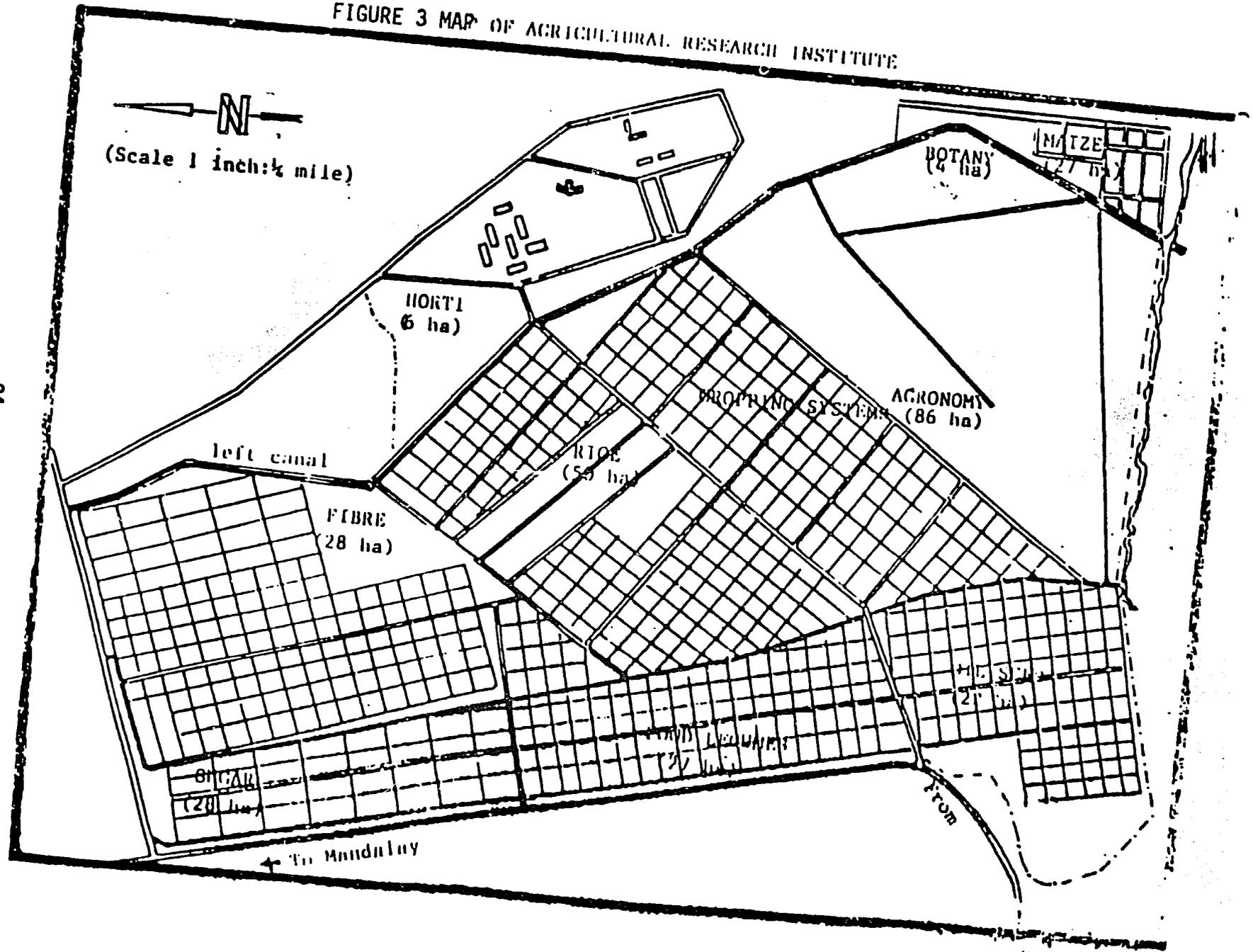
The following section describes the Yezin and satellite stations' conditions, outlines the proposed physical development plans, and identifies relevant station management issues to be addressed during project implementation.

IV.1.2.1. Agricultural Research Institute, Yezin

IV.1.2.1.1. The Site

The farm includes 911 acres of which 690 acres are cropped, and about 200 acres improved, i.e. laid out and planted to crops of the area. The farm lies on the broad, flat, alluvial plain starting 1.25 miles from the Yezin Dam. A layout of the farm is shown in Figure 3 and Annex Map No. 4.

FIGURE 3 MAP OF AGRICULTURAL RESEARCH INSTITUTE



the Yezin and satellite stations will be upgraded so that excess water can be removed in the monsoon season and irrigation distribution increased during the dry season. At the same time consultants knowledgeable in the operation and maintenance of land leveling and tillage equipment will assist ARI in leveling the research field area in order to improve irrigation, and to train ARI staff in the proper setting and operation of tillage equipment.

ARI has been provided laboratory equipment by past UNDP/FAO projects, MOPP, and other donors. Much of this equipment is not being fully utilized due to lack of training and/or missing parts and accessories. The project will provide two person-months of consultant services each year during the first three years of the project to assist ARI/Yezin to:

- Prepare an inventory of laboratory equipment at Yezin and a list of necessary parts and accessories;
- Assess the illustrative list of laboratory equipment to be purchased under the project, correct for duplication or omissions and prepare the PIO/C;
- Make the required repairs;
- Develop an inventory control system; and
- Train staff at Yezin in the proper maintenance and operation of laboratory equipment.

A library science consultant will be provided for two man months, as early on in the project as possible, to do an inventory assessment and then prepare a purchase order for books, journals and related materials to update the ARI library at Yezin. Upon delivery of the materials the consultant will return for one month to catalog the purchased books and to provide library science training.

IV.1.4.2.2.

Crop Science and Related Disciplines

The project will provide for Agronomic/Plant Breeding Specialists for each of the four major crops (maize, sesame, sunflower and groundnut) to be present for one month a year for four years. These experts will assist counterpart ARI staff to plan field trials relating to soil preparation, farming systems, plant spacing, fertilizer requirements, pest control, water management and varietal improvement. They will also assist in the introduction of exotic and hybrid varieties, and for regional adaption and yield trials.

Weed infestation and rodent damage are the two major constraints to increased crop production in Burma, especially on irrigated land during the monsoon. The project will provide 14 person-months of consultancy services to address weed and rodent, as well as insect and disease problems.

The project also provides eight person-months of technical assistance in soil science, draft animal power, and research design. The soils expert will assist in soil classification at the sub stations and will advise the crop improvement staff in designing fertilizer response trials. Due to long range projections of continued fuel shortage in Burma, the project will include research on improved draft animal efficiency and especially weed cultivation, possibly with assistance from ICRISAT.

IV.2.0. Training Analysis

IV.2.1. Strategy

Both degree and short-term training are among the most highly desired and needed elements of development in Burma. More technological exchange on the international level is needed in order to conduct necessary development research. This increased exchange will require that a number of people be released from key positions in research institutions to take advanced degrees. This needed increase in trained staff is being addressed by projects of AID and other international donors through various scholarship programs. Therefore, additional overseas training directed at agricultural research is needed and BARD addresses this training issue to the fullest extent possible. The team, in consultation with Agriculture Corporation (AC) staff, determined that a maximum of 10 PhD, 25 MS, 51 short-term, and 20 study tour participants could realistically be recruited, be released from their duties, and meet the language requirement during the life of project. (See Training Plan).

IV.2.1.1. Long-Term Training: The AC prefers that their participants be proven employees before sending them for foreign training. Also, the positions to which participant graduates will be assigned require previous administrative and technical experience, usually for three years with the AC. Consequently, new employees of the AC who otherwise would be available are not considered eligible. Also, staff who have had foreign training are not eligible for further overseas training until they have served at least three years with the AC after such training.

The proposed subject matter areas were chosen both for their applicability to maize and oilseed research and to meet requirements in the basic discipline areas. Upon completion of their time with BARD, the scientists may be transferred to other crop or basic research in their field and be equally productive in new areas.

IV.2.1.2. Short-Term Training: The short-term training positions also meet the needs of higher level staff for upgrading in their professional specialties. These officials have the requisite background experience and theory, and with an opportunity to interact with international colleagues, they will remain technically current in their fields of specialization. Since they are primarily in supervisory positions, they will be able to pass on what they gain from their experiences to their respective staff members through in-service training activities.

IV.2.1.3. Study Tours and Professional Meetings: The study tours and professional meetings will offer opportunities for Burma's top agricultural researchers and scientists to associate and exchange ideas with their international counterparts. Again, as

~~with~~ the short-term training, these exposures will allow the ~~scientists~~ to stay abreast of their scientific fields.

IV.2.1.4.

English Language Proficiency: A significant number of long and short-term training candidates, who are otherwise technically proficient will lack adequate English language skills. This problem has been recognized by government policy makers and is being addressed by expanding the Institute of Foreign Languages (IFL), and having English taught at all levels of the school system, particularly at the university level. However, at the present time, English language teaching facilities are inadequate to meet current and projected demand. Therefore, enrichment training will be provided for all candidates who score below the required ALIGU level through the Technical Assistance component. This training will utilize the teaching method known as "Teaching of English as a Foreign Language" (TOEFL).

The TOEFL program will be implemented in two stages. The first stage will consist of program design and the identification of training materials and aids. The second stage will be the actual training. Both activities could best be accomplished by the Technical Assistance contractor, utilizing resident TOEFL specialists who will be selected on a competitive basis.

IV.2.2.

Training Plan

IV.2.2.1.

English Language In-Country Training: The AC will identify candidates for screening and English language testing as early as possible after project obligation. A list of initial candidates that will require English language enrichment training will be ready and candidates available by the time the TOEFL program is designed and ready for implementation.

IV.2.2.2.

Long-Term Training: The AID Office will work with the Agriculture Corporation immediately after authorization to identify as many of the thirty-five long-term training candidates as possible. Every effort will be made to admit those candidates identified and judged to have the required English language proficiency to appropriate U.S. institutions as early as possible. It is anticipated that fifteen scholars will enter advanced degree courses in 1986, thirteen in 1987 and seven in 1988. All long-term candidates should be in training not later than the fall semester of 1988. The AID Office will prepare PIO/Ps (Project Implementation Order/Participants) to cover all long-term training. It is proposed that long-term participant training be provided through the S&T/IT contract with Partners for International Training. This arrangement is based upon the previous record of success of this institution in dealing with Burmese scholars and their proven capability to: (a) select institutions and courses of study which are appropriate for participants; (b) provide relevant and effective orientation to the U.S. and especially student life in America; (c) regularly

monitor the academic progress and well-being of the participants; and (d) provide timely assistance and support during the participants' period of study.

The following information relates to PhD and Master degree training. A list of fields of training for Ph.D. and M.Sc. is located in the Financial Plan Section.

IV.2.2.2.1.

PhD

- (a) Duration - 3.5 years/student
- (b) Location - U.S.A.
- (c) Cost per student - \$25,000/Yr x 3.5 Yrs = \$87,500
- (d) Timing - Six students will begin their training the second year of the project and complete their degree in the 5th year. Four students will not begin until the third year of the project and complete the requirements for their degrees in the sixth year.

IV.2.2.2.2.

MASTERS

- (a) Duration - 2.5 years/student
- (b) Location - U.S.A.
- (c) Cost per student = \$25,000/Yr x 2.5 yrs = \$62,500
- (d) Timing - Nine students will begin training the second year, nine the third year, and seven the fourth year.

IV.2.2.3.

Short-Term Out-of-Country Training

Approximately 51 candidates from the ARI will be selected for short-term training and 20 for observation tours. Short-term training will involve periods varying from 1 to 6 months per person, and include academic courses, seminars conducted by institutions other than universities, on-the-job training, and familiarization tours. The training courses will be selected to meet the particular requirements of the candidate and the training objective.

The same procedures for the identification and screening of candidates for long-term training described earlier will apply to short-term training. The AID Office will be responsible for processing short-term training. The technical assistance team will assist by identifying suitable courses and other training possibilities to meet the training goals. Short-term training is proposed as follows:

IV.2.2.3.1.

Training at International Centers.

IV.2.2.3.1.1.

Number of participants - The project proposes to enroll 38 participants for training at International Agriculture Research Centers (IARCS), 10 at the University of the Philippines/Los Banos (UPLB), and 3 for sesame production training in Israel. The duration of training will vary from 2 months to 6 months.

IV.2.2.3.1.2.

Fields of Study - Maize breeding/agronomy and station development training will be conducted at CIMMYT, cropping systems and integrated pest management training will be conducted at IRRI, and research training on animal drawn implements and groundnut production training will be conducted at ICRISAT. Six participants will receive rodent control training at the National Crop Production Center at UPLB in the Philippines and four will be trained in library science and information retrieval at UPLB.

IV.2.2.3.2.

Study Tours and Society Meetings

Ten AC participants will be selected for study tours and 10 for professional society meetings during the life of the project.

IV.2.2.3.3.

Administration Arrangements

The Mission project manager will be responsible, with the AC, for the selection of short-term participants and to arrange for their training. PIO/P's will be used.

IV.2.2.3.4.

Cost

IRRI

8 participants for 6 months each - 48mm	
International Travel (\$1000/participant)	8,000
Training cost (\$2000/participant/month)	<u>96,000</u>
	<u>\$104,000</u>

CIMMYT

10 participants for 6 Mo each - 60 mm	
10 participants for 2 Mo each - 20 mm	
International Travel (\$3000/participant)	60,000
Training cost (\$2000/participant/month)	<u>160,000</u>
Participants Total	<u>\$220,000</u>

ICRISAT

2 participants for 4 Mo each - 8 mm	
8 participants for 6 Mo each - 48 mm	
International Travel (\$800/student)	8,000
Training cost (\$2,000/participant/month)	<u>112,000</u>
	<u>\$120,000</u>

IV.1.2.1.2. Additional Farm Research Area

The farm has acquired 500 acres of partially forested uplands, adjacent to the southeast border of the farm, shown on Appendix Map No. 2. The area is bordered on one side by the main highway to Pin Laung, thus providing good access. The area has rolling hills with numerous gullies and sparse forest cover. Some areas have been cleared and cultivated by local farmers. Upland crop research could be conducted in the level portions of this area. A land classification and soil survey will be needed to delineate the areas where upland crop research could be conducted.

IV.1.2.1.3. Soils

There are seven types of soils on the station. The soils range from alluvia to clay loams with subsoils composed of coarse sand which provides sub-surface drainage and reduces water logging of the surface clays. According to an FAO classification, the soils map of the farm shown in Appendix Map No. 3 uses the following mapping units that reflect the origin of the soil and effect of the soil forming factors:

- GBM -- Gray Broina Soil (on silty subsoil)
- MG -- Meadow Gley Soil (water affected -- reduced condition)
- MSLG -- Meadow Slightly Gleyed Soil (slightly water affected)
- MA -- Meadow Alluvia Soil (normal profile)
- MAS -- Meadow Alluvia Soil (on coarse sand)
- GBF -- Gray Brown Forest Soil (on sloping land form)
- GART -- Gray Artificial Soil (disturbed land)

IV.1.2.1.4. Climate

Yezin is in the transition area between the wet zone of Southern Burma and the dry zone of Mandalay and Pakokku. Annual rainfall averages from 40 to 60 inches occurring mainly in the months of June through September, with an average of 80 rainy days a year.

March and April are months of evaporative demand deficit. May through September are months of water surplus, with deficits in mid-June and late September.

IV.1.2.1.5. Surface Water

The surface water resources of the farm are primarily from Yezin Creek, stored behind the Yezin Dam. Extreme fluctuations in annual stream flows and a study of alternative water sources prompted the construction of

additional tube wells. Ten tube wells have been constructed, four for station use and six for irrigation. Location of these wells are shown in Appendix Maps No. 5 and 6. Two irrigation wells yield 383 and 450 g.p.m. at a depth of 320 and 180 feet respectively. Pumps for two irrigation wells have not been installed. Electricity is available at the sites. Additional tube wells, if required, could be constructed to augment the irrigation water supply.

IV.1.2.1.6. Drainage

The drainage design includes two components. The first component is the disposal of surface drainage as runoff originating outside of the farm. For proper drainage, the runoff must be routed in canals that either 1) pass through the farm, or 2) along the east hillside edge of the farm. In the first alternative, runoff would be diverted through an outlet canal outside of the farm extending to the west about one mile to a drain canal along the old Yezin Creek bed. The second alternative involves the construction of an interceptor canal along the east hillside edge of the farm which would divert the flow into Naraban Creek south of the farm.

Without either outlet, runoff is trapped above the lower farm boundary and inundation of the fields below the 93 meter contour interval is occurring.

The second component is the provision of canals of sufficient capacity to drain the excess water accumulated during the monsoon period on the lower lying lands of the farm.

IV.1.2.1.7. Interceptor Canal

The area to the east of the farm may be delineated into seven watersheds shown on Appendix Map No. 2. Watershed No. seven is divided into five sub-watersheds.

Estimated flood flow amounts are listed in Table 1. These estimates are based on a very short period of rainfall records and a high degree of error in these values may exist. The cumulative flows along the interceptor are shown in Col. 2 of Table 1, and cost estimates are calculated in Table 2.

The following data will be required in order to determine the feasibility of the interceptor canal and to refine its design:

1. Recording rain gauge data from the nearest weather station to Yezin to determine the design storm magnitudes for various storm durations equal to the time of concentration in the water sheds;

2. Recalculations of design discharge capacity for the interceptor canal for runoff from the watersheds; and

3. A semi-detailed topographic map along the alignment of the proposed interceptor canal to determine the feasibility of this canal and to design the required check and drop structures and outlet into the Naraban Creek.

The project will provide the services of a surface water civil engineer for two months to carry out the field work and complete a preliminary design. The engineer should have had prior experience in the tropics with the design of canal check and drop structures. It is assumed that the engineer will be provided all support facilities including field survey personnel, equipment and other engineering facilities by ARI.

Table 2

Interceptor Channel Characteristics

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Location Watershed area	Cumulative Flow (ft ³ /sec)	W (ft)	D (ft)	Water extension (ft ²)	H (ft)	Excavated Area (ft ²)	Excavation (Yd ³)	Labor 5K/day (Ks)	Structures (Ks)	Total Cost (Ks)
Interceptor 7a thru 7c	27	10	3	39	5.0	75	16,202	81,011	81,011	162,025
Interceptor 7a thru 6	44.1	11	3.5	47	5.5	91	23,807	119,033	119,033	238,067
Interceptor 7a thru 5	82.8	14	5.0	95	7.0	147	52,184	260,871	260,871	521,741
Interceptor 7a thru 4	111.1	16	5.5	118	7.5	176	95,194	475,973	475,973	951,945

Table 2

INTERCEPTOR DRAINAGE COSTS

	Cost			
	Excavation	Labor	Structures	Total
	Yd ³	5K/day**	K	K
Interceptor 7a thru 7c *	16,202	81,011	81,011	162,075
OR				
7a thru 6	23,807	119,033	119,033	238,067
OR				
7a thru 5	52,174	260,871	260,871	521,741
OR				
7a thru 4	95,194	475,973	475,973	951,945

* Maize and Cereals Area

** assumes hand labor will ave 1 yd³ per day

IV.1.2.1.8. Water Management

A major objective of irrigation development at Yezin is an integrated system, whereby well water can be pumped into the left main canal and two right minor canals for gravity delivery to those portions of the farm commanded by the gravity canal system.

The maize and small grains division plots off the left main canal will be sprinkler irrigated by pumping from the holding tanks at the top of the division land.

Shallow surface wells will be constructed at locations where high ground water will permit the use of portable surface centrifugal pumps and at locations along drains, where check structures are operated as dry season water sources.

Additional tube wells will be constructed, if necessary to maintain a more uniform water delivery to the experimental plots. The primary area for well drilling will be the lowland areas adjacent to the main drain, where the underground aquifer has good groundwater bearing potential.

IV.1.2.1.9. Electrification

Due to the cost and time required, electrification development will be done incrementally. An 11 KVA power line has been constructed along road R 4 as shown on Appendix Map No. 5. Electrification will be provided to those areas served by electric irrigation pumps.

IV.1.2.1.10. Research Priorities

The preponderance of research scientists, laboratory facilities, field equipment, and support staff and housing reside at the Yezin station. The ARI substations have been recently established and will be developed and staffed during the life of this project. Consequently, all research, other than yield trials and fertilizer trials to verify adaptation of crops to rotations in the various agroclimatic zones, will be conducted at Yezin. Most of the research conducted at the substations will be coordinated and supervised by Yezin staff, at least until the end of the project.

The research priorities for maize and the oilseed crops will be:

- Varietal and quality improvement, including the coordination of all exotic germplasm introductions;
- Cropping systems research to develop rotations that fit the various agroclimatic zones;
- Agronomy trials, including fertilizer response trials, weed control, spacing and data of planting trials;
- Integrated pest management, including rat control research;
- Post harvest storage and processing research; and,
- On-farm water management and conservation.

IV.1.2.2. Aung Ban Satellite Research Station, representing upland rainfed conditions

IV.1.2.2.1. The Site

This farm, recently established by the ARI, lies about 14 miles south of Heho in Shan State and about two miles from Aung Ban Village, adjacent to the Heho-Aung Ban highway. It is representative of the upland rain-fed agro-environment, and includes a total of 107 acres of moderate to steeply rolling hills. (See Figure 4.) ARI has established a 10 acre experimental area which is planted to rotational crops. (See Figure 5.) The farm will conduct research under rain-fed conditions and irrigation is planned for germplasm maintenance only.

IV.1.2.2.2. Soils

Ferralsols and Acrisols characterize most of the upland soils, 500 to 1500 meters elevation in the Aung Ban area. The Acrisols of the Shan plateau are acid, medium textured and unless eroded have fair productivity potential. They have low CEC and base saturation with 1:1 lattice clays and very low available phosphate.

IV.1.2.2.3. Climate

The monthly maximum and minimum temperatures for 1979, 80, 81, and 82 for Heho are shown in Table 3. Due to its higher elevation, temperatures in Aung Ban will be slightly lower than those shown for Heho.

The monthly rainfall for Aung Ban from 1981 through August 1984 are shown in Table 4. The annual rainfall varies, for this period from 29.2 to 44.0 inches. There are generally two peaks in May/June and again in September/October, with a dip in the rainfall in July/August.

FIGURE 4 AUNGBAN AGRICULTURE RESEARCH FARM
KALAW TOWNSHIP
SHAN STATE
ELEVATION 4,319 FT

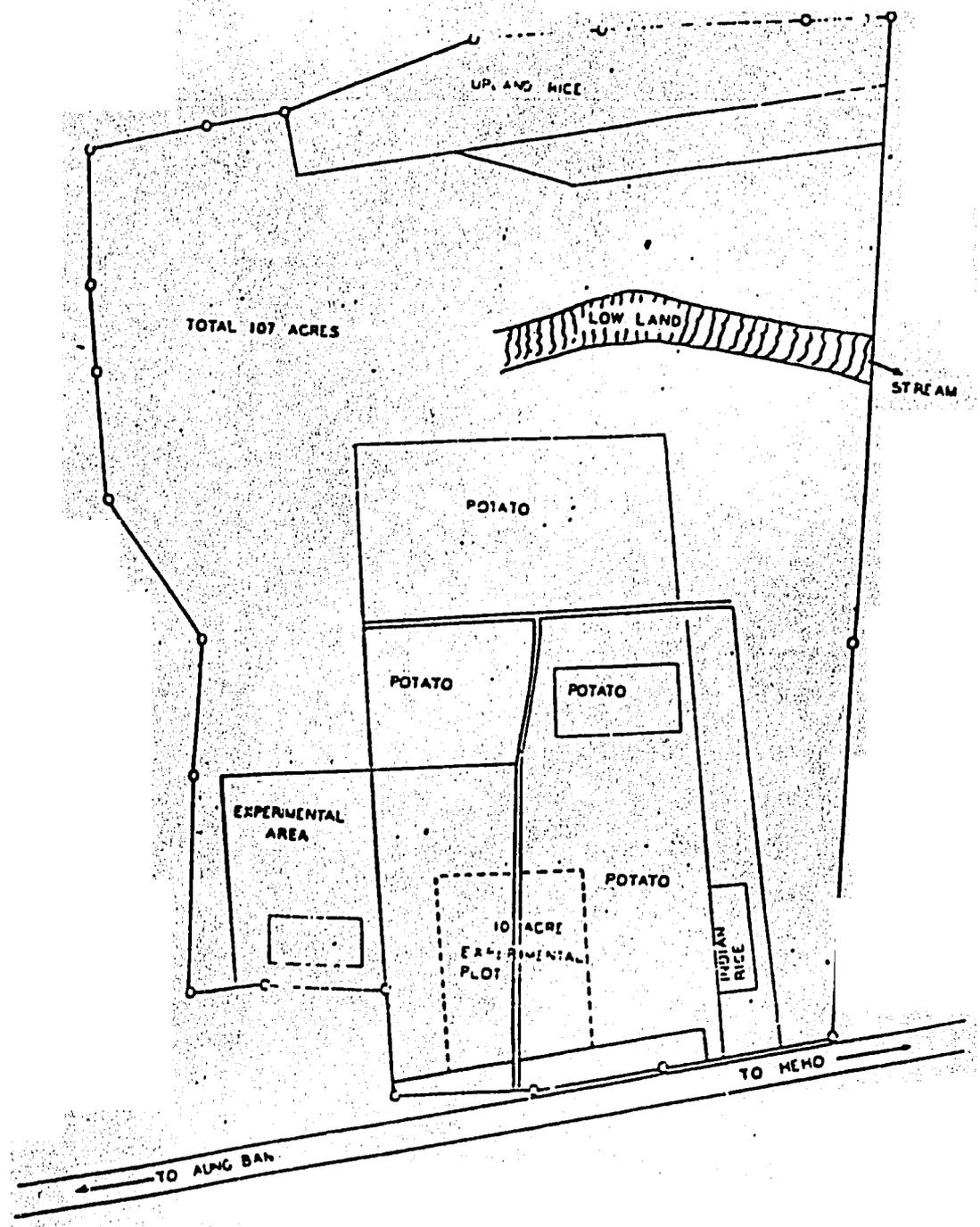
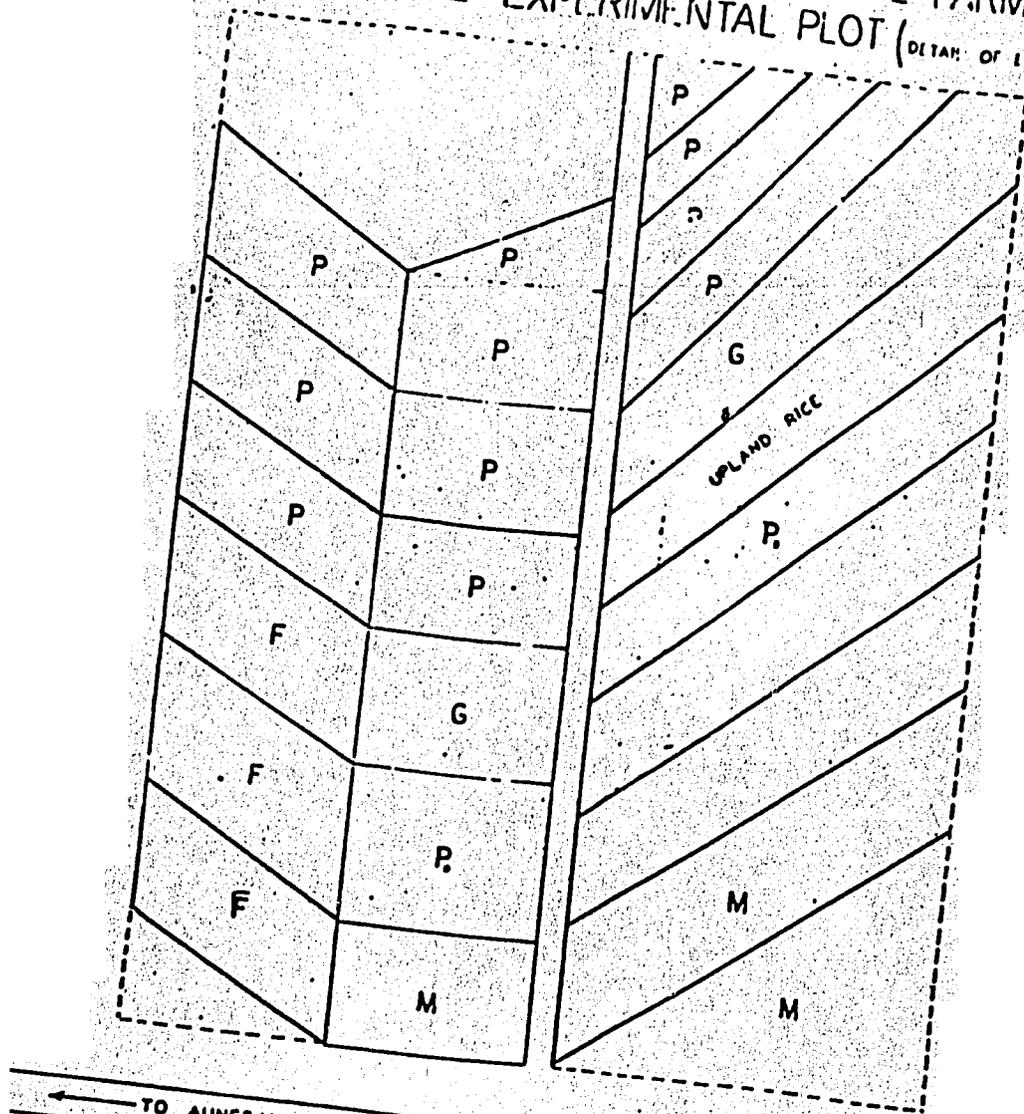


FIGURE 5 AUNG BAN ARI EXPERIMENTAL FARM
 90 ACRE EXPERIMENTAL PLOT (DETAIL OF EXPERIMENTS)



← TO AUNGBAN HIGHWAY TO MEMO →

P	PASTURE	3AC WILD POTENTIAL
G	GROUND NUTS	3AC SOIL RESEARCH
P	POTATOES	3AC PASTURE
M	MAIZE	1AC FARM BUILDINGS
F	FURROW	

THIS FARM WAS STARTED IN 1980-81

Table 3 MINIMUM MAXIMUM TEMPERATURES: AUNG BAN - 1979-1982

Month	1979		1980		1981		1982		Ave.	
	Max.	Min.								
Jan.	22.4	3.7	25.8	0	26.0	1.0	23.7	2.7	24.5	2.4
Feb.	24.9	9.6	27.3	-0.4	30.0	2.0	24.1	5.6	26.6	4.2
Mar.	26.6	11.6	32.7	5.0	30.0	6.0	27.6	8.5	29.2	7.8
Apr.	28.9	16.1	36.7	11.2	32.0	10.0	30.4	4.8	32.0	10.3
May	27.7	17.5	37.0	5.6	33.0	14.0	29.8	17.7	31.9	17.4
Jun.	27.3	19.8	30.0	15.8	28.0	18.0	26.6	19.8	30.5	18.2
Jul.	27.0	19.1	28.0	18.0	28.0	18.0	26.9	19.3	27.5	18.7
Aug.	26.5	19.1	30.0	18.3	28.0	16.0	26.3	19.2	27.7	18.2
Sep.	26.3	17.1	28.0	16.1	30.0	16.0	26.4	18.4	27.7	16.9
Oct.	25.8	14.8	28.3	10.5	30.0	14.0	27.1	15.7	27.9	13.8
Nov.	20.3	10.7	27.0	6.0	30.0	6.0	23.8	7.3	26.8	7.5
Dec.	32.0	6.8	26.2	2.7	27.0	1.0	23.1	3.3	27.1	3.5

*Aung Ban minimum average temperatures will be slightly lower than those listed above for the Heho area.

TABLE 4

PRECIPITATION BY MONTHS OF AUNG BAN RESEARCH STATION, ELEV. 4,400 ft.

Month	1981		1982		1983		1984	
	Rainy days	Rain fall	Rainy days	Rain fall	Rainy days	Rain fall	Rainy days	Rain fall
inches.....							
January	nil	nil	nil	nil	nil	nil	nil	nil
February	1	0.78	nil	nil	1	0.32	2	0.88
March	1	0.08	nil	nil	1	0.42	nil	nil
April	5	1.75	1	0.09	4	2.01	6	3.54
May	11	6.93	14	7.17	8	6.44	8	6.49
June	17	6.05	9	3.66	13	7.80	11	5.48
July	15	4.53	9	2.91	7	2.22	10	2.82
August	9	4.35	14	4.17	6	3.77	20	16.42
September	12	9.86	9	5.21	10	5.45		
October	8	3.90	10	4.91	12	6.46		
November	14	5.78	2	1.09	12	8.31		
December	2	0.14	nil	nil	1	1.72		

IV.1.2.2.4. Miscellaneous Facilities

There is a stone/masonry as well as a bamboo building on the farm. An 11,000 KVA electric line traverses the farm near the building complex. A 11,000 - 440 KVA transformer will be required to provide electric service for the research center and houses for farm staff.

Water supply for laboratories, home and gardens will be supplied from a tank located on a high point near the center of the farm about 1/4 mile from the building site. This tank will be supplied by pumping from a perennial stream about 1/2 mile to the north of the tank involving a 50-70 foot lift. A 10 ft. x 10 ft. x 6 ft. concrete and stone tank of about 5,000 gallon capacity and a 250 gpm electric pump will be required. The water from the tank would be conducted by gravity pipes to the station complex, which lies about 30 ft. lower than the tank. Electric service will be provided to the pump and a preliminary design assumes about four hours pumping per day. The final design, including pipe sizes, can be determined when an alignment profile is conducted and elevations and distances are known.

IV.1.2.2.5. Research Constraints

Excess water during the monsoon creates conditions making it difficult to cultivate and control weeds. The farm should be laid out on the contour, with raised beds and grassed excess water diversions installed. This system also reduces soil erosion which is a problem in the area.

Phosphate deficiency is severe; using the Olsen method the soil tests at (0 p.p.m.) P₂O₅. The station staff also suspects Mg deficiency.

First crops are planted in May and harvested during rainy period. This affects seed set and causes moldy heads of sunflower.

IV.1.2.2.6. Research Priorities

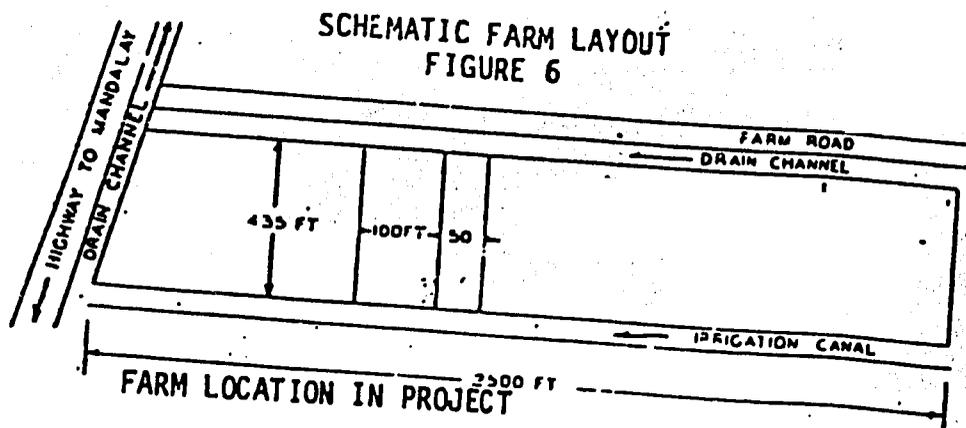
- Fertilizer response trials on maize and oilseeds and wheat including minor elements.
- Rotation cropping systems trials and minimum tillage trials winter disease nurseries for cereals and oilseeds to detect resistance adaptive yield trials.

