- PN-AAN-046

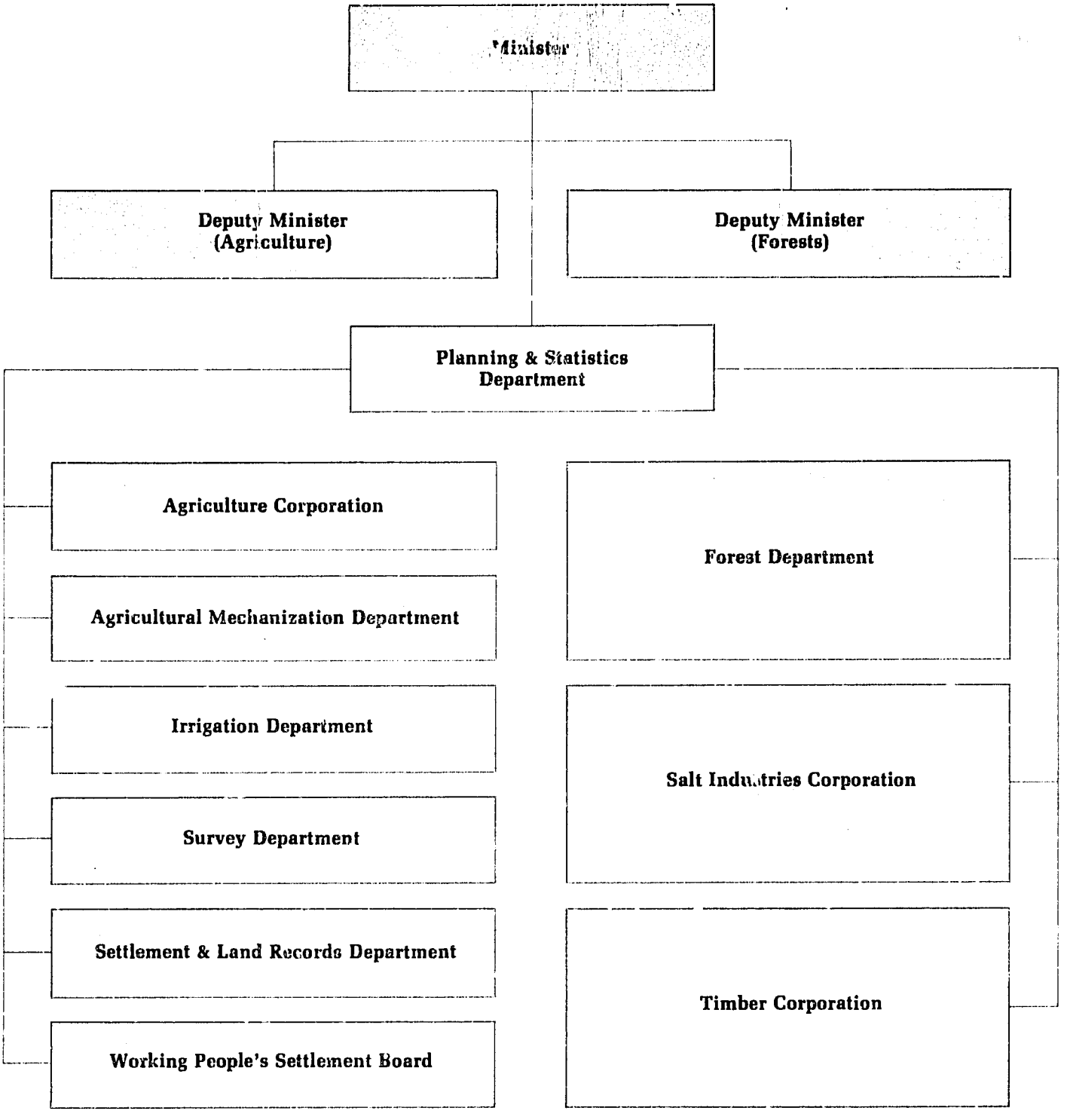
# Burma Maize And Oilseeds Production Project

## 1982-1985

Agriculture Corporation
of the
Burma Ministry of
Agriculture and Forests
and
The Midwest Universities
Consortium for
International Activities, Inc.

United States Agency for International Development
Project Number: 482-0005
Contract Number: ASB-0005-C-00-2046-00

# ORGANIZATION OF THE BURMA MINISTRY OF AGRICULTURE & FORESTS



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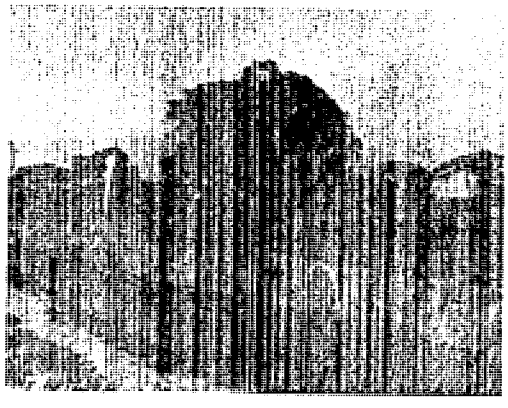
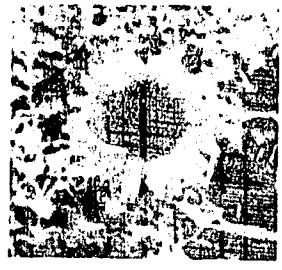
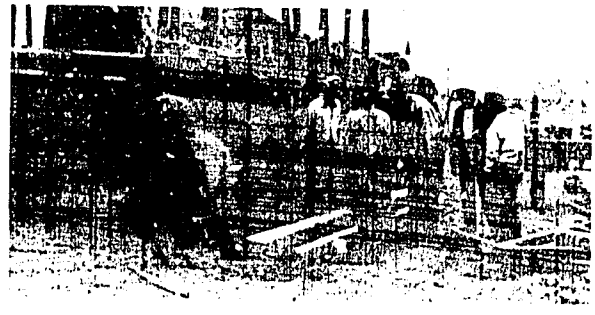






# 1. INTRODUCTION

Edible oil is a very important food constituent, being second only to rice in Burma. In recent years the production on approximately 19.5 percent of the cultivated land has not been able to keep pace with the population growth, and Burma has had to import edible oils with a value up to seven to eight million U.S. dollars annually in recent years.

Maize has been cultivated for at least 800 years in Upper and Lower Burma, as well as Shan State, mostly for direct human consumption. Sesame also has been a cultivated crop for more than one thousand years, grown mostly in the Mandalay and Magwe Divisions. Groundnuts were introduced in the late nineteenth century and are grown principally in the Mandalay and Magwe Divisions. Sunflower was introduced in 1974 and its production has been increasing steadily.

After it was determined that a project concerning maize and oilseed crops might be feasible, a team of consultants developed the Project Paper, which was approved and signed June 18, 1981, by Mr. David N. Merrill Representative for the United States Agency for International Development in Burma.

The Deputy Minister, Ministry of Planning and Finance of The Socialist Republic of the Union of Burma, signed the Project Grant Agreement with the Ambassador of the United States of America to Burma, on October 26, 1981, initiating the Maize and Oilseeds Production Project (United States Agency for International Development Project Number 482-0005). The Maize and Oilseeds Production Project is to be terminated September 30, 1986.

The Project Grant Agreement, in its "Definition of the Project", states that the Project "will consist of increasing production of oilseed crops and maize and fostering the adoption of improved technology and production practices for these crops, by means of technical assistance, improved seeds, fertilizer, agricultural equipment; by training in Burma, the United States and other countries; and by necessary local staff and costs".

The Project Grant Agreement, Annex 1, states, "The purpose of the Maize and Oilseeds Production Project is to increase production of oilseed crops (principally groundnut, sesamum, and sunflower) and maize in an estimated 28 townships of rural Burma, with positive effects on rural income, on national food supply, on nutrition and on the balance of trade".

In addition, the Project is to:

(1) Improve national research capability in maize and oilseeds.

(2) Introduce improved maize and oilseed technology and production practices (seed, water, fertilizer, integrated plant protection).

(3) Develop four fully-equipped and staffed seed farms.