IV.1.2.3. ARI Satellite Station in Myananda, Representing semi-arid, irrigated conditions

IV.1.2.3.1. The Site

The farm lies about 10 miles north east of Mandalay adjacent to a primary paved road. The farm is a portion of a 95,000 acre summer and monsoon season irrigation project area served by the Sedawgyi weir. With completion of the Sedawgyi Dam in 1986, this area will be increased to 137,000 acres. In the dry season about 37,000 acres are irrigated.

The farm lies in an area that has been cultivated for over 200 years but irrigated formerly only during monsoon. The farm has been in operation for three years. In 1979-80, the project area was consolidated and land leveling, roads, irrigation and drainage canals and structures were constructed. About 5% of the project area is in roads, irrigation and drainage canals. The location of the farm in the project is shown in Figure 6. The farm layout is shown below:



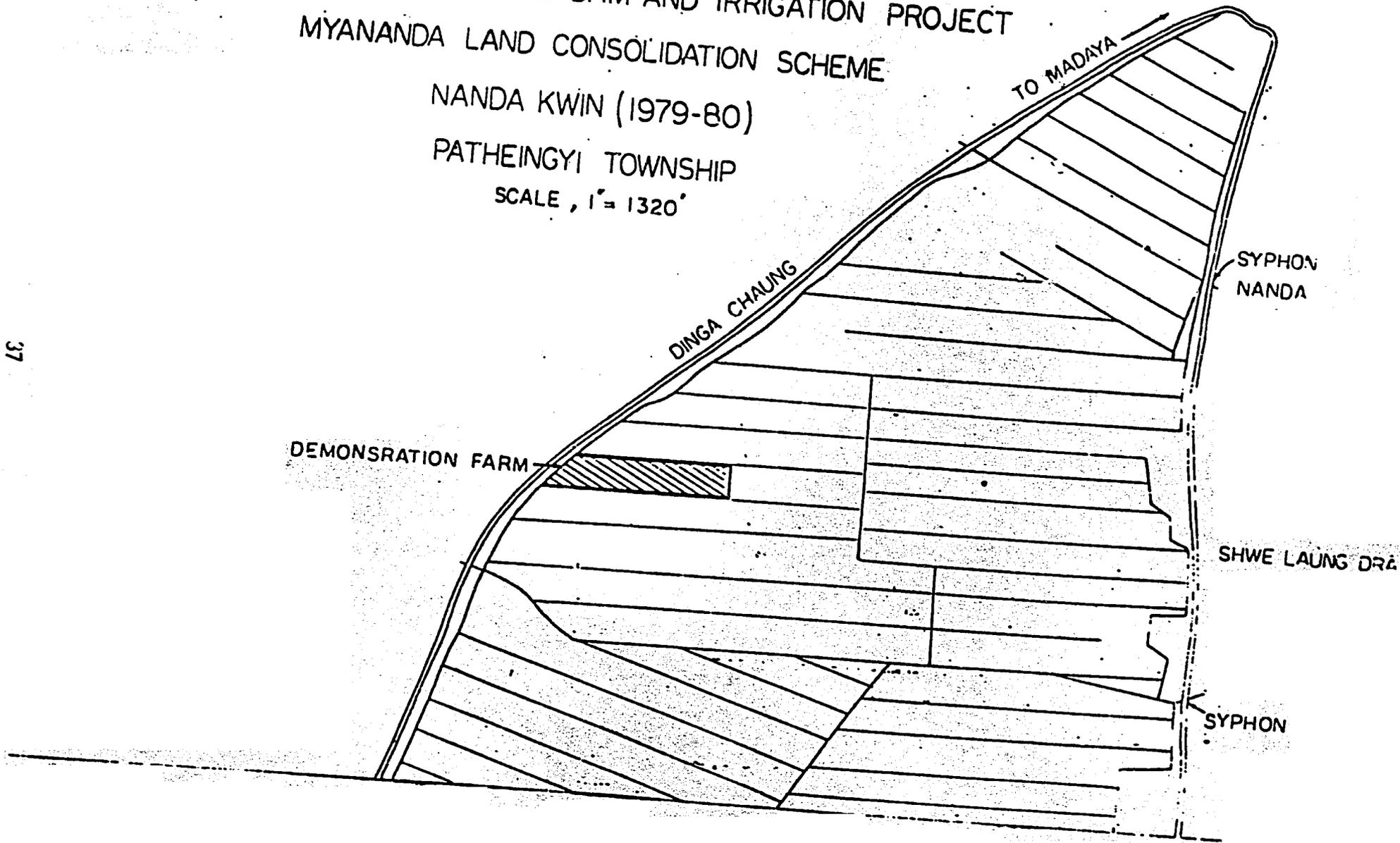
The farm is laid out so that there is 435 feet between irrigation and drain canals and subdivided into 100 and 50 ft. wide strips. The 50 foot strip is 1/2 acre and the 100 foot strip is one acre. During consolidation the land was leveled. Small cross field dikes paralleling the canals are occasionally required to help assure uniform application of water. The land areas between the dikes and canals is slightly undulating, and requires smoothing to provide optimum conditions for efficient irrigation.

FIGURE 6A- SEDAWGYI MULTIPURPOSE DAM AND IRRIGATION PROJECT
MYANANDA LAND CONSOLIDATION SCHEME

NANDA KWIN (1979-80)

PATHEINGYI TOWNSHIP

SCALE, 1" = 1320'



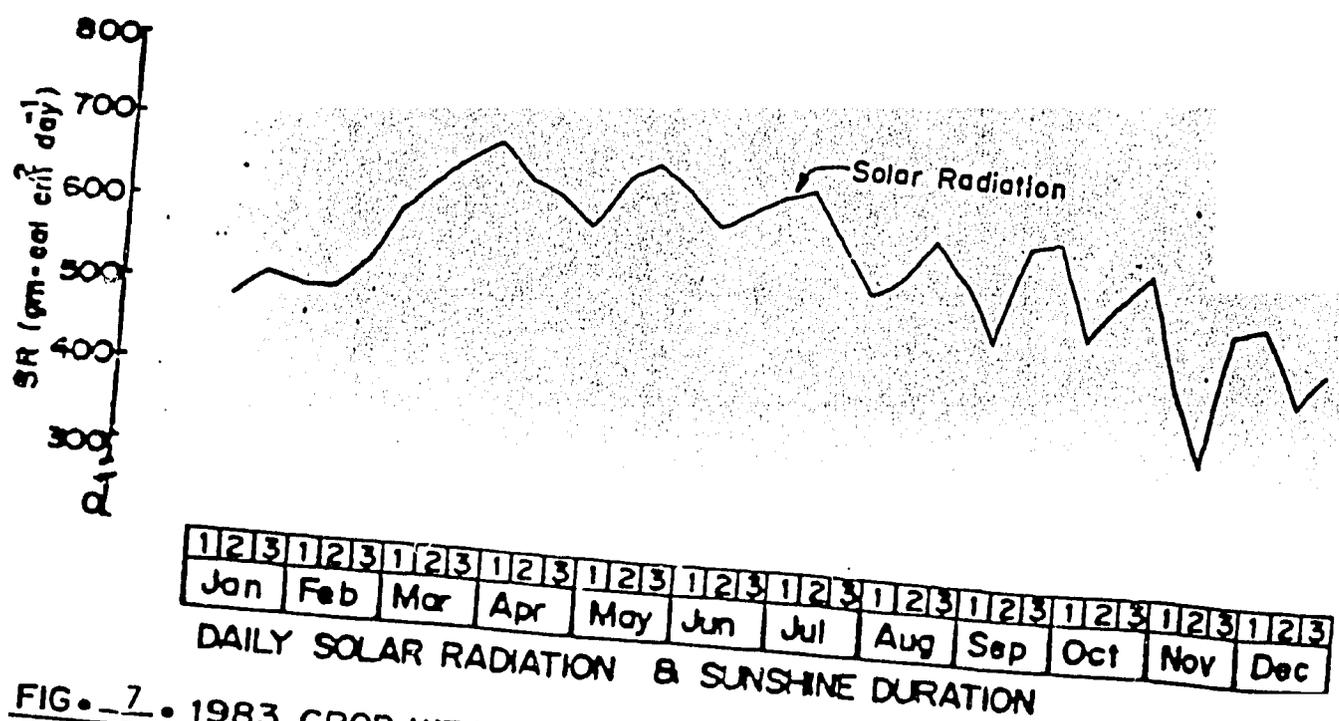
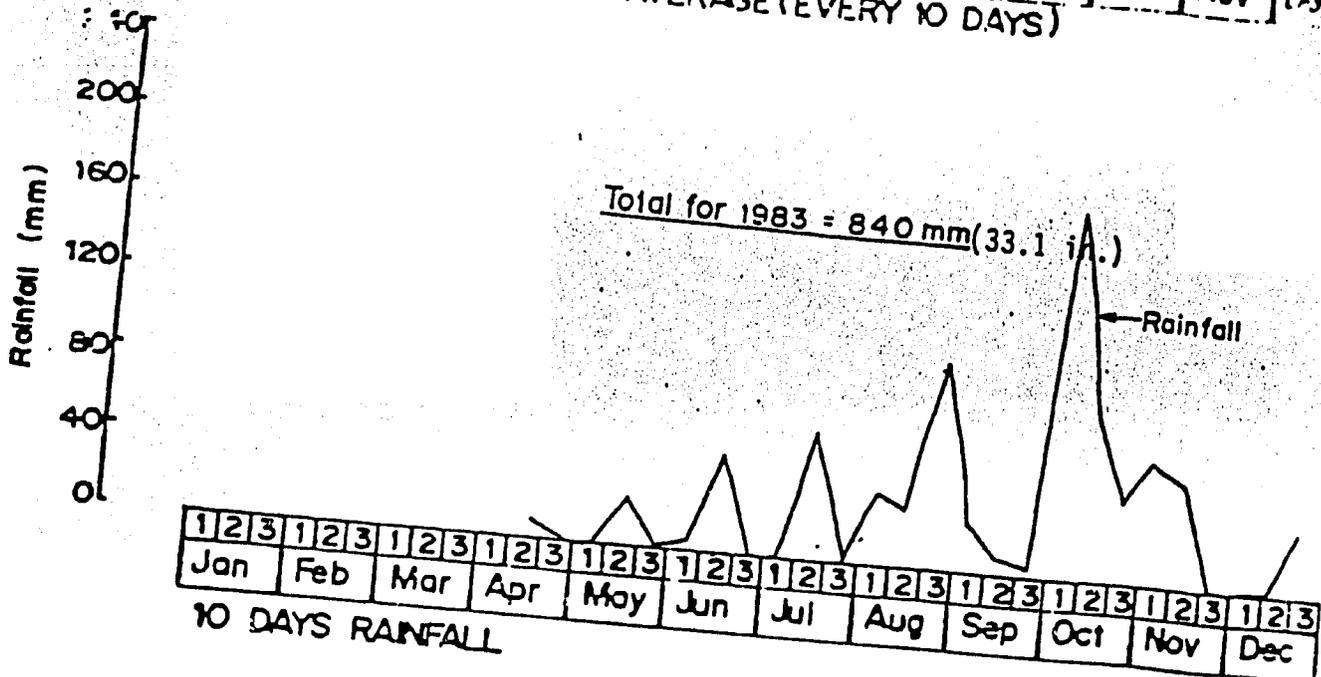
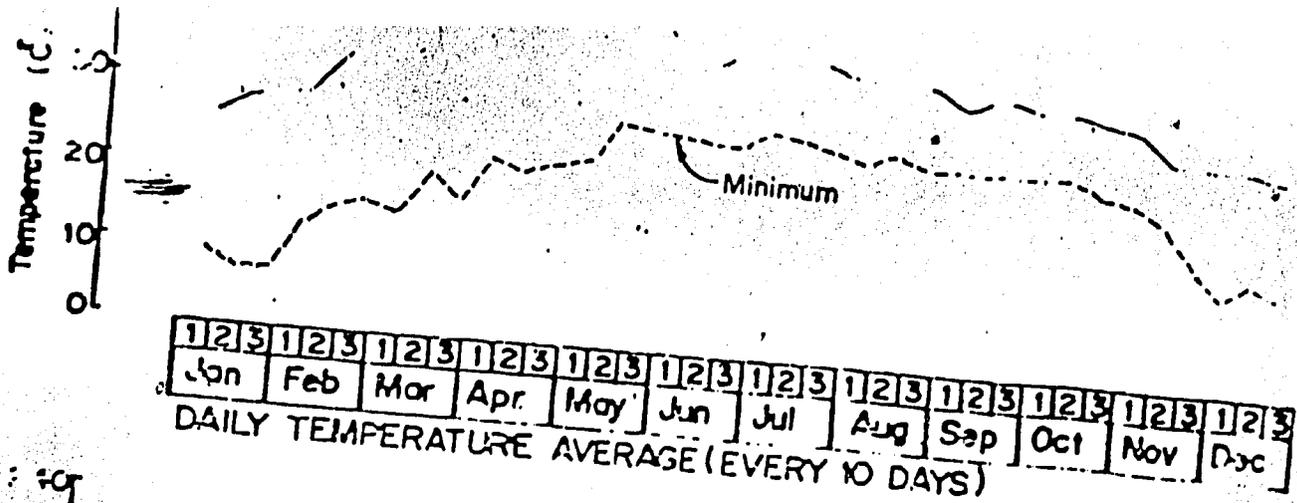


FIG. 7. 1983 CROP WEATHER, MYANANDA (PATHEINGYI)

IV.1.2.3.2. Climate

The temperature, rainfall and solar radiation amounts for 1983 are shown in Figure 7. These data are fairly typical for Upper Burma and shows a total annual rainfall of 840 mm (33.1 inches) in two peaks, August and October, and largely concentrated during the August through November period.

IV.1.2.3.3. Water Resources

Water is delivered to the farm canal by the project and is generally dependable throughout the year. Occasionally water is pumped about four feet from the drain into the lower end of the plots to provide additional irrigation water. Additional five hp lift pumps will be provided to the farm to assure this operation. Surface ground water is available. A concrete lined open well was constructed nearby in 1978 to a depth of 20 feet. The water surface is four feet from ground surface (near the end of the monsoon period). During the dry season the water level will drop to about 10 feet from ground surface. The well has not been dry since construction. Water quality is good and the well provides potable water to about 150 people in the surrounding neighborhood. For farm potable water, a tube well would be more sanitary.

Drainage of the farm is provided by a canal shown in the sketch. This drain water is good quality and occasionally utilized for irrigation. The water in the dug well, being only four feet from the ground surface suggests the possibility of a sub-surface drainage problem. If the water level rises closer to the ground surface, there would be a drainage problem and sub-surface drains would be required. The farm officials report that no such problem exists in the farm area.

IV.1.2.3.4. Soils and Irrigation

The soils are bottom land soils that are classified as vertisols, wet black in monsoon, dark grey in the dry season and deeply cracked due to 2:1 lattice clays, naturally fertile with fair drainage and a ph of 7.0 to 7.5.

The soils of the farm area have been cultivated for a prolonged period and the consolidation land development activities have further disturbed the soils. A soil survey has been conducted and it was observed that the soils have less than 0.5 % slope and will require relatively little leveling and smoothing for irrigation. The infiltration and permeability is very low. There is some salinity in other portions of the project but none in the farm area. Cotton grown on these soils require water about every 15 days. This indicates clayey type soils with relatively high water

holding capacity. Physical soil testing and analysis and equipment to conduct these tests are required by the farm.

Irrigation water is delivered by an earth canal. Holes are cut in the canal bank to permit water into the plots. Cross dikes in the plots are constructed as required to help assure uniform distribution of the water. The government will provide concrete lined canals and cross checks to control the water for irrigation management research. Flume type water measuring weirs will be required at the inlet and outlet openings to the plots.

IV.1.2.3.5. Miscellaneous Equipment

The farm requires three additional low lift pumps with about 5 hp and ten foot lift. Fencing around the farm and buildings will be provided by the SRUB.

Various water measuring equipment, such as cut throat and trapazoidal flumes and soil moisture and infiltration measuring equipment, will be required as irrigation management research is developed.

No electric service is provided to the farm. A 11,000 KVA line parallels the highway. To get electric service from this line will require a 11,000 - 440 step-down transformer, along with switch gear, wire and poles, should the project decide to finance electrification of the farm.

IV.1.2.3.6. Constraints

The station has the capacity for year-round irrigation, which could provide a cropping intensity of 300%. However, there is insufficient drainage to allow for timely land preparation for succeeding crops. Rat damage is also a major problem for both crops and irrigation dikes.

Rotations

This station will primarily be used for cropping systems research on sesame, groundnuts, rice, cotton, sorghum, food legumes and wheat. Because of the potential for irrigation, many variations of rice or cotton based rotations are possible.

IV.1.2.4. ARI Satellite Station in Nyaung Oo, representing semi-arid, rainfed conditions

IV.1.2.4.1. The Site

The farm lies adjacent to the south east of Pagan Township bounded on the west and east sides by paved roads as shown in Figure 7. The farm includes 257 acres adjoining the 400 acre Extension Farm. The Extension Farm concentrates on horticultural trials grown under irrigation provided by sprinkler, surface and one acre of drip irrigation systems.

The ARI tract is presently being farmed under rainfed conditions by local cultivators. The project will address problems of, and conduct research under, dry land or rainfed conditions. Water is required only for supplying the station laboratory, housing, and garden needs. The general region around Pagan practices little irrigation. The ARI farm is representative of the regional cultivation and farming environment conditions. There are no buildings or other facilities on the ARI farm.

Climate

The average monthly temperature and rainfall are shown in Table 5. The average annual rainfall is 21 inches and average daily temperatures are 21° minimum and 30° maximum.

Table 5 Monthly Maximum Temperature and Ave Monthly Rainfall

Nyaung Oo

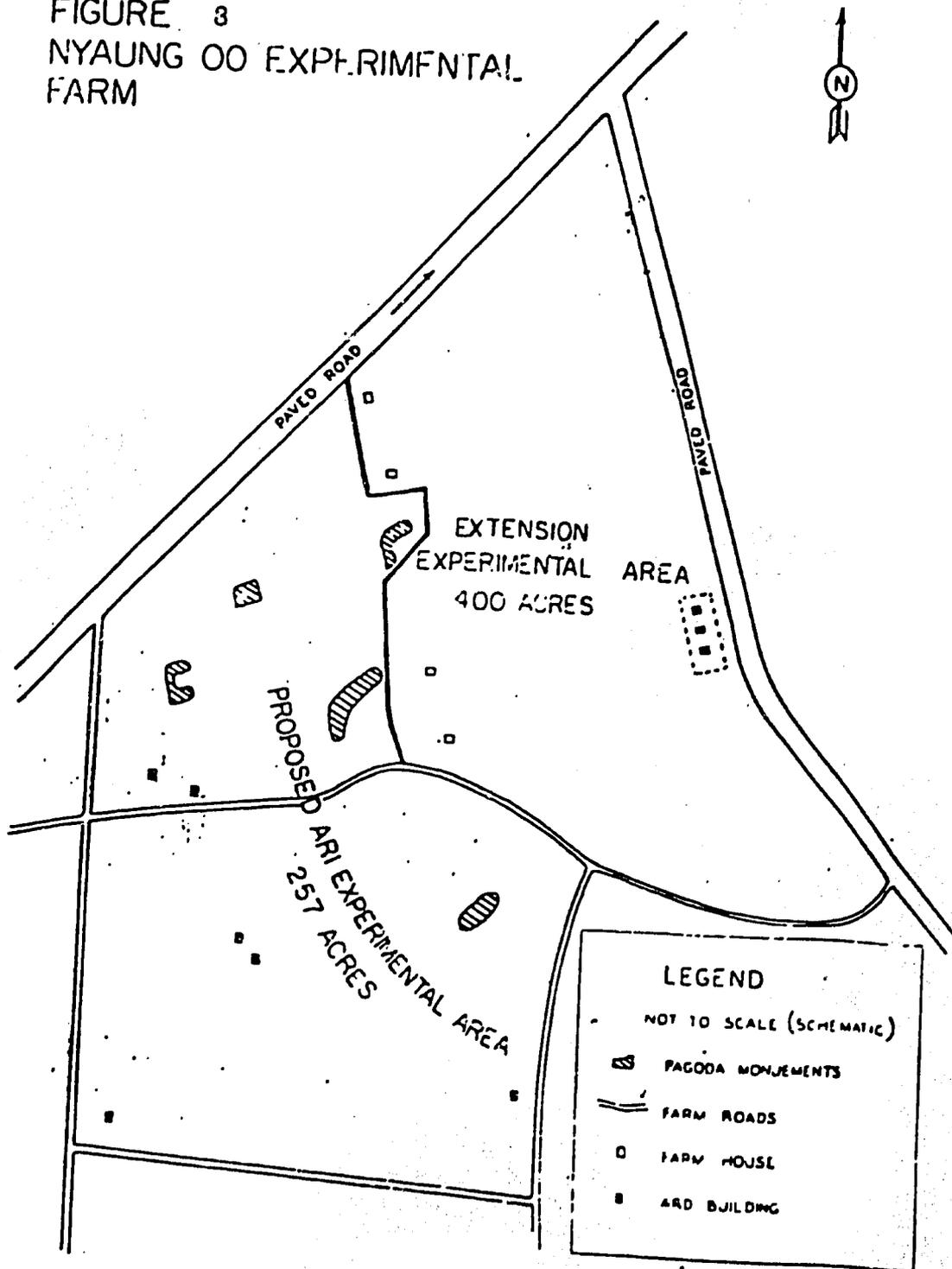
20 Year Average

<u>Month</u>	<u>Temp. Monthly</u>			<u>Rainfall</u>
	<u>Max C</u>	<u>Ave. Min C</u>		<u>mm</u>
January	28	15.5	13	0
February	32	23.5	15	0
March	37	28.5	20	Trace
April	36	29.0	22	10
May	36	31.0	26	40
June	35	30.5	26	60
July	34	29.5	25	90
August	33	29.0	25	110
September	32	28.5	25	120
October	31	27.0	23	105
November	31	25.0	19	Trace
December	30	24.0	18	0

Average	32	26.5	21	Total 535 (21.0 in)

Very poor and unpredictable distribution is the norm. July may receive no rain one year and 200 mm the next. These data are fairly typical for the middle central region of Burma and show an annual rainfall of 535 mm (21 inches) with a peak in September and possibly no rain in July. In this zone, 50% of sown sesame fails each year on the average because of drought.

FIGURE 3
 NYAUNG OO EXPERIMENTAL
 FARM



IV.1.2.4.2. Soils

The soil is a Rogosols on station and andosols and lithosols predominate on the surrounding land. The station soils are old, coarse sandy alluvial deposits, well drained and of low fertility.

IV.1.2.4.3. Water Resources

The extension farm obtains water by pumping from the Irrawaddy River, about two and one-half miles east of the farm. The water is lifted about 271 feet from the river to two concrete holding tanks, located on the high part of the farm, total capacity of 15,000 gallons. From these tanks the water is conveyed by a network of underground pipelines serving the entire farm. The pipelines extend to the west and south extension area borders and will be available to the A.R.I. station which is adjacent to the Extension farm.

The early monsoon crop is planted soon after the first rains which begin no later than mid May. Groundnuts, maize, and sunflowers predominate as early monsoon crops. These crops are harvested in August and followed by groundnuts as soon as the seedbed can be prepared or by spring wheat in September/October. The station will conduct minimum tillage experiments to determine its effect on the late monsoon crop.

IV.1.2.4.4. Rotations

Early crops consist of sesame, groundnut, cotton and sorghum. Late crops are sesame and pigeon pea.

IV.1.2.4.5. Research priorities

- Varietal improvement under arid zone conditions.
- Moisture use and conservation studies
- Intercropping as a means of reducing evaporation.
- Stabilization of crop yields.

IV.1.2.4.6. Research constraints

- Considering the low annual rainfall, sandy soil, and the lack of availability of irrigation to area farmers, crops can only be grown 5 to 6 months each year.
- Soils are of low fertility

IV.1.2.5. Shwelaung Satellite Research Station - Shwelaung, Irrawaddy Delta

IV.1.2.5.1. Site

The proposed site is located in the lower Irrawaddy delta within the Lower Burma Paddy Land Development Project (LBPLD). The project consists of 33,000 acres of rainfed paddy fields. There are no roads in the project area, all transportation is by boat. Using conventional river transportation it now takes 13 hours to reach Wakema from Rangoon and one hour more to reach the substation from Wakema.

The LBPLD is empoldering the land by construction of embankments, parallel drain channels, and sluice gates to prevent flooding in the monsoon caused by the high water level in the river and the tidal action in the delta. With the introduction of dikes to prevent flooding during the monsoon and low lift pump irrigation during the dry season, the AC is planning on increasing the cropping intensity to 134% from the present level of 109%. Water control will allow the farmers to grow sunflowers, sesame, soybeans, and groundnut after rice.

IV.1.2.5.2. Station development

The substation now consists of four acres of paddy fields. ARI is planning on purchasing an additional 30 to 40 acres in the future. The project area has been recently empoldered so flooding is controlled. The SRUB will construct the necessary building on the station. AID will provide generators for station electrification, low lift irrigation equipment and two boats for transportation. There are no roads in the station area and very few in the lower delta.

IV.1.2.5.3. Soils

The lower delta has typical alluvial soils classified as Gleysols. The area is saturated with water close to the surface for most of the year and is poorly drained.- the soils are generally of heavy texture, grey, and very productive if fertilized.

IV.1.2.5.4. Climate

In the Irrawaddy lower delta there is a distinct wet and dry season. The 100 inches of rainfall occurs from mid May to mid October. Annual temperature variation is slight between 22°C to 32°C on average.

IV.1.2.5.5. Rotations

The cropping intensity of the delta is now estimated at 109% which means that only 9% of the land area has a second crop following paddy.

Water logging and a lack of water control is the reason most often given to explain the present low intensity. With the introduction of water control structures and low lift irrigation the delta will be able to grow crops year around.

IV.1.2.5.6. Research Priorities

In addition to the rice based cropping systems research, ARI will use the station for oilseeds adaption trials, fertilizer response trials, and minimum tillage experiments.

IV.1.3.

Crop Protection (Pest Management)

Experience over the last few decades has led to the conclusion that pests * must be managed rather than eliminated entirely, even locally. There is a growing consensus that all control or management tactics for existing pests in a farming system must be integrated with other farm practices into a total farming system. This concept is especially valid in the humid tropics where intensive cropping patterns are emerging.

It is significant that agricultural crops in Burma have relatively few serious insect and plant disease problems. This situation is due in part to the relative isolation created by mountains and the oceans and by the modest importation of plant material in recent years. Also important has been the general practice of traditional agriculture that does not favor pest outbreaks. There is evidence that the recent changes to intensify and increase agricultural productivity in Burma have already resulted in increased crop protection problems, just as has occurred in other countries. Thus it is necessary to include pest management as an integral component of intensive agricultural development.

The farming systems research programs in Burma offer an opportunity to integrate general cropping patterns and practices with integrated pest management.

IV.1.3.1.

Current Pest Problems

A list of the most serious pests of maize, groundnut, sesame, sunflower, and soybean was provided by the Agriculture Corporation. This list has been supplemented by discussions with Burmese Crop Protection Scientists and FAO Plant Protection Staff, and a review of recent reports. This information is summarized in Table 6. The list is far from complete, especially as regards nematodes, soil insects and pathogens, and plant viruses.

By far the most ubiquitous and damaging classes of pests in Burma are rats and weeds. These are major problems in maize and all the oil seed crops as well as most other Burmese crops. Rodent damage to groundnuts runs as high as 90% crop loss, and effective weed control in experimental tests has increased groundnut yield by 17 baskets per acre. Three species of rats (Rattus exulans, R. rattus, R. bengalensis) are found through-out the country. Currently there are no satisfactory management practices in place and losses are devastating. There appears to be little effective predation by birds or animals. An effective rat management capability is without question the most pressing crop protection need in Burma.

*(used here to indicate all noxious organisms)

Weeds, particularly the perennial grassy species, are also a major problem. With existing technology, weed control can be effective in maize and oil seed crops during periods of moderate rainfall provided adequate labor is available. However, manual and mechanical methods are not effective when continuous heavy rains occur in the monsoon season. New tactics and strategies need to be developed for these wet periods.

Insects and diseases can be just as devastating as rodents and weeds, and they are occasionally. However, these are controllable with pesticides, resistant cultivars, or by appropriate cultural practices. Multiple (from 1 to 4) applications of insecticides are required to control insect pests on groundnut and sesame.

Parakeets, parrots and other birds are reported to be a severe problem in certain localities, especially on farms located near wooded areas. No satisfactory controls are known. Frightening the birds is only partially successful.

IV.1.3.2

Pesticide Use in Burma

No pesticides are produced in Burma. They are purchased, imported and controlled internally by the government. The only pesticide now being imported that is not currently approved for use in the USA is aldrin, which is used as a soil treatment against termites and chafer grubs in groundnut. No satisfactory substitute has been identified and use is limited to areas where these problems exist. The total quantities of insecticides and fungicides used in Burma is relatively low. Herbicides are used only on oil palm and rubber.

Pesticide resistance appears not to have developed in Burma except possibly on cabbage and related cruciferous crops in Shan State where the diamondback moth is reported to be a major problem. Continued use of insecticides on sesame and groundnut could result in resistance development.

Pesticide residue problems are not a problem on maize and oil seed crops. Use of insecticides and fungicides on stored seeds will require ample safeguards to prevent consumption of treated seed by humans or animals. The use of pesticides in this research project will be limited, and done by or under the supervision of trained personnel. The minimal use of pesticides will not result in use or environmental problems (see Environmental Considerations, Annex 2).

IV.1.3.3

Assessment of Potential Future Pest Problem

In developing countries throughout Asia and the rest of the world, increasing agronomic inputs almost invariably creates conditions more favorable for outbreaks and damage from insect,

weed, pathogen and vertebrate pests. This changing status of the pest complex associated with more intensive cropping practices has been particularly well demonstrated in rice-based cropping systems in the Philippines, Thailand and Indonesia. Until appropriate management tactics were developed and practiced, minor insect pests and plant pathogens became major problems and caused extensive losses. The same scenario is predictable for Burma unless appropriate preventive Integrated Pest Management (IPM) practices are developed and used.

New crop pests originate from two major sources: (1) exotic species imported accidentally and (2) native species that adopt an introduced crop. The first source poses by far the greatest threat to Burmese Agriculture. There are major pests of maize and oilseed crops in other areas that would be serious if not disastrous in Burma. Even the best quarantine procedures are not 100% effective so it is predictable that some exotic pests will come to Burma. For example, new exotic weed species have been discovered recently.

The other source of new pests are native insects and pathogens, existing on indigenous wild plants which are closely related to an introduced crop. Over time these may adapt to and attack the related crop. The very recent discovery of a previously unknown dipterous insect attacking young sunflower stems at the Kyaung Magyi MOPP Farm is an example of a new pest on an introduced crop. Whether it will prove to be an indigenous or exotic species has significance in terms of what action should be taken.

IV.1.3.4

The Role of Integrated Pest Management (IPM)

IPM is an ecologically based approach to crop protection that emphasizes the need to utilize multiple tactics to maintain pest populations below economically harmful limits (economic thresholds). The principal tactics of crop protection are: (1) cultural (planting dates, rotation, etc.); (2) host plant resistance; (3) biological control; and, (4) chemical pesticides. Traditional rice culture in Southeast Asia provides a good example of an excellent pest management system. The long dry fallow period destroys many insects, pathogens, and rodents. Planting and harvesting times are uniform throughout regions to conform to the monsoon rains. The paddy-rice transplanting system provided good weed control and native rice varieties evolved that had considerable resistance to pests. Biological controls operated without disruption from pesticides. Unfortunately the traditional rice system and most other traditional cropping systems are not productive enough to feed the world's expanding human population.

The challenge in intensifying productivity is to incorporate adequate control tactics into new farming systems to prevent pest outbreaks and crop losses. Efforts in plant breeding must include incorporation of pest resistance. Cultural practices should be

modified, as feasible, to reduce pest induced crop losses. Parasites, predators and pest pathogens should be encouraged or at least not destroyed. Pesticides must be used only as needed and in such a way as to avoid harmful impacts on non-target life.

IV.1.3.5

Requirements to Develop IPM for Maize and Oil Seed Crops

IPM programs for cropping systems require much more basic knowledge than for single unilateral approaches. These are outlined as follows:

(a) Research: While the techniques required to develop IPM for the several phyla of pests vary considerably, the basic approaches are similar.

- Determine the identity of each pest species (difficult for some plant pathogens and nematodes).
- Determine population dynamics/epidemiology for each pest species.
- Determine alternate hosts.
- Determine each pest's distribution in Burma.
- Develop monitoring techniques for surveys and for determining infestation/infection levels.
- Determine economic thresholds and the extent of crop losses.
- Survey for natural enemies and determine their effectiveness.
- Working with plant breeders to develop resistant cultivars.
- Working with agronomists and farming systems scientists, study impacts of cultural practices on pest problems.
- Evaluate pesticides for control of each major pest including proper dosage, timing, and impacts on biological control agents.

(b) Trained Scientists: Much of the above research requires well-trained crop protection scientists skilled in the needed technologies and methodologies. A corps of scientists trained to the MS and PhD levels is required in each discipline. The data in Tables 8 and 9 indicate that adequately trained people are not now and will not be in place in the near future unless additional advanced degree training is provided. It is also evident that some technical assistance must be provided until training objectives are met.

(c) Facilities

Present laboratories and those under construction appear to be reasonably adequate for plant pathology (including nematology) and entomology (including vertebrates). However, a suitable facility for maintaining insect colonies on growing plants is needed. This should be a screened building with a glass or plastic roof.

(d) Equipment

A detailed evaluation of existing equipment should be made to determine what additional items are required. A few of the obviously needed items are included in the commodities list.

(e) Library

Many of the pests found in Burma are known elsewhere and have been carefully studied. Much information is available in the literature to supplement existing Burmese knowledge. It is essential that existing crop protection book and periodical acquisitions be surveyed and augmented as needed.

(f) Domestic Travel

Pests vary considerably from one ecological zone to another. Crop protection scientists must be able to travel to where the problem exists. Field work at Yezin and at the proposed substations as well as elsewhere will be needed and therefore adequate transportation is essential.

IV.1.3.6

Rat Control

The rat problem in Burma is now out of control and no systematic approach for controlling rat populations appears to be underway. It is recommended that very early in the new project a scientist from the Denver Wildlife Research Center experienced in tropical rodent management practices developed at the UPLB National Crop Protection Center in the Philippines be sent to Burma for two or three months to train local scientists and set up experimental demonstration type trials. He should be available 2 or 3 times a year for three years to monitor and provide technical assistance for the program.