(4) Develop an operational farm management information system for monitoring farm-level production practices and providing feedback on results to research and extension centers.

(5) The participant trainees, when returned to Burma, should be placed within the research, extension, seed farm and fertilizer distribution elements of the Project.

(6) Development of a functional rhizobium (inoculant for groundnuts and soybeans) production facility.

The objectives of the Project include developing the four seed farms for production of foundation and certified seed, providing significant amounts of fertilizer to supplement local supplies, and the development of a rhizobium production facility for production of inoculum for groundnuts and soybeans so as to increase nitrogen fixation and reduce the requirements of nitrogen fertilizers. All of these factors will increase the production of oilseed crops and maize and lesser dependency on imports of edible oils.

The project provides technical assistance, training, agricultural and laboratory equipment, fertilizer and seed material to effect more widespread adoption of improved agricultural practices so as to increase the production of edible oil crops. Many technical aspects are involved, including more efficient land preparation and cultural practices, use of recommended chemical fertilizers as well as organic manure, higher yielding seed, proper plant density, irrigation and water management practices, efficient farm management, control of weeds, diseases, insects and other pests, timely harvesting and proper storage.

The quantitative goals include:

(1) To increase maize production by 228,000 MT.

(2) To increase groundnut production by 258,000 MT, of which 87,000 MT will be directly attributable to Project areas included in intensive and extensive townships and an additional 171,000 MT attributable indirectly to other groundnut acreage throughout Burma through the spread of rhizobium inoculation technology.

(3) To increase sesamum production by 25,000 MT.

(4) To increase sunflower production by 53,000 MT.

(5) To increase soybean production by 12,000 MT.

(6) To increase gross farm income by K 1,273 million (US $177.0 million).

(7) To increase production and possible export of oil cake and related products by K 373.0 million ($52.0 million).

(8) To increase the value of and reduce possible imports of edible oil by K 499.0 million ($69.0 million).

(9) To improve nutrition by an increase in availability of edible oil by 30% from approximately 2.8 kg. to 3.8 kg. per capita.

The Project is financed by the U.S. Agency for International Development (US $30 million) and the government of the Socialist Republic of the Union of Burma (US $21 million). From the onset of the Project through

January, 1985, the USAID contributed about 57 percent of its share, and the Government of Burma, about 52 percent.

The Project Grant Agreement was first amended January 7, 1983, for clarification, etc.; also, the kyat grant to be 77,761,694.55, to be disbursed first to the Grantee within thirty days after the date of Amendment No. 1 of the Project Grant Agreement, etc. This Amendment No. 1 was signed by the Deputy Minister, Ministry of Planning and Finance, and the Ambassador of the United States of America.

Dr. Maung Shein, Deputy Minister for Planning and Finance, Socialist Republic of the Union of Burma, and Mr. Daniel A. O'Donohue, Ambassador of the U.S.A., signed an amendment to the Project Grant Agreement on April 10, 1984, stipulating that the U.S.A. provide a grant of seven million dollars to the Government of the Socialist Republic of the Union of Burma, during the year 1984, to be used for the procurement of fertilizer and equipment, and for training of personnel.

The U.S. Agency for International Development monitors the Project through Dr. Charles A. Simkins, the Agricultural Development Officer in Rangoon, as well as Mr. Charles D. Ward, USAID Representative in Burma, and Mr. Thomas Kellermann, USAID/Washington. Dr. Simkins is assisted by Mr. Dennis J. Weller, Assistant Agricultural Development Officer, Rangoon.

The Maize and Oilseeds Production Project is under the direction of the Agriculture Corporation, Ministry of Agriculture and Forests, the Socialist Republic of the Union of Burma, the Managing Director of which is U Khin Win. U Tin Hlaing, General Manager (Extension); U Hla Myint Oo, General Manager (Planning and Statistics); and Dr. Thaung Tun Hlaing, Training Officer, Assistant General Manager, all of the Agriculture Corporation, are actively involved in the direction of the Project.

U Mya Maung, Deputy General Manager, Agriculture Corporation, is the Project Director of the Maize and Oilseeds Production Project (M.O.P.P.), the office being located in Rangoon. He is ably assisted by U Siang Uk, Deputy Project Director and U Than Htay, Deputy Project Director, along with a selected staff of well qualified personnel.

Bids were received for the contract from numerous U.S. Title XII universities and consortia. A delegation of four Burmese and representatives of the U.S. Agency for International Development selected the Midwest Universities Consortium for International Activities and Texas A & M University to provide two components of the Project: technical assistance and the long-term and short-term training for Burmese students and other participants. The contract between the U.S. Agency for International Development (USAID) and the Midwest Universities Consortium for International Activities (MUCIA) was signed in February, 1982.

The Ohio State University (OSU) was designated as the lead institution responsible for managing the technical assistance and long and short-term training components of the Project. Dr. Harold Bauman, Assistant Dean of the College of Agriculture, OSU, has been OSU Campus Coordinator for the Project. Currently, Dr. Mark Headings is serving in this capacity. Mrs. Emily Paull is the Training Coordinator for the Project at Ohio State University.

Dr. William L. Flinn, Executive Director of the Midwest Universities Consortium for International Activities (MUCIA) also has his office at Ohio State University. Dr. Donald G. McCloud is the Associate Executive Director of MUCIA. Dr. Stephen J. Summerhill, Assistant Director, MUCIA, has been replaced by Dr. Terance W. Bigalke.

Dr. Frank Calhoun is the Campus Coordinator for the Project at Texas A & M University. Dr. Edna Koenig was the Training Coordinator at TAMU until August, 1984. Mrs. Violetta Burke Cooke, Office of International Programs is in charge of this work at present.

*Fig. 1. U Mya Maung, M.O.P. Project Director; Mr. Charles Ward, USAID Representative to Burma; Dr. Charles Simkins, Agriculture Development Officer/USAID; and Dr. William Flinn, Executive Director/MUCIA, inspecting Sunfola sunflowers in the Irrawaddy Division.*

# 2. TRAINING

A very important component of this Project involves training for Burmese in various scientific fields relating to production of maize and oilseed crops, as well as agricultural economics and farm management. This training, both long-term and short-term, is expected to have an enduring effect on Burmese agriculture, especially the production of maize and other oilseed crops.

## 2.1. GRADUATE DEGREE TRAINING

The Project Grant Agreement proposed that a total of thirty-six (36) Burmese should receive long-term training in order to attain graduate degrees (25 for M.S. degrees and 11 for Ph.D. degrees), with the assumption that these graduates would return to continue the work of improving and increasing the production of edible oils in Burma.

Since the first group to start training for M.S. degrees did not leave Burma until June, 1983, nearly two years after the Project started, it is doubtful that the goal of achieving 25 M.S. degrees can be accomplished. Sixteen persons have been sent to study at U.S. universities under the Project; one had to return to Burma for medical reasons and a total of fifteen are there at the present time.

Table 1 indicates the names of the students who left for training in the United States in 1983. It also shows the disciplines, names of the universities in the U.S. and the dates estimated by faculty advisors for completion of the work for the M.S. degree.

**Table 1. Students Who Started Training for M.S. Degrees, September, 1983.**

| Name | University | Discipline | Estimated Date of Degree Completion |
|---|---|---|---|
| U Hoke San<br>Orchard Mgr./AC | Colorado State U. | Soil & Water Mgt. | 02-86 |
| U Saw Thet Swe<br>Dy. Asst. GM/AC | U. of Georgia | Groundnut Breeding | 08-85 |
| U Tin Win<br>Coord./MOPP | U. of Georgia | Groundnut Production | 12-85 |
| U John Ba Maw<br>Jr. Res. Off./ARI | Ohio State U. | Maize Breeding | 08-85 |
| U Kyaw Soe<br>Dy. Div. Mgr./AC<br>Sagaing Div. | Ohio State U. | Soil Plant Relations | 08-85 |
| U Soe Win Maung<br>Dy. Twp. Mgr./AC | Ohio State U. | Agricultural Economics | 08-85 |
| U Than Htay<br>Dy. State Mgr./AC<br>Mon State | Ohio State U. | Agricultural Extension | 12-85 |
| U Tin Htut Oo<br>Prog. Off./Proj.<br>Mgt. & Eval./AC | Ohio State U. | Agricultural Economics | 12-85 |
| U Hla Myint<br>Asst. GM/AC | Texas A & M U. | Plant Pathology | 12-85 |

Table 2 lists the names of the students who left for graduate training in the U.S. in June, 1984. The areas of study, names of the universities and the estimated dates for completion of work for the M.S. degree also are included.