Table 6. Pests of maize, sesamum, groundnut, mung bean and soybean in Burma

<u>Crop</u>	<u>Common Name</u>	<u>Scientific Name</u>	<u>Current Status</u>
Maize	Leaf worm	<u>Spodoptera litura</u>	minor
	Maize aphid	<u>Rhopalosiphum maidis</u>	minor
	Rice weevil	<u>Sitophilus oryzae</u>	major in storage
	Maize leaf blight	<u>Drechslera turcica</u>	minor
	Rats	<u>Rattus exulans</u>	serious in field and storage
		<u>R. rattus</u>	
		<u>R. Bengalensis</u>	
	Birds (parakeets)		serious locally
	Weeds, especially perennial grasses		major
Sesamum	Common hairy caterpillar	<u>Spilosoma obliqua</u>	major
	Sesamum leaf roller	<u>Antigastra cataluanalis</u>	major
	Sesamum jassid	<u>Orosius sp.</u>	vectors phyllody
	Peach aphid	<u>Myzus persicae</u>	minor
	Two-spotted sesamum bug	<u>Eysacoris guttiger</u>	occasional serious outbreak
	Sesamum phyllody	(microplasma)	major
	Rats	3 species	major
	Weeds	many species	major
Sunflower	Gram pod borer	<u>Heliothis sp</u>	minor
	Leaf worm	<u>Spodoptera litura</u>	minor
	Common hairy caterpillar	<u>Spilosoma obliqua</u>	minor
	Jassid	<u>Empoasca sp.</u>	transmits
	Schlerotium blight	<u>Schlerotium rolfsii</u>	minor, could be serious without rotation

Table 6 (cont)

	Leaf stem blight	<u>Alternaria helianthi</u>	major in monsoon
	Rats	3 species	serious
	Birds (parakeets)		serious locally
	Weeds	many species	major
Groundnut	Termites	? spp	serious locally
	Cockchafer grub	<u>Anomala antiqua</u>	serious locally
	Common hairy caterpillar	<u>Spilosoma obliqua</u>	major
	Leaf worm	<u>Spodoptera litura</u>	major
	Groundnut leaf binder	<u>Aproaerma modicella</u>	major
	Leaf spot	<u>Cercospora spp.</u>	severe in monsoon
	Crown (collar) rot	<u>Aspergillus niger</u>	moderate
	Mold	<u>Aspergillus flavus</u>	produces aflatoxin
	Rats	3 species	major
	Weeds	many species	major
Soybean	Spotted bean borer	<u>Maruca testivalis</u>	?
	Rats	3 species	?
	Weeds	many species	major
Mung Bean	Striped bean flea beetle	<u>Luperodes suturalis</u>	moderate
	Rats	3 species	major
	Weeds	many species	major

Table 8. Number of Burmese Scientists in the Agriculture Corporation trained beyond the B.Ag in the crop protection disciplines.

<u>Discipline</u>	<u>ARI</u>		<u>ARD</u>		<u>Extension</u>		<u>Total</u>	
	<u>MS</u>	<u>PhD</u>	<u>MS</u>	<u>PhD</u>	<u>MS</u>	<u>PhD</u>	<u>MS</u>	<u>PhD</u>
Plant Pathology	1	0	1	0	1	0	3	0
Entomology	0	0	2	0	1	0	3	0
Nematology	0	0	0	0	1*	0	1	0
Weed Science	0	0	0	0	0	0	0	0
Vertebrate Science	0	0	0	0	0	0	0	0
Totals	1	0	3	0	3	0	7	0

*Currently working on non-nematological assignment.

Table 9. Number of Burmese Scientists in the Agricultural Corporation now or tentatively scheduled to go abroad for MS or PhD degrees.

<u>Discipline</u>	<u>MS</u>	<u>PhD</u>
Plant Pathology	3	1
Entomology	2	1
Nematology	0	0
Weed Science	1	0
Vertebrate Science	0	0
Totals	6	2

IV. 1.4.

Technical Assistance Requirements

IV.1.4.1.

Long-term: Technical assistance will be provided under a single AID direct contract which will include 102 person-months of long-term and 67 person-months of short-term consultancy. Two long-term experts in the fields of research administration and research station development will be assigned to the ARI over a period of 4 1/2 calendar years.

The Research Administration Specialist will also serve as the Team Leader for the contract team. However, one of the most pressing needs at the Yezin station and the four proposed satellite stations is for the physical upgrading of the areas on which the research is to be performed. ARI staff at Yezin and the project design team agree that the most severe physical constraints impeding sound research are inadequate drainage during the monsoon, lack of irrigation during the dry season and a need for spare parts, repair and maintenance for much of the existing farm machinery and laboratory equipment. Therefore, it may become necessary to mobilize as early on in the project as possible, the station development specialist and the short-term specialists in irrigation, drainage, equipment and machinery. If he can be mobilized before the Research Administrator, the Station Development Specialist will serve as the interim Acting Team Leader.

The Team Leader/Research Administration Specialist will be stationed at Yezin for a period of four years. His principal responsibilities will include:

- Liaison on behalf of the Technical Assistance Team with the AC, the ARI Project Manager and AID;
- Supervision of the Technical Assistance Team, including planning and coordination of all short-term assistance; and
- In conjunction with AC staff and the AID ADO, planning for all long and short-term training, study tours and professional conference participation to be funded under the project.

With respect to Research Administration, he will:

- Advise AC and ARI counterpart managers on long range planning for crop production research;
- Advise ARI scientists on research design, data collection, and data analysis; and
- Coordinate maize and oilseed research among the various divisions in ARI, both at Yezin and the satellite stations.

~~The~~ qualifications of this Research Administration Advisor should include:

- A PhD degree in an Agricultural science such as Agronomy;
- A working knowledge of field plot design, data collection and analysis;
- Preferably, 5 years of overseas agriculture research experience; and
- Experience in research management and administration.

In consultation with the Team Leader, the Station Development Specialist will be responsible for planning, coordinating and supervising the activities of the short-term farm equipment, machinery, drainage and irrigation specialists. In addition, he will be responsible for the following:

- In conjunction with staff from ARI and AID and the Procurement Services Agent, preparation of specifications for all equipment and machinery procurements.
- Development of a system for, and provision of in-service training in inventory control.
- Overseeing of delivery/installation of all project-procured equipment and machinery at project site.
- Coordination, planning and supervision of all aspects of station development at Yezin and the four satellite stations.

The qualifications of this specialist should include:

- An advanced degree in Agriculture Engineering with a strong background in station development;
- At least 5 years of overseas experience in monsoonal climates; and
- Knowledge and experience in irrigation, land leveling, and farm equipment use, maintenance and repair.

IV 1.4.2. Short-term Technical Assistance

IV.1.4.2.1. Station Development: A total of 24 pm of short-term consultants will be made available in the fields of irrigation and drainage, and in the use and maintenance of laboratory and farm equipment and machinery. In the first year of the project these short-term consultants will address the major field and laboratory problems identified by the ARI research staff. As early as possible in the project, the drainage and irrigation systems on

JPLB

10 participants for 6 Mo each - 60 mm
International Travel (\$1,000/participant) 10,000
Training cost (\$2,000/participant/month) 120,000
\$130,000

ISRAEL

3 participants for 6 Mo each - 18 mm
International Travel (\$3,000/participant) 9,000
Training cost (\$2,000/participant/month) 36,000
\$45,000

STUDY TOURS AND MEETINGS

2 participants for 270 days total
International Travel (\$2,000/participant) 40,000
Per Diem (\$100/day/participant) 27,000
Total \$67,000

IV.2.2.4.

Management Training

Agriculture Corporation and ARI staff indicated a strong desire for training in research and extension management. The design team agreed this was a valid objective. Such courses are offered by USDA/OICD in the United States as are courses in organization and management development, and managing integrated rural development. These courses are designed for and restricted to developing country administrators and managers. Participant trainees either on long or short-term assignment with administrative responsibilities could be scheduled to attend these courses in the United States. If the demand exists, these courses could be conducted in Burma. The courses are six to nine weeks in duration in the U.S. and can be tailored to meet local needs.

Tuition, books and fees for these courses plus a living allowance vary in cost from \$6,500 to \$9,000 depending on the course duration. Air travel, if not otherwise covered, would be an additional \$3,000. Costs for conducting the course in-country can be requested from USDA/OICD, but are estimated at \$ 20,000 to \$25,000 per course. The in-country courses could also be arranged on a "train the trainer" format so that Burma could conduct their own courses on these subjects with no or minimal assistance from USDA.

40X

Costs have been budgeted for five long-term participants to attend U.S. based research management courses each year at \$175,000 (5x\$7,000/yr x 5 years) and for two Burma based courses during the life of the project at \$50,000, making a total of \$225,000 for management training.

IV.2.2.5.

In-Service Training, Agriculture Corporation

The AC has just completed a new Central Agriculture Development Training Center (CADTC) with the assistance of the Japanese Government. Located near Hlegu, Rangoon Division, it will provide pre and in-service training to the AC staff on a regularly scheduled basis. With a capacity of 300 trainees, it will replace the in-service and pre-service training formally conducted at ARI, Yezin. ARI will continue to provide in-service training in specialized technical subjects for extension and research. The Center will also conduct pre-service training for new AC staff and in-service training as needed for employees from village to national staff.

Areas of study, scheduling and capacity are presented in the Financial Plan of this paper.

The AC begins training new recruits from the Yezin Agriculture Institute, which grants a bachelor's degree in agriculture, and the three diploma granting Agriculture Institutes at Thaton, Pyinmana and Patheingyi soon after they are employed. Yezin Agriculture Institute graduated 270 students in 1984 and the three diploma institutes graduated 300 students. Those recruited by the AC, approximately 500 each year, receive two months of pre-service training and are then placed in field posts on a one year probation. Upon completion of the probation period they are eligible for various in-service training courses. Initially, the courses are of a technical nature or on-the-job training. As the staff are promoted and gain more responsibility, they receive training in administration, accounting, procurement, planning and evaluation. Township through national level staff receive training at CADTC from the junior assistant to general manager grades. Village level staff are trained by township and division staff who also assist with farmer training programs.

In conjunction with BARD, ARI Yezin will provide subject matter training as shown in Annex 8. They plan to train 570 staff per year in nine different subject matter areas. Over the five year period 1985 to 1990 they will hold 65 classes and train 2,850 staff.

It is proposed that village level staff will receive specialized crop technical training at CADTC in 1985. Staff showing aptitude for research are given training assignments at Yezin for developing their research capability and those who show promise are given assignments at research stations.

Other training given on the basis of work records and competitive exams are BAg degree training at the Agriculture Institute for diploma holders, and MS or PhD training at foreign institutions, sponsored by various donor organizations. In recent years, approximately ten AC employees per year have gone for advanced degree overseas training. Overseas short-term training and study tours are also available for AC staff who have demonstrated capability and aptitude and require specialized training in their jobs.

IV.3.0. Institutional Analysis

The Socialist Republic of the Union of Burma covers approximately 250,000 square miles (676,588 square kilometers) which is divided into 7 States and 7 Divisions. The latter covers Burma proper where the vast majority of Burman's live and the former covers the hill states which contain sizeable minority groups.

The Burmese political system is organized in a single legal party, the Burma Socialist Programme Party which embodies the "Burmese Way to Socialism". The BSPP is organized at the national level, regional level (roughly at the State or Division levels) at the unit level (township) and cell (village tract, village or town). At the national level the party is led by a 260 member Central Committee which in turn is governed by a 15 member Central Executive Committee headed by a Chairman and a General Secretary.

Parallel to the political party organization are bodies comprised of elected members. Starting at the village tract level, which usually comprises a group of villages, village tract council members are elected by the village members. At the same time they vote for township, division and national representatives. Each township will have at least one member on the State or Division People's Council, but townships with higher populations may have more. Finally, the 475 representatives to the National People's Assembly (PYITHU HLU TAW) are chosen by the State/Division People's Councils.

At each level; Village Tract, Township and State/Division, the Council chooses an Executive Committee which will choose a Chairman and Secretary. This Committee handles major decisions of the elective bodies at each level. Relative to agriculture, at each level a member of the Executive Committee will be responsible for agricultural and forestry activities.

On the administration or implementation side of government organization, authority is vested in a Council of State. This Council contains 29 members selected by the People's Assembly. Each of the 14 States and Divisions choose one member and the People's Assembly, as a group, chooses an additional 14 members. The Prime Minister makes up the 29th member. The Council of State nominates members to the Cabinet or Council of Ministers which are approved by the People's Assembly. The Council of Ministers (comparable to a Cabinet) consists of the Prime Minister, 2 Deputy Prime Ministers and 20 Ministers.

IV.3.1.

Agriculture and Agricultural Research Policy

Agricultural policy, including research policy, is determined by the Burma Socialist Program Party and the Council of State. Implementation plans based on the agricultural policy are developed by the Agricultural Study Group chaired by the Minister of Agriculture and Forests. Research plans are prepared by the Agricultural Science Research Committee of the Agricultural Science Research Division. This committee is comprised of representatives of the Agriculture Corporation, the universities and the university level Institutes of Agriculture and Forests.

National planning is based on a series of 4 year plans, usually within a longer 20 year plan. Within the 4 year plan the annual agricultural plan is prepared and passed for approval each year by the People's Assembly (PYITHU HLUTTAW). This plan sets crop production targets and allocates inputs.

IV.3.2.

The Ministry of Agriculture and Forests

Overall responsibility for managing and implementing agricultural activities rests with the Ministry of Agriculture and Forests, which consists of seven Department and three Corporations. Crop research, development, production and extension are the responsibilities of the Agriculture Corporation. The Ministry organizational chart is shown in Figure 1.

IV.3.3.

The Agriculture Corporation

The Agricultural and Rural Development Corporation (ARDC) was set up in 1954 to undertake development needs in the Agricultural sector. The ARDC operated a country-wide program with a network of offices and depots. Overlapping field responsibilities between the ARDC and the Department of Agriculture led to a merger of the two agencies in 1962 under the Agriculture Corporation, to which was also added the Land Use Bureau at that time.

The Agriculture Corporation is the agency of The Ministry of Agriculture and Forests given responsibility for crop production, extension and research. The Corporation is divided into 10 Divisions headed by 8 General Managers and two Deputy General Managers. These 10 Divisions are further divided into 54 sub-Divisions. The divisions which will be of primary concern to the Burma Agricultural Research and Development Project are Extension, Applied Research and the Agricultural Research Institute. The latter will be the Project Implementing Agency for the government. The Organization of the Agricultural Corporation is shown in Figure 2.

The Managing Director of the Agriculture Corporation is appointed by the Council of State. At the State and Division levels, the State Directors are appointed by the Minister of

Agriculture and Forests as are the Township Managers of the Agriculture Corporation. At the lower levels, the appointments of village managers and village tract managers are made by the Managing Director of the Agriculture Corporation. The Agriculture Corporation currently has 15 PhD's on its staff and 45 people hold Master's degrees.

IV.3.3.1. The Agricultural Research Institute

Established in 1971, the Institute was reorganized in 1978 into seven crop divisions and five disciplines as follows:

Crop Divisions	Disciplines
1. Rice	1. Agronomy
2. Maize and other Cereals	2. Botany
3. Oil Seeds	3. Chemistry
4. Fiber Crops	4. Entomology
5. Food Legumes	5. Plant Pathology
6. Sugar Crops	
7. Horticulture	

In addition there is an Administration Division which includes the machinery shop and motor pools, and a farm mechanization division established under the IRRI/CIDA supported project.

The Institute is located at Yezin, 254 miles north of Rangoon. At the same site are located the Forest Research Institute, the Veterinary Research Center and the Ministry of Education's University Institutes of Agriculture, Veterinary Science and Forestry. Research plots of ARI cover 278 acres of a total area of 690 acres of floodplain below hills which rise to the east of the Institute. Approximately 500 acres of hill ground above the station buildings are also available for research or other uses. The land for the Institute was acquired in 1965, layout completed in 1969, and building begun in 1975.

With assistance from the UNDP/FAO (UNDP project BUR/72/003) a program to strengthen ARI was begun in 1974. This consisted of expansion of facilities, development of the research laboratories and fields, supplying research laboratory equipment and farm implements, providing technical assistance, staff development and training. This phase was completed in 1978 when the Institute reorganized as noted above. In 1979 the Institute was completely moved to Yezin.

At present the ARI receives support from the UNDP assisted by the FAO (UNDP project Bur/77/009) in food crops development. It also has a project for rice varietal improvement, rice based cropping systems research and small farm machinery development which is jointly supported by IRRI and CIDA.

The UNDP/FAO and IRRI/CIDA projects are organized in a quasi-independent fashion from the Institute's regular organization. In that sense they have a Burmese Project Director who acts as a counterpart to the expatriate chief of party. In the IRRI/CIDA project there are 3 technical committees that are concerned with the 3 aspects of the project. These committees determine direction within the project and help establish policy and monitor progress. They will work directly with project staff and expatriate advisors in their area. In the UNDP project there is a Director and one Technical Committee.

The Burmese Project Director coordinates the activities of the project with the various crop divisions and disciplines of the Institute as well as with the Institute's administration which manages auxiliary labor and controls shops and farm equipment. He facilitates receipt of commodities, helps locate candidates for training and assists the technical assistants in carrying out their responsibilities. Under the USAID BARD project, a similar management structure will be established.

For projects at the Institute, staff are assigned directly to the project and carry out research/production activities as identified by the project. For the IRRI/CIDA rice based cropping systems research, 11 satellite stations were established and function as research substations for cropping systems. For the USAID project, some of these sites will be upgraded as full research sub-stations, concentrating on maize and oilseeds in four different climatic/farming systems zones. During the project they will be under the direction of the Agricultural Research and Development project director.

The UNDP project has an authorized staff of 100 with 59 actually employed, while the IRRI-CIDA project has an authorized level of 62. Outside of these projects the Institute has an authorized staff level of 431 with 302 on board. Fifty-eight of the latter group are staff officers, with an additional 35 senior field officers who are in position for further training and advancement. With the 8 junior field assistants, a total of 101 scientific research staff are presently at the Institute. Of this group only 3 have PhD's and 10 have MSc's. Sixty-two vacancies currently exist out of an authorized scientific staff level of 163. Design team members as well as Government officials and ARI staff have identified this shortage and the existing low level of training of staff as the major weakness in Burma's research capability.

For the BARD project, the Institute is requesting an additional 157 research positions, of which 111 are senior field assistant level and above, and 46 are junior field assistant level.

This increase is required to operate the 4 new satellite stations as well as the project office in Rangoon, and to provide staff at Yezin for the increased emphasis on maize and oilseeds identified by current Government policy.

While this appears to be a large number of scientists for the project, it must be remembered that the development and assignment of staff will be over a five to ten year period, that there is a current shortage of scientific staff to accomplish the needed research in Burma and that there are nearly six hundred graduates from agricultural schools that are to be employed each year. Given the existing situation in Burma, the suggestion for staff positions is reasonable. This employment will also develop a cadre of staff eligible for foreign training. Lack of eligible staff has been a major constraint in Burma to taking advantage of available overseas training positions.

The existing staffing pattern and proposed new organizational chart are shown in Figures 8 and 9.

IV.3.3.1.1. BARD Project Organization and Staffing (See Figure 11 and 12 for BARD staffing pattern and organizational chart).

A new division is being organized in ARI to manage the BARD project and the more permanent function of managing the four new research stations. These stations, which represent the four major agro-ecological zones in Burma, are Shwelaung for high rainfall delta crops; Myananda in the irrigated area; Nyaung Oo in the arid zone; and Aung Ban in the hill country.

The project staff will work closely with the maize and oilseeds divisions of ARI in variety and crop quality improvement, soil and water management, crop and pest management and post harvest technology. The staff will also work with the satellite stations in station development and maize and oilseed research.

Research coordination will be initiated with regional research and extension offices, the agricultural university, and regional agricultural institutes that are located near satellite stations.

A small project office will be located in Rangoon to handle transshipment of supplies and equipment and provide travel assistance.

Short and long term technical training is an additional major component of the project that will be monitored by project staff (See Training Analysis). English language training is required at the ARI, Yezin Campus. Project staff will assist with the organization of this training and provide local hire teachers from the foreign community where possible. This will be particularly important the first three years of the project when participants are going for both long and short term training. It may well be continued through the life of the project to help provide for future English language competency.

IV.3.3.1.2. Staffing

Staff for foreign sponsored projects are provided from Ministry of Agricultural and Forests staff on an incremental basis and, due to the temporary nature of the assignments, are normally given a grade increase for the time they work on the project. At the time of completion of the project, they may retain this grade if a position is available or revert to their former grade if there is not. Only the advisory support staff will be paid by project funds. All other project staff are paid from regularly budgeted government funds.

IV.3.3.2. Applied Research Division (ARD)

The Applied Research Division of the Agriculture Corporation has a mandate for conducting applied research and producing seed for farmers. Research is conducted on 19 central farms operated by ARD throughout Burma. Seed production of the major crops is done on 21 other farms.

ARD reportedly was authorized 2500 positions, including laborers, with 1200 positions filled in Dec. 1983. Staff holding degrees from diploma through PhD were estimated at 314, of which 56% were estimated to be on the central farms, 25% at headquarters. There were 6 PhD's, 10 MSc's and 200 BSc's, with the rest having diplomas.

ARD has had or currently has responsibility for several foreign assisted projects or elements of projects including Cotton Improvement, Crop Improvement and Seed Improvement.

IV.3.3.3. Extension

Under the Agriculture Corporation the Extension Division has 5 major responsibilities:

- implementation of the Annual Agriculture Plan.
- distribution of essential supplies and inputs to the cultivators in co-ordination with other Departments and Corporations.

- distribution of pure seeds in co-ordination with the Research Division.
- extension/education to farmers.
- co-ordination of agricultural activities with the various levels of the People's Councils.

In September of each year the Cultivation Supervision Committee at village tract level,* sets targets for areas and production goals for each crop to be grown in the area. The targets are recorded by the Agriculture Corporation and passed up through the system. The Ministry of Agriculture and Forests prepares the National Plan for presentation to the Ministry of Planning in March/April as was noted above. The plan is then presented to the Cabinet and they then present it to the National Assembly for final approval.

The Ministry of Agriculture and Forests is responsible for implementing the approved plan down to the village level. Inputs will be delivered to the township level according to preliminary plan documents and 4 year plans. After the People's Assembly has approved the annual plan the Ministry of Agriculture and Forests sends the inputs out to the village tract levels. Each farmer is required to declare his intended cropping program. At this time he is encouraged to follow a cropping program that will help the Village Tract to meet its planned objectives. Farmer decisions are recorded as part of the national data base. Allocation of inputs according to farmer declarations insures accuracy.

In 1975 a program was tested for new, high yielding rice varieties using selective concentration of resources. Authorities decided that due to the continued scarcity of production inputs, existing resources should be concentrated. Therefore, authorities determined which areas had the most potential for rice and assured inputs to cooperating farmers in those areas. This test led to a Whole Township Production Development Programme for major crops. Under this program production inputs are allocated to townships selected as having high potential for each crop according to planned targets for that crop in that township. Inputs include fertilizer, seed, pesticides and extension staff. Additionally, strong political and administrative organization at local levels are maintained through elected councils and nominated committees to coordinate the activities of all government agencies. Mass participation is encouraged through mobilization of voluntary labor and mutual help. Production camps may be established where

*The Committee is made up of the following:
 Chairman, Village Tract People's Council, Chairman Secretary, Village Tract People's Council Secretary, Village Manager, Agriculture Corporation Surveyor, Settlement and Lands Records Department Representative, Farmers' Asiayone Representative, Village Tract Cooperative Society.

applied training of new techniques is undertaken. Production camps normally have a meeting hall and a storage facility for crop ~~inputs~~. The land of the production camp is usually cultivated by the Production Camp Farmer's Committee.

At the village tract level the extension service has a village manager who is in charge of one or more village tracts (groupings of villages). Above him will be a village tract manager who works as a supervisor of a team of village managers. The ratio of village managers to village tracts varies, although for areas which are included in projects such as the World Bank Paddy Project or the USAID MOPP project the ratio is usually 1 village manager per village tract.

IV.3.4.0.

The Institute of Agriculture, Yezin

This Institute which is under the Ministry of Education, is the only University in Burma giving a bachelor's degree in Agriculture. Approximately 200 students are graduated annually and seek employment in various Ministry of Agriculture Departments. Since 1980 the Institute has awarded Master of Science Programs in agronomy, entomology, soil science, pathology and physiology. Five to ten students receive MS degrees each year. To date the MS candidates have been selected from Institute staff and have been retained as faculty. However negotiations are under way to allow other agriculture department staff to compete for these positions, particularly the Agriculture Research Institute (ARI) staff. As the university and ARI campuses adjoin, this provides an opportunity for the ARI staff to retain their ARI position and do their research at ARI while attending the University. Another point being negotiated is an affiliation of ARI staff with the university faculty. Although there is now a close collegial relationship between the ARI and university staff, efforts are being made by both the Ministry of Education and Ministry of Agriculture and Forests to officially bring the two institutions closer together. The University has been assisted by two UNDP projects which have provided technical assistance as well as farm machinery and laboratory equipment. Six hundred acres of land are available for university research. The five year BAg. program calls for extensive field research and a complete report of this research before graduation. Also faculty research and advance degree research is conducted in the fields and laboratories of the university.

Other formal agriculture training in Burma is provided by the agriculture high schools and regional agriculture institutes that issue diplomas rather than degrees. High School graduates may go directly to the Agriculture University while non-graduates go to the regional schools that give diplomas after a three year course. Until 1983 diploma holders could, upon passing an entrance exam, enter the university and in three years receive

~~BSc~~ degrees. Since 1983 this opportunity has been suspended for diploma holders. However it is under negotiation for reinstatement.

IV.3.5.0. Relations Among Agencies

The possibilities for collaboration among the University Institutes, the Ministry of Livestock and Fisheries' Veterinary Research Institute and the Ministry of Agriculture and Forests' ARI are limited by their division and among different Ministries. Thus, official collaboration and coordination must come from the level of the Prime Ministers Office or above. Any collaboration between the Veterinarian Research Institute, Forest Research Institute and ARI would require direction from the level of the Minister of Agriculture and Forests. At the level of the Agriculture Corporation, coordination is only assured between ARI, ARD and Extension by the Managing Director. Within the ARI, the General Manager assures inter-disciplinary effort by the 13 divisions.

IV.3.5.1. Coordination

Project coordination with the Institute of Agriculture is currently on a personal basis. As mentioned in the section on the Institute of Agriculture, negotiations are underway between the Ministries of Education and Agriculture and Forests to make official closer cooperation between the ARI and the Agricultural Institute on their campuses at Yezin.

Thus, at present, communications between the University and the other Institutes at Yezin occur only on an informal basis. In as much as the various staffs are well acquainted and live in a relatively confined area this informal communication channel is perhaps sufficient for keeping the professional staff aware of each other's activities. If the closer cooperation between the university and adjoining Forest Research Institute that has developed since the posting of a Forestry advisor is indicative, then the posting of the two long term advisors at ARI should also increase University/ARI cooperation. A major goal of these advisers will be to exchange ideas and experience. However, any direct collaboration, especially requiring the sharing of resources, is often difficult due to the tedious approval processes that require transmitting requests up to the concerned Ministries. Discussion with both Ministry of Education and Ministry of Agriculture and Forests leaders indicate their desire for closer cooperation and the sharing of facilities where appropriate. It is reported that negotiations are progressing satisfactorily and with all research staffs supporting more cooperative activities, progress should continue. Until a more formal working arrangement can be provided by the government to facilitate this collaboration at the research and instructional level, the Institute of Agriculture's resources can only be available to this project in an informal way based on personal relationships.

Work with the Extension and Applied Research Divisions of AC ~~are~~ on a more official basis and therefore coordinated from ARI and AC headquarters to the farmers' fields through Whole Township Production programs. Reorganization is currently underway in AC to more clearly define the role of research between ARI and the Applied Research Division. The potential exists for basic and applied research responsibility going to ARI and a new organization being established to operate the seed farms and state production farms. This would facilitate research coordination. However, ARI and BARD staff with applied research responsibility would also need to be given the responsibility for coordination with Extension to assure the continued flow of new research into farmers' fields.

It appears that a fairly good relationship exists among the different divisions within the Agriculture Corporation. At least one gets the impression that ARD and Extension are willing to share some land and facilities with ARI. However, there is some duplication of effort. ARD carries out some experimental work without direct collaboration with ARI researchers. This is generally site specific crop verification testing. By the same token, extension has seed production farms that function independently of ARD's seed production program. This is the case, for example, with USAID's MOPP project.

Apparently the Burmese Government is giving some consideration to reorganizing the research and seed production functions of the Agriculture Corporation. However, any reorganization cannot be assured for the life of this present project. It is therefore necessary, from an institutional point of view, for ARI to develop its own research outstations in the major agro-ecological zones. However, this project foresees limiting the development of stations so that, in the event of reorganization, stations presently under ARD will not become duplicative of newly established ARI stations.

ARI has contact with the international agricultural research centers who have responsibility for crops similar to those grown in Burma. IRRI, with financing from Canada through CIDA, manages rice breeding cropping systems and small farm machinery projects for ARI. Maize and wheat nurseries and consultation are provided by CIMMYT. Oilseed and food legumes technology is provided by IITA and ICRISAT. Other technological exchanges occur between ARI and Thailand and the Philippines on maize and rice and with India and Bangladesh on general agricultural subjects.

FAO has provided broad assistance in agriculture over a long period of time. They currently have a project on food legumes with ARI.

IV.3.6.0.

Linkages Among Party, Public Administration and Technical Line Agencies

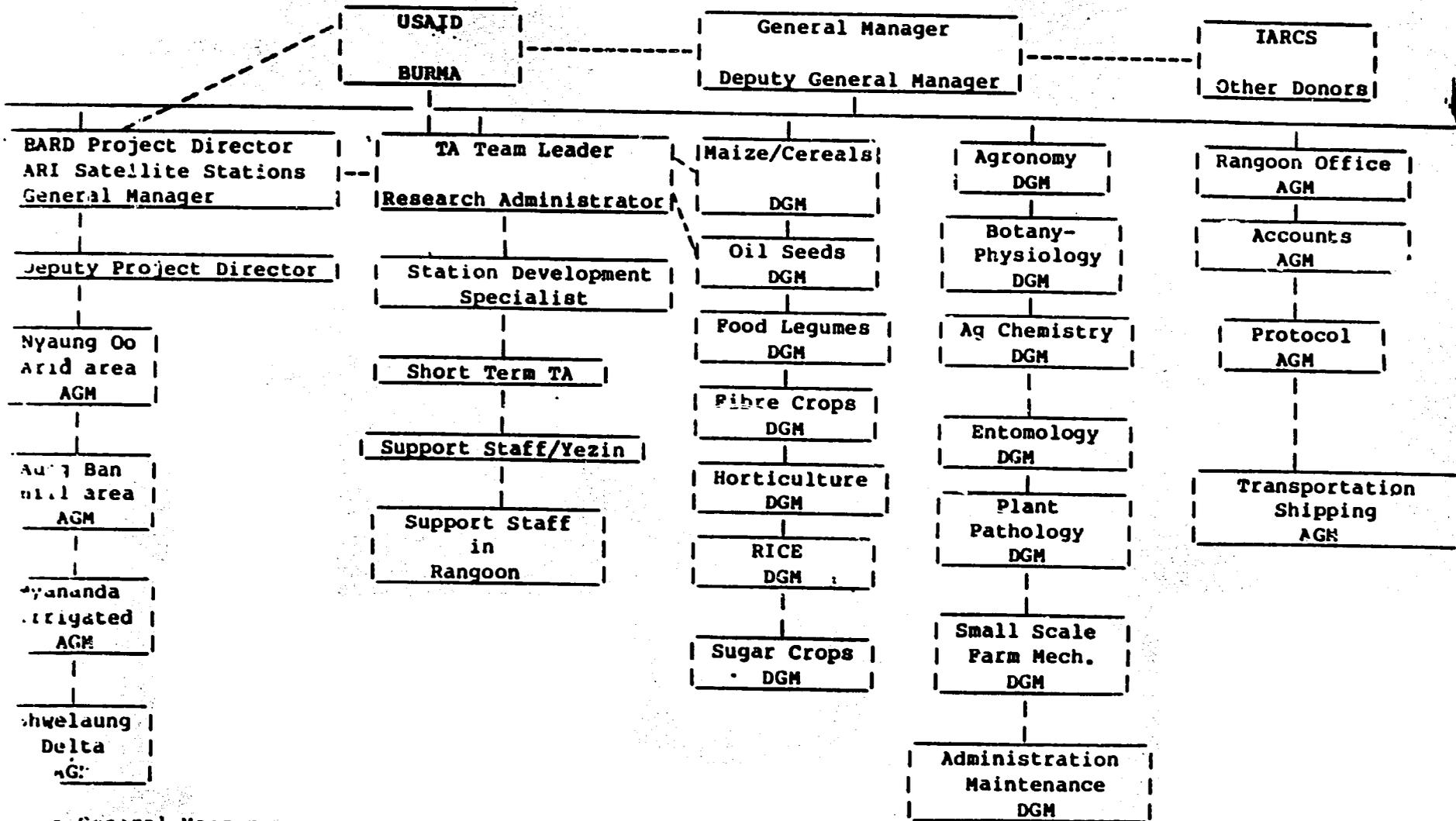
BSPP and elected Township Peoples' Council representatives take an active role in establishing targets and monitoring progress in agricultural production. They are also instrumental in locating land, cooperating farmers and workers and other resources. Because the Party is central to all activity in Burma, the staff of the AC including ARI, ARD, and Extension will be required to work closely with the BSPP officials at all levels. In fact, most senior agricultural officers are now being assigned responsibility by the Party for promoting agriculture in one township. Although this takes officers away from other duties from time to time, it serves to keep them in contact with the field and farmers' problems.

Policy decisions as well as research priorities will be channelled through Party, People's Councils and A.C. officials. At the Village and Village Tract Levels, the A.C.'s Village Tract Managers, Peoples Council's and BSPP cell members maintain a dialogue concerning all agricultural activities in the area. This includes National Policy concerns and the local area's contributions to policy goals, farmer needs and administrative and resource needs and constraints. Because of the extensive organization of the extension service and the intimate involvement of political and administrative officials problems identified for research are readily channelled through the system. By the same token research results can be almost immediately translated into on-farm testing and utilization.

FIGURE 10

Agricultural Research Institute, Yezin

Organizational Chart



- General Manger

- Deputy General Manager

- Assistant General Manager.