**Table 2. Students Who Started Training for M.S. Degrees in 1984.**

| Name | University | Discipline | Estimated Date of Completion |
|---|---|---|---|
| Daw Htay Htay Win | U. of Georgia | Pathology; Agronomy | 12-86 |
| U Mya Than | Oregon State U. | Seed Technology | 12-86 |
| U San Nyunt | Oregon State U. | Seed Technology | 09-86 |
| U Kyaw Moe | Texas A & M U. | Agronomy | 08-86 |
| U G. Thang Khan Mung | Texas A & M U. | Extension & Rur. Dev. | * |
| U Tin Nwe | Texas A & M U. | Crop Breeding/Sesame | 12-86 |
| U Thein Htoon | Mississippi State U. | Seed Processing & Storage | 05-86 |

**U G. Thang Khan Mung returned to Burma in February, 1985, due to an eye problem that interfered with his studies.*

At the present time it is estimated that eleven of the candidates for M.S. degrees will require an extension of time after the expected completion date, to be able to finish work for the M.S. degree. This is due to English requirements necessary for comprehension of graduate level courses, and in some cases academic deficiencie as a result of differences in the educational systems o Burma and the U.S.

The candidates for the 1985 long-term training pro gram for M.S. degrees are listed in Table 3.

**Table 3. Candidates for M.S. Degrees in the U.S.A., 1985.**

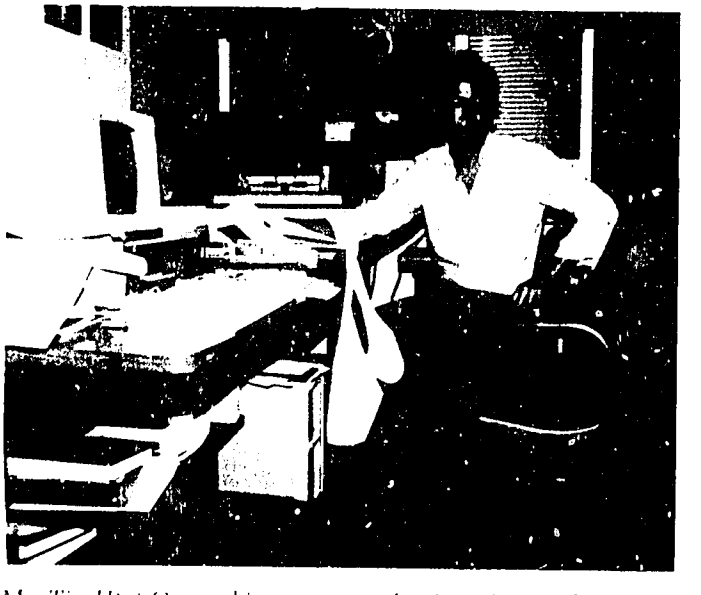
| Name | Title & Location | University | Discipline |
|---|---|---|---|
| U Ba Hein | Dy. Twp. Mgr., Pakokku, Magwe Div. | Ohio State U. | Extension |
| U Myo Nyunt | Research Assistant, Rice Div., ARI, Yezin | Ohio State U. | Plant Breeding |
| U Tin Saung | Estate Manager, Plantation Crops Div., AC, Yebyu | Ohio State U. | Agronomy Weed Control |

The Project was planned to provide training for Ph.D. degrees for eleven (11) candidates. Five potential candidates have been named but none have been selected to date.

*The Honorable U Maung Maung Gyi, Burmese Ambassador to the U.S., and Mr. Aung Koe, Educational Attaché, are welcomed to The Ohio State University by Dr. Duane Spriesterbach, Chairman of the MUCIA Board of Directors. Seated also at the table are Vice-President for Agriculture, Max Lennon, and Acting Provost, Francille Firebaugh, both of The Ohio State University and MUCIA Board members.*

*Mr. Latt, Dr. Ray Langham, Dr. Murray Kinman, and Oliver Smith at a sunflower research field at the Texas A & M University.*

*Mr. Kyaw Soe conducting variety trials for corn at The Ohio State University.*



*Mr. Tin Htat Oo working on an evaluation of argicultural projects in developing countries at the MUCIA Executive Office.*

*Mr. Mya Than, long-term participant at Oregon State University, plants seeds for variety trials research.*

*Graduation! Mr. John Ba Maw receives his masters degree from The Ohio State University in Columbus, Ohio.*

*1984 Burmese graduate students and short-term participants in peanut and sesame production studying peanut diseases at the Texas A & M University Plant Disease Research Station at Yoakam.*

*Mr. Than Htay studying weed control for soybeans at The Ohio State University.*

## 2.2 SHORT-TERM TRAINING

Provisions were made in the Project Agreement for seventy (70) Burmese to participate in short-term training programs of two to six months, involving study, observation and learning new techniques for improved production. Short-term training on maize and oilseed crops has been conducted in several countries.

The Agricultural Project Planning and Analysis Course (TC 140-2), 05-17-82 to 07-23-82, and the Agricultural Project Implementation Course (TC 140-16), 07-26-82 to 09-03-82, in Washington, D.C., were attended by:

| | |
|---|---|
| U Sann Myint | Agriculture Corporation |
| U Thaung Tun Hlaing | Agriculture Corporation |
| U Kyaw Myint | Agriculture Corporation |

The following attended the Development and Operation of Agricultural Extension Programs Course (TC 140-5), 06-07-82 to 08-06-82, and the Keys to Agricultural Development at the Local Level Course (TC 140-32), 08-09-82 to 08-20-82, at the University of Missouri, Columbia, Missouri:

| | |
|---|---|
| U Khin Maung Aye | Agriculture Corporation |
| U Maung Maung | Agriculture Corporation |
| U Aung Soe Myint | Agriculture Corporation |

The 1982 Summer Extension Study Tour in the U.S.A. constituted the following:

**Sunflower Tour**
**08-09-82 to 10-01-82:**

| | |
|---|---|
| U Tun Shwe | Agriculture Corporation |
| U Kyaw Kyaw Nyein | Agriculture Corporation |

**Groundnut/Soybean Tour**
**08-23-82 to 10-01-82:**

| | |
|---|---|
| U Siang Uk | Agriculture Corporation |
| U Ba Thaung | Agriculture Corporation |

**Sesame Tour**
**08-23-82 to 10-01-82:**

| | |
|---|---|
| U Kyaw Khin | Agriculture Corporation |
| U Hla Myo | Agriculture Corporation |

**Maize Tour**
**08-23-82 to 10-01-82:**

| | |
|---|---|
| U Chit Saing | Agriculture Corporation |
| U Aye Myint Tun | Agriculture Corporation |

The NIFTAL Training Course in Legume/Rhizobium Technology, 11-11 to 12-10-82, in Bangkok, Thailand, was attended by:

| | |
|---|---|
| Daw Khin San Wai | Agriculture Research Inst., Yezin |
| Daw Nwe Nwe Aung | Agriculture Research Inst., Yezin |

The Agricultural Project Planning and Analysis Course (TC 140-2) and the Agriculture Project Implementation Course (TC 140-16), in Washington, D.C., 04-18 to 06-24-83, were attended by:

| | |
|---|---|
| U Mya Maung | Agriculture Corporation M.O.P.P. |
| U Hla Oo | Agriculture Corporation |
| U Aung Sann | Agriculture Corporation |

U Hla Than, Agriculture Research Institute, Yezin, attended the University of Hawaii NIFTAL Rhizobium Technology Course at Maui, Hawaii, and mainland, U.S.A., 05-01 to 07-31-83.

The following attended the Microcomputer Training Course, BUCEN, Washington, D.C. and Carbondale, Illinois, 09-06 to 12-24-83:

| | |
|---|---|
| U Kyi Win | Agriculture Corporation |
| U Maung Maung Yi | Agriculture Corporation |

The Applied Use of the Nitrogen-Fixing Aquatic Fern *Azolla* Course in Bangkok, Thailand, 01-22 to 02-04-84, was attended by:

| | |
|---|---|
| U Thein Win | Agriculture Corporation |
| U Sein Win | Agriculture Corporation |

The following attended the Course in Technical and Economic Aspects of Soybean Production (TC 120-6) at Champaign, Illinois, 05-28 to 08-31-84:

| | |
|---|---|
| Daw Shirley Smellie | Agric. Corp./Inspector/ARI/ Yezin |
| Daw Nyunt Nyunt Wai | Agric. Corp./Deputy Farm Manager |
| U Tun Thein | Agric. Corp./State Manager |

A group of eight participants left Rangoon July 12, 1984, to go to the U.S.A. on the Maize and Sunflower Study/Observation Tour. The following were included:

**SUNFLOWER TEAM**

| Name | Title | Location |
|---|---|---|
| U Sein Win, Team Leader | Division Manager | Mandalay |
| U Htwe | Township Manager | Budalin |
| U Win Myint | Township Manager | Min Hla |
| U Kyawt Maung | Township Manager | Pyawbwe |

**MAIZE TEAM**

| Name | Title | Location |
|---|---|---|
| U Tun Yee, Team Leader | State Manager | Taunggyi |
| U Aye Thein | Township Manager | Maubin |
| U Hla Kyi | Township Manager | Letpadan |
| U Soe Win | Village Tract Manager | Bassein |

The members of the Maize and Sunflower Teams went to Ohio State University, Columbus, Ohio, and spent some time also at the Ohio State University Training Center at Wooster, Ohio. They had many tours in Ohio and other midwestern states to see maize production, went to Chicago, Illinois, to observe the grain marketing system, to North Dakota to see the production of sunflowers, and through the central and eastern states to Washington, D.C. They returned from the U.S. October 22, 1984.

U Than Tun left June 27, 1984, and participated in the Maize and Sunflower Study/Observation Tour July-October, before proceeding to CIMMYT in Mexico for further training in maize. He returned to Burma November 23, 1984.

The seven participants of the Groundnut and Sesame Study/Observation Tour left Rangoon August 15, 1984, for Texas A & M University, College Station, Texas, and returned to Burma November 29, 1984. The following participated:

**SESAME TEAM**

| Name | Title | Location |
|---|---|---|
| U Tun Than, Team Leader | Division Manager | Rangoon Division |
| U Mya | Township Manager | Wakema Township |
| U Mya Tha | Township Manager | Kyaukse Township |
| U Ko Lay | Township Manager | Nyaung Oo Township |

**GROUNDNUT TEAM**

| Name | Title | Location |
|---|---|---|
| U Hla Toe, Team Leader | Dy. Division Manager | Magwe Division |
| U Bo | Township Manager | Singu Township |
| U Myint Thein | Inspector | M.O.P.P., Rangoon |

The sesame and groundnut teams were taken on many tours by Texas A & M University staff members to observe production of sesame, groundnuts and soybeans at the Plant Disease Research Station at Yoakum, the Texas A & M University Research Centers at Prairie View, Uvalde, Lubbock and Stevensville, a groundnut processing plant, and the Texas State Fair. They made an extensive trip across Texas, New Mexico and Arizona, to visit the sesame station at Yuma, Arizona, then returned to College Station, Texas.

The following left for the International Institute for Tropical Agriculture (IITA) in Nigeria, November 6, 1984, to attend the World Cowpea Research Conference and Study Tours and to visit the International Center for Research in Semi-Arid Tropics (ICRISAT) in India, and the Kasetsart University, Bangkok, Thailand, also the Maize Training Center and a seed processing plant in Thailand, before returning to Burma December 25, 1984:

| | |
|---|---|
| U Siang Uk | Ag. Corp./M.O.P.P./Deputy Director |
| U Pe Maung Thein | Agriculture Corporation |

U San Myint and U Hlaing Min, both of the Planning and Statistics Division/Agriculture Corporation, left January, 1985, to attend a computer training course at Western Illinois University in the U.S.A. The course is scheduled for January 18 to July 26, 1985.

The schedule for proposed short-term training for 1985 follows:

| Subject | Country | Duration Time | Number of Participants |
|---|---|---|---|
| Irrigation and Farm Management Study/Observation Tour (Ohio State University) | U.S.A. | 14 weeks April to August | 4 |
| Sesame & Groundnut Study/Observation Tour (Crop Production) Texas A & M University | U.S.A. | 14 weeks May to September | 4 |
| Maize & Sunflower Study/Observation Tour (Crop Production) (Ohio State University) | U.S.A. | 14 weeks June to September | 4 |
| Training at ICRISAT, Groundnut Breeding | India | 6 months May 15 to November 15 | 2 |
| Training at ICRISAT, Groundnut Production | India | 6 months May 15 to November 15 | 2 |
| Technical & Economic Aspects of Soybean Production. INTSOY | U.S.A. | 12 weeks May 13 to August 15 | 2 |
| Training in Maize Production at CIMMYT (or Illinois) | Mexico | 5½ months May to October 15 | 2 |
| Seed Improvement and Farm Management: U.S. Dept. of Agric. Course—Seed Improvement (9 weeks); Farm Management Course (Ohio State U.) (4 weeks); study/observation in Thailand (1 week) Thailand | U.S.A. | 14 weeks May 28 to September 10 | 4 |
| Soil Testing and Fertilizer Management: U.S. Dept. of Agric.—North Carolina State U. (TC 120-5) | U.S.A. | 8 weeks June 3 to August 3 | 2 |
| Project Planning, Project Analysis and Agriculture Policy: (1) Project Planning for Agriculture and Rural Development (TC 140-15) (5 weeks, March 27 to May 3); U. of Minnesota; (2) Project Analysis for Agriculture and Rural Development (TC 140-2) (6 weeks, May 6 to June 14) U.S. Dept. of Agric.; (3) Agriculture Policy Seminar (TC 140-1) (4 weeks, June 17 to July 12) U.S. Dept. of Agric., U. of Minnesota | U.S.A. | 16 weeks March 27 to July 12 | 2 |
| Rhizobium Training on Quality Control. NIFTAL, Hawaii | U.S.A. | 14 weeks | 2 |

A decision was made by the Agriculture Corporation in April 1985, to cancel the Training in Maize Production Course at CIMMYT, scheduled for May to October, 1985. The Seed Improvement and Farm Management course had been filled by the time the U.S. Department of Agriculture received the names and data of the personnel selected to attend. It is anticipated that participants will be sent in 1986.

The Sesame and Groundnut Study/Observation Tour and the Maize and Sunflower Study/Observation Tour were cancelled in May, 1985.

The participants of the 1985 Irrigation and Farm Management Study/Observation Tour are:

| | |
|---|---|
| U Than Htay, Team Leader | Deputy Project Director M.O.P.P. |
| U Sein Win | Village Tract Manager, Chaungmagyi Seed Farm |
| U Soe Tin | Village Tract Manager, Sebin Seed Farm |
| U Soe Myint | Village Tract Manager, Kyaungsu Seed Farm |

The group of participants of the Irrigation and Farm Management Study/Observation Tour left Rangoon April 20, 1985, for Seattle, Washington, U.S.A. They are scheduled for a 12-week tour in the U.S.A., then 2 weeks in Thailand, before returning to Burma.

The following participants left Rangoon on May 12, 1985 to attend the Crop Production Course at ICRISAT in India, which starts May 15, 1985:

Daw Aye Thant Tin, Deputy Township Manager, Kyaukpadaung

U Kauk, Yin, Township Manager, Natmauk

U Thein Aung, Deputy Township Manager, Magwe

Daw Mu Mu Han, Inspector/AC/MOPP

## 2.3. SHORT-TERM TRAINING IN BURMA

A course on Project Design was conducted August 9-25, 1982, in Burma, by Mr. Kenneth Smith and Mr. Barney Hibble. The course, attended by Agriculture Corporation personnel, was well received.