- Deputy Assistant General Manager

FIGURE 11

ADDITIONAL BURMESE GOVERNMENT MANPOWER REQUIREMENT FOR PRODUCTION ORIENTED BURMA AGRICULTURAL AND DEVELOPMENT RESEARCH PROJECT (BARD)

Title (grade level)	Rangoon Project Office	Yezin	257A Myaung Oo	107A Aung Ban	25A Myananda	100A Shwelaung	Sub Total	Total
Research Staff								
1 Project Director		1					1	
1a Deputy Project Director		1					1	
2 Asst. Project Director	1	7	1	1	1	1	12	
3 Dy Asst. C. Manager (DAGM)	1	17	3	4	2	5	32	
4 320-440 (Jr. Research Officer)		17	3	4	5	4	33	
5 210-330 (Sr. Field Asst)		19	2	4	6	4	35	
6 150-220 (Jr. Field Asst)		19	11	7	2	4	46	
Sub-totals	2	81	20	20	16	18	157	157
Support Staff								
7 Account Officer		1					1	
8 Branch Officer		2	1	1	1	1	6	
9 Upper Division Clerk	1	2	1	1	1	1	7	
10 Typists	1	6	1	1	1	1	11	
11 Lower Division Clerk	1	2	1	1	1	1	7	
12 Car Driver/Boat Driver	1	5	4	5	3	3	21	
13 Office Assistant	1	3	1	1	1	1	8	
14 Night/Day watchman	2	2	4	2	2	2	14	
15 Storekeeper	1	3	2	1	1	1	9	
16 Steno typists English		1					1	
17 Tractor drivers			2	1	1	1	5	
18 Asst. tractor drivers			4	3	3	2	12	
19 Mechanic			1	1	1	1	4	
20 Carpenter			1	1	1	1	4	
21 Blacksmith			1	1	1	1	4	
Sub-totals	8	27	24	20	18	17	114	114
22 Laborers			10	10	10	10	40	40
GRAND TOTALS	10	108	54	50	44	45	311	311

NOTE:

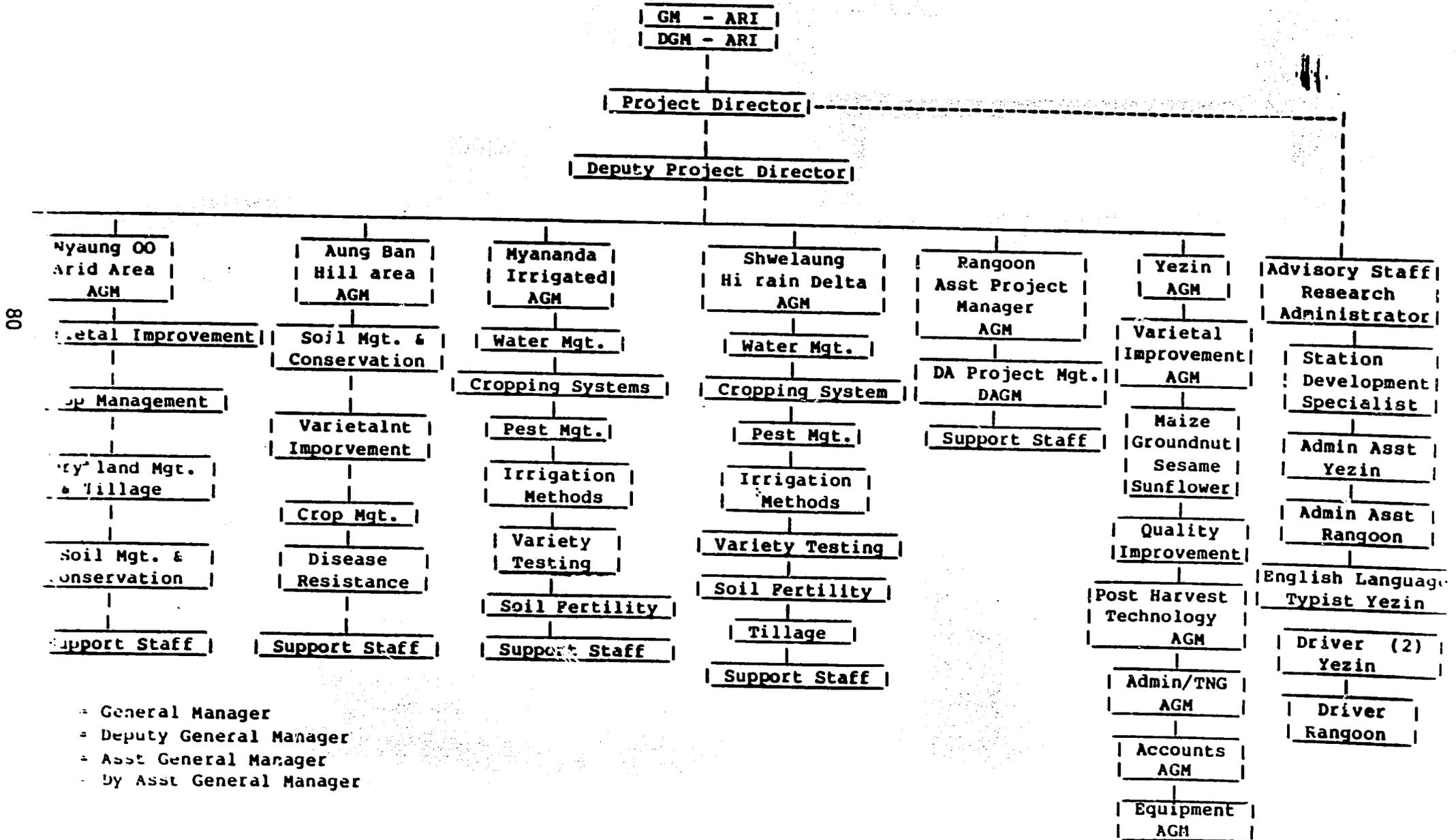
Additional SUB staff requirements for BARD and the four Satellite Stations are projected over the long term development planned for these stations and their support facilities at Yezin. See Annex 5

FIGURE 12

AGRICULTURAL CORPORATION

Burma Agricultural Research and Development Project (BARD)

Organizational Chart



IV.4.0. Economic Analysis

Several analyses have shown that investment in agricultural research has high positive economic rates of return. Rates of twenty percent to 150% have been estimated IRR's for research projects in many places in the world. Unfortunately, these analyses are always ex post facto, and no good way has been developed to estimate benefit streams that may result from investments in agricultural research.

For this analysis, therefore, we have calculated the costs of the investment, set an acceptable rate of return of 15% and calculated the benefit stream that would be required to give the chosen IRR.

TABLE 10 summarizes the calculations, indicating that a benefit stream of approximately U.S. dollars 7,300,000 would be required during years 7 through 12 to cover investment and recurrent costs. It was assumed that no benefits would be derived from the research project until after the end of the initial 6 year project. This assumption is probably overly conservative. As a considerable amount of station development will be done over the project period and the procuring and shipping of commodities from the U.S. will take considerable time, we cannot expect direct research efforts on this project to get underway until the second or third year. Additionally, training of Burmese scientists is assumed to require 2.5 to 3.5 years. Selection of these candidates, will begin in the first year of the project, so the earliest we can expect any participant to return from long-term training will be in the fourth year of the project. Granted, some research will be underway by existing ARI scientists, technical assistance will be in place and short-term participant training will begin to produce results in early years as will the output from long and short-term technical assistance. However, most research output from ARI in the early years of the project will be linked to prior research efforts, therefore it is preferable to assume benefits will begin to accrue in year 7.

The choice of a twelve year period for calculating the return to investment was done for two reasons. First, it is comparable to the period of time that was required to develop and disseminate the high yielding rice varieties and the associated technology that has previously been done in Burma. Secondly, it is a reasonable period of time to amortize the commodities that are purchased, i.e. they will be used, for 10 years after arriving in-country. Although no residual values are entered into the calculations, at least 50% of permanent facilities and 24 years of professional life of each scientist trained will remain.

TABLE 10 - DETERMINATION OF BENEFIT STREAM
 REQUIRED TO COVER INVESTMENT COSTS
 (U.S. DOLLARS (000) - 12 YEAR PERIOD)

Year	Total Costs	Total Benefits	Net Benefit Stream "Cash Flow"	Discounted Cash Flow 15%
1	3549	-0-	-3549	-3085.8
2	4455	-0-	-4455	-3368.6
3	2728	-0-	-2728	-1793.7
4	2533	-0-	-2533	-1448.3
5	2017	-0-	-2017	-1002.9
6	818	-0-	- 818	- 353.6
7	535	7300	+6765	+2542.9
8	560	7300	+6740	+2203.3
9	590	7300	+6710	+1907.4
10	620	7300	+6680	+1651.2
11	650	7300	+6650	+1429.4
12	683	7300	+6617	+1236.7
	<u>19738</u>	<u>43800</u>	<u>+24062</u>	<u>- 82.0</u>

The costs for the first 6 years are derived from the project budget, and include all budget components, including contingencies and a 5% inflation factor. The costs for the second 6 year period were calculated as the recurrent costs for personnel, utilities, operations, and supplies. The year 7 figure was inflated at 0.5% or 5.0% compounded rate to cover inflation through year 12.

The choice of 5% as the inflation factor for both the U.S. and Burmese economies was based on present rates. Burma has actually had a lower rate as can be seen in the CPI and WPI. Inflation rates in the U.S. are also currently below 5%.

Index	Year	1978-79	1979-80	1980-81	1981-82	1982-83	1983 ^{1/}	1984 ^{2/}
CPI		100.97	106.64	106.61	107.80	113.43	118.28	119.6
WPI		100.46	104.96	107.49	99.66	101.63	104.48	105.22

^{1/} Ave. indexes for 12 month calendar year

^{2/} Ave. indexes for first 4 months of calendar 1984

1978 = 100

Source: Ministry of Planning and Finance, Central Statistics Organization, "Selected Monthly Economic Indicators" Statistical Paper No. 3 March & April 1984.

Total costs over the twelve year period are estimated as \$19,738,000 U.S. dollars. A total benefit stream of \$43,800,000 will need to be produced (\$7,300,000 per year) in order to give a total net benefit stream of \$24,062,000 which when discounted over the period at 15% will just cover investment costs. That is, at that level the project will have produced a 15% internal rate of return.

The potential for producing a benefit stream of \$7,300,000 seems to be very great. For example there are 675,000 hectares (1,667,925 acres) of groundnuts presently grown in Burma. Seeding rates are about 120 kg per hectare (107 lbs/acre). Seeding rates vary considerably, as do seed costs, which are probably 500-1000 kyat/acre (\$60-\$120). A study undertaken by ULG consultants for the UNDP and Ministry of Cooperatives, suggests that improved row seeding and better quality of seed could reduce seed by 1/3. Assuming a present average seed cost of \$90.00/acre, and a reduction of \$30/acre on approximately 1,650,000 acres, a total net saving of \$49,500,000 per year would be gained. Seed technology research along with animal drawn or hand seeder development would alone account for 2/3 of the required benefit stream of \$7.3 million if only 10% of the savings were attributed to research.

By the same token increases in yields through variety selection, cultural practices, pest control or other measures that will be undertaken in research by the project could produce additional economic flows. A 10% increase in the national yield average of 580 lbs/acre for groundnuts, or 58 lbs/acre would produce about \$30/acre or \$49.5 million/yr. Again 10% of this attributed to research would cover 2/3 of the required benefit stream.

Sesame, now grown on 1,468,000 hectares, (3,627,428 acres) and yielding only about 140-150 lbs per acre (160 kgs/ha) also has great potential for yield increases through research.

Post harvest losses in groundnuts, now estimated at 20%, and sesame, presently at 15% also are potential areas for research. In fact small increases in yields, small reductions in post harvest losses, or small reductions in seed use, alone, are sufficient to produce a very high IRR for investment in research in Burma. Given that the extension system is in place for moving research findings to the farms, there is spectacular opportunity for economic gains to the country and its farmers.

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IV.5.0. SOCIAL SOUNDNESS ANALYSIS

There appear to be no complicating issues that will impede the successful implementation of the research project described in this paper. The purpose of the project is to strengthen the capability of the Ministry of Agriculture and Forests, especially the Agricultural Research Institute (ARI) to plan, organize and carry out production-oriented research in maize, oilseeds and other selected crops. The immediate beneficiaries will therefore be research scientists working with these crops. Subsequent beneficiaries will be the small farmers who dominate the agricultural sector and consumers of edible oil.

Little has been written on rural society in Burma and how the development process affects rural people. Farm family profiles do not exist. Accurate production, income, savings and consumption data are difficult to obtain. However, experience gained by AID/Burma under the Maize and Oilseeds Production and Primary Health Care Projects, helps us to understand better the characteristics of rural society in Burma and the constraints facing agriculture. This section describes briefly the agriculture sector in a social context, the beneficiaries, the proposed impact area, and the role of women in the project.

IV.5.1.0. Socio-cultural Context

Burma is an agrarian society with 64 percent of its population devoted to agriculture. As a result of continued population growth and egalitarian land reform, average farm size has declined by 13 percent over the past 30 years. Three-fifths of all farm families cultivate less than 5 acres, the average size farm holding is 7.5 acres.

TABLE 11

Farm Size Classification

	<u>Acreage Size</u>					
	<u>5</u>	<u>5-10</u>	<u>10-20</u>	<u>20-50</u>	<u>50-100</u>	<u>100+</u>
No. of families (million)	2.6	1.0	0.5	0.1	0.002	0.001
% of total	61.0	24.0	12.0	3.0	0.05	0.01
Area of farms (million acres)	6.2	7.7	7.2	3.0	0.1	0.4
% of total farm acreage	25.0	31.0	29.0	12	0.5	1.8

Source: Oilseeds Production and Processing Project Feasibility Report, UNDP/ADB for Ministry of Cooperatives. Prepared by LG Consultants Ltd.

Burmese families are depicted as nuclear structures, and large extended families do not normally appear as production units. Therefore, most of the farms will be operated by a family composed of a mother, father and children. Families do not normally live on the land that they farm but rather in small to medium sized, settlements, surrounded by the croplands.

Farm labor requirements are largely met by the nuclear family. Heavy work such as land preparation, leveling, and bunding is done by the men. Women participate in planting, transplanting, weeding and harvesting. Farmers do hire outside labor at critical times, such as for transplanting rice.

Animal traction is widely used in Burma. Using either cattle or water buffalo, farmers prepare land using simple wooden plows with steel ploughshares, and level and till land with wooden equipment. Most of the transport in rural areas is done with ox carts. Ownership of animal traction units exceeds 50% in most of the areas visited by the design team. Hiring of oxen for land preparation may be done by farmers not owning their own beasts, although government tractor-hire services are sometimes available, usually at lower cost than oxen rental rates.

Livestock are important on farms in many areas, but this varies according to land type, cropping systems and climate. Work animals are highly esteemed, and well cared for. Farmers feed oilseed meal to work-oxen, and grow fodder, particularly sorghum, for oxen.

As a result of the high-yielding rice scheme, most Burmese farmers now transplant rice in paddy fields. With sesame, seed is usually broadcast on ploughed ground and thinned later with the use of a harrow. Groundnuts are generally sown in rows, often in furrows opened with a wooden row-maker and covered with a drag. A similar technique is being extended by the MOP Project for sunflowers, although the traditional method is to broadcast seed. Maize is planted and cultivated as a row crop.

Use of inorganic fertilizer is limited by the amount manufactured locally and government imports. Most fertilizer is used on targeted crops. Some farmers are able to apply farm yard manure, depending on the number of animals owned and the availability of carts for hauling.

In Burma, literacy is high (69 percent) and among most rural farm-families, at least one person can read and write Burmese. Because of this, extension programs have been quite successful in disseminating information on new technologies, especially in the health and agricultural sectors. The fact that the government places a very high priority on increasing agricultural productivity, and favors production campaigns and export drives, greatly enhances the effectiveness of the agricultural extension service.

Agriculture in Burma is overwhelmingly in private hands with 97.5 percent of agricultural commodities produced by self-employed farmers. The cooperative sector accounts for 2.2 percent of agricultural production. The state sector produces the remaining fractional amount and is involved mainly with industrial crops such as sugarcane, tobacco, jute and cotton.

Increased agricultural production has come about largely from increases in yields due to improved cultivation practices, varietal improvement, and the introduction of commercial fertilizers. Per acre yield increases have accounted for three-fourths of the 130 percent increase in crop production over the past 20 year period. The remaining increase in agriculture output is attributable to 30 percent more land being put into production since 1961. However, the rate that new land can be brought into crop production is declining with the result that more emphasis is being placed on increasing yields on existing cultivated land to sustain agricultural productivity.

Although the average farm is small, crop yields low and farm income limited, the Burmese farmer operates his enterprise as an economic unit. He understands the relationship between increased inputs and increased yields, and how this translates into greater net farm income. Common constraints to increased production are the lack of water and fertilizer. The farmer understands, for example, that every 56 lb. bag of urea (9 kyats/bag) added to the maize crop will increase yield by 10 to 15 baskets (value of 200-300 kyats). Burmese farmers have demonstrated their willingness through the Whole Township High-Yielding Paddy Program and the Maize and Oilseeds Production Project to use improved varieties and cultural practices. This economic rationale has contributed to the doubling of rice production over the past decade. It is important, therefore, to look at the important elements and the linkages between research and extension in these highly successful programs.

IV.5.1.1. 1. Whole Township HYV Program

The success of the Whole Township High Yield Paddy Production Program to increase paddy yields is indicative of the likely success in the transfer of research to extension for maize and oilseed crops. Anticipated agricultural production increases during the 1950s and 1960s, failed to materialize. Even the importation of new high-yielding paddy varieties from IRRI did not provide significant improvements. Further research work in Burma was required before a range of inputs needed to support new paddy varieties was derived. This package of inputs, or impact points, was first carried out on 500 acres where 40 farmers were provided with necessary assistance so that they could comply with the ten impact points. Impressive yield increases were obtained from this program and it was eventually extended to 82 townships in Burma.

In view of the scarcity of crop production inputs, such as improved seed varieties, fertilizer, and pesticides, these "Selective Concentrated" townships were located in areas offering the most favorable returns. Soils and climate were the main determinants for inclusion into the Whole Township Production Program. In addition, staff and facilities of the extension service are also considered as important program inputs. The main components of this type of research-extension improvement in crop production linkages are:

- (a) Promotion and use of tested and recommended technology,
- (b) Selection of areas for production with comparative soil and climatic advantages,
- (c) Strong political and administrative organization at local levels,
- (d) Mass participation through use of voluntary labor to alleviate the constraint of labor shortages in peak periods, and
- (e) Establishment of technology/social centers to promote diffusion of ideas such as "Production Camps".

Available evidence shows that farmers' acceptance of new technology using the Whole Township approach has been high. This is attributed to a combination of factors including profitability to the participating farm families as expressed in increased real income as well as the mix of social and peer pressure encouraging participation.

The Extension Division of the Agriculture Corporation in coordination with the Burma Socialist Program Party (BSPP) has the main responsibility for the above components. The Research-Extension linkage described above will help assure that innovations from research which carry the probability of increased returns will be readily accepted and applied by Burma's farmers in the areas of maize and oilseeds crops.

IV.5.2.

Beneficiaries and Participants

The most immediate and visible beneficiaries of the project will be the research scientists of the Ministry of Agriculture and Forests who will receive training and other technical benefits. In addition to those scientists who receive training, staff at ARI in the maize and oilseeds crop areas will benefit from additional laboratory and field equipment, better management and improved land development. Eventual beneficiaries of the project are the 2,500,000 maize/oilseeds farm families who will adopt research results from this project and translate them into increased production. It has been estimated that a savings of 250 kyats per acre in groundnuts alone can be achieved through

improved varieties and other research-related inputs. Sesame, a major project crop and one indigenous to Burma, has one of the lowest yields in Asia. Sri Lanka and Pakistan are obtaining yields double that of Burma's, and neighboring Thailand's sesame yields are almost triple. Research into drought and disease resistant varieties plus improved production practice can increase these yields by 2-3 baskets (approx. 100 - 150 lbs./acre) with few additional inputs. Research relating to the increasing national production of sunflowers can benefit farmers by substituting sunflowers for relatively lower oil yielding crops.

Crop	Acres ('000)	Increased Net Income potential	Total Annual Net benefit ('000)
Sesame	3,400	K. 200	K. 680,000
Groundnut	1,650	K. 250	K. 412,500
Sunflowers	500	K. 400	K. 200,000
Maize	500	K. 100	K. <u>50,000</u>
			K.1,342,500

Total annual increased net income potential created by improved research in maize and oilseeds is estimated at 1,342 million Kyats or 500 kyats per farm family per year. This represents a substantial improvement in income to the many farmers who earn less than 2,000 Kyats per year.

The secondary beneficiaries of agricultural research will be consumers through improved nutrition. National production of edible oil, the second most important food in the national diet, stands at 5 kg/capita. Burma has established a goal of attaining self-sufficiency in edible oil production by 1994. This will require an additional supply of 9 kg/capita. The strategy for attaining this objective involves increasing per acre yields through the substitution of higher oil-yielding crops. Typically, the initial benefits of agricultural research goes to the producers, in the form of increased income from higher production levels. Then, this advantage shifts to the consumer as the expanded output results in lower prices. With proper agricultural policy, prices acceptable to both consumers and producers will result in benefits to both constituencies.

IV.5.3.

Impact

AID's primary objective is to help people in developing countries meet their basic human needs through equitable, sustainable growth. One constraint to sustained agricultural growth in Burma is a shortage of research staff. This project addresses that need, among others, and will eventually result in the development and dissemination of increased research findings to farmers to sustain planned production increases.

It is likely that maize and oilseeds research will, in addition to the benefits discussed above, have a positive impact on income distribution as a consequence of gains being transferred to consumers. As pointed out, historically the effects reducing the real costs of production have benefited consumers. Evidence shows that the real income of low income families is increased relatively more than that of higher income groups through agricultural modernization, including agricultural research, thereby reducing inequality in income. Increased production leads to: a) increased farm income; b) improved nutrition through increased consumption of protein-rich crops; c) improved balance of trade by reducing edible oil imports as well as increasing other agricultural product exports, and finally by d) expanded employment in agricultural-related activities. Technology derived from research takes time to be developed, tested, extended and adopted. For these reasons, total project impact, while it can be categorized, will not be fully measurable for years after the project.

IV.5.4.

Role of Women

Although this project is not directly involved in affecting social changes to alter the roles of women and girls in Burmese society, they will be beneficiaries of the project both as direct participants as well as beneficiaries of improved technology generated from research. Sufficient data and analyses do not exist to paint a complete and accurate composite of the rural woman. It is known, however that Burmese women are independent and accustomed to an unusually high degree of freedom compared to some other Asian countries. They are a major element in the agricultural labor force, comprising approximately 50% of the farm workers. Also, many are directly involved in farm management and thus benefit from technological innovations developed by research and disseminated through the extension services.

At the present time, women account for 200 of the 250 Bachelor Degree graduates from the Institute of Agriculture. Most of these graduates are employed by the Agriculture Corporation in extension, research and land planning. It is to this pool of trained personnel that M.Sc and Ph D degree training will be offered under this project.

IV.6.0.

ENVIRONMENTAL CONSIDERATIONS:

The project's purpose is to strengthen the capability of the Ministry of Agriculture and Forests particularly the Agricultural Research Institute, to plan, organize, and carry out an expanded program of production-oriented research in maize, oilseeds, and other selected crops. Because it is a research and institution-building project, it will have little direct or immediate negative environmental impact, and no formal Environmental Assessment is required within the USAID project design process. However, as part of a major program to improve agricultural productivity in terms of per acre yields and to increase total national production of selected agricultural commodities, a number of environmental and natural resource management issues arise. These bear on the sustained success of the program itself, or more generally on the process of agricultural modernization and development in Burma. Some of these considerations also relate to other development sectors, such as public health, energy and power and forestry.

A review of some of these environmental considerations is found in Annex 2. The following list includes some recommendations for addressing them through the Agricultural Research and Development Project.

Recommendations:

1. A Crop Protection Assessment should be conducted as part of the mid-project evaluation of the Maize and Oilseeds Production Project. The Mission can request AID/W support under the worldwide Crop Protection Project to provide the services of an expert consultant to travel with the MOPP evaluation team for the specific purposes of:

- reviewing the pest management recommendations contained in the MOP Environmental Assessment and the crop protection sections of the the Agricultural Research and Development Project Paper in light of the actual pest problems encountered in the field under the MOPP to date, and
- preparing a revised strategy for crop protection to be carried out during the remainder of the project.

This Crop Protection Assessment would also lay the basis for crop protection work under the planned MOPP II.

2. The Regional Environmental Advisor should begin passing to the ADO in Rangoon information and reports on Agroecosystems Analysis, particularly the publications of the Indonesian Research Groups on Agroecosystems. The ADO can then share these publications with Burmese agricultural scientists as appropriate.

3. The Regional Environmental Advisor should prepare a list of recommended titles in the areas of agricultural ecology, agroecosystems analysis, soil conservation, environmental management in agriculture, and agroforestry. This list should be made available to the Agricultural Research and Development Project, to be acquired for the ARI library under that project.

4. ARI should consider establishing a division for Soil Conservation and Hydrology. Staff training for this new division could begin under the new Agricultural Research and Development Project.

5. A soil erosion/soil conservation assessment should be conducted at an early date and orientation provided to the SRUB's top planners of the potential hazards and some possible solutions to those problems.

- The soil erosion problems in Burma have not progressed to the point where they cannot be controlled by good soil conservation and water control measures.
- The longer the delay in instituting these measures the greater will be the damage and the more costly will be the control and rehabilitation programs.

V.O.

IMPLEMENTATION PLAN

V.O.1.

Preliminary Actions. The project is planned to cover a six-year implementation period. It is anticipated that AID/W authorization will occur no later than the end of November, 1984, leaving adequate time for the negotiations and signing of a project agreement in order to begin implementation during FY 85. The anticipated Project Assistance Completion Date (PACD) is September 30, 1990.

In preparation for the project, a number of activities are already underway as part of ARI's current program. For instance, the four sites for the proposed satellite research stations have been identified. ARI, however, still must acquire the land for certain parts of the Nyaung Oo and Wakema sites.

Some buildings are already completed or are under construction in Aung Ban, Myananda and Nyaung Oo, and site managers and some staff have been designated for all sites.

A Project Management Committee will be formed to periodically review project progress and address any issues which might be raised by the ARI, USAID or the TA Team Leader. The AID ADO will serve on this committee, and the AC will designate members from the Planning and Projects Division and Extension Division who will serve in an advisory capacity.

There are 16 long-term, advanced degree scholars currently studying in the U.S. under the MOPP. It is anticipated that at least 7 of these will be assigned directly or indirectly to work with the BARD. It is recommended that as soon as possible efforts be made to identify and prepare potential candidates for the project's long-term training component as early as possible.

The ARI should also budget for all costs anticipated to be incurred during the 1985/86 Burmese fiscal year (April 1, 1985 - March 31, 1986) during the next budget preparation cycle.

V.1. Project Implementation Schedule

V.1.1. AID Actions Required

TIMING [Mos. before
(-) or after (+)
signing of ProAg]

- | | |
|---|-----------------|
| 1. Project Paper submitted to AID/W | -7 |
| 2. Project Paper approved | -6 |
| 3. Draft authorization text cabled to USAID/Rangoon and authorization signed | -6 |
| 4. RLO prepares negotiating draft of Project Grant Agreement (ProAg) | -5 |
| 5. Preparation of PIO/T for TA Contract by USAID/Rangoon | -3 thru -1 |
| 6. Preparation of RFTP for TA by ACO | -1 thru 0 |
| 7. AIDREP enters ProAg negotiations with Burmese Government | -1 |
| 8. ProAg signed | 0 |
| 9. RFTP published | +1 |
| (a) Proposals prepared | +1 - +3 |
| (b) Proposals submitted | +4 |
| (c) Establishment of competitive range | +5 |
| (d) On-site or Home Office interviews with firm within competitive range | +6 |
| (e) Contractor selected | +7 |
| (f) Contract negotiations and execution | +8 |
| (g) First TA mobilized | +10 |
| (h) reassessment of project design in conjunction with TA Team Leader and SRUB Project Director | |
| 10. Preparation of PIO/Cs for TA furnishings, vehicles and equipment support by USAID/Rangoon | -1 thru +1 |
| 11. Preparations of PIO/Cs for Project start up equipment by USAID/Rangoon | -1 thru +1 |
| 12. Preparation of PIO/T by USAID/Rangoon for PSA | +4 |
| (a) Preparation of RFTP for PSA by ACO | +5 |
| (b) Submission of proposals | +7 |
| (c) Establishment of competitive range | +7 |
| (d) On-site or Home Office interviews | +8 |
| (e) Contract award, negotiations and execution | +11 thru +12 |
| 13. Preparation of PIO/Ps for Participant Training (PT) | as per schedule |

	14. Preparation of ProAg amendments	as required
	15. Mid-term evaluation	29-31
	16. Review of quarterly reports of T.A. & interim, internal evaluations	quarterly
	17. Final Impact Evaluation	59-61
V.1.2.	<u>Burmese Government Start-up, Management and Staffing Actions</u>	
	1. ProAg signed	0
	2. Conditions Precedent met (if applicable)	
	3. ARI designates Project Manager, counterpart staff and project management team	0
	4. Selection and assignment of managers, researchers and staff at Yezin and the satellite stations.	0
	5. Annual budgets prepared including all anticipated project costs	0
	6. Facilities, administrative support services & all necessary documentation provided for contract team.	is required
	7. Joint AID/SRUB review of contractor proposals and PSA proposals in USA	+4 - +5
	8. Possible home office (U.S.) or in-country site visits for/by short-listed bidders.	+6
	9. Preliminary re-assessment of project design in conjunction with AID and TA team leader.	+11
	10. Station Development in Yezin and Sub-Stations	0 - +64
	11. Implementation of Field Research Program	" "
	12. Implementation of Lab Research Program	" "
	13. Selection of Trainees	+3 - + 54
	14. Facilitation of Technical Assistance Program	+8 - + 54
V.1.3.	<u>Technical Assistance Contractor's Activities</u>	
	1. Bids prepared/submitted	+1 - +
	2. Possible home office or in-country site visits	+6

	3. <u>Contractor Award</u>	+7
	4. Placement of Team Leader/Research Administrator/Station Development Specialist	10
	5. Language training, if necessary for Long Term TA	+10 thru +13
	6. Placement of Irrigation Engineer	+10
	7. Placement of Surface Water Civil Engineer (Drainage)	+10
	8. Placement of Laboratory Equipment Specialist	+10
	9. Placement of Farm Equipment Specialist	+10
	10. Preliminary re-assessment of Project Design	+10
	11. Placement of short-term TA	as per schedule
	12. Submission of Quarterly and	quarterly
V.1.4.	<u>Procurement Services Agent</u>	
	1. Preparation of Bids	+5 thru +7
	2. On-site visits	+12 thru +14
	3. Confirmation of specifications	" "
	4. Preparation of bid invitations	+15 - +16
	5. Eval., award and processing of purchase orders	+17 - +18
	6. Management of shipments, expediting and payments	for Duration
	7. Preparation of semi-annual reports	semi-annual
V.1.5.	<u>Training Schedule</u>	
	1. Team Leader, ARI Project Manager and USAID/ADO to re-confirm priority disciplines.	+10
	2. Competitive selection of applicants.	+11
	3. Placement arranged by sub-contractor.	per schedule
	4. English language up-grading if necessary.	" "
	5. Arrival in U.S. and orientation.	" "
	Ph.D.	" "
	M.Sc.	" "
	6. Short Term Training & Study Tours	to be determined

V.1.6.

Evaluation Schedule

- | | |
|------------------------------------|-----------|
| 1. Re-assessment of Project Design | +11 |
| 2. Mid-Term Evaluation | +29 - +31 |
| 3. Final Impact Evaluation | +56 - +58 |

PROJECT IMPLEMENTATION SCHEDULE

AID ACTIONS	FY 85				FY 86				FY 87				FY 88				FY 89				FY 90			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Project Paper Submitted to AID/W	X																							
Project Paper approved	X																							
Project Authorization signed	X																							
ProAg drafted by RLO	X																							
Prep. of PIO/T - TA by USAID/Rangoon		X																						
Prep. of RFP - TA by ACD			X																					
RFP published			X																					
ProAg signed			X																					
Proposals prepared & submitted				X																				
Establishment of competitive range						X																		
On-site/Home Office interviews						X																		
Contract execution						X																		
First TA mobilized						X																		
Re-assessment of Project Design						X																		
Preparation of PIO/Cs for TA support by USAID			X																					
Preparation of PIO/Cs for Project Support by USAID			X																					
Preparation of PIO/T for PSA by USAID				X																				
Preparation of RFP by ACO						X																		
Submission of proposals						X																		
On-site/Home Office interviews						X																		
Contract execution for PSA							X																	
Mid-term evaluation													X											
Final Impact evaluation																								X

PROJECT IMPLEMENTATION SCHEDULE

TECHNICAL ASSISTANCE ACTIVITIES	FY 85				FY 86				FY 87				FY 88				FY 89				FY 90			
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Bid prepared				X																				
Home Office or on-site Interviews				X	X																			
Contract award					X																			
Procurement Team Leader/Research Administrator mobilized, as well as:																								
Station Development Specialist					X																			
Irrigation Specialist					X																			
Drainage					X																			
Laboratory Equipment					X																			
Farm Machinery					X																			
Other Short-Term T.A.					X																			
Re-assessment of Project Design					X																			
Selection of TOEFL Specialist					X																			
Identification of needed equipment & machinery						X	X																	
Preparation of Specifications for PIO/CS							X																	
Provision of Technical Assistance					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mid Term Evaluation													X											
Final Impact Evaluation																								X

PROJECT IMPLEMENTATION SCHEDULE

	FY 85				FY 86				FY 87				FY 88				FY 89				FY 90							
	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
PROCUREMENT SERVICES AGENT ACTIVITIES(PSA)																												
Preparation of Bids					X																							
Home Office or On-site Interviews						X	X																					
Contract award						X																						
Preparation of IFBS								X																				
Evaluation of Bids, Issue Purchase Orders									X	X																		
Expedite Deliveries										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
Inspection and consolidate shipments										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
Arrange for Shipping and Insurance										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
Process Documentation										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				
Arrange for Payments										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X				

100

59X

V.2.0. Contracting and Procurement Plan

V.2.1. Technical Assistance Contract

In accordance with the preference of the Burmese Government, an AID direct contract is proposed for the provision of technical assistance under this project.

Given the fact that there are many U.S. Title XII universities as well as a few, small, minority or women-owned consulting firms which can offer expertise in the field of agricultural research, serious consideration has been given to the possibility of limiting the solicitation of proposals to one or both of these sectors.

However, after a number of discussions which the design team held with staff members and consultants from FAO, UNDP, IRRI, the World Bank and AID, there evolved a consensus that the administrative and logistical requirements for operating in Burma at the present time are extremely difficult and demanding.

For this reason, it was determined that the preferred method for contractor selection would be open, competitive bidding. In this way, U.S. Universities, International Agricultural Research Centers (IARCs), large and small technical firms, or consortia representing combinations of such institutions will be able to submit proposals reflecting the widest possible range of technical expertise, backstop capability and methodological approaches.

From the experience of the MOPP program, the following considerations should be taken into account by prospective consultants, interested contractors, and the committee evaluating bids:

(1) Although furnished housing will be available, living standards for long and short-term consultants will be basic and simple.

(2) Consultants will probably have access to the US Embassy commissary, but they will have to "live off the land" to a great extent, as imported goods are very limited.