Training courses have been given on maize and oilseed crops at the Central Agriculture Development Center. Dr. Charles Simkins, U Mya Maung, Mr. Dennis Weller and Dr. Ervin T. Bullard gave lectures on sunflowers at the In-service Training Course on February 26, 1985.

Dr. Chamnan Chutkaew, Kasetsart University, Thailand, gave a seminar on maize research and production to 240 students at the Agriculture University, Yezin, in August, 1984.

## 2.4. ENGLISH TRAINING

In order to shorten or eliminate time required for completion of English requirements after arriving at U.S. universities, the USAID/MUCIA contract was amended 11-06-84 in order to initiate a program of intensive English language training in Rangoon for candidates for graduate training.

The candidates for graduate training in the U.S.A. in 1985 started an intensive English language training program at the M.O.P.P. headquarters January 21, 1985. Mrs. Veronica Ward is the instructor for the course.

As an additional feature of the course, arrangements were made to have lectures in English three times a week for the trainees in the intensive English language training program. Dr. William Flinn, Dr. Frank Calhoun, Dr. William Chappell, Dr. E.T. Bullard, Dr. Charles Simkins, Mr. Ross Hagan, Mr. Dennis Weller, Mr. Norman Illsley and Mr. George Otey have given lectures under this program.

## 2.5. ON-THE-JOB TRAINING

There has been considerable on-the-job training since the inception of the Project, in varying degrees of formality, by senior members of the M.O.P.P. staff, all of the M.U.C.I.A. long-term personnel, many short-term contract consultants and by the U.S.A.I.D. Agricultural Development Officer and the Deputy Agricultural Development Officer, in many visits to the seed farms and township areas.

Training has been conducted by consultants for seed farm personnel on the seed farms on methods of assembling agriculture implements, as well as maintenance of tractors and agricultural implements. Two U.S. consultants, Mr. Lester Kocourek and Mr. Matthew Peart; Mr. Norman Illsley, an agricultural engineer; and Mr. Ross Hagan, Water Management Specialist, assisted in this training program on the four seed farms during February and March, 1985.

Assistance in assembly of equipment, instructions in tractor driving, the use of specific equipment and maintenance were given in August, 1984, by Mr. Richard Isert, Area Service Manager, John Deere Intercontinental, Ltd., Bangkok; also Mr. Weerachit Sirikul and Mr. Ampol Boon Oua, both of whom are associated with CPAI in Bangkok. Mr. Isert returned to Burma in March, 1985, to conduct more training related to the equipment at the four seed farms.

The seed farm personnel also have received on-the-farm training by Mr. Ross Hagan and U Than Htay in water management techniques, land leveling and irrigation methods.

Lectures have been given by Dr. William Chappell to the seed farm personnel on herbicides and setting up weed control trials, also the use of spray equipment, including hands-on experience.

Dr. E.T. Bullard has assisted the seed farm managers and research technicians in the establishment of research trials for variety and fertilizer testing at the seed farms, as well as collecting plant material and soil samples for analyses.

*Fig. 2. Foreign consultants training the Kyaungsu Seed Farm staff in the assembly and maintenance of farm equipment.*

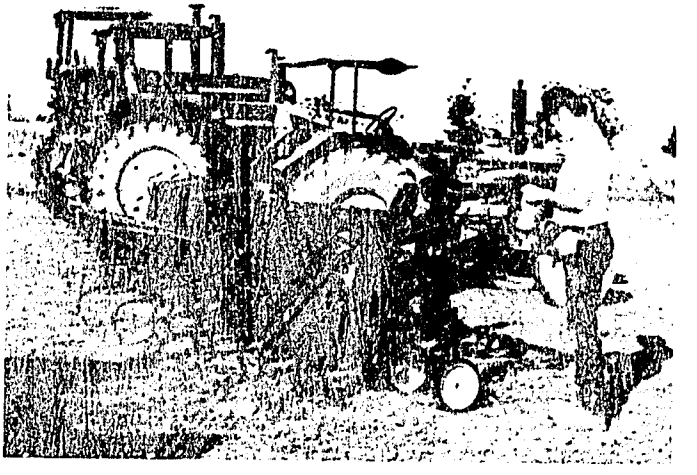


*Fig. 3. Mr. Norman Illsely, Agricultural Engineer, inspecting newly assembled cultivators at the Kyaungsu Seed Farm.*



*Fig. 4. Weed control training at the Thitcho Seed Farm, conducted by Dr. William Chappell, Weed Control Specialist.*

*1984 short term participants in peanut and sesame production using the hedge 125' combine to thrash sesame at the Texas A & M University Research Center at College Station.*

*1984 Burmese short term participants in peanut and sesame production studying sesame production in the High Plains at the Texas A & M University at the Lubbock Research Center.*

# 3. TECHNICAL ASSISTANCE

The Midwest Universities Consortium for International Activities (MUCIA) which is comprised of eight U.S. midwestern land-grant universities, and Texas A & M University were selected to provide the technical assistance for the Maize and Oilseeds Production Project. The Ohio State University was designated as the lead university in this respect.

## 3.1. LONG—TERM MUCIA CONTRACT EMPLOYEES

The Project Grant Agreement states that there will be "an average of three long-term experts during an approximate 4½-year period, or approximately 13 person years of long-term technical assistance".

Dr. Donald E. Herr, an Ohio State University professor who previously had worked in India on an OSU contract, arrived in Rangoon December 9, 1982, as MUCIA chief of party and production agronomist. Dr. Herr served in Burma in this capacity until December 8, 1983.

Mr. George W. Otey arrived January 10, 1983, to fill the position of Seed Technologist. Mr. Otey, who had varied experience with Texas A & M University and with the U.S. Agency for International Development in Vietman, also had worked in sesame breeding and establishment of seed farms in the Philippines and Somalia. Mr. Otey completed a two-year tour of duty and left Burma March 14, 1985.

Dr. Ervin T. Bullard, an agricultural consultant, arrived February 11, 1984, to fill the position of MUCIA Team Leader. Dr. Bullard retired from the U.S. Agency for International Development in 1979, after serving in a number of positions for twenty-five years in various tropical and subtropical countries, involving research and production in agronomic and horticultural crops, as well as administration. He worked as a short-term consultant in agricultural development in many areas since his retirement until coming to Burma.

Mr. Ross E. Hagan arrived in Rangoon April 8, 1984, to work as the Water Management Specialist. Mr. Hagan, Agricultural Engineer, (M.S. degree, University of Hawaii), has had broad experience as a consultant in many countries, including Tanzania, Mauritania and the Philippines, working as a water management specialist, designing and evaluating irrigation systems. Mr. Hagan served a short-term consultancy in Burma for the Asian Development Bank in 1980, at which time he worked with the Irrigation Department.

Dr. Arlo P. Thompson, Plant Breeder, a specialist in sunflower, arrived in Burma April 27, 1985, to fill the position of Oilseed Crop Production Specialist. (The long-term position of Crop Protection Specialist has been changed to Oilseed Crop Production Specialist.) Dr. Thompson worked [illegible] years in sunflower research with Asri-Seed [illegible] national in Fargo, North Dakota, until he term[illegible] in order to accept the position in Burma. Early [illegible] his career, he served in the U.S. Peace Corps in Morrocco and Guatemala. Dr. Thompson was in Burma on a short-term consultancy for MUCIA on the M.O.P. Project during January and February, 1984.

## 3.2. SHORT-TERM CONSULTANTS

The Project Grant Agreement anticipated that there would be a total of 50 person months of short-term consultants for specialized technical services of one to two months duration each, during the course of the Project. The following technical areas were indicated in the Project Paper:

| | |
|---|---|
| Seed Technology | 3 Person-months |
| Rhizobium | 3 Person-months |
| Soil testing | 3 Person-months |
| Agricultural Mechanics | 4 Person-months |
| Farming Systems | 3 Person-months |
| Irrigation Cropping Systems | 3 Person-months |
| Computerization in Management | 2 Person-months |
| Research Planning | 3 Person-months |
| Extension Material and Extension Development | 4 Person-months |
| Integrated Pest Management | 3 Person-months |
| Land Use Planning | 2 Person-months |
| Weed Control | 3 Person-months |
| Insect Control | 4 Person-months |
| Land Drainage | 2 Person-months |
| Grain Storage | 2 Person-months |
| Rodent Control | 1 Person-months |
| Disease Control | 4 Person-months |

Dr. William Gregg, Seed Technologist, Mississippi State University, served as a consultant to the Maize and Oilseeds Production Project, December 10-24, 1981, assisting in locating the sites of the seed farms, and providing information about seed handling and processing.