(3) By U.S. standards, health conditions are demanding and medical facilities and services are sometimes inadequate. All proposed consultants should have a full medical clearance before assignment.

(4) Employment opportunities for spouses and schooling beyond elementary level for children outside of Rangoon are essentially non-existent.

upon arrival in Burma. This group will include such items as appliances and selected furnishings (refrigerators, air-conditioners, etc.) for the residences of the TA team, and two vehicles for the TA team. The first group will be procured by the AID Office through PIO/Cs immediately after obligation. The AID Office and Agriculture Corporation will identify these items and the Regional Commodity Management Officer will assist in the preparation of the specifications and the PIO/C. These items will be procured on a competitive basis in accordance with regular AID commodity procurement procedures.

Procedures for the procurement of laboratory and agricultural field equipment and project vehicles have been discussed with representatives of SER/COM and the Agriculture Corporation. Because of the quantities and complexities involved and based upon the successful procurement system utilized in MOPP, it is planned that the Technical Assistance Team will be responsible for identifying most required equipment items. The actual purchases and finalizing of specification will be handled by an experienced Procurement Service Agent (PSA). It is felt that a key to the success of procurement within the MOPP was the willingness and availability of the PSA to confer directly with that project's prime contractor and host country technical counterparts concerning specifications whenever it is deemed necessary.

In Burma, the following constraints will challenge the PSA who is contracted for this project:

- i) Regulations, clearances and procedures for importing commodities into Burma are extremely complex.
- ii) The AID/Rangoon Staff is small and will be able to provide very little support to the PSA.
- iii) Telecommunications between Burma and the U. S. is sometimes irregular.
- iv) The PSA will not be allowed to have a U.S. representative stationed in Burma but may arrange to have a local representative through normal Burmese Government procedures.

For these reasons, the PSA selected for this job must be able to demonstrate a proven record of successful experience under similar conditions, and must possess the necessary level of resources and back-stop capability.

As there are a number of qualified small businesses who have had experience in AID procurement, a small business set-aside would be appropriate for the PSA contractor selection process.

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Again, there are a number of qualified small businesses and 8A firms who have experience in AID procurement and they should be encouraged to bid for this contract. However, in light of the level of difficulty and potential risks involved, the selection of the PSA will be done via open, competitive bidding.

(5) Processing of documentation for customs clearances, residence permits, visa extensions, importation of personal effects, etc. while being the responsibility of the Burmese Government, can be frustrating and time consuming.

(6) Inter-personal relations are of the utmost importance in Burma. Consultants' effectiveness and acceptability will greatly depend upon their ability to relate well with their counterparts.

Therefore, the weighting of criteria for evaluating bids should reflect the importance of the previous experience and effectiveness of proposed candidates, and especially for the Team Leader's position.

Local cost support for the contractor financed from the Burmese Government's local currency funds will include office space, some equipment and supplies, secretarial and administrative support, fuel, drivers and maintenance for project vehicles. To facilitate the smooth operation of technical assistance activities, funds for support staff should be included within the TA contract, and budgeted at U.S. Embassy Foreign National salary rates. In Yezin, a general services officer, an English language typist, a driver and a driver-mechanic should be included. A travel and shipping expediter and a driver may be needed in Rangoon. Domestic travel and per diem costs will be paid from project dollar funds according to actual costs and standard AID rates.

A PIO/T for contractual services should be prepared in advance of the signing of the ProAg. An RFP soliciting competitive bids should be issued as soon as possible after funds are available and the Project Grant Agreement is signed. If the Implementation Schedule is adhered to, technical review of bids, and either on-site visits in Burma by firms in the competitive range, or home-office visits by AID and Burmese Government bid evaluators should occur in the first quarter of FY 86.

In either case, it is highly desirable that Burmese Government be closely involved in contractor selection and that prospective contractors be thoroughly informed about project conditions and expectations.

If the schedule is adhered to, the Team Leader/Agricultural Research Administrator, the Station Development Specialist, the Farm Machinery and Laboratory Equipment Specialists and the Irrigation Engineer should arrive in country by the second quarter of FY 86.

V.2.2.

Commodities and Vehicles

Commodities will be divided into two groups for procurement purposes. The first group will consist of those commodities that the technical assistance team will need for their work immediately

Procurement Plan

AID grant-financed purchases under this project will include approximately \$172,500 worth of agricultural equipment and machinery, \$52,200 of irrigation equipment, \$328,893 of laboratory, shop and office supplies and equipment, \$522,450 of miscellaneous field research equipment, household furnishings and farm supplies, \$183,510 of spare parts, \$100,000 of seeds, fertilizers and chemicals, \$500,000 for library resource materials, \$370,000 for cement and other building materials and \$345,000 for project vehicles. Including procurement and shipping, total U.S. financed commodities costs are \$3,526,919. All procurements will be made according to AID regulations and good commercial practice. An outline of the guidelines and procedures to be followed is given below:

Procurement Procedures

- *- Burmese Government reviews and approves the final equipment list;
- contractor completes the equipment specifications in detail, ensuring that they are in a form that can be tendered;
- AID and the Burmese Government approve final commodity specifications; and
- PSA issues and advertises commodity specifications;
- PSA prepares IFBs and/or RFPs; and
- PSA evaluates bids and submit award recommendations to AID/Burma.

After selection of suppliers the PSA will take the following actions:

- Issue purchase orders;
- Expedite deliveries to ports of exit;
- Inspect and consolidate equipment shipments;
- Arrange freight forwarding and insurance, process insurance.
- Arrange for flow of documents and information to the buyer; and
- Arrange for payment of commodities.

The Burmese Government will be responsible for Burmese customs clearance and transport of commodities to project sites, as well as for payment of any and all duties, fees, taxes, handling charges, or other levies.

- * Requirement for Burmese Government approval of final equipment specifications may be waived, if the Burmese Government is satisfied that all issues have been resolved after review and approval of final equipment list. Elimination of this step would shorten the procurement cycle by about 60 days.

The timing of the procurement steps for the purchases of ~~equipment~~ will be as follows.

- day 1 PSA, TA Contractor and AID/Burma finalize equipment specifications.
- day 60 Host government approves equipment specifications; PSA requests publication of advertisement and prepares IFB.
- day 75 Advertisement is published in Commerce Business Daily (CBD) and PSA issues IFB.
- day 125 Bid closing deadline.
- day 135 Evaluation and recommendations for award submitted to AID/Burma.
- day 165 Recommendations approved and PSA issues purchase orders.

Because the groups of equipment are in many cases unrelated, require different lead times and are needed at different times in the project, it is anticipated that several separate procurements will take place, each following the steps outlined above.

In general, it is assumed that from the time specifications are finalized until the arrival in port, vehicles and tractors will require between 10 to 12 months, and small items between 5 - 8 months.

Procurement Guidelines

- 1) Source of commodities - The major portion of project commodities will be of U.S. source and origin, procured in accordance with AID Geographic Code 000 (USA) guidelines. However a waiver to procure some items from Code 941 countries is proposed in order to allow for the provision of some materials which are not readily available from the U.S.

Up to \$250,000 worth of spare parts for existing equipment and machinery which is not of U.S. origin may be required. The short-term equipment and machinery consultants will determine on an item by item basis, which parts can or cannot be replaced by U.S. manufacturers.

Up to \$50,000 worth of cement may be required. Cement is not a U.S. export item.

Up to \$15,000 worth of household furnishings, \$50,000 worth of seeds, \$50,000 worth of small, laboratory equipment and \$7,000 worth of Burmese-keyboard typewriters may also need to be procured from Code 941 sources. Thus a total not to exceed \$422,000 of project and support commodities are proposed to be procured in this manner.

- ii) Source of Transportation Services - Ocean
Transportation will be restricted to Code (USA).
- iii) Marking - AID's Marking regulations will be observed in accordance with the Foreign Assistance Act (FAA) requirement that commodities be identified to show that the project is financed by the U.S. government.

V.3.0. Administrative Arrangements

V.3.1.0. Burmese Government

Principal coordinating and budgetary responsibility will be with the Ministry of Planning and Finance, and in particular with the Director General of the Foreign Economic Relations Department (FERD). Overall responsibility for managing and implementing the project rests with the Ministry of Agriculture and Forests (MAF). The Agriculture Corporation (AC) under its Managing Director, will be directly responsible for implementation of the project and for coordination with other departments and corporations within the MAF as well as with other government ministries. The General Manager of the Agricultural Research Institute (ARI) will assume responsibility for operational and implementation aspects of the project and will designate a Project Director to manage the program. The Team Leader of the Technical Assistance Team and the representative of the PSA will report and be responsible to the Project Director.

V.3.1.1. Audits

Responsibility for audits for all programs and projects of the Burmese Government lies with the Central Accounts Office of the Council of the Peoples' Inspectors. Representatives of this office are assigned to monitor financial and procurement activities of major Departments and Corporations, including the AC, and they have already expressed an interest in cooperating and coordinating in audits of AID-assisted projects in Burma. Therefore, any audits should be done jointly by the Regional Inspector General's office in Manila in coordination with the Central Accounts Office. There is no indication at this time that this project will require special audit coverage.

V.3.2. AID Office in Rangoon

The AID Agricultural Development Officer (ADO) will serve as project manager to assist the Burmese Government in project implementation and to oversee project monitoring. The project manager will be responsible for all project matters on the AID side. This person will work closely with counterparts in the ARI and will be the main contact point between the AID Office and the ARI. The ADO will assist in developing a detailed project implementation plan and will monitor project progress based on that plan. He/she will be responsible for obtaining other expertise from other AID Office staff and regional personnel when such expertise is needed. The ADO will anticipate implementation problems, provide guidance, and will keep the AIDREP informed at all times of project status and of problems that may require the AIDREP's attention or intervention.

The ADO will carry out all pre-obligation actions, will work to see that conditions precedent are met and will initiate the procurement and training plans. He/she will work closely with the AC in identifying and screening candidates for training. The ADO will act as the main contact with the technical assistance team and will be responsible for internal project progress reports.

The AID Office in Rangoon has only six full-time, direct hire staff. It is currently anticipated that by the time this project gets underway, five other projects will be either on-going (Primary Health Care I & II and MOPP), under preparation (Edible Oil Processing and Distribution) or under design (MOPP II). Therefore, if office space and professional staffing remain at present levels, support which USAID/Rangoon will be able to provide may be a constraint to project execution.

V.3.3. Technical Assistance (TA) Team

The (TA) team for the Burma Agricultural Research and Development (BARD) Project will consist of two long-term (102 pm) and approximately fifteen short-term (65 pm) consultant positions. The long-term Research Administrator will serve as the overall TA Team Leader and will liaise with the General Manager and Deputy General Manager of the ARI, the BARD Project Director, and with the managers of the four satellite research stations. There are three underlying objectives of the TA approach:

- 1) To effectively relate the technical skills and expertise of the consultants to the requirements of the ARI and the project objectives
- 2) To strengthen the institutional capacity of the ARI in Yezin and the four satellite research stations; and
- 3) To transfer the management and technical skills necessary to ensure continuity and institutional growth after the project is completed.

Although the contract will be between AID and the TA contractor, the Team Leader will report and be responsible to the General Manager of the ARI for all programmatic and operational aspects of the research and development project. The Team Leader will also work closely with the USAID ADO and be responsible to him for all contractual matters. He will also provide AID copies of all reports and correspondence which are submitted to the Burmese Government.

All AIDREPs and Missions are now required to submit project progress reports to AID/Washington. Therefore, the T.A. Team should be required to prepare and submit regular reports on project progress and financial drawdowns no later than ten days before the AID/Rangoon reports are due to be despatched to Washington.

The Station Development Specialist and all short-term TA consultants will be responsible to the Team Leader, who, in conjunction with the ARI Project Director and the appropriate counterpart staff, will have the following responsibilities:

- 1) prepare Terms of Reference and job description prior to the "Call Forward" for each consultant;
- 2) prepare an orientation/preparation packet of materials for each consultancy;
- 3) assist in the introduction and settling in of each consultant;
- 4) ensure that all necessary clearances and documentation are completed prior to the arrival and departure of all consultants; and
- 5) ensure that all necessary in-country travel arrangements and living accommodations are ready prior to arrival of each consultant.

V.3.4

Procurement Services Agent (PSA)

The Procurement Services Agent will be responsible for the actual procurement of project commodities, and will follow AID procurement procedures which are outlined in the Procurement Plan of this Project Paper.

V.3.5

Regional and AID/W Assistance

Project implementation, particularly initial implementation actions, will depend greatly on assistance to be provided to the AID Office by the Regional Legal Advisor (RLA), the Area Contracting Officer (ACO) and the Regional Commodity Management Officer (RCMO). The RLA is located in Colombo and the ACO and RCMO are located in Bangkok. They will provide timely assistance in their areas of responsibility.

The AID procurement specialist in Singapore will also provide such assistance in expediting commodity procurement as may be required.

Additionally, the AID Office may require the services of personnel in the areas of training, preparation of RFPs, etc. These services will be provided the AID Office either by USDH staff in AID/W or from IQCs.

EVALUATION ARRANGEMENTS

This project is intended to be the initial phase of a long-term AID involvement in the agricultural research, maize and oilseed production sectors in Burma. As such, planning for evaluation is an important project component. Several evaluative activities are included in the project design to be jointly undertaken by the Burmese Government and AID.

VI.1.

Preliminary Re-Assessment of Project Design: It is anticipated that up to 18 months may elapse between the time of project design and actual project start-up. Therefore it is recommended that a preliminary evaluation be conducted by the Project Director, the AID ADO and the Technical Assistance Team Leader to re-assess the project design in the light of any important policy or institutional developments which may have occurred in the interim. At that time, the implementation plan could be amended as might be deemed necessary and appropriate. As the Project Agreement will in all likelihood have been signed within the previous year, this re-assessment should not involve any changes in that agreement.

VI.2.

Mid-Term Evaluation: A major evaluation, to be performed in collaboration among Burmese Government, AID and outside consultants, is scheduled between months 29-31, at which time the following elements should be addressed and decisions made:

VI.2.1.

Physical Infrastructural Development at Yézin and satellite stations

- progress
- cost
- implications of any changes or delays on other project objectives
- recommendations

VI.2.2.

Station management

- staffing
- research design & methodology
- research execution, reporting and dissemination
- relative progress vis a vis objectives
- water and land management
- coordination with other national and international research and training institutes

VI.2.3. Equipment

- procurement, clearance & delivery
- appropriateness of lab farm and library equipment
- utilization
- repair & maintainence

VI.2.4. Counterpart Staffing

- adequate staff for maize and oilseed research
- effectiveness

VI.2.5. Long & Short-Term T.A.

- appropriateness of expertise and adherence to project timetable
- effectiveness
- recommendations for remaining short-term T.A. requirements

VI.2.6. Training

- conformity with original plan and time table

It is also recommended that the Team review the results of the Mid-Term Evaluation of the MOP Project, and especially the Crop Protection Assessment if, as per the recommendation included in the Environmental Considerations section of this paper, one is included in that review.

It will be important that this mid-term evaluation not focus on research or production results. Rather it should assess the progress achieved in station development, research organization and research methodology, and confirm the appropriateness of the research in relationship to the farming systems available to farmers in each of the four agro-ecological zones addressed by the project. The evaluators must ensure that farming practices research and crop adaptation trials are being conducted within the same parameters that will be available to the farmers. For example, the use of irrigation on the arid zone and rain-fed hill stations should be limited to germplasm manipulation activities or seed multiplication. This issue is covered in the Technical Analysis section of the Project Paper, but is repeated here in order to ensure that evaluative criteria reflect this intent.

This mid-term evaluation will also serve as a basis for determining if and what type of further AID assistance might be required in the agricultural research sector. If a positive

determination is forthcoming, then plans for a project identification exercise would be prepared. This mid-term evaluation team will also prepare recommendations concerning terms of reference for the Final Impact Evaluation.

VI.3.0. Final Impact Evaluation: A Final Impact Evaluation is scheduled for the third quarter of the sixth year of the project, or sometime in 1990.

VI.4.0. Funding Arrangements: Project funds will be used to pay for the costs of U.S. consultants required to assist in the mid-term evaluation as well as the final Impact Evaluation in 1989-90. It is estimated that up to \$100,000 in grant funds plus Burmese Government-funded local costs will be required. AID/Washington technical assistance and guidance will most likely be needed from such offices as PPC/Evaluation and Asia/Development Planning to help in defining the scope of the evaluations and possibly to recruit qualified evaluation team members.

VII.O. COST ESTIMATE AND FINANCIAL PLAN

Inputs -Budget

The inputs required are estimated to have a U.S. dollar value of \$17.9 million. The AID contribution is estimated at \$11.3 million or 63% and the Burmese Government's contribution is estimated as \$6.61 million or 37%. The AID contribution will cover all foreign exchange costs of technical assistance, training and commodities, and \$600 thousand of local currency costs required for English language training, local support staff and local costs for consultants. The Burmese Government will cover all local costs of personnel, construction, locally manufactured commodities, housing for expatriate technicians and operations costs. (See budget for detail).

Inflation is calculated at a 5% compounded rate on unexpended balances to mid-year. This total of \$1,542,100 represents 8.5% of the total budget. Contingencies have been added for long-term training which may be required for some degree fields (\$200,000), long-term personnel costs to cover different contracting modes (\$225,000), and 5% on all commodity procurement costs (\$163,300). Finally a 30% physical contingency was added to cover costs of construction budgeted as a Burmese Government contribution (\$730,000). Total contingencies of \$1,543,400 represent 8.6% of the total project budget.

Manpower is calculated as 102 person months of long-term technical assistance, and 65 person months of short-term technical assistance, for a total cost of \$2,250,000 or 21% of foreign exchange (FX). The Burmese Government will contribute 550 person years of professional staff at a value of 7,200,000 Kyats and junior professionals and laborers valued at 7,400,000 Kyats. Total host contribution for personnel is valued at 14,410,000 Kyats (\$1,774,000). Total personnel costs represent 25% of the total value of inputs.

Training and development of local professionals is considered key to long-term research goals in Burma. Consequently 10 candidates are scheduled for PhD training in the U.S. for a total of 35 person years. Twenty-five additional candidates will receive training to the MSc level for a total of 62.5 person years. ARI professionals will also be sent to IARC's and other international institutions for periods of 2 to 6 months. A total of 51 persons are scheduled for this training equal to 280 person months. In order for Burmese professionals to participate in international conferences, meet with other researchers, and acquaint themselves with research around the world, funding for participation in 20 meeting and study tours have also been scheduled. In-country training for ARI staff in management and other professional areas is budgeted in both U.S. (outside trainers) and Burmese (in-country subsistence and other costs) budgets. Total training costs therefore are \$3,320,500 or 18.5% of the total Project Budgets.

Construction of houses, laboratories, offices and warehouses as well as engineering works for drainage and irrigation will be a contribution of the local government. This is estimated to cost \$2,250,900 or 14% of the total budget. Imported items such as pumps,

pipes and refrigerated cold storage units are budgeted under U.S. commodity contributions.

Locally manufactured commodities such as medium sized tractors, and farm equipment of an estimated value of \$185,500 will be contributed by the host government. An estimated total value of \$3,526,900 in imported commodities will be contributed by AID. Of that only a few small items such as animal equipment will be non U.S. source and origin. There is, however, \$250,000 budgeted for spare parts and repairs of existing farm and shop implements and laboratory equipment. As some of this is of European or third world origin, spare parts may be either locally procured or of non-U.S. origin.

It should be clearly understood that the commodity list is to be treated as an indicative list and will need to be revised during project implementation. The reason for this is that the design team did not have sufficient time to inventory all of the existing commodities at ARI. Additionally, engineering studies on drainage and irrigation will probably require changes in that equipment. The design team also scheduled a farm machinery specialist and a laboratory equipment specialist to work with the station development technical assistant in inventorying all existing equipment, determining what can be repaired or modified and then revising equipment lists accordingly. Finally, commodities that are in the pipeline from the UNDP and IRRI/CIDA projects as well as USAID's MOPP project were not completely known. Therefore only commodities under categories I, II, VII and IX should be procured before technical assistance experts make their surveys.

The estimated total value of commodities is \$3,712,400 or 20.1% of the total budget.

Other budgeted items include land development, building rental or site development, and utilities. Tractor and vehicle operating costs and installation costs for electricity and water will be paid by Agriculture Corporation Office supplies and vehicle operating expenses for U.S. technicians are a contribution of USAID. Total other expenses are \$1,175,000 or 6.6% of the total budget.

Vehicles for personal use by U.S. technicians will be purchased under the project and imported and registered by the USAID/Burma mission. Because it is virtually impossible for privately owned vehicles (POV's) to be imported without excessive duties (over 200%). U.S. technicians will not be allowed to ship their own vehicles. Therefore the project will provide vehicles for both business and private use. A similar arrangement will be made for major household durables needed to furnish TA staff housing which is being built by the Burmese Government.

The total budgeted inputs therefore are as follows:

	<u>000's U.S.\$</u>	<u>% of budget</u>
Technical Assistance	2,250.0	12.6
Host Country Personnel	1,924.0	10.7
Training	3,410.5	19.0
Construction	2,250.9	12.6
Commodities	3,712.4	20.7
Other costs	1,175.0	6.6
Inflation	1,542.1	8.6
Physical Contingencies	1,543.4	8.6
Evaluation	<u>100.0</u>	<u>0.6</u>
Total	<u>17,908.3</u>	<u>100.0</u>

VII. TABLE 12
 SUMMARY COST ESTIMATE
 AND FINANCIAL PLAN
 (U.S. \$'000)

SOURCE	AID		HOST COUNTRY		TOTAL
	FX	LC	FX	LC	
USE					
PERSONNEL					
U.S.	2,250.0				2,250.0
Local		210.0		1,714.0	1,924.0
TRAINING	3,320.5			90.0	3,410.5
CONSTRUCTION				2,250.9	2,250.0
COMMODITIES	3,526.9			185.5	3,712.4
OTHER COSTS		170.0		895.0	1,175.0
EVALUATION	100.0				100.0
INFLATION	1,022.7			519.4	1,542.1
CONTINGENCY	588.3			955.1	1,543.4
TOTAL	10,918.4	380.0		6,609.9	17,908.3

VII. TABLE 13 FINANCIAL PLAN - BUDGETS

LINE ITEM	BUDGET BY LINE ITEM - THOUSANDS OF U. S. \$												TYPE OF PROJECT		TOTAL	
	FY 85		FY 86		FY 87		FY 88		FY 89		FY 90		USAID	SRUB	ALL COSTS	
	USAID	SRUB	USAID	SRUB	USAID	SRUB	USAID	SRUB	USAID	SRUB	USAID	SRUB				
1. Personnel																
U.S.	210.0		445.0		570.0		450.0		375.0							
Local	62.0	171.4	12.0	342.8	62.0	342.8	12.0	342.8	12.0	342.8		171.4	2,250.0	710.0	1,714.0	2,250.0
2. Training	250.6	15.0	591.0	15.0	881.0	15.0	892.5	15.0	553.4	15.0	150.0	15.0	3,320.5	90.0	3,410.5	
3. Construction		725.0		1,433.0		92.9									2,250.9	2,250.9
4. Commodities	1,920.0	110.0	727.1	35.5	279.1	20.0	226.7	20.0	228.0		80.0		1,526.9	185.5	3,712.4	
5. Other	34.0	109.0	50.0	199.0	60.0	189.0	50.0	169.0	50.0	169.0	40.0	60.0	200.0	895.0	1,175.0	
TOTAL	2,530.6	1,110.4	12,077.1	12,025.3	11,852.1	659.7	1,631.2	546.8	1,218.4	526.8	1,270.0	246.4	9,587.4	5,135.4	14,722.8	
6. Inflation St	63.3	29.3	155.4	151.9	231.5	82.5	285.4	95.7	213.3	92.2	73.3	67.8	1,022.7	519.4	1,542.1	
7. Contingencies	107.3	72.5	100.8	143.3	71.0	139.3	56.3	200.0	48.9	300.0	1204.0	100.0	588.3	955.1	1,543.4	
8. Production													100.0		100.0	
TOTAL	2,704.2	1,132.2	12,333.8	12,320.5	12,154.6	881.5	2,072.9	842.5	1,480.6	919.0	1547.3	414.2	11,298.4	6,609.9	17,908.3	

VII. TABLE 14 FINANCIAL PLAN - BUDGETS

FY OUTPUT	BUDGET BY OUTPUT - THOUSANDS OF U. S. \$												LIFE OF PROJECT		TOTAL ALL COUNTRIES
	PY 85		FY 86		FY 87		FY 88		FY 89		FY 90		PROJECT	PROJECT	
	USAID	SPUB	USAID	SRUB	USAID	SRUB	USAID	SRUB	USAID	SRUB	USAID	SRUB			
1 1	650.5	252.0	592.4	312.1	444.9	305.7	373.4	309.6	299.0	296.9	10.0	125.7	2,370.2	1,602.0	3,972.2
1 2	60.0	15.0	462.0	15.0	785.0	15.0	800.5	15.0	522.0	15.0	150.0	15.0	2,788.5	90.0	2,878.5
1 3	202.6	65.5	143.0	47.5	108.0	29.5	95.0	21.5	43.4	7.0			592.0	171.0	763.0
1 4	64.5	52.9	312.5	147.7	149.8	156.6	130.3	160.7	139.0	167.9	10.0	85.7	1,390.1	771.5	2,161.6
1 5	20.0		130.0		115.0		100.0		100.0		80.0		545.0		545.0
1 6	445.0	745.0	267.2	1,503.0	165.0	152.9	115.0	40.0	115.0	40.0	20.0	20.0	1,567.2	2,500.9	4,066.1
1 7	40.0		170.0		84.4								344.4		344.4
TOTAL	2,514.6	1,110.4	2,077.1	2,025.3	1,852.1	659.7	1,611.2	546.8	1,218.4	526.8	1270.0	245.4	9,587.4	5,135.4	14,722.8
Inflation	61.1	24.1	155.9	151.9	231.5	82.5	205.4	95.7	213.3	92.2	73.3	67.8	1022.7	512.4	1,542.1
Contingency	107.1	72.5	100.0	143.3	71.0	139.3	56.3	200.0	48.9	300.0	1204.0	100.0	588.3	955.1	1,543.4
Evaluation													100.0		100.0
TOTAL	2,704.2	1,212.2	2,131.8	2,320.5	2,154.6	881.5	2,072.9	842.5	1,480.6	919.0	1547.3	414.2	11,298.4	6,609.9	17,908.3

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TABLE 15 BUDGET BY OUTPUT - LINE ITEM AND FISCAL YEAR

USAID AND BURMA

(Thousands of U. S. Dollars)

OUTPUTS	PY 85		PY 86		PY 87		PY 88		FY 89		FY 90		TOTAL		TOTAL PROJECT
	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	
1															
Personnel	10.0	51.0	110.0	147.6	355.0	156.7	1295.0	160.6	220.0	167.9		85.7	1,220.0	771.5	1,991.5
Construction															
Commodities	630.5	110.0	217.4	35.5	69.9	20.0	63.4	20.0	64.0						
Other	10.0	49.0	15.0	129.0	20.0	129.0	15.0	129.0	15.0	129.0	10.0	40.0	1,045.2	185.5	1,230.7
TOTAL 11	640.5	242.0	592.4	312.1	444.9	305.7	373.4	309.6	299.0	296.9	10.0	125.7	2,270.2	1,602.0	3,972.2
2															
Training	60.0	15.0	11.0	15.0	65.0	15.0	47.0	15.0	47.0	15.0		15.0	351.0	90.0	441.0
Personnel															
Commodities															
Other															
TOTAL 12	60.0	15.0	11.0	15.0	65.0	15.0	47.0	15.0	47.0	15.0		15.0	351.0	90.0	441.0
3															
Training	202.4		141.0		108.0		95.0		43.4						
Personnel		65.5		47.5		29.5		21.5		7.0				592.0	592.0
Commodities															
Other															
TOTAL 13	202.4	65.5	141.0	47.5	108.0	29.5	95.0	21.5	43.4	7.0				592.0	592.0
4															
Personnel		52.9	60.0	147.7	60.0	156.6	60.0	160.7	60.0	167.9		85.7	240.0	771.5	1,011.5
Construction															
Commodities	630.5		31.5		69.9		63.3		64.0						
Other	10.0		15.0		20.0		15.0		15.0						
TOTAL 14	640.5	52.9	312.5	147.7	149.9	156.6	118.3	160.7	139.0	167.9	10.0	85.7	1,065.1	771.5	1,836.6
5															
Personnel			30.0		15.0										
Construction															
Commodities	20.0		100.0		100.0		100.0		100.0				45.0		45.0
Other	20.0														
TOTAL 15	20.0		130.0		115.0		100.0		100.0				45.0		45.0
6															
Personnel	220.0		220.0		145.0		95.0		95.0						
Construction		725.0		1,433.0		92.9							775.0		775.0
Commodities	555.0		27.2											2,250.9	2,250.9
Other	10.0		20.0	70.0	20.0	60.0	20.0	40.0	20.0	40.0	20.0	20.0	682.2		682.2
TOTAL 16	885.0	745.0	267.2	1,503.0	165.0	152.9	115.0	40.0	115.0	40.0	20.0	20.0	1,567.2	2,500.9	3,858.1
7															
Personnel	30.0		45.0		45.0									120.0	120.0
Construction															
Commodities	50.0		125.0		39.4										
Other															
TOTAL 17	80.0		170.0		84.4									120.0	120.0
													334.4		334.4

VII. TABLE 16 BUDGET BY SUB LINE ITEM AND FISCAL YEAR

USAID AND BURMA

(Thousands of U. S. Dollars)

LINE ITEM	FY 85		FY 86		FY 87		FY 88		FY 89		FY 90		TOTAL		TOTAL	
	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	PROJECT	
	FX	LCIFX	LCIFX	LCIFX	LCIFX	LCIFX	LCIFX	LCIFX	LCIFX	LCIFX	LCIFX	LCIFX	LCIFX	LCIFX	LCIFX	
PERSONNEL																
U.S. L.T.	75.0		300.0		300.0		190.0		300.0					1275		1275.0
U.S. S.T.	135.0		345.0		270.0		150.0		75.0					975		975.0
Tot U.S.	210.0		645.0		570.0		340.0		375.0					2250		2250.0
LOCAL	52.0	171.4	62.0	342.8	62.0	342.8	12.0	342.8	12.0	342.8		171.4	210.0	1714.4	90.0	1924.0
TRAINED:																
U.S. Degree			350.0		1700.0		1762.5		1475.0		150.0			2437.5		2437.5
U.S.	202.2		129.6		107.6		81.6		30.0					551.0		551.0
Study Tours	11.4		13.4		13.4		13.4		13.4					67.0		67.0
Local		15.0		15.0		15.0	15.0	15.0		15.0		15.0			90.0	90.0
Manpower	35.0		100.0		60.0		35.0		35.0					265.0		265.0
TOTAL TRAINING	250.6	15.0	593.0	15.0	1881.0	15.0	1892.5	15.0	1553.4	15.0	150.0	15.0	13320.5	90.0		3410.5
CONSTRUCTION																
Buildings		429.0		1000.0		92.9									1517.9	1512.9
Drainage & Irr		80.0		33.0											113.0	113.0
Land Dev.		225.0		400.0											625.0	625.0
TOTAL CONSTRUCTION		725.0		1433.0		92.9									2250.9	2250.9

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VII. TABLE 16 cont'd

LINE ITEM	FY 95		FY 86		FY 87		FY 88		FY 89		FY 90		TOTAL			TOTAL	
	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	U. S.	SRUB	PROJECT		
	FX	LC FX	LC FX	LC FX	LC FX	LC FX	LC FX	LC FX	LC FX	LC FX	LC FX	LC FX	LC FX	LC FX	LC		
COMMODITIES																	
I Tractors & Farm equipment	172.5		110.0		0.5										172.5	110.5	283.0
II Irr. & water	25.0		27.7		10.0										52.2	10.0	62.2
III Station Dev.	370.0														370.0		370.0
IV Laboratory			125.0		39.4										214.4		214.4
V Shop			47.9												52.9		52.9
VI Offices	211.5														61.5		61.5
VII Misc Equip			150.0		10.0	50.0	20.0	50.0	20.0	27.5					477.5		477.5
VIII Household	45.0														45.0	50.0	95.0
IX Trucks & veh	145.0				15.0										345.0	15.0	360.0
X Spare Parts			100.0		20.0		20.0		43.5						183.5		183.5
XI Seed-Parts-Cum			25.0		25.0		25.0		25.0						100.0		100.0
Shipping & Proc.	447.0		150.0		44.7		11.7		32.0						692.4		692.4
XII Library	200.0		100.0		100.0		100.0		100.0						500.0		500.0
TOTAL COMMODITIES	1944.0	110.0	727.1	35.5	279.1	20.0	226.7	20.0	228.0	80.0	13526.9	185.5	3712.4				
OTHER																	
Office Supplies	10.0	10.0	20.0	20.0	30.0	20.0	20.0	20.0	20.0	20.0	10.0	10.0	110.0	160.0	210.0		
Gas & Oil, Elect	20.0	10.0	30.0	20.0	30.0	20.0	30.0	20.0	30.0	20.0	30.0	10.0	170.0	160.0	270.0		
Land & Bldg Dev		89.0		129.0		129.0		129.0		129.0		40.0	645.0	645.0	645.0		
Elect/Water Inst				30.0		20.0							50.0	50.0	50.0		
TOTAL OTHER	30.0	109.0	50.0	199.0	60.0	189.0	50.0	169.0	50.0	169.0	40.0	60.0	280.0	895.0	1175.0		

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VII. TABLE 17 BUDGET FOR TECHNICAL ASSISTANCE
(\$ '000)

Technical Assistance	Person Months	Project Year					Total
		1	2	3	4	5	
1. LONG-TERM							
	54	\$ 75	\$150	\$150	\$150	\$150	\$675
	48		150	150	150	150	600
	102						
2. SHORT-TERM							
A. Farm Equipment	10	45	45	30	30	-	150
B. Laboratory Equipment	6	30	30	30	-	-	90
C. Surface Water Civil Engineer	4	30	30	-	-	-	60
D. Irrigation Engineer	4	30	30	-	-	-	60
E. Library Science	3	-	30	15	-	-	45
F. Ground Nut Research	4	-	15	15	15	15	60
G. Maize Research	4	-	15	15	15	15	60
H. Sunflower Research	4	-	15	15	15	15	60
I. Sesame Research	4	-	15	15	15	15	60
J. Weed Science	4	-	15	15	15	15	60
K. Rodent Control	4	-	15	30	15	-	60
L. Entomologist/Plant Pathologist	6	-	30	30	30	-	90
M. Soil Scientist	4	-	30	30	-	-	60
N. Animal Power	2	-	15	15	-	-	30
O. Statistics/Research Design	2	-	15	15	-	-	30
Sub-total	65						
TOTAL TECHNICAL ASSISTANCE	167	\$210	\$645	\$570	\$450	\$375	\$2,250

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VII. TABLE 18 BUDGET FOR SHORT-TERM TRAINING

(\$'000)

Training (Duration/Participant)	No. of Participants	Project Year					Total
		1	2	3	4	5	
A. IARC'S							
1. <u>CIMMYT</u>		\$	\$	\$	\$	\$	\$
Maize Breeding (6 Mos.)	5	(1)15	(1)15	(1)15	(1)15	(1)15	75.00
Maize Agronomy (6 Mos.)	5	(1)15	(1)15	(1)15	(1)15	(1)15	75.00
Station Development (2 Mos.)	10	(5)35	(5)35	-	-	-	70.00
2. <u>IRRI</u>							
Cropping Systems (6 Mos.)	4	(1)13	(1)13	(1)13	(1)13	-	52.00
Integrated Pest Mgt. (6 Mos.)	4	(1)13	(1)13	(1)13	(1)13	-	52.00
3. <u>ICRISAT</u>							
Animal Traction (4 Mos.)	2	(2)17.6	-	-	-	-	17.60
Groundnuts	8	(2)25.6	(2)25.6	(2)25.6	(2)25.6	-	102.40
B. OTHER							
1. <u>UPLB/NCPL</u>							
Rodent Control (6 Mos.)	6	(2)13	(2)13	(2)13	-	-	39.00
2. <u>ISRAEL/Sesame</u>							
(6 Mos.)	3	(3)42	-	-	-	-	42.00
3. <u>INFORMATION</u>							
Retrieval (4 Mos.)	4	(2)13	-	(2)13	-	-	26.00
Sub Total IARC's & Other	51	202.2	129.6	107.6	81.6	30	551.00
B. Society Meetings (7 Days)	10	(2) 5.4	(2) 5.4	(2) 5.4	(2) 5.4	(2) 5.4	27.00
Study Tours (20 Days)	10	(2) 8	(2) 8	(2) 8	(2) 8	(2) 8	40.00
Sub Total Meetings and tours	20	13.4	13.4	13.4	13.4	13.4	67.00
TOTAL SHORT-TERM TRAINING		\$ 215.6	\$ 143.0	\$ 121.0	\$ 95.0	\$ 43.4	\$618.00

VII. TABLE 19 BUDGET FOR MSc DEGREE TRAINING
(\$'000)

	No. of trainees	Y E A R						Total
		1	2	3	4	5	6	
B. M.Sc Degree		\$	\$	\$	\$	\$	\$	\$
Plant Breeding - Maize	1	-	25	25	12.5	-	-	62.5
Plant Physiology - Maize	1	-	-	-	25	25	12.5	62.5
Plant Pathology - Maize	1	-	-	-	25	25	12.5	62.5
Agronomy - Maize	1	-	25	25	12.5	-	-	62.5
Plant Breeding - Oilseeds	3	-	25	50	62.5	37.5	12.5	187.5
Plant Agronomy - Oilseeds	3	-	25	50	62.5	37.5	12.5	187.5
Plant Pathology - Oilseeds	1	-	-	25	25	12.5	-	62.5
Plant Entomology - Oilseeds	1	-	-	25	25	12.5	-	62.5
Plant Physiology - Oilseeds	1	-	-	-	25	25	12.5	62.5
Weed Control	1	-	25	25	12.5	-	-	62.5
Soil Fertility	1	-	-	25	25	12.5	-	62.5
Water Management	1	-	25	25	12.5	-	-	62.5
Agriculture Engineering	1	-	-	-	25	25	12.5	62.5
Plant Breeding-Food Legumes	1	-	25	25	12.5	-	-	62.5
Plant Agronomy-Food Legumes	1	-	-	25	25	12.5	-	62.5
Post-Harvest Engineering	1	-	-	-	25	25	12.5	62.5
Cropping Systems	1	-	-	-	25	25	12.5	62.5
Soil Conservation	1	-	-	25	25	12.5	-	62.5
Microbiology	1	-	25	25	12.5	-	-	62.5
Other M.Sc degrees	2	-	25	50	37.5	12.5	-	125.0
Total M.Sc Degree Training	25	-	\$225	\$425	\$512.5	\$300.0	\$100.0	\$1,562.5

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VII. TABLE 20 . BUDGET FOR PhD DEGREE TRAINING
(\$'000)

A. <u>PhD Degrees</u>	No. of trainees	Y E A R						Total
		1	2	3	4	5	6	
		\$	\$	\$	\$	\$	\$	\$
Genetics & Production-Maize	1	-	25	25	25	12.5		87.5
Genetics & Production-Oilseeds	2	-	25	50	50	37.5	12.5	175.0
Agronomy	1	-	25	25	25	12.5		87.5
Soil Science	1	-	25	25	25	12.5		87.5
Ag Econ/Statistics	1	-	25	25	25	12.5		87.5
Plant Physiology	1	-	-	25	25	25.0	12.5	87.5
Plant Pathology	1	-	-	25	25	25.0	12.5	87.5
Entomology	1	-	-	25	25	25.0	12.5	87.5
Microbiology	1	-	-	25	25	25.0	12.5	87.5
Total PhD Training	10		\$125	\$250	\$250	\$187.5	\$ 62.5	\$875.0

TABLE 21. BUDGET FOR HOST COUNTRY CONTRIBUTION

(5-Year Project Period)

<u>Staff</u>	<u>Kyats</u>	<u>Kyats</u>
Professionals	7,200,000	
Field Assistance	3,200,000	
Laborers	4,000,000	
Sub-Total Staff		14,400,000
<u>Land</u>		
Yezin 400 acres	2,000,000	
Sub-stations 475 acres	2,400,000	
Sub-Total Land		4,400,000
<u>Equipment</u>		
Laboratory		6,000,000
<u>BUILDINGS & OTHER Capital Investments</u>		
<u>New Buildings</u>		
Laboratories (5)	K1,500,000	
Godowns (5)	K1,000,000	
Offices (4)	K 600,000	
Staff Quarters (24)	K2,400,000	
Laborers Quarters (52)	K2,600,000	
Threshing Floors (7)	K 700,000	
Misc. Buildings	K2,000,000	
Expatriate Quarters (3)	K 900,000	
Sub-Total New Buildings	11,700,000	
Existing Buildings	1,000,000	
Fencing	1,000,000	
Sub-Total Buildings & Capital Investment		13,700,000
<u>Supplies</u>		1,250,000
<u>Land Development</u>		
Yezin	2,250,000	
Satellite Stations	3,000,000	
Sub-Total Land Development		5,250,000
TOTAL HOST GOVERNMENT CONTRIBUTION (KYATS)		K56,000,000
TOTAL HOST GOVERNMENT CONTRIBUTION (DOLLAR EQUIVALENT)		\$ 6,609,900

Table 22 - HOST COUNTRY BUDGET FOR PERSONNEL

Personnel - Burmese Government

Personnel of the Burmese Government are allocated to Fiscal Years and outputs as follows:

Output	Fiscal Year						Total
	1	2	3	4	5	6	
#1	53.0	147.6	156.7	160.6	167.9	85.7	771.5
#3	65.5	47.5	29.5	21.5	7.0		171.0
#4	52.9	147.7	156.6	160.7	167.9	85.7	771.5
Total	171.4	342.8	342.8	342.8	342.8	171.4	1714.0

The allocation of output #3 equals 10% of the SRUB personnel contribution and is budgeted by the Fiscal year in which Training at IARC's would take place. Allocations to outputs 1 & 4 are equally divided from the remaining 90% of personnel costs.

Table 23 - HOST COUNTRY BUDGET FOR COMMODITIES

Commodities:

The following commodities are estimated to be of local manufacture and procurement and are budgeted as Burmese Government contributions.

- | | |
|---|------------------|
| 1. Tractors 5 @ \$ 20,000 ea | \$100,000 |
| 2. Farm Equipment - miscellaneous | 10,000 |
| 3. Trailer boxes - local construction | 500 |
| 4. Motorcycles - 10 @ 500 | 5,000 |
| 5. Windmills - local manufacture | 10,000 |
| 6. Boat - local construction | 10,000 |
| 7. Other Misc equipment local manufacture | 50,000 |
| | \$185,500 |

Items	Fiscal Year				Total
	1	2	3	4	
1	100.0				100.0
2	10.0				10.0
3		.5			.5
4		5.0			5.0
5		10.0			10.0
6		10.0			10.0
7		10.0	20.0	20.0	50.0
Total	110.0	35.5	20.0	20.0	185.5

These commodities are allocated to output #1

Table 24 - CONTINGENCY BUDGET BREAKDOWN

Contingencies

U.S. AID

1. Long Term Education		
\$5000/MSc candidate X 25	=	\$125,000
\$7500/PhD candidate X 10	=	\$ 75,000
Total Ed. Cont. Budget last year	=	\$200,000
2. Personnel Costs		
Allow 10% above budget for contracting costs or salary increases		
\$2,250,000 X .10	=	\$225,000
3. Commodities		
Allow 5% over budget in year of purchase		
Total U.S. Contingencies	=	\$163,300
	=	\$588,300

BURMESE GOVERNMENT

4. Construction		
Allow 30% Contingency for construction of buildings, drainage and irrigation structures - budgeted in year of expenditures		
\$ 2,250,900 X .30	=	\$675,000
5. <u>Other Costs</u>		
Allow 10% contingency on other costs		
\$895,000 X .10	=	\$89,500
6. <u>Personnel</u>		
Allow 10% on personnel		
\$1,714,000 X .10	=	\$171,400
7. <u>Training</u>		
Allow 2% \$90,000 X .02	=	\$ 18,000
8. <u>Commodities</u>		
	Total Burmese Government	\$955,100
	Total Contingencies	<u>\$1,543,400</u>

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VIII.0. CONDITIONS PRECEDENT, COVENANTS, WAIVERS AND STATUS OF NEGOTIATIONS

VIII.1.0. Conditions Precedent

To initial disbursement, designation of representatives and counterpart staff.

VIII.2.0. Covenants

AID/Rangoon plans to seek the following covenants in the Project Agreement.

VIII.2.1.1. The Cooperating Country shall covenant to provide sufficient existing and incremental budgetary and staff support to accomplish the objectives of the project.

VIII.2.1.2. The Cooperating Country shall covenant that during the period of the project, if AID grant contributions totalling \$11.3 million are provided, the Burmese Government will provide the equivalent of \$6.6 million on goods and services.

VIII.2.1.3. The Cooperating Country shall covenant to process and clear expeditiously, and to store and distribute properly, all goods financed under the Grant.

VIII.2.1.4. The Cooperating Country shall covenant to pay any and all taxes and duties on AID-financed commodities, and/or to exempt such commodities from such costs.

VIII.2.1.5. The Cooperating Country covenants to afford AID representatives the opportunity at all reasonable times to inspect the project and the utilization of goods and services funded under the Grant.

VIII.2.1.6. This project shall be subject to such other covenants as AID may deem advisable.

VIII.3.0. Waivers

It is recommended that a source/origin waiver from AID geographic code 000 to code 935 (Selected Free World, other than U.S. or Burma) be provided to permit the USAID/Burma to procure the following:

\$250,000 for spare parts for existing laboratory and field equipment.

\$50,000 for cement

\$15,000 for household furnishings

\$50,000 for seeds to be purchased from international sources

\$7,000 for Burmese Keyboard typewriters available only from Germany

VIII.4.0. Status of Negotiation

General Burmese Government approval for AID to formulate projects in the agricultural sector in cooperation with Burmese Government authorities was received in December, 1980.

In December, 1983, a Project Identification Team prepared a PID which was reviewed at high Burmese Government levels. AID/Rangoon was authorized to proceed with further discussions and explorations with a view toward the preparation of this project paper.

This paper is the result of 39 man-months of intensive field visits, research and discussions with Burmese Government officials, by AID direct-hire and contract specialists.

Agriculture Corporation officials participated fully at all stages of the project design and the substantive sections of the paper were carefully reviewed by the General Manager of the Planning and Projects Division and the General Manager of the ARI. The Managing Director of the Agriculture Corporation met with the Team after this review and agreed in principle with the report of his staff.

A finalized copy of this paper has been provided to the Agriculture Corporation and any suggestions made and agreed to for further changes will be cabled to AID/W.

It is expected that if the project is approved by both sides, this document will serve not only as an AID approval document but also as a joint guide to project implementation.

MURMA Agriculture Research and Development Project (482-0012)

Annex 1

PROJECT DESIGN SUMMARY

LOGICAL FRAMEWORK

NARRATIVE SUMMARY	OBJECTIVELY VARIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
<p><u>GOAL</u></p> <p>To increase agricultural productivity in terms of per acre yields and total national production. (This requires more intensive use of existing cultivated land through the development, adaption and diffusion of a continuous stream of improved, tested technologies suitable for on-farm application.)</p>	<p>-10% increase in yields of maize and oilseed crops in selected townships.</p> <p>-sustained agricultural growth rate of <u>5%</u> per year</p>	<p>-Agriculture Corporation Records</p> <p>-Census & Statistics Data</p> <p>-Special Reports</p>	<p>-SRUB policies and priorities remain unchanged</p> <p>-Continued political & social stability and economic growth;</p> <p>-Normal weather patterns;</p> <p>-Price relationships between target crops and other crops remain in a favorable situation</p>
<p><u>PURPOSE</u></p> <p>To strengthen the capability of the Ministry of Agriculture and Forests, especially the Agriculture Research Institute (ARI) to plan, organize and carry out production oriented research in maize, oilseeds and other selected crops.</p>	<p>-investment of <u>1%</u> of agricultural GDP for recurrent and capital expenditure for agricultural research</p> <p>-improved crop production techniques and management recommended and employed by farmers</p>	<p>-Agriculture Corporation Records</p> <p>-Site Visits</p> <p>-Project Records/Evaluation</p> <p>-Special surveys</p>	<p>-Agriculture Corporation able to recruit and retain quality personnel</p> <p>-SRUB policies and priorities remain unchanged</p> <p>-Research actually conducted, reported and disseminated</p>
<p><u>OUTPUTS</u></p> <p>1. Increased production-oriented research completed</p>	<p>-increase in number of, applied and adaptive research trials by ARI during LOP at Yezin and the 4 satellite stations</p>	<p>-Agriculture Corporation Records</p> <p>-Project Evaluation and Quarterly reports</p> <p>-Site Visits</p> <p>-AID/W procurement and shipping records</p>	<p>-Timing and quality of inputs are provided according to specification</p> <p>-Adequate supplies of building materials and fuel are available for project needs</p>

NARRATIVE SUMMARY	OBJECTIVELY VARIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
OUTPUTS (cont'd)			
2. Increased number of trained research personnel involved with maize and oilseed crop research.	<ul style="list-style-type: none"> -102 research personnel trained and occupying positions related to research of maize and oilseed crops within the Agriculture Corporation. -35 advanced degree (25 MS; 10 PhD) -67 short-term technical researchers 		
3. Increased number of active cooperative programs and established linkages between Burma's research institutions and international research institutions.	<ul style="list-style-type: none"> -Scientific exchanges with CGIAR-supported centers -In-Country workshops -Plant materials & information flow in place 		
4. Development of improved maize and oilseed varieties.	<ul style="list-style-type: none"> -Improved maize and oilseed varieties released to farmers and collection of promising varieties is available for field testing selection and further breeding 		
5. Fully equipped and staffed reference library at ARI, Yezin.	<ul style="list-style-type: none"> -Approximately 5,000 books and 400 periodicals subscription added to the library at ARI -Audio Visual copying equipment and other supplies added to the library. 		
6. Renovated and new physical structures at Yezin and 4 satellite stations (Burmese contribution)	<ul style="list-style-type: none"> -Warehouses, office and ancillary facility renovation, land development and construction at Yezin and 4 satellite stations 		
7. Improved analytical capacity for laboratories in Yezin, and for field research in Yezin and at 4 satellite stations, including equipment, machinery. (U.S. contribution)			

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NARRATIVE SUMMARY		OBJECTIVELY VARIABLE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
INPUTS				
AID Funding				
1. Technical Assistance	\$ 2.2 million	-167 pm of Technical Assistance - 67 participants in short-term training programs <u>AID</u> <u>Technical Assistance</u> a. 102 p.m. of long-term T.A. b. 55 p.m. of short-term T.A. <u>Training</u> a. 10 Ph.D. programs b. 25 M.S. programs c. 51 participants in short-term courses d. Participation in 20 meetings and/or <u>Machinery, Equipment and commodities</u> a. Farm, machinery and equipment b. Laboratory equipment c. Spare parts d. Library reference materials and equipment e. Project related supplies and support materials	-Agriculture Corporation -Project Records and Reports -Project Audits -Monitoring visits	-Conditions precedent are met on schedule -Participants are named, qualified and processed on schedule -Budgets forthcoming as planned -Contractor selection, procurement and staffing proceeds on schedule
2. Participant Training	\$ 3.3 million			
3. Commodities	\$ 3.5 million			
4. Other Costs	\$ 0.6 million			
5. Contingency/Inflation	\$ 1.6 million			
6. Evaluation	\$ 0.1 million			
	\$11.3 million			
Burmese Government Funding				
1. Participant Training	\$ 0.1 million			
2. Building and Construction	\$ 2.3 million			
3. Other (salaries wages, operating costs)	\$ 2.5 million			
4. Commodities	\$ 0.2 million			
5. Inflation/contingency	\$ 1.5 million			
	\$ 6.6 million			

Environmental Considerations in Agricultural Research and Development Project

Environmental considerations in agricultural research and development projects may conveniently be divided into three categories. The first category relates to the constraints imposed on the project itself by environmental and natural resource conditions. The task of agricultural researchers generally is to take national production policies and enable farmers to adapt or modify their environment and resources through new techniques, inputs, or infrastructure. Soils, water, genetic stocks -- the natural resource base -- together with the environmental conditions of climate, weather, pests and weeds are the givens. Understanding of these environmental resources is essential to farmers as well as to researchers. It is also important to agricultural administrators, who base their policies and programs according to their understanding of the capabilities of the country's agricultural resources.

To stress the need for agro-environmental information may seem superfluous. It is inherent in all agronomic work. Nevertheless, agricultural project activities are frequently sited where there is inadequate water, soils are inappropriate for the intended purpose, or upstream erosion will deposit alluvial sands on carefully prepared test plots. It is important to set aside sufficient research resources for adequate assessment of land and water resources, to analyze the data, continue monitoring the key variables, and revise research agendas accordingly.

The second category of environmental considerations covers the potential impacts of the project itself on future agricultural programs. For example, irrigation projects often cause problems such as raised water tables and soil salinization and alkalization. This category of problems is closely linked to the first category, and again the strategy for avoiding or reducing such problems is to obtain adequate environmental agro-environmental information.

The final category of environmental considerations in agricultural research and development projects covers those impacts that the project may have on other sectors. An important example is the incidence of poisoning by misuse or accidental exposure to agricultural pesticides.

Productivity and Sustainability

Agriculture is the means by which people manipulate natural ecosystems to produce increased amounts of foodstuffs and other desired materials. Agricultural intensification means increased productivity and production of these desired commodities, and consequently greater alteration of the existing agroecosystem.

Increased productivity is not, however, the only agricultural goal of farmers or societies. Stability in yields may rank of equal or even higher importance to farmers than high productivity. Widely fluctuating yields, either due to weather or to periodic pest infestations or other causes are especially hard on low income or traditional farmers. A third goal or criteria of the success of farming systems is sustainability, or the ability to maintain a given yield over a long period of time even in the face of major stresses on the system.

An example of a threat to sustainability is soil erosion. If soil loss is more rapid than the process of soil formation, fertility declines. Fertilizer inputs may compensate for the loss of natural fertility up to a point. But eventually erosion may wear away the surface soil layers, or the structure of the soil is altered to such an extent that the productivity of the system declines or collapses.

Other qualities may also be important. Equity or job opportunities are often considerations in national agricultural policies. But from a production standpoint, the qualities of productivity, stability, and sustainability are key. Agricultural researchers and planners are often compelled to focus their attention almost exclusively on productivity. Traditional farmers may favor stability. From an environmental management perspective, the key criteria is sustainability.

The discussion here of environmental and natural resource considerations is based on the premise that increased productivity should be only one of several goals in Burma's agricultural research and development efforts. If the new techniques and improved varieties developed are unstabled, they won't be accepted in the field by farmers and the program will be set back. If the innovations developed are not sustainable within the localities where they are introduced, the intensification program may appear to succeed for a number of years, but only at a high cost when complications arise in the future.

Not all impacts on sustainability, stability, or even productivity can be anticipated and addressed in advance. And trade-offs always have to be made. The point is that agricultural researchers, including environmental management specialists, must do their best to anticipate and address such problems, and measure their achievements against all three criteria, not production alone.

The Burmese Context

Burma's uniqueness is frequently commented on from nearly every perspective. Certainly its agricultural resource situation appears to be a special case when compared with other countries in Asia. Burma has special features in its demographic pressures, its stage of agricultural modernization, crop pest problems, and diversity of agricultural environments. All of these set the context for environmental considerations relating to Burma's agricultural development.

Demographic Pressures

Burma has a relatively large population, but also a large and fertile land area. It is among the few countries in Asia still possessing significant areas of good, underutilized agricultural land. Thus it benefits from the availability of a large domestic market and labor force, while not suffering the severe human pressure on land resource that characterizes other populous Asian countries. Furthermore, it appears that land holdings in Burma have not yet been sub-divided into unviably small units, and most farmers still work their own land.

The population is growing rapidly, however, and Burma continues to push agricultural production to meet foreign trade targets as well as to satisfy domestic needs. Large areas traditionally have been swidden cultivated, and hillsides or mountain slopes are the sites of most vegetable production. High seasonal rainfall, rapid deforestation (both during the mid 19th century and again since the Second World War) have accelerated the country's soil erosion. The Irrawaddy carries one of the heaviest silt loads of any river in the world. Geologically, this is a transfer of soil and sediments from the Himalayan foothills to the delta region. Within historical times, the seacoast coastline has moved from Pegu to its present -- and still extending -- boundary. Within the past century, the Sittang River has become unnavigable because of sedimentation. The natural, geological process of soil erosion has been accelerated to the point where sedimentation threatens the viability of water impoundment projects for power or irrigation, and good upland soils are being lost from production, while highly fertile new lands are being created in the delta region.

Stage of Agricultural Modernization

Agricultural modernization -- the introduction and spread of high-yielding seeds and inputs -- got off to a late start in Burma. Given its low population density and agricultural fertility, this has not imposed a food deprivation on the country. On the positive side it means that Burma can benefit from the experience of others. Burmese researchers can now

examine and adopt the most recent research achievements of the international agricultural research centers, and of numerous national programs. They can also critically review the experiences of those other countries, and thereby choose to avoid some of the problems or complications that those countries have encountered.

The cautious approach to modernization also means that Burma's agriculture did not undergo the full shock of the drastic global oil price increases of the 1970s. Burmese farmers have not yet become dependent on energy intensive inputs and petroleum-fueled mechanization.

Pest Problems

Agriculture in Burma is still relatively free from pests and plant disease problems. This undoubtedly is due in part to the country's climatic patterns and the natural isolation given by its mountain and marine boundaries. Another probable factor, however, is the general low intensity of Burmese agriculture and continued reliance on traditional varieties of crop species. These traditional varieties should have high resistance or tolerance to local pests and diseases. The lack of cropping intensity provides opportunity for annual fallows. Also natural predators of pest species remain well established, perhaps as a side benefit of the still small use of pesticides used in the country.

Environmental and Resource Diversity

Other notable agroecological characteristics of Burma include the diversity in local environmental conditions -- soils, microclimates, and water availability. ARI has already identified four major agroclimatic regions, around which they are basing their field station network. But there are also three major soil groups, with many local variations. Vegetation cover and land use patterns vary significantly, partly because of the tremendous variety in human cultural groups. Accessibility to roads and other transportation varies widely, but would generally be considered poor. All of these factors together result in a high degree of heterogeneity of agricultural practices and potentials. Programs to optimize production will need to take this diversity into account.

Environmental Management for Burma's Agricultural Research and Development

From an environmental management perspective, Burma is a fortunate country in many ways. As described above, Burmese agriculture doesn't yet have the same degree of environmental management problems confronted in most Asian countries. Land pressures are not severe, there is still significant forest cover,

pesticide usage is meagre, chemical fertilizer use is low, and animal draft power is plentiful. The most serious environmental management issue facing Burmese agriculture today appears to be soil erosion. This topic is briefly addressed below. An on-going concern for USAID in its agricultural assistance work is pest management and the careful, restrained use of pesticides. This topic is covered within the Project Paper. A final topic that will be addressed here is the need for agricultural ecology, or a multidisciplinary systems approach to research planning and programming.

Other key environmental considerations for Burma's agricultural research and development would include:

- irrigation
- germ plasm
- agro-forestry
- shifting cultivation
- grazing
- energy

Shortages of time and information forbid the covering of these topics here.

Soil Erosion

The soil erosion problem may well be more serious, currently, within the forestry sector than in agriculture. Preliminary findings from the FAO's remote sensing forest inventory indicate that forests now cover barely 40 percent of the country, with annual clearing taking place at a very conservatively estimated 600,000 ha annually during 1975-1980. Soil erosion resulting from this rapid deforestation threatens Burma's agricultural development through accelerated sedimentation of irrigation channels and agricultural water tanks. It will also make water flows increasingly erratic and may well increase the already severe variability in Burma's weather patterns, while contributing to the expansion of the dry and semi-arid zones of the country. This is because deforestation of the upper watershed of major rivers will reduce their watershed's retention capacities. Seasonal variations in water flow are already extremely high. The Irrawaddy, which as the country's largest river system should also be the most stable, shows a thirty-fold difference in peak and low flows. Three quarters of the Irrawaddy's load is carried in the three months of July, August, September. This extreme peak-decline characteristic will be exacerbated further at current rates of deforestation.

Furthermore forest cover in the monsoonal tropics appears to play an important role in regulating local rainfall patterns. In the Amazon Basin it is estimated that 50 percent of all rainfall is locally generated through evapotranspiration from the Amazonian

rainforest. Albedo effects from forest cover may also be a factor. Correlation between forest cover and rainfall patterns is still hypothetical for monsoonal Asia -- years of careful monitoring would be required to establish firm evidence. But there is no doubt that deforestation reduces local water supplies to the point that the effects of low rainfall years is worsened. An interesting Burmese case in point is the drought of 1883-1885 and the ensuing crop failures and hunger that occurred in the Dry Zone. Rainfall during that period was within the normal low-cycle range, but two decades of rapid deforestation in the surrounding region had eliminated the normal surface and ground water supplies, so that the effect was similar to a severe drought. This "drought", incidentally, was blamed on the misrule of King Thebaw, and was used as one of the reasons for removing him, and the Annexation of Upper Burma.

Soil erosion in Burma is also very much an agricultural problem. Shifting cultivation in the uplands is often identified as the major agricultural source. But the combination of highly erosive soils, a long dry season, and heavy and intense rainfall during the wet season gives most of the country high erosion potential. Erosion from agricultural as well as from degraded forest lands is already evident in the Central Lowland, the Dry Zone, Pegu Yoma, and the Shan Upland.

Agricultural intensification, can be a major stimulus to increased soil erosion. As early maturing and non-photosensitive varieties are introduced, along with expanded availability of irrigation and other inputs, the cropping season is extended, fallow periods are shortened or eliminated, and soils are worked more frequently. New crops, such as maize, may provide less vegetative cover. And new crops and varieties, with high cash value, mean that more erosion sensitive areas will be brought into production.

Surprisingly, soil conservation is virtually unmentioned within the documents we have reviewed from ARI or the AC. ARI has a Soil Science and Chemistry Division. To their credit, from an environmental management perspective, this Soil Science Division has active research and development programs in bio-fertilizers and rhizobium. But they appear to have no activities or plans in the area of soil conservation.

The Forest Research Institute does have a soil conservation and watershed management unit. Based on the experience of other Asian countries, however, it is very important for the agriculture sector to develop its own competence in soil conservation. Forestry agencies are seldom capable of working effectively on agricultural land with farmers.

Agricultural intensification requires serious and on-going attention to on-farm soil management and conservation if it is to be sustainable.

Agricultural Ecology - Dealing with Agricultural Diversity

ARI already uses the Farming Systems or Cropping Systems research methods supported by IRRI and other international research centers. These methods were developed to fill some important gaps in tropical agricultural research: the need to coordinate work from individual disciplines or individual crops to the complexity of on-farm management. This complexity is a function of diverse agroecological conditions, local socioeconomic factors, and the new opportunities afforded by scientific agricultural research developments.

Cropping systems methods are now well established and widely known. Paralleling these methods, however, has been the evolution of multidisciplinary work based on ecological sciences and systems theory. The methodological approach is somewhat broader than the established farming systems or cropping systems methods, and it can be used to examine different levels in the hierarchies of agricultural ecosystems, or agroecosystems. The concepts and procedures of Agroecosystems Analysis, the principal research tool of what might be considered an emerging discipline of agricultural ecology, have now been pretty well refined and proven for the purposes of understanding a local or regional agroecosystem and identifying key questions to guide research efforts for that area.

The bulk of this agroecology work has been conducted in Southeast Asia, in Thailand and Indonesia. It has been underway for nearly a decade at Chiang Mai and Khon Kaen universities in Thailand. Last year, Indonesia established a Research Group on AgroEcosystems. Housed informally within the Ministry of Agriculture's Agency for Agricultural Research and Development, this research network has a membership of more than 70 senior Indonesian agricultural research officials, researchers from universities, and staff from several provincial government planning agencies. The research network has achieved collaboration between government research stations and universities and from a wide variety of disciplines in the agricultural, natural, and social sciences. The group's current focus is on improving the understanding of the diverse patterns of dryland cultivation possible in the uplands of Java and in the islands of Eastern Indonesia, and in the tidal swamplands of Kalimantan.

Agroecosystems analysis, cropping systems research, and other interdisciplinary or multidisciplinary research activities have an important role in programs for agricultural intensification. They can facilitate communication between scientists and planners, and are helpful in developing the agro-environmental information needed for planning and implementing project activities. Such multidisciplinary work may be essential for anticipating and addressing the problems and complications that inevitably arise from successful productivity programs.

ARI's cropping systems work is to be commended and encouraged. In addition, it may prove useful under the new research project to develop communications between ARI and the evolving national networks for agroecosystem analysis evolving in Thailand and Indonesia. A primary purpose of the project is to strengthen ARI's research capability by developing training in the full range of agricultural disciplines. As ARI's competence in these disciplines is strengthened, it will be possible and desirable to utilize multidisciplinary work for those areas where it is needed.

Recommendation

1. A Crop Protection Assessment should be conducted as part of the mid-project evaluation of the Maize and Oilseeds Production Project. The Mission can request AID/W support under the worldwide Crop Protection Project to provide the services of an expert consultant to travel with the MOPP evaluation team for the specific purposes of:

- reviewing the pest management recommendations contained in the MOPP Environmental Assessment and the crop protection sections of the the Agricultural Research and Development Project Paper in light of the actual pest problems encountered in the field under the MOPP to date, and

- preparing a revised strategy for crop protection to be carried out during the remainder of the project.

This Crop Protection Assessment would also lay the basis for crop protection work under the planned MOPP II.

2. The Regional Environmental Advisor should begin passing to the ADO in Rangoon information and reports on Agroecosystems Analysis, particularly the publications of the Indonesian Research Groups on Agroecosystems. The ADO can then share these publications with Burmese agricultural scientists as appropriate.

3. The Regional Environmental Advisor should prepare a list of recommended titles in the areas of agricultural ecology, agroecosystems analysis, soil conservation, environmental management in agriculture, and agroforestry. This list should be made available to the Agricultural Research and Development Project, to be acquired for the ARI library under that project.

4. ARI should consider establishing a division for Soil Conservation and Hydrology. Staff training for this new division could begin under the new Agricultural Research and Development Project.

5. A soil erosion/soil conservation assessment should be conducted at an early date and orientation provided to the SRUB's

top planners of the potential hazards and some possible solutions to those problems.

- The soil erosion problems in Burma have not progressed to the point where they cannot be controlled by good soil conservation and water control measures.
- The longer the delay in instituting these measures the greater will be the damage and the more costly will be the control and rehabilitation programs.

Annex 3

Narcotics Impact Statement

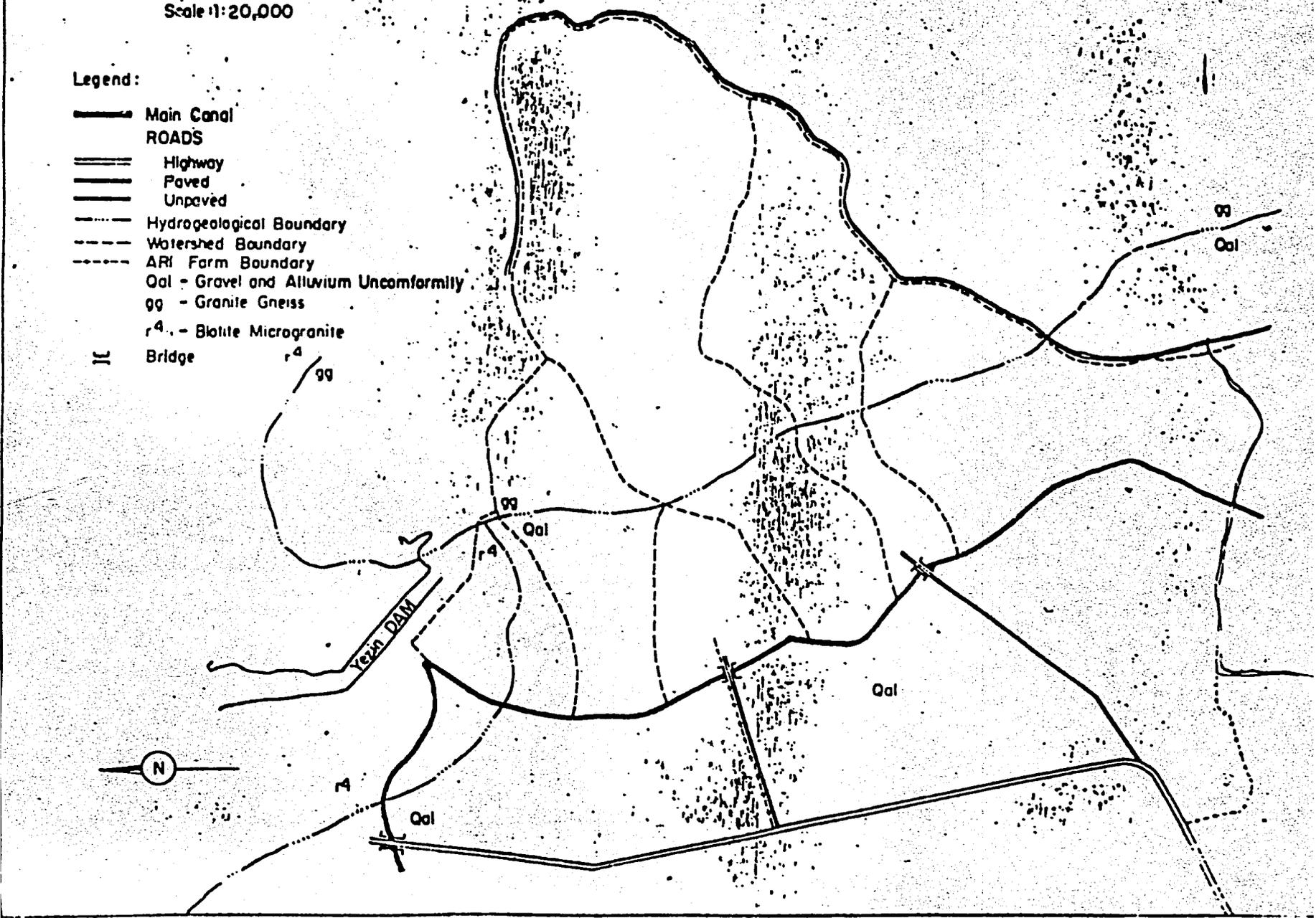
There is no direct linkage between this project and the illicit cultivation of opium poppy or the manufacture of heroin. However, the ARI Satellite Station in Heho, Shan State which is to be a part of this project, is close to one of the areas where there is a major Burmese Government crop substitution and poppy eradication program. That program receives assistance from the Bureau of International Narcotic Matters, Department of State.