Dr. James C. Delouche, Seed Technologist, Mississippi State University, assisted the Project as a consultant for three weeks in April and May, 1982.

Mr. Gaylord V. Skogerboe, Irrigation Engineer, Visiting Professor, Department of Agricultural and Irrigation Engineering, Utah State University, was a short-term consultant for the Project June 13 to August 4, 1982. Mr. Skogerboe visited the four seed farms and made recommendations on topographic mappings, well drilling and future irrigation designs. He also visited the Wakema area and made recommendations concerning pumps for irrigation, etc.

Mr. Gaylord V. Skogerboe returned to Burma for ten days in December, 1982, to prepare designs for the irrigation and drainage facilities for the four seed farms.

Dr. Robert J. Davis, Soil Microbiologist and Legume Inoculant Specialist, of NIFTAL (Nitrogen Fixation by Tropical Agricultural Legume), University of Hawaii, was on TDY in Burma in February, 1983, advising on the production of *Rhizobium*, a legume inoculant.

Mr. M.D. Robinson, Stone & Webster Engineering Corporation, Boston, Massachusetts, visited Burma February 12-26, 1983, as a consultant to determine the electrical power and equipment requirements for the four seed farms and the Wakema pilot irrigation project. It was his task also to assess the ability of the existing distribution systems to furnish adequate electric service for these projects, to prepare specifications for diesel generators, transformers, bare conductor and other electrical items not manufactured in Burma, to prepare cost estimates and to assist in the development of implementation plans to provide electrical power for the proposed projects.

Dr. James C. Delouche worked as a short-term consultant in Burma again in March, 1983, to advise on technical aspects of seed processing.

Mr. Gaylord V. Skogerboe spent six weeks TDY, July 16 to August 27, 1983, designing irrigation and drainage systems for the Chaungmagyi and Sebin Seed Farms.

Dr. Donald G. McCloud, Associate Director, MUCIA, and Dr. Stephen J. Summerhill, Assistant Director, MUCIA, visited Burma on an administrative visit in July, 1983.

Dr. William L. Flinn, Executive Director, MUCIA, and Dr. Harold D. Bauman, Campus Coordinator for the Project, Ohio State University, were in Burma in August, 1983, for administrative visits.

Dr. Arlo P. Thompson, Sunflower Specialist, Asri-SeedTec International, Fargo, North Dakota, worked on consultancy in Burma for one month, January and February, 1984. He visited all the seed farms and made recommendations for sunflower seed production.

Dr. Edna Koenig, Training Coordinator, Texas A & M University, spent one week in April, 1984, in Rangoon, discussing training programs with MOPP officials, USAID personnel and MUCIA employees.

Mr. A.B. (Ben) Manring, President, Manring Corporation, Bellevue, Washington, was in Burma August 2 to 16, 1984, to discuss the purchase of commodities with MOPP, USAID and MUCIA personnel.

Dr. Chamnan Chutkaew, maize breeder and Corn Project Leader, Kasetsart University, Bangkok, Thailand, was in Burma for a short-term consultancy from August 13 to September 1, 1984. Dr. Chutkaew traveled to the seed farms and to the Agricultural Research Institute to discuss research and production practices and to make recommendations for the future. He supplied seed material of some of the outstanding maize varieties and hybrids being grown in Thailand at the present time, for research trials at the seed farms.

Mr. Richard Isert, John Deere Intercontinental, Ltd.; Mr. Weerachit Sirikul and Mr. Ampol Boon Oua, CPAI, all of Bangkok, Thailand, were in Burma August 16 to September 1, 1984, to train seed farm personnel in the assembly and use of the John Deere Implements, as well as tractor driving.

Dr. Robert J. Davis, University of Hawaii, and Dr. Douglas P. Beck, Mississippi State University (contract with USAID/Thailand), were in Burma October 2-16, 1984, serving on consultancy concerning legume inoculant *(Rhizobium)* production, research and distribution in Burma. They made a trip to the inoculant production plant at ARI/Yezin, to several of the seed farms, and to the peat deposits and the site of the proposed second production plant at Maymyo.

Mr. A.B. Manring and Mr. Lee Eklund of the Manring Corp., spent two weeks TDY in December, 1984, assisting in developing specifications for purchase of commodities in 1985.

As a result of the decision to ask for the services of three U.S. consultants to work at the seed farms to assist in the assembly, use and maintenance of equipment, Mr. Lester Kocourek, Mr. Matthew H. Peart and Mr. Gayne Gasal arrived January 23, 1985. Mr. Kocourek is the owner of Lesko Dairyland, Reedsville, Wisconsin, where he owns and operates a large dairy farm. Mr. Peart farms more than three hundred acres in Ohio, as well as instructing in agricultural engineering at The Ohio State University Technical Institute, Wooster, Ohio. Mr. Gasal owns and operates a large farm in Jamestown, North Dakota, specializing in sunflowers and cattle. When they arrived in Rangoon they sorted equipment at the MOPP warehouse in Rangoon the first week before proceeding to the seed farms. Mr. Gasal found it necessary to return to the U.S. January 30th. Mr. Kocourek remained in Burma until March 15th and Mr. Peart left March 18, 1985.

Mr. Norman Illsley, Agricultural Engineer, also arrived January 23, 1985, to develop and test animal traction farm implements such as planters, seeders and cultivating equipment, also to design and test harnesses for bullocks. As it was essential to complete the assembly of the new field equipment at the four seed farms, Mr. Illsley worked with Mr. Kocourek, Mr. Peart, and Mr. Hagan in assembling the equipment and instructing the seed farm personnel in the use, operation and maintenance, as well as setting up an inventory of all equipment at each seed farm. After Mr. Kocourek and Mr. Peart left, Mr. Illsley pursued the original purpose of his TDY, making several trips to the seed farms. Mr. Illsley's time was extended to May 31, 1985.

Dr. Johnny C. Wynne, Groundnut Breeder, and Dr. William V. Campbell, Entomologist, of the Peanut Collaborative Research Support Program (CRSP), arrived January 28, 1985, to spend a few days making recommendations for future research for groundnuts. Both are on staff at North Carolina State University. They agreed to supply plant material for research trials, also some visual aid materials.

Dr. Frank Calhoun, Office of International Affairs, Texas A & M University, arrived February 7, 1985, and Dr. William L. Flinn, Executive Director, MUCIA, arrived February 11, 1985, to discuss the progress of the Project, technical assistance and participant training for 1985. They made a one day trip to the Kyaungsu Seed Farm as it was not possible to make a longer trip to visit all the seed farms. They departed February 18, 1985.

Dr. William E. Chappell, Professor Emeritus, Virginia Polytechnic University (VPI), was in Burma from

February 18 to March 14, 1985. Dr. Chappell is a weed control specialist who now is president of Vegetrol, Inc. He made a trip with Dr. E.T. Bullard to the four seed farms to give lectures on weed control and minimum and zero tillage, as well as setting up research trials and demonstrating spray equipment. He discussed the exhibits on weed specimens presented at all of the seed farms. He also had discussions with the weed control research personnel at the Agricultural Research Institute, Yezin.

Mr. Richard J. Isert, returned to Burma on March 2, 1985, to assist in training tractor drivers and mechanics at the four seed farms in the use of the new tractors and implements. He also had courses on repair and maintenance of the tractors and equipment.

# 4. STAFF

The staff of the Maize and Oilseeds Production Project changes from time to time, due to transfer of personnel, as well as staff members leaving Burma for long and short term training programs.