Annex 1

MAP NO.1 HYDROGEOLOGICAL MAP OF ARI FARM
Yezin, Burma
Scale 1:20,000

Legend:

- Main Canal
- ROADS
- ==== Highway
- ==== Paved
- ==== Unpaved
- - - - Hydrogeological Boundary
- - - - Watershed Boundary
- - - - ARI Farm Boundary
- Qal - Gravel and Alluvium Unconformity
- gg - Granite Gneiss
- r⁴ - Biotite Microgranite
- Bridge

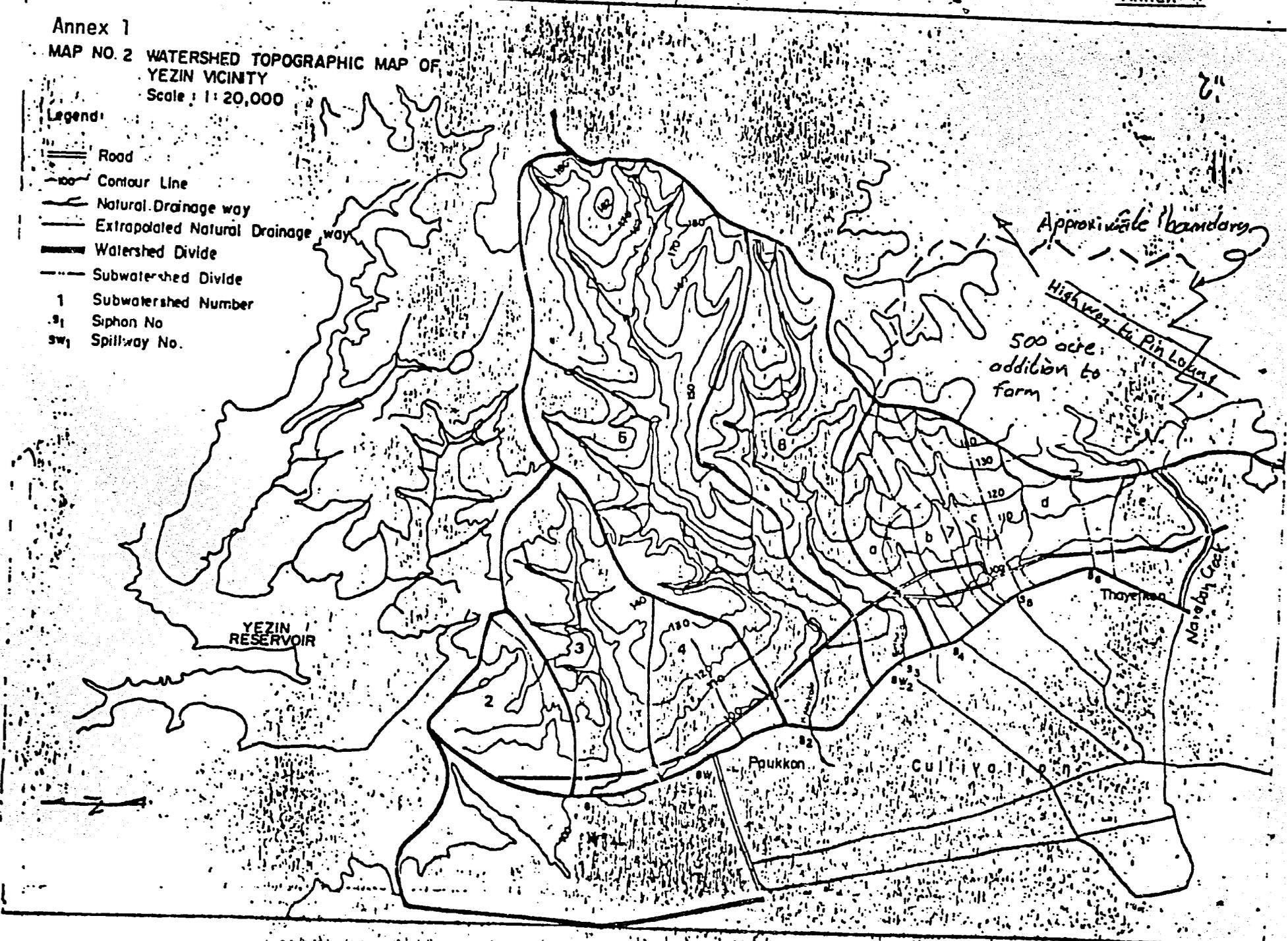


144

828

Annex 1
MAP NO. 2 WATERSHED TOPOGRAPHIC MAP OF
YEZIN VICINITY
Scale : 1 : 20,000

- Legend:
- Road
 - Contour Line
 - Natural Drainage way
 - Extrapolated Natural Drainage way
 - Watershed Divide
 - Subwatershed Divide
 - 1 Subwatershed Number
 - s₁ Siphon No.
 - sw₁ Spillway No.



Annex 1

MAP No 3 SOILS OF ARI FARM
 Yezin, Burma
 Scale 1:10,000

Legend

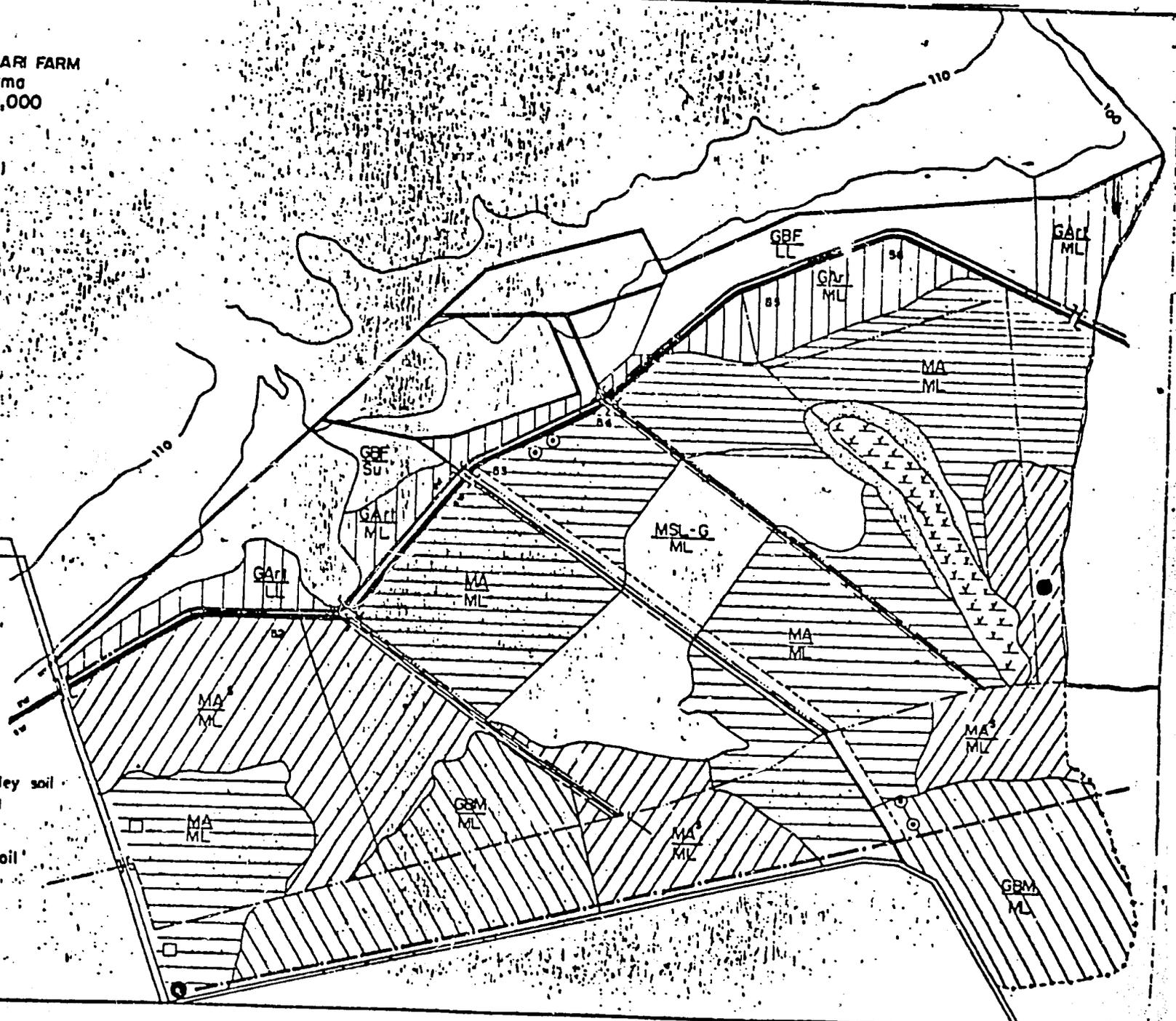
- Main Canal (LH)
- Minor
- Field Channel
- ROADS
- Highway
- Paved
- Unpaved
- Contour
- Boundary
- Bridge
- WELLS
- IA ARI
- Domestic
- Irrigation
- DRAINAGE
- Stream
- Main Drain
- Lateral Drain
- ELECTRICITY
- 33 kv
- 11 kv
- 400 kv

TEXTURAL LEGEND

- HL - Heavy Loam
- ML - Medium Loam
- LL - Light Loam
- Su - Supes

SOIL LEGEND:

- GBM - Gray-Brown Meadow (on silty)
- MG - Meadow Gley soil
- MSL-G - Meadow Slightly Gley soil
- MA - Meadow Alluvial soil
- MA^a - Meadow Alluvial Soil (on coarse sand)
- GBF - Gray Brown Forest soil
- Gart - Gray Artificial soil



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83X

Annex 1

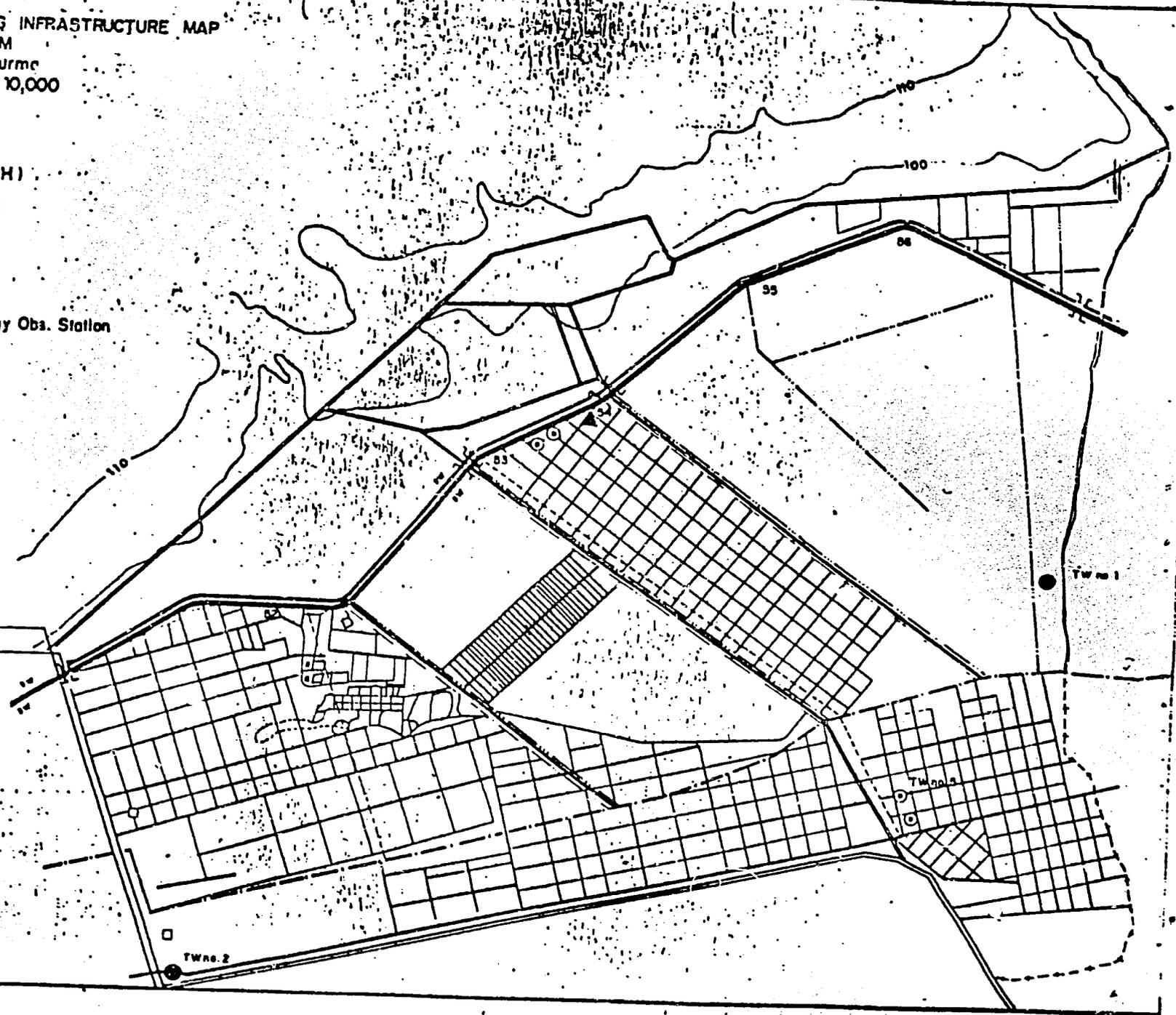
Annex 4

MAP NO. 4 EXISTING INFRASTRUCTURE MAP
ARI FARM
Yezin, Burma
Scale: 1:10,000

Legend:

- Main Canal (LH)
- Minor
- - - Field Channel
- ROADS
- Highway
- Paved
- Unpaved
- ▲ Agro-Meteorology Obs. Station
- ~ 100 Contours
- - - Boundary
- J Bridge
- WELLS
- A
- ARI
- Domestic
- Irrigation
- DRAINAGE
- Stream
- Main Drain
- - - Lateral Drain
- ELECTRICITY
- 33 kv
- 11 kv
- - - 400 kv

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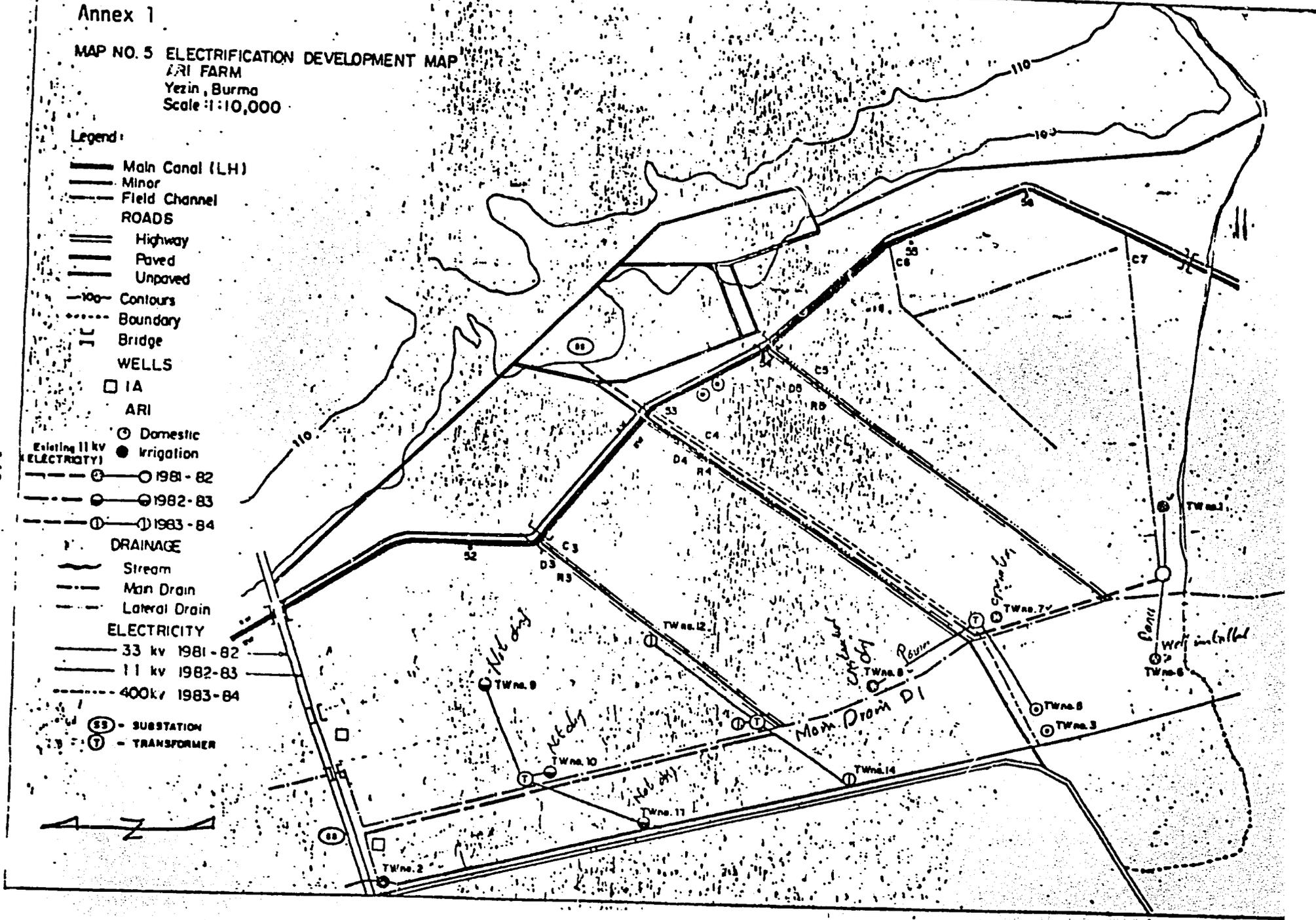
Annex 1

MAP NO. 5 ELECTRIFICATION DEVELOPMENT MAP
ARI FARM
Yezin, Burma
Scale 1:10,000

Legend:

- Main Canal (LH)
- Minor
- Field Channel
- ROADS
- Highway
- Paved
- Unpaved
- Contours
- Boundary
- Bridge
- WELLS
- IA
- ARI
- Domestic
- Irrigation
- Existing 11 kv (ELECTRICITY)
- 1981-82
- 1982-83
- 1983-84
- DRAINAGE
- Stream
- Main Drain
- Lateral Drain
- ELECTRICITY
- 33 kv 1981-82
- 11 kv 1982-83
- 400kv 1983-84
- SS - SUBSTATION
- T - TRANSFORMER

148



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Annex 1
MAP NO. 6 IRRIGATION DEVELOPMENT MAP,
ARI FARM
Yezin, Burma
Scale: 1:10,000

Legend:

- Main Canal
- Minor
- - - Field Channel
- Roads
- Highway
- Paved
- Unpaved
- ~100~ Contours
- - - Boundary
- Bridge

- WELL IRRIGATION AREAS
- ▨ 1st Priority
 - ▩ 2nd Priority
 - ▧ 3rd Priority

WELLS

- IA
- ARI
- Domestic
- Irrigation
- 1981-82
- 1982-83
- 1983-84

Drainage

- Stream
- Main Drain
- Lateral Drain

Pipelines

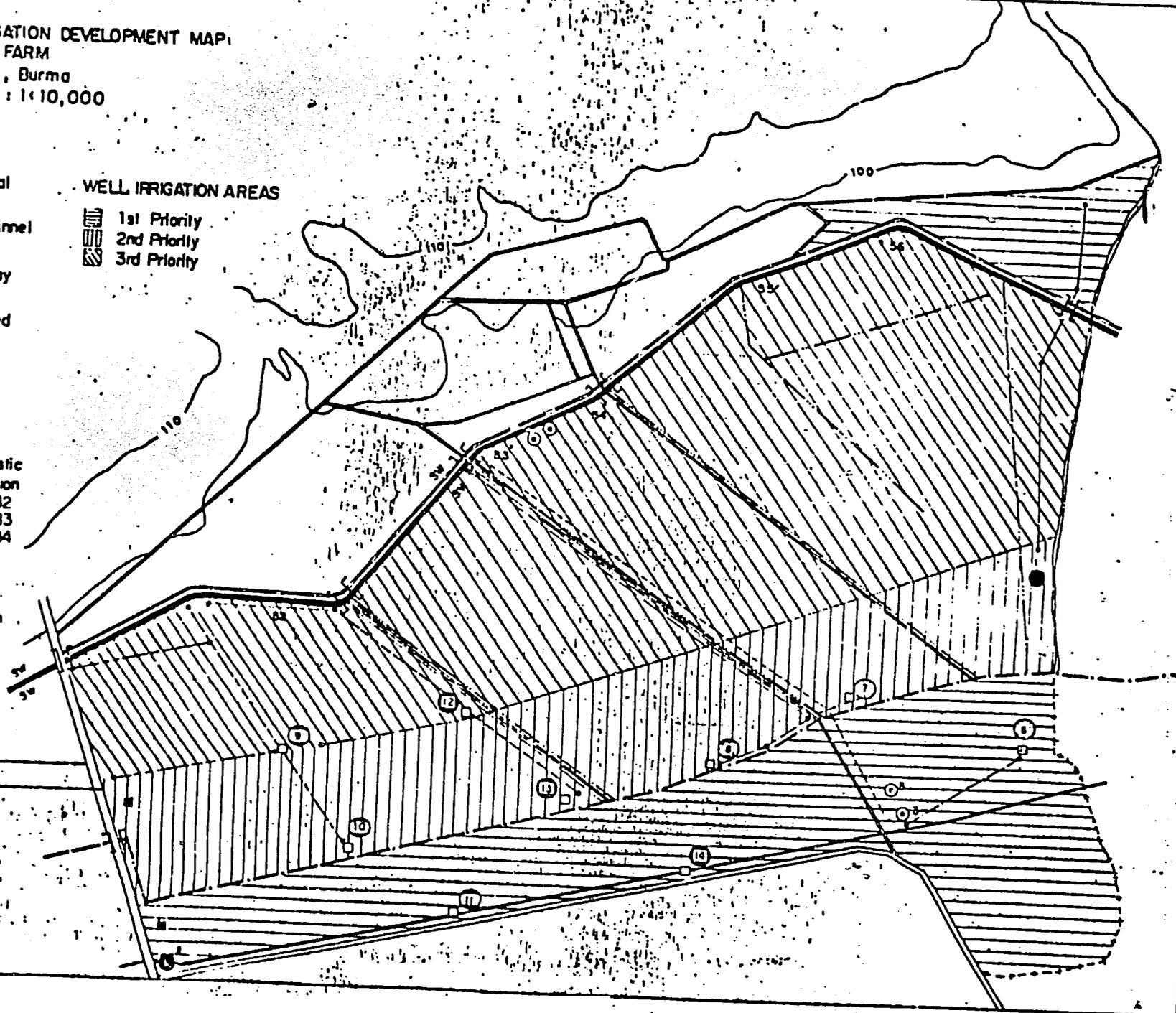
- Existing
- - - 1981-82
- - - 1982-83
- - - 1983-84

ELECTRICITY

- 33 kv
- 11 kv
- - - 400 kv



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Annex 1
MAP NO. 7 DRAINAGE DEVELOPMENT MAP
ARI FARM
Yezin, Burma
Scale 1: 10,000

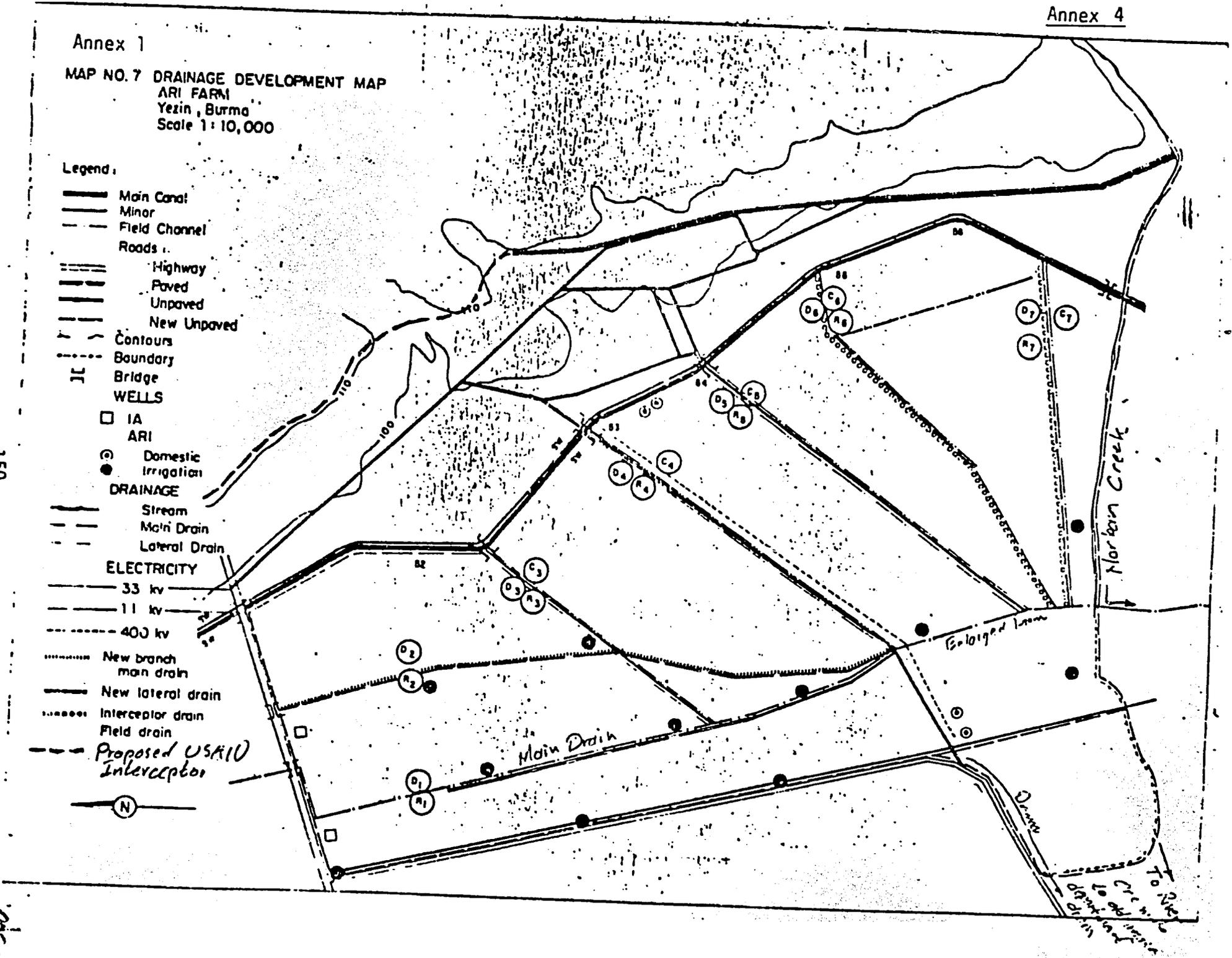
Legend:

- Main Canal
- Minor
- - - Field Channel
- Roads:
 - ==== Highway
 - ==== Paved
 - ==== Unpaved
 - ==== New Unpaved
- - - Contours
- - - Boundary
- ⌈ Bridge
- WELLS
 - IA
 - ARI
 - Domestic Irrigation
- DRAINAGE
 - Stream
 - Main Drain
 - - - Lateral Drain
- ELECTRICITY
 - 33 kv
 - 11 kv
 - - - 400 kv
- New branch main drain
- New lateral drain
- Interceptor drain
- Field drain
- - - Proposed USAID Interceptor



150

X 50



Morbin Creek

Main Drain

Enlarged Lateral

Drain

To River
Cut in
to
the
river
to
be
filled
with
mud

TRAINING SCHEDULE FOR CADTC

Annex 4

Sr. No.	Type of Training	Total No. of Trainees	No. of Trainees per course	Duration (m) X Frequency	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
I	PRE-SERVICE TRAINING	500	500													
(1)	B. Ag		250	2x1			200	200								
(2)	Dip. Ag		150	2x1											200	200
(3)	H. S.		100	2x1	100	100										
II	ON-THE-JOB TRAINING	595	115													
(1)	Division Level	45	15	1/4-1/2x3												
(2)	Township Level	250	50	1/2-1 x5	50	50			50	15		15				
(3)	Village Level	300	50	1-1 1/2x6	50	50			50	50	50	50	50	50	50	15
III	IN-SERVICE TRAINING	240	110													
(1)	S. M. S.	80	20	3-6x4					20	20	20	20	20	20	20	
(2)	Specialist Comprehensive								20	20	20	20	20	20	20	
	(a) Central township	20	10	3x2					10	10	10	10	10	10	10	
	(b) Village tract	60	30	6x2	30	30	30	30	30	30	30	30	30	30	30	
(3)	Extension - General Agri.	60	30	3x2					30	30	30	30	30	30	30	
(4)	Planning/Project	20	20	3x1						20	20	20				
		1,335	725	-	230	230	230	230	210	245	200	255	200	230	230	245

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Project Budget Covering Government Contribution

Annex 5

Country Socialist Republic of the Union of Burma

Project No.

Title Maize, Oilseeds and Other Selected Crop Production Oriented Research Project

Sr. No.	Training	Total		1985-86		1986-87		1987-88		1988-89		1989-90	
		mm	ks	mm	ks	mm	ks	mm	ks	mm	ks	mm	ks
	Project Personnel Staff at the ARI Yezin Farms		13,258		2,651		2,651		2,652		2,652		2,652
	Training Component In service training ARI Yezin (subsistence & local travel)		918		183		183		183		183		186
	Equipment Expendable equipment ARI Yezin Farms		4,928		468		1,638		1,444		909		469
	Non expendable equipment ARI Yezin Farms												
	Buildings and Premises ARI Yezin Farms		35,600		-		3,000		14,900		14,150		3,550
	Clearing Charges		3,500		700		700		700		700		700
	Miscellaneous component Operation and maintenance cost Yezin Farms		18,800		1,200		4,400		4,400		4,400		4,400
	TOTAL		77,004		5,202		12,572		24,279		22,994		11,957
			\$9,059										

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X98.

Diesel Requirement for the Project

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			FE					
			Total	1985-86	1986-87	1987-88	1988-89	1989-90
1.	Land development							
	Ditcher	500 hrs x 3	1,500	1,500				
	Loader	"	1,500	1,500				
	Dozer	500 hrs x 6	3,000	3,000				
	Tipper	1,500 hrs x 2	3,000	3,000				
	Leveler	500 hrs x 3	1,500	1,500				
	Canal	500 hrs x 5	2,500	2,500				
	Unforeseen		2,000	2,000				
			15,000gal	15,000gal				
2.	Farm operations (Local)							
		<u>5 years</u>						
	Tractor	6 x 6,000	36,000	7,200	7,200	7,200	7,200	7,200
	Trucks	6 x	54,000	10,800	10,800	10,800	10,800	10,800
	Generators	3 x	10,000	2,000	2,000	2,000	2,000	2,000
			100,000gal	20,000gal	20,000	20,000	20,000	20,000

Manpower Requirement for Production Oriented Burma

Agriculture Research and Development Project

Sr. NO.	Title (Grade Level)	Rangoon Project Office	Yezin Nyaung OO	R57A	I07A Iban	25A Ianda	I00A IShwe-Iaung	Total	Exist-ing	Addi-tional
1.	Project Director		1					1		1
2.	Dy. Project Director		1					1		1
3.	Dy. General Manager (Admin)		1					1		1
4.	Dy. General Manager (C&D)		8					8	8	-
5.	Breeder (Cereal, Oilseeds & Legume)		3					3	-	3
6.	Agronomist (")									
7.	Assistant General Manager	1	10	1	1	1	1	15	3	12
8.	Dy. Assistant Manager	1	51	3	4	2	5	66	34	32
9.	Junior Research Officer		53	3	4	5	4	69	36	33
10.	Senior Research Assistant		44	2	4	6	4	60	25	35
11.	Junior Research Assistant		73	11	7	2	4	97	51	46
	Sub-total	2	248	20	20	16	18	324	157	167

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XLB

Sr. NO.	Title (Grade Level)	Rangoon Project Office	Yezin Nyaung 00	R57A Aung- ban	107A Myan- landa	25A Shwe- laung	100A Total	Exist- ling	Addi- tional
	Support Staff								
12.	Account Officer		1				1		1
13.	Branch Officer		2	1	1	1	6		6
14.	Upper Division Clerk	2	4	2	2	2	14	T	7
15.	Typists	1	6	1	1	1	11		11
16.	Lower Division Clerk	1	2	1	1	1	7		7
17.	Car Driver/Boat Driver	1	5	4	5	3	21		21
18.	Office Assistant	1	3	1	1	1	8		8
19.	Night/Day watchman	2	2	4	2	2	14		14
20.	Storekeeper	1	3	2	1	1	9		9
21.	Steno typist English		1	-	-	-	1		1
22.	Tractor Drivers			2	1	1	5		5
23.	Asst. tractor driver			4	3	3	12		12
24.	Mechanic			1	1	1	4		4
25.	Carpenter			1	1	1	4		4
26.	Blacksmith			1	1	1	4		4
	Sub-total	9	29	25	21	19	118	7	114
27.	Laborers			10	10	10	40	-	40
	Grand Total	11	277	55	51	45	485	164	321

Burmese Government Budgets and Staffing for ARI and BARD.

ARI has developed additional budgets and staffing patterns related to BARD and the development of Yezin and the four satellite stations. This reflects a broader, longer term approach to the development than the proposed BARD project can initially encompass. These figures and charts are shown below as indicative of ARI's expanded plans for the Yezin stations and its four satellites.