Following is a list of the senior staff members actively engaged in the Project at the present time:

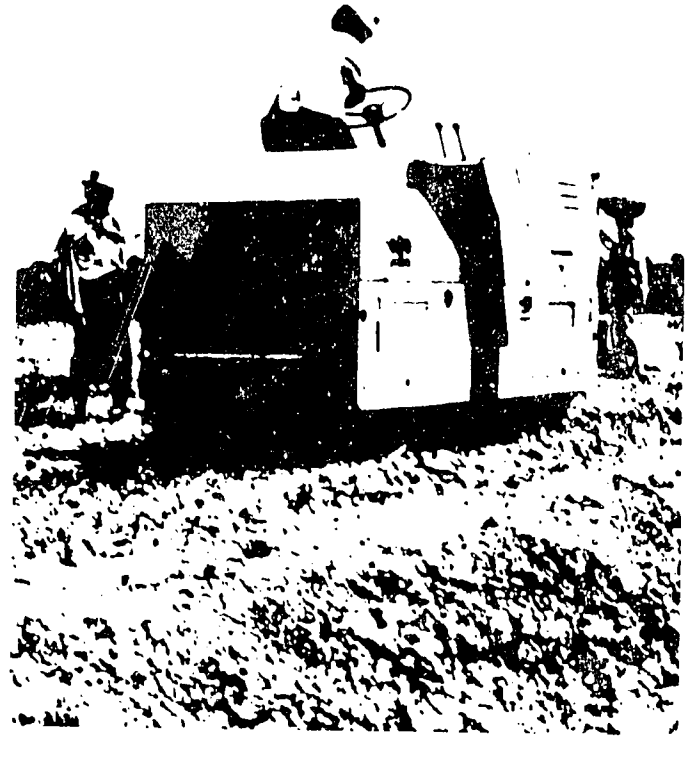
| Names | Title |
|---|---|
| U Mya Maung | Project Director |
| U Siang Uk | Deputy Project Director |
| U Than Htay | Deputy Project Director |
| U Thaung Tin | Seed Technologist, Dy. G.M./A.C. |
| U Ba Thaung | Agronomist, Deputy, G.M./A.C. |
| U Ni | Extension Specialist, Expeditor |
| Dr. Ervin T. Bullard | MUCIA team leader, Agronomist |
| Mr. Ross E. Hagan | Water Management Specialist |
| Dr. Arlo P. Thompson | Oilseed Crop Production Specialist |
| U San Myint | Planning Officer |
| U Maung Maung Gyi | Assistant Proj. Manager, Expeditor |

The Division Supervisors for the Maize and Oilseeds Production Project are:

| | |
|---|---|
| U Khin Maung Chit | Magwe Division |
| U Hla Myint | Mandalay Division |
| U Ye Lwin | Pegu Division |
| U Htwe | Sagaing Division |
| U Christna Bahadur | Shan State |
| U Ko Ko Lat | Irrawaddy Division |

Senior staff members of the four seed farms are:

| | |
|---|---|
| U Ko Lay | Farm Manager, Chaungmagyi Seed Farm, Mandalay Division |
| U Thein Pe | Deputy Farm Manager, Chaungmagyi S.F. |
| U Thaung | Farm Manager, Kyaungsu Seed Farm, Pegu Division |
| U Maung Maung | Deputy Farm Manager, Kyaungsu S.F. |
| U Tin Myint | Farm Manager, Sebin Seed Farm, Mandalay Division |
| U Ne Win | Deputy Farm Manager, Sebin Seed Farm |
| U Soe Win | Farm Manager, Thitcho Seed Farm, Pegu Division |
| U Than Tun | Deputy Farm Manager, Thitcho Seed Farm |



# 5. SEED FARMS

One of the objectives of this Project is the development of four fully equipped and staffed seed farms for the production of certified and foundation seed. Two of these, the Chaungmagyi and Sebin Seed Farms, have been designated to produce foundation seed on 110 acres for maize and 70 acres for oilseeds, while the Kyaungsu and Thitcho Seed Farms were designated to produce certified seed from the foundation seed on 3,000 acres of maize and 800 acres of oilseeds.

All of the seed farms are being operated under the Agriculture Corporation/Extension Division, Ministry of Agriculture and Forests.

The Project Paper specified that a total of $2,548,960 should be allocated for seed farm equipment, plus an additional 15 percent for spare parts amounting to $382,344, totaling $2,931.304. The Project Grant Agreement specifies that approximately $5 million should be allocated for machinery and equipment for seed farms, seed processing facilities, a rhizobium production facility, research equipment for the Agricultural Research Institute, water pumps and related equipment, extension demonstration equipment, and costs of procurement. As of January, 1985, a total of $2,020,617.50 had been paid for equipment.

The buildings of the four seed farms are listed in Table 4, as well as the physical facilities on the farms.

**Table 4. Seed Farm Infrastructure Development (Numbers and Status), to March 31, 1985.**

| Items | Chaungmagyi | Sebin | Kyaungsu | Thitcho |
|---|---|---|---|---|
| MANAGEMENT: | | | | |
| Office building | 1* | 1 | 1 | 1 |
| Training hall | 1 | | 1 | 1* |
| Guest house | 1 | 1* | 1* | 1 |
| HOUSING: | | | | |
| Officers' quarters | 1* | (1) | | 1* |
| Staff quarters, 2-unit | 1 + 3* | 3* + 1 | 2* + 2 | 2* + 3 |
| Staff quarters, 4-unit | | | | |
| Barracks | | | | |
| Dining hall | | (1) | | |
| Water tank, elevated | 1 | 1 | | 1 |
| Water tank, ground | 1 | 1 | 1 | 1 |
| FARM OPERATIONS: | | | | |
| Maintenance shop | 1* | 1* | | 1* |
| Parts store | 1* | 1* | | 1* |
| Tractor shed | (1) | (1) | (1) | 1 |
| Implement shed | (1) + 1 | 1 | | (1) |
| Fertilizer store | 1 | + (1) | 1 | 1 |
| Insecticide store | | 1* | 1 | |
| SEED PROCESSING: | | | | |
| Processing building | 1* EO | EO | | |
| Conditioned storage | EO | EO | | |
| Ventilated storage | 1 | | | 1 |
| Laboratory and office | EO | EO | | |
| Drying floor | 4 | 2 | 2 | 4 |
| Generator house | 1 | | | |
| Electrification | EO | EO | | |
| PHYSICAL FACILITIES: | | | | |
| Road, access | | | | 2* + 2½ |
| Road, on-farm | 4 miles | 1.0 mi. | 2.0 mi. | 0.5 mi. |
| Fencing | 4 miles | 0.7 mi. | 0.7 mi. | 4.4 + 1.5 mi.* |
| Land leveling, rough | 90 acres | 90 acres | | |
| Irrigation canals, unlined | 1.2 miles | 0.7 mi. | | |
| Drainage ditches | 4.5 miles | 0.8 mi. | 2.0 mi. | 0.5 mi. |

*NOTE: *Under Construction ( ) Temporary Structure EO Equipment Ordered*

## 5.1. SYNOPSIS

The Chaungmagyi Seed Farm is one of the two farms designated to produce foundation seed, principally maize and groundnuts. The farm has 350 acres, of which 314 acres have potential for irrigation. Work is progressing on the water management and irrigation system, expected to be completed before the termination of the Project. Equipment has been ordered for seed processing and storage, and it is expected that the buildings will be completed by the time the equipment arrives.

The target for 1985-86 is to produce 75 acres of maize during the monsoon and 125 for the winter crop. The farm also will produce 75 acres of groundnuts during the monsoon and 25 in the winter season.

The Sebin Seed Farm is comprised of 345 acres, 290 of which are considered cultivable. The 1985-86 target is to produce 80 acres of sunflower, 30 acres of groundnuts and 20 acres of sesame for foundation seed during the monsoon, and 120 acres of sunflower and 50 acres of sesame for the winter crop, also for foundation seed.

It is expected that the electrical installation will be completed in 1985. The equipment has been ordered for the processing and storage buildings. Work is continuing on the water management and irrigation system.

The Kyaungsu Seed Farm has 880 acres, 800 of which can be cultivated. The 1985-86 target is for 50 acres of groundnuts for certified seed in the monsoon season, and for the winter crop, 200 acres of groundnuts and 200 acres of sunflower for certified seed. About 150 acres of rice will be produced also in the monsoon season.

The Thitcbo Seed Farm is the largest, having 3,111 acres, of which 2,200 are considered to be cultivable. The 1985-86 target is to produce 800 acres of maize and 100 acres of groundnuts for certified seed in the monsoon season, and 800 acres of maize and 300 acres of groundnuts for certified seed for the winter crop.

Work is progressing on the 9-mile access road from Nattalin. Some drainage problems have been improved.

## 5.2. CHAUNGMAGYI SEED FARM

The Chaungmagyi Seed Farm, selected to produce maize and groundnut foundation seed, is comprised of 350 acres located in Pyawbwe Township, Mandalay Division. This farm lies about 10 miles north of the Sebin Seed Farm.

The Chaungmagyi Seed Farm has 304 acres that can be used for crop production. A total of 180 acres had been developed by the end of 1984. It is expected that the remaining 124 acres will be developed before the end of the Project in 1986.

Total USAID disbursements from the beginning of the Project until January, 1985, relating to farm machinery in place, at the Chaungmagyi Seed Farm, amount of $186,301.43, for tractors, cultivating equipment, trucks, spare parts, generator, tools, pumps, pesticide and soil kits, etc.

By March 31, 1985, a 1.2-mile canal had been built, as well as 4.5 miles of drainage ditches. (The Chaungmagyi Dam is seven miles from the farm.) Ninety acres of land had been rough-leveled. Four miles of on-farm roads had been constructed. Barbed wire fencing (4 miles) had been completed. Potable water is available from a 500-foot well.

*Fig. 5. First irrigation, December, 1984, at the Chaungmagyi Seed Farm.*

Electrical power is being provided by a 2 KW diesel generator. It is planned to obtain electrical power in the future from the high tension lines runing across the farm, by using a transformer for dropping the voltage from 33 kV to 11 kV, then another transformer to drop to 400 V, which will be split to provide 3-phase current at 220 V, for running the seed processing equipment, machine shop, etc., as well as for domestic purposes.

The staff has a total of 16, including the farm manager, deputy manager, field inspector, 9 field men, 2 research people, 5 in seed production, 2 in seed processing and distribution, 2 tractor drivers and 1 office person.

The following buildings were completed by March 31, 1985:

Training hall
Guest house
2 unit quarters (1 of 4)
Generator house
Diesel ground tank
Water tank, ground
Water tank, elevated
Implement shed
Fertilizer storage bldg.
Ventated storage bldg.
Drying floors (4)

The following buildings should be completed during 1985-86:

Office building
Officers' quarters
Staff quarters, 2-unit (3)
Maintenance shop
Processing building
Parts store
Insecticide store
Seed storage bldg. (temp. and humidity regulated)

---

Foundation seed has been produced on the Chaungmagyi Seed Farm as follows:

| Year | Crop | Acres Sown | Acres Harvested | Yield Baskets per Acre | Total Yield Baskets* |
|---|---|---|---|---|---|
| 82-83 | Maize | 35 | 25 | 28.00 | 700 |
| | Groundnut | 45 | 36 | 30.39 | 1094 |
| 83-84 | Maize | 60 | 50 | 38.40 | 1920 |
| | Groundnut | 90 | 75 | 36.40 | 2730 |
| 84-85 (Estimate) | Maize | 65 | 51 | 41.25 | 2104 |
| | Groundnut | 40 | 35 | 34.34 | 1202 |

*One basket of shelled maize weighs 55 pounds.
One basket of unshelled groundnuts weighs 25 pounds.

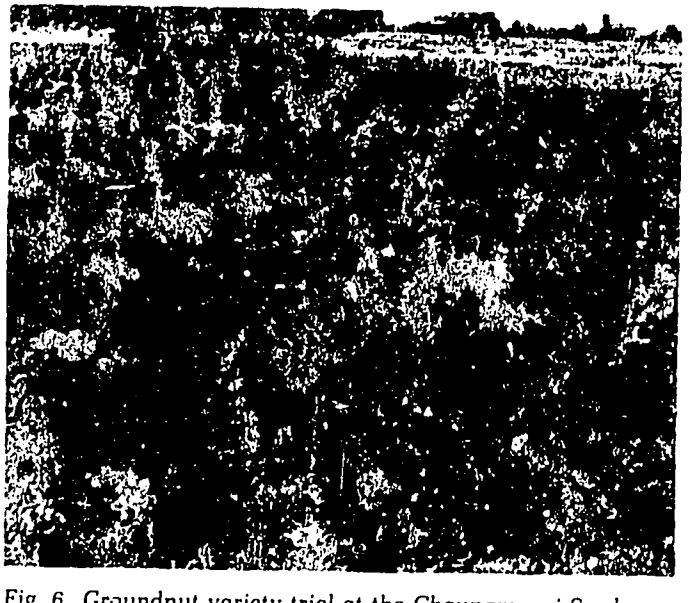


*Fig. 6. Groundnut variety trial at the Chaungmagyi Seed Farm.*

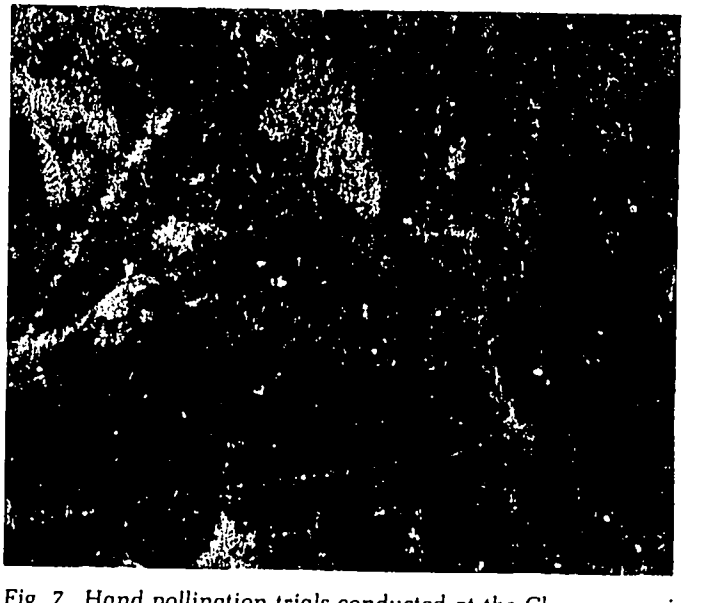


*Fig. 7. Hand pollination trials conducted at the Chaungmagyi Seed Farm showed that it is possible to double the yield of seed by hand pollination in areas where bee activity is low.*

The production plan for 1985-86 for the Chaungmagyi Seed Farm is the following:

| Crop | Variety | Season | Acres to be Sown | Estimated Yield/Acre Baskets* |
|---|---|---|---|---|
| Maize | Shewar (8) | Monsoon | 75 | 40 |
| **Maize: Total** | | **Monsoon** | **75** | **40** |
| Groundnuts | Sinpadetha (2) | Monsoon | 5 | 35 |
| Groundnuts | Magwe (11) | Monsoon | 70 | 35 |
| **Groundnuts: Total** | | **Monsoon** | **75** | **35** |
| Maize | Shewar (8) | Winter | 125 | 34 |
| **Maize: Total** | | **Winter** | **125** | **34** |
| Groundnuts | Sinpadetha (2) | Winter | 25 | 30 |
| **Groundnuts: Total** | | **Winter** | **25** | **30** |

**One basket of shelled maize weighs 55 pounds.*
*One basket of unshelled groundnuts weighs 25 pounds.*

Various research trials have been conducted on the Chaungmagyi Seed Farm, including variety trials on maize and groundnuts, as well as fertilizer trials for both crops. Two groundnut trials were established during the winter 1984-85 growing season. Two trials were established during the winter 1984-85 growing season. Two trials for pollination of sunflower were set up for the winter season of 1984-85. Dr. Chamnan Chutkaew, Kasetsart University, Bangkok, Thailand, supplied seed from Thailand for a maize variety trial