**Additional Manpower Requirements
for ARI Maize and Oilseeds Research**

POSITION <u>YEZIN</u>	ADMIN		AGM	Sr	Jr	Sr	Jr	TOTAL
	GM	DGM		Res DyAGM	Res 320	Asst 210	Asst 150	
<u>ADMINISTRATION</u>	1	1						2
<u>Varietal Improvement (Breeding)</u>								
- Groundnut			1	1	1	1	1	5
- Sunflower			1	1	1	1	1	5
- Sesamum			1	1	1	1	1	5
- Maize			1	1	1	1	1	5
			<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>20</u>
<u>Quality Improvement</u>								
- Chemistry			1	1	1	1	1	5
- Oil				1	1	1	1	4
- Protein/amino acid				1	1	1	1	4
- Milling				1	1	1	1	4
			<u>1</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>17</u>
<u>Crop Management</u>								
- Soil			1	1	1	1	1	5
- Water				1	1	1	1	4
- Fertilizer				1	1	1	1	4
- Agro tech				1	1	1	1	4
- Protein				1	1	2	2	6
			<u>1</u>	<u>5</u>	<u>5</u>	<u>6</u>	<u>6</u>	<u>23</u>
<u>Post Harvest Technology</u>								
- Rice quality testing			1	1	1	1	1	5
- Yield Losses				1	1	1	1	4
- Food processing				1	1	2	2	6
- Storage				1	1	1	1	4
			<u>1</u>	<u>4</u>	<u>4</u>	<u>5</u>	<u>5</u>	<u>19</u>
Research Staff	1		7	17	17	19	19	81
Support Staff		1						27
							TOTAL	108
<u>RANGOON</u>								
Administration			1	1				2
Support Staff								8
TOTAL								10

<u>SHWELAUNG</u>	<u>ADMIN</u> <u>DGM</u>	<u>Sr</u> <u>Res</u> <u>AGM</u>	<u>DyAGM</u>	<u>Jr</u> <u>Res</u> <u>320</u>	<u>Sr</u> <u>Asst</u> <u>210</u>	<u>Jr</u> <u>Asst</u> <u>150</u>	<u>TOTAL</u>
<u>Farm Manager & Admin</u>		1	1				2
		1	1				2
<u>Cropping Systems</u>							
- Patterns			1			1	2
- Implements				1		1	2
- Fertility Trials				1	1		2
			1	2	1	2	6
<u>Varietal Improvement for C.S.</u>							
- Rice							
- Oilseeds (Testing)			1		1		2
- Legumes							
- Fibres Jute							
- Small grain							
			1	1	1	1	4
<u>Fertilizer Management</u>							
- Biofertilizer			1		1		2
- Efficient use of Chem-fertilizer							
			1		1		2
<u>Tillage</u>							
- Minimal				1		1	2
<u>Water Use</u>							
- Pumps							
-Irigation frequency			1		1		2
Research Staff		1	5	4	4		18
Support Staff							17
Labor							10
TOTAL							45

89x

<u>Aung Ban</u>	<u>ADMIN</u> <u>DGM</u>	<u>Sr</u> <u>Res</u> <u>DyAGM</u>	<u>Jr</u> <u>Res</u> <u>320</u>	<u>Sr</u> <u>Asst</u> <u>210</u>	<u>Jr</u> <u>Asst</u> <u>150</u>	<u>TOTAL</u>
<u>Farm Manager & Admin</u>	1	1				2
<u>Soil Management</u>						
- Fertilizer		1		1	1	3
- Trace Element			1		1	2
- Pasture						
- Soil Conservation			1		1	2
	<u>1</u>	<u>2</u>	<u>2</u>	<u>1</u>	<u>3</u>	<u>9</u>
<u>Varietal Improvement</u>						
- Groundnut		1		1	1	3
- Wheat						
- Potato						
- Maize			1		1	2
- Vegetables						
- Flowers						
	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>5</u>
<u>Crop Management</u>						
- Agro Technique		1		1	1	3
- Crop Protection			1	1	1	3
	<u>1</u>	<u>1</u>	<u>1</u>	<u>2</u>	<u>2</u>	<u>6</u>
Research Staff	1	4	4	4	7	20
Support Staff						20
Labor						10
TOTAL						50

COMMODITIES BUDGET - USAID PROCUREMENT

ITEM	Unit Price	Qty	Total Price
I. TRACTORS AND FARM EQUIPMENT			
1. 120 H.P. Diesel powered high crop Farm Tractor with dual wheels	40,000	2	\$80,000
2. Trailors, 4 wheel farm type, 5 ton min. capacity with tires-running gear only	1,500	6	9,000
3. 16 - 18' Bumper Type lowboy equipment Trailor with beaver Tail	15,000	1	15,000
4. Tractor pulled lawn mowers	2,000	2	4,000
5. Tandem disk - hydrallic controlled, pull Type on rubber 10 ft.	4,000	2	8,000
6. Disc plow - 3 disc - hydrallic lift	2,500	2	5,000
7. Mold board plow, 2-16" bottoms	2,500	2	5,000
8. Rotary stalk and brush choppers	3,500	4	14,000
9. Spring tooth harrows	2,000	4	8,000
10. Tractor mounted sprayers	1,000	5	5,000
11. Culti-packers	1,000	6	6,000
12. Seedburo, 18 inch rasp bar thresher for sunflowers, sesame and other crops	4,000	1	4,000
13. Three pt. hitch-mounted broadcast Fert. spreader	1,500	3	4,500
14. Rear mounted Tractor blade for use with 120 H.P Tractor 10 ft. wide	2,500	2	5,000
Total Tractors and Farm equipment			\$172,500

ITEM	Unit Price	Qty	Total Price
II. IRRIGATION - WATER			
15. Booster High Pressure Irrigation pump and gun Engines	4,500	2	9,000
16. High Pressure Aluminum Pipe 5"(ft)	3	4,000	2,000
17. Lift Pumps for tube wells - 10 H.P. electric powered	1,600	2	3,200
18. Low Volume (50-100 gpm) irrigation pumps for pumping from rivers and canals	500	10	5,000
19. Irrigation pump, 2" outlets, Diesel powered/portable	1,000	5	5,000
20. Irrigation pipe, 2" with 12 sprinklers (Rain Bird type) (feet)	2	2,000	4,000
21. Pressure pump and pressure Tank, with electric motor, gauges, pipe and Fittings for station water system	2,500	4	10,000
22. PVC pipe and Fittings (/ft)	1	4,000	4,000
			52,200
III. STATION DEVELOPMENT			
<u>Yezin = Commodities only</u>			
23. a) Diversion Drainage Ditch structures			15,000
24. b) Central Drainage			10,000
25. c) Irrigation Improvements			10,000
26. d) 4 Pre Fab cold storage units	5,000	4	200,000
<u>OUTSTATIONS</u>			
27. a) 1 pump to be used for pumping water 2 miles with a 300 ft head delivering 250 gpm - electric	25,000	2	50,000
28. b) 1 pump to be used for pumping water 1 mile with 50 ft head, electric	25,000	1	35,000
<u>ALL STATIONS</u>			
29. a) Cement			50,000
30. b) Cast iron pipe			10,000
			370,000

ITEM	Unit Price	Qty	Total Price
IV. LABORATORY			
31. ENTOMOLOGY			
a) Insectary 20' x 40' glass roof, screen side	10,000	1	10,000
b) Cages 3' x 2' x 3'	100	0	1,000
c) Museum cabinets - metal, airtight	1,000	2	2,000
d) Insect pins - unit of 2,000	10	6	60
e) Petri dishes	16.70	12,002	200
f) Enlenger Flasks 200 ml	24	4,002	1,152
g) Graduated cylinders 25,100,500,1000	each 12	8,002	1,152
h) Refrigerator 13 ft ³	600	3	1,800
i) Micro applicator, ISCO Model M	2,500	1	2,500
j) Scale, Platform 24 lb	30	2	60
k) Stirrer - hot plate Corning 440065	250	1	250
l) Internal Timer, minute winder		12	12
m) Counter, lab	200	2	400
n) Agrothermograph, recording	400	4	1,600
o) Chart paper	15	20	300
p) Blender	75	2	150
q) Glass container for Blender	15	2	30
r) Thermometer-maxi-min	20	2	40
s) Microscope, stereoscopic, Model 25 Lg	1,000	2	2,000
t) Incubator, Elconap Type Alt3	400	1	400
u) Magnifiers, illuminated	125	2	250
v) Pesticide respirator (Burrows 807400)	20	12	240
w) Handlens, 10 x Hastings, Bausch 8 lamb	30	12	360
x) Cages, animal, Vaughn collapsible	75	16	1,200
y) Cage, animal, Transparent, Jewel	25	24	600
z) Mobile rack 12 cage, Jewel	400	2	800
aa) Balance, spring, Autopsy	260	1	260
bb) Caliper, Dial, Inside-Outside	45	1	90
cc) Bottle Tray, Reujert Mc Bride bottle	20	2	40
dd) Rack, standard drying rack	50	2	100
Sub total Entomology			29,102

ITEM	Unit Price	Qty	Total Price
32. WEED SCIENCE			
a) Knapsack Sprayer, Semi-automatic, 16 liters cap., (shell chen. Co)	850	2	1,700
b) Laboratory Sprayer, 4 ft wide, 16 ft long, 9 ft high, (L.F. Bouse 8 R.W. Bove, Agri Res. Services, USA)	3,000	1	3,000
c) Complete Hozzle assembly 1/4 TT, 8001, 8002, 8004, brass teejet	10	15	150
d) Nozzle tips 8002 brass teejet	3	5	15
e) Nozzle tips 8003 brass teejet	3	5	15
f) Nozzle tips 8004 brass teejet	3	5	15
g) Meter stick, Altt 6410 - M 20	10	2	20
h) Meter Stick, Altt 6410-M 40	2	3	6
Sub total weed			4,921
33. MISC AND OTHER LAB			
a) Disposable chemicals	\$4,000/yr	5	20,000
b) Glassware - plasticware	\$4,000/yr	5	20,000
c) Other-Disposable	\$5,000/yr	5	25,000
d) Exhaust fans	\$2,000/yr	2	4,000
e) Lab equipment			50,000
f) Lab repairs, spares, maint. parts			50,000
Sub total general lab			169,000
34. OILSEEDS LAB			
a) Oil extractor - lab type	2,000	1	2,000
b) Incubating & heating oven	2,000	1	2,000
c) Lab microscope	2,000	1	2,000
d) Top loading precision balance	2,000	1	2,000
e) Soil moisture tensiometer	500	4	2,000
f) Soil moisture meter	200	2	400
g) Measuring calipers	25	12	300
h) Bottles - various types/doz	12	50	720
Sub total Oilseeds			11,420
Total Laboratory			214,443

ITEM	Unit Price	Qty	Total Price
V. SHOP YEZIN			
35. Engine Analyser	3,000	1	3,000
36. Timing lights	50	2	100
37. Air compressor portable	2,000	1	2,000
38. Air hose & fittings	500	2	1,000
39. 4 ton chain hoist	500	2	1,000
40. 8 ton chain hoist	700	2	1,400
41. Vise	300	2	600
42. Anvil	300	2	600
43. Twist drills - sets	333	3	1,000
44. Tow chains 16'3/8"	50	16	800
45. Tow chains 16'1/2"	100	4	400
46. Tow chains 16'5/16"	50	16	800
47. Overcenter chain tighteners	25	16	400
48. Hammers - Ball pein 30,24,20,16,12, oz	20	40	800
49. Portable electric welder with engine	2,500	1	2,500
50. Puller set	1,500	1	1,500
51. Tool set (Sockets, end, open, box wrenches, chisels, punches, etc complete 1/4 - 3/8, 1/2, 3/4 drives, tool-boxes)	15,000	1	15,000
52. Welding rod - mixed lot			10,000
53. Bolts - nuts - stock - screws - keys, washers - mixed lot			10,000
Total shop			52,900
VI. OFFICE			
54. Manual typewriter, Burmese keyboard	550	5	2,750
55. Manual typewriter, Burmese keyboard	650	5	3,250
56. Manual typewriter, English keyboard	350	7	2,450
57. Electric typewriter - wide carriage	1,200	2	2,400
58. Extra ribbons for above	4	25	100
59. Photocopier, with spares & paper	7,100	2	14,200
60. Micro-computer - 16 Bit, 1 floppy disc drive, one 10 K hard disc	8,000	2	16,000

ITEM		Unit Price	Qty	Total Price
VI.	61. Software & programs	500	8	4,000
	62. Color monitor	600	1	600
	63. Stand-by voltage regulator for computer, with approx 20-40 min operating time-off-line, includes batteries	1,000	2	8,000
	64. Discs, Fuses, extra drives			4,000
	65. Calculators TI 59	300	4	1,200
	66. Calculators - rechargeable	40	10	200
	67. Solar powered calculators	20	10	200
	68. File cabinets	200	10	2,000
	69. Telephone-PBX, acessor, cable			200,000
Total Office				261,550
VII.	<u>MISCELLANEOUS EQUIPMENT</u>			
	70. Centrifugal fans, 12000 to 2000	300	5	1,500
	71. 10 H.P. Briggs & Stratton engine	1,000	5	5,000
	72. 5 H.P. Briggs & Stratton engine	650	5	3,250
	73. Electric Motors for centrifugal fans	150	5	750
	74. 10 H.P. electric motor	500	5	2,500
	75. 5 H.P. electric motor	250	5	1,250
	76. 3 H.P. electric motor	150	3	450
	77. 1 H.P. electric motor	100	5	500
	78. 1/2 H.P. electric motor	50	5	250
	79. 1/4 H.P. electric motor	40	5	200
	80. Air conditioner, 18000 BTU, window	2,000	10	20,000
	81. Air conditioner-central, 50000 BTU	10,000	2	20,000
	82. Diesel Auxiliary Generator, 60 K.W.	10,000	2	20,000
	83. Generators 5 KW - 220V, cont.oper.	2,000	10	20,000
	84. Weather station	2,500	5	12,500
	85. Dehumidifier	1,000	6	60,000
	86. Plastic shade screen - square feet	2	8,000	16,000
	87. Hand operated garden planter	50	5	250
	88. Animal Drawn Tool Bars	1,000	10	10,000
	89. Sample Seed Huller, Hand operat. for peanuts	50	2	100
	90. Seed buro peanut thresher	2,900	1	2,900

ITEM	Unit		Total
	Price	Qty	Price
VII. 91. Corn sheller-single ears	200	1	200
92. Seed grader	1,000	1	1,000
93. ULV (elect) sprayer	50	50	2,500
94. AUX 6 V. rechargeable battery for ULV	20	100	2,000
95. Battery charger for above	200	5	1,000
96. One-new animal pulled planter	200	5	1,000
97. Inter-row cultivator, adjust width	100	10	1,000
98. Hand operated back pack sprayer	50	50	2,500
99. Seed tester & cleaner, Lab Fenel Ross clipper	700	1	700
100. Seed cleaner - Fenel Ross clipper M-2B with extra screen	1,900	1	1,900
101. Precision drop push planter	55	50	2,750
102. Seeder/Fertilizer Earthway 9000B	1,000	2	2,000
103. Grass mowers high wheelers 19"-25"	1,000	6	6,000
104. 100 KVA Transformer 11,000 to 440/220	15,000	3	45,000
105. Steel-Iron: reinforcing, plate, rods, angles, U's, I's, misc - lot			50,000
106. Spare parts for farm machinery now at station			200,000
107. Decorticator - sunflowers			15,000
			477,450

VIII. HOUSEHOLD FURNISHINGS/HOUSE

108. Water filters	150
109. Water heaters 50 gal	250
110. Table lamps (40 50 each)	200
111. Floor lamps	100
112. Swivel chairs	200
113. Step down transformers 240 - 120	300
114. Air conditioners (5 @ \$600)	3,000
115. Desk lamps (2 @ \$25 each)	50
116. Electric stove	900
117. Electric refrigerator (side by side)	1,000
118. Electric freezer 15.7 cu ft.	1,000

<u>ITEM</u>		Unit	Total
		Price Qty	Price
VIII	119. Automatic washer		700
	120. Electric dryer		500
	121. Dehumidifier		260
	122. Floor polisher		150
	123. Vacuum cleaner		175
	124. Bed, Box, spring double		200
	125. Bed, mattress double		300
	126. Bed frame, metal		150
	127. Bed, Box spring single (2)		300
	128. Bed, mattress single (2)		300
	129. Bed frame, single (2)		200
	130. Rugs (with backing) (2)		300
	131. 6" sponge rubber (60)		60
	132. Bathroom Facilities (Medicine Cabinet) with mirror, stool		255
	133. Drapery upholstery material		1,000
	134. Garden tools (hoses, sprinkler)		150
	135. Lawn Mower		100
	136. Screening Material		150
	137. Copper Wiring		500
	138. Fire extinguisher and alarm		250
	139. Ice Chest		50
	140. T. V. Antenna, booster, wiring		300
	141. Other furnishings		1,500
FURNISHINGS/ House			15,000
TOTAL HOUSEHOLD FURNISHINGS (3 houses)			45,000

94x

IX. TRUCKS AND VEHICLES

142	Trucks, 7-8 ton	50,000	3	150,000
143	Pickups, 2,000 cc, small	10,000	4	40,000
144	4 WD, 2,000 cc, small	15,000	5	75,000
145	Cars, Sedans, 2,000 cc or less	15,000	2	30,000
146	Boat Motors & accessories			50,000

Total trucks & vehicles 345,000

X. Spare Parts

Category	Value of equip- ment for which spare parts are needed	Factor %	Value of spare parts for Category
I			69,000
II			34,500
III			8,840
IV			11,250
V			4,634
VI			1,500
VII			9,810
VIII	(a)		35,300
	(b)		3,675
IX			5,001
147	TOTAL SPARE PARTS		<u>183,510</u>

XI. SEEDS - FERTILIZER - CHEMICALS

148	Seeds	50,000
149	Fertilizers	20,000
150	Chemicals (Weedicides/seed/storage)	20,000
151	Micro elements	10,000

TOTAL 100,000

XII. LIBRARY (includes shipping)

152 Total Library 500,000

SUMMARY OF COMMODITIES BUDGET

I. Tractors & farm equipment	172,500
II. Irrigation & water	52,200
III. Station Development	370,000
IV. Laboratory	214,443
V. Shop-mechanics	52,900
VI. Offices	261,550
VII. Miscellaneous equipment supplies	477,450
VIII. Household furnishings	45,000
IX. Trucks & vehicles	345,000
	<hr/>
SUB TOTAL	1,991,043
X. spare parts	183,510
XI. Seeds fertilizer chemicals	100,000

TOTAL COMMODITIES - FOB 2,274,553

SHIPPING & PROCUREMENT

a) (I - X) 30%	652,366
b) (XI)	
60,000 x 133%	80,000
40,000 x 50%	20,000

TOTAL SHIPPING 752,366

SUB-TOTAL COMMODITIES - CIF 3,026,919

XII. LIBRARY 500,000

TOTAL COMMODITIES 3,526,919

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The Training Programme of the Central Agriculture

Development Training Center

OBJECTIVES

The objectives of the Central Agriculture Development Training Centre are:

To facilitate improvement of agriculture extension workers by close tying-up with the existing training facilities and extension systems.

To develop agricultural productivity by widely spreading new technologies among peasants throughout the whole country.

TRAINEES

1. Trainees to be selected are:

- (a) Pay-scale: 320-15-440 Kyats
 450-25-700 "
 500-30-800 "
- (b) Minimum service: Seven years
- (c) Minimum Qualification: Diploma in Agriculture
- (d) Health: Good Condition
- (e) Efficiency: Be active and dutiful

2. Number of Trainees to be invited.

No.	Pay-scale	No. of invited Staff	No. of Selected Trainees
1.	320-15-440	800	200
2.	450-25-700	280	80
3.	500-30-800	60	20
		Total 1,140	300

3. Terms of Trainings
 Trainings will be divided into five terms for On-the-Job Training Course.

First Course	- 50 trainees (1984-85 fiscal year)
Second Course	- 60 trainees
Third Course	- 60 trainees
Fourth Course	- 60 trainees (1985-86 fiscal year)
Fifth Course	- 60 trainees
Total:	<u>300 trainees</u>

Subjects and Lectures for First Training Course (1/84)

No.	Subjects	Day	Hours	Lecturer
1.	Special Instructions for AC Staff	1	3	Managing Director
2.	Burma Socialist Programme Party & Central Peasant Organization	2	16	Head of the Department
3.	Research Works	12	36	General Manager & Experts
4.	Township special high yield works and Extension Methods	10	30	General Managers & Divisional Managers
5.	Special Instructions of General Managers and Dy. General Managers	10	30	(6) General Managers (1) Dy. G.M.
6.	Studying on outlines of Projects	2	6	(2) Dy. G.M. and Project Managers
7.	7- Special Projects	7	21	Project Managers
8.	Lectures	3	9	(3) Japanese
9.	Lectures	3	9	Visiting Experts of AC.
Total:		50	150	

Daily Time Table for Trainees

Time to wake up	0500 hours
Physical Exercises	0530 to 0600 hours
Breakfast	0630 to 0700 "
Practice in the field (or) Practice in Laboratories	0730 to 1030 "
Lunch	1100 to 1200 "
Day Lectures	1230 to 1530 "
Practice in the field	1600 to 1700 "
Free time and sports	1700 to 1800 "
Dinner	1800 to 1900 "
Night time discussion	1930 to 2130 "
Time to go to bed	2200 hours

Detailed Programme for On-the-Job Training No. 1/84

No.	Subjects	Day	Hours
1.	Special Instructions for AC Staff	1	3
2.	Burma Socialist Programme Party	1	3
3.	Central Peasant Organization	1	3
4.	Research works of A.R.I., Yezin	2	6
5.	Research works of A.R.D., Rangoon	2	6
6.	Rice Based Research Works	2	6
7.	Other Cereal Crops Research Works	1	3
8.	Oil Crops Research Works	2	6
9.	Industrial Crops (Especially on Cotton, Jute and Sugarcane) Research works)	2	6
10	Pulses (Peas & Beans) Research Works	1	3
11.	Extension Methods	1	3
12.	Required methods for Whole Township High Yield Paddy Production	1	3
13.	Required methods for Whole Township High Yield Paddy Production	1	3
14.	Required methods for Whole Township High Yield Corn Production	1	3
15.	Required methods for Whole Township High Yield Maize Production	1	3
16.	Required methods for Whole Township High Yield Groundnut Production	1	3
17.	Required methods for Whole Township High Yield Sesamum Production	1	3
18.	Required methods for Whole Township High Yield Sunflower Production	1	3
19.	Required methods for Whole Township High Yield Long Staple Cotton Production	1	3
20.	Required methods for Whole Township High Yield Butter Bean/Black Gram Production.....	1	3
21.	Instructions of General Manager (Administration)	2	6
22.	Instructions of General Manager (Accounts)	2	6
23.	Instructions of General Manager (Planning)	2	6
24.	Instructions of General Manager (Procurement & Distribution)	2	6
25.	Instructions of General Manager (Plantation)	1	3
26.	Instructions of Dy. General Manager (Land Use)	1	3

No.	Subjects	Day	Hours
27.	Establishment of Projects	2	6
28.	Special Projects - Seed	1	3
29.	" - Plant Protection	1	3
30.	" - MOPP	1	3
31.	" - Crop Intensification	1	3
32.	" - Industrial Crops	1	3
33.	" - Kinda Multipurpose Dam	1	3
34.	" Sedawgyi Multipurpose Dam	1	3
35.	Extension Methods of Japan	1	3
36.	Methods of Farming Implements	1	3
37.	Rice Cultivation Methods of Japan	1	3
38.	Paddy Breeding Methods	1	3
39.	Cropping Pattern	1	3
40.	Methods to use Pesticides	1	3
Total :		50	300

INSERVICE TRAINING PROGRAM FOR MAIZE, OILSEEDS AND OTHER SELECTED CROPS

Annex B

ARI, Yezin

Sr. No.	Training	Duration	Number of Participants										Total	
			1985-86		1986-87		1987-88		1988-89		1989-90		Time	Number
			Partici- pant	Time	Partici- pant	Time	Partici- pant	Time	Partici- pant	Time	Partici- pant	Time		
1.	Maize Production and Breeding	30 days	1	60	1	60	1	60	1	60	1	60	5	300
2.	Sunflower Production and Breeding	30 days	1	60	1	60	1	60	1	60	1	60	5	300
3.	Groundnut Production and Breeding	30 days	2	120	2	120	2	120	2	120	2	120	10	600
4.	Sesamum Production and Breeding	30 days	1	60	1	60	1	60	1	60	1	60	5	300
5.	Food Legume Production and Breeding	30 days	1	60	1	60	1	60	1	60	1	60	5	300
6.	Pest Management	15 days	2	60	2	60	2	60	2	60	2	60	10	300
7.	Cropping System	15 days	2	60	2	60	2	60	2	60	2	60	10	300
8.	Fertilizer Management and trails	30 days	2	60	2	60	2	60	2	60	2	60	10	300
9.	Animal Drawn Implement utilization Training	15 days	1	30	1	30	1	30	1	30	1	30	5	150
TOTAL			13	570	13	570	13	570	13	570	13	570	65	2,850

PROJECT AUTHORIZATION AND REQUEST FOR ALLOTMENT OF FUNDS

Country: Burma
Project: Agricultural Research and Development
Project No.: 482-0012

Pursuant to Part I, Chapter 1, Section 103 of the Foreign Assistance Act of 1961, as amended, I hereby authorize a Grant to the Government of the Socialist of the Union of Burma (the "Cooperating Country") of not to exceed Three Million United States dollars (\$3,000,000*, the "Authorized Amount") to help in financing certain foreign exchange costs of goods and services for the project as described in the following paragraph:

The project (hereinafter referred to as the "Project") is designed to assist the Government of the Socialist Republic of the Union of Burma in increasing agricultural productivity in terms of per acre yields, especially maize and oilseed crops. This will be accomplished by strengthening the research capability of the Agricultural Research Institute (ARI) to plan, organize, and execute production oriented research in maize, oilseeds, and other selected crops at the main station at Yezin and four satellite stations located in the four major agroclimatic zones in Burma. The project shall provide training, technical assistance, construction of research facilities, field equipment, laboratory equipment, library books and periodicals, and station development.

I approve the total level of A.I.D. appropriated funding planned for this Project of not to exceed Eleven Million Three Hundred Thousand United States Dollars (\$11,300,000) including further increments during the period of grant funding up to this total, subject to the availability of funding in accordance with A.I.D. allotment procedures.

*\$3,000,000 in FY 85, funds permitting	
\$3,000,000 in FY 86	"
\$3,000,000 in FY 87	"
\$2,300,000 in FY 88	"

I hereby authorize the initiation of negotiation and execution of the Project Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority, subject to the following essential terms and major conditions together with such other terms and conditions as A.I.D. may deem appropriate:

a. Source and Origin of Goods and Services

Except for ocean shipping, goods and services financed under the Grant shall have their source and origin in the Cooperating Country or in the United States, except as A.I.D. may otherwise agree in writing,

provided that: 1) training services may be undertaken in third countries as well as in the United States, in accordance with the provisions of AID Handbook 10, and 2) the services of third-country technicians may also be financed from the Grant by the United States contractor. Ocean shipping financed under the Grant shall be procured in the United States except as A.I.D. may otherwise agree in writing.

b. Initial Conditions Precedent to Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement, for any expenditure of funds, the Cooperating Country shall designate representatives to undertake the Project and a Project Management Committee.

c. Covenants

1. The Cooperating Country shall covenant to provide sufficient existing and incremental budgetary and staff support to accomplish the objectives of the project.
2. The Cooperating Country shall covenant that during the period of the project, if A.I.D. grant contributions totalling \$11.3 million are provided, the Burmese Government will provide the equivalent of \$6.6 million on goods and services.
3. The Cooperating Country shall covenant to process and clear expeditiously, and to store and distribute properly, all goods financed under the Grant.
4. The Cooperating Country shall covenant to pay any and all taxes and duties on AID-financed commodities, and/or to exempt such commodities from such costs.
5. The Cooperating Country covenants to afford A.I.D. representatives the opportunity at all reasonable times to inspect the project and the utilization of goods and services funded under the Grant.
6. This project shall be subject to such other covenants as A.I.D. may deem advisable.

Assistant Administrator
Bureau for Asia

Checklist of Statutory Criteria

PROJECT CHECKLIST

A. GENERAL CRITERIA FOR PROJECT

1. FY 1982 Appropriation Act Sec. 523; FAA Sec. 634A; Sec. 653 (b)

(a) Describe how authorizing and appropriations committees 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 amount)?

Congressional Notification will be made before authorization. Assistance is within OYB.

2. FAA Sec. 611(a)(1). Prior to obligation in excess of \$100,000, will there be:

No

(a) engineering, financial or other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

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?

No further legislative action required.

4. FAA Sec. 611(b); FY1982 Appropriation Act Sec. 501. If for water or water-related land resource construction has project met the standards and criteria as set forth in the Principles and Standards for Planning Water and Related Land Resources, dated October 25, 1973? (See AID Handbook 3 for new guidelines.)

N/A

PROJECT CHECKLIST

ANNEX 10

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all this assistance for it will exceed \$1 million, has Mission Director certified and regional Assistant Administrator taken into consideration the country's capability to maintain and utilize the project? N/A
6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs. No
7. FAA Sec. 601(a). 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; and (c) encourage development and use of cooperatives, and 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. The project strengthens agriculture research institutions to improve agriculture productivity. This improved technology will be directed toward small farmers in the maize and oilseeds crop areas and will further competition and initiative in the private sector.
8. FAA Sec. 601 (b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in and foreign assistance programs including use of 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) The project will facilitate Burmese Government investment in rural development in Burma and may therefore indirectly encourage U.S. private trade investment. It is planned that project procurement will be the U.S. except when or unless suppliers there cannot supply items needed. Technical assistance from U.S. firms will be funded under the project.

PROJECT CHECKLIST

ANNEX 10

9. FAA Sec. 612(b), 636(h); FY 1982 Appropriation Act Sec. 507.
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 in lieu of dollars.
- The Burmese Government is contributing 37 percent of the cost of this project. No procurement is planned in countries for which the U.S. owns excess currencies.
10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release?
- There is no U.S. owned Burmese currency available for this project.
11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?
- Yes
12. FY1982 Appropriation Act Sec.521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity?
- N/A
13. FAA 118(c) and (d). Does the project comply with the environmental procedures set forth in AID Regulation 16? Does the project or program take into consideration the problem of the destruction of tropical forests?
- A categorical exclusion under section 22 CFR 216.2(c)(2)(XIV) has been requested.
14. FAA 121 (d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (dollars or local currency generated there from)?
- N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b), 111, 113, 281(a). Extent to which activities will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits development on a sustained basis, using the appropriate U.S. institutions; (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; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A, 104, 105, 106. Does the project fit the criteria for the type of funds (functional account) being used?

c. FAA Sec. 107. Is emphasis on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for the small farms, small businesses, and small incomes of the poor)?

Project will significantly improve agricultural productivity in maize and oilseeds crops. Private farmers and laborers, at least half of which are women, will benefit from the project. Because of fuel constraints, animal traction and labor-intensive production methods will be emphasized.

Yes

Yes. The project will improve cultivation methods utilizing appropriate technology such as locally made, animal drawn planters, cultivators and other farm implements.

PROJECT CHECKLIST

ANNEX 10

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the letter cost-sharing requirement being waived for a "relatively least developed" country)?

Yes

e. 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, or is the recipient country "relatively least developed"? (M.O. 1232.1 defined a capital project as "the construction, expansion, equipping or alteration of a physical facility or facilities financed by AID dollar assistance of not less than \$100,000, including related advisory, managerial and training services, and not undertaken as part of a project of a predominantly technical assistance character.

N/A

f. FAA Sec. 122(b). 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?

Yes

g. 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 civil education and training in education and training in skills required for effective participation in governmental processes essential to self-government.

The project supports Burmese Government's program to increase edible oil quantity and quality nationwide. The program was conceived by the Burmese to meet a critical national food requirement. It is focused on and will encourage institutional development.

C. STANDARD ITEM CHECKLIST (PROCUREMENT)

- | | |
|---|--|
| 1. <u>FAA Sec. 602.</u> Are there arrangements to permit U.S. small business to participate equitably in the furnishing of commodities and services financed? | Yes |
| 2. <u>FAA Sec. 604(a).</u> Will all procurement be from the U. S. except as otherwise determined by the President or under delegation from him? | Yes |
| 3. <u>FAA Sec. 604(d).</u> If the cooperating country discriminates against marine insurance companies authorized to do business in the U.S., will commodities be insured in the United States against marine risk with such a company? | The cooperating country does not discriminate. |
| 4. <u>FAA Sec. 604 (e); ISDCA of 1980 Sec. 705 (a).</u> 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? (Exception where commodity financed could not reasonably be procured in U.S.) | N/A |
| 5. <u>FAA Sec. 604(g).</u> Will construction or engineering services be procured from firms of countries otherwise eligible under Code 941, but which have attained a competitive capability in international markets in one or these areas? | N/A |
| 6. <u>FAA Sec 603.</u> Is the shipping excluded from compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, 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? | No |

7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished by private enterprise on a contract basis to the fullest extent practicable? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs? Yes
8. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will U.S. carriers be used to the extent such service is available? Yes
9. FY 1982 Appropriation Act Sec. 504. If the U.S. Government is a party to a contract for procurement, does the contract contain a provision authorizing termination of such contract for the convenience of the United States? It will
- B. Construction
1. FAA Sec. 601(d). If capital (e.g., construction) project, will U.S. engineering and professional services be used? N/A
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? N/A
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 (except for productive enterprises in Egypt that were described in the CP)? N/A
- C. Other Restrictions
1. FAA Sec. 122(b). 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 exist to insure that United States foreign aid is not used in a manner which, contrary to the best interests of the United States, promotes or assists the foreign aid projects or activities of the Communist-bloc countries? Yes
4. Will arrangements preclude use of financing:
- a. FAA Sec. 104(f); FY 1982 Appropriation Act Sec. 525: (1) To pay for performance of abortions as a method of family planning or to motivate or coerce persons to practice abortions; (2) to pay for performance of involuntary sterilization as method of family planning, or to coerce or provide financial incentive to any person to undergo sterilization; (3) to pay for any biomedical research which relates, in whole or part, to methods or the performance of abortions or involuntary sterilizations as a means of family planning; (4) to lobby for abortion? Yes
- b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property? Yes
- c. FAA Sec. 660. To provide training or advice or provide any financial support for police, prisons, or other law enforcement forces, except for narcotics programs? Yes
- d. FAA Sec. 662. For CIA activities? Yes
- e. FAA Sec. 636(i). For purchase, sale, long-term lease, exchange or guaranty of the sale of motor vehicles manufactured outside U.S., unless a waiver is obtained? Yes

- f. FY 1982 Appropriation Act, Sec. 503 Yes
To pay pensions, annuities,
retirement pay, or adjusted service
compensation for military personnel?
- g. FY 1982 Appropriation Act, Sec. 505 Yes
To pay U.N. assessments,
arrearages or dues?
- h. FY 1982 Appropriation Act, Sec. 506 Yes
To carry out provisions of FAA
section 209(d) (Transfer of FAA
funds to multilateral organizations
for lending)?
- i. FY 1982 Appropriation Act, Sec. 510 Yes
To finance the export of
nuclear equipment, fuel, or
technology or to train foreign
nationals in nuclear fields?
- j. FY 1982 Appropriation Act, Sec. 511 No
Will assistance be provided
for the purpose of aiding the
efforts of the government of such
country to repress the legitimate
rights of the population of such
country contrary to the Universal
Declaration of Human Rights?
- k. FY 1982 Appropriation Act, Sec. 515 No
To be used for publicity or
propaganda purposes within U.S. not
authorized by Congress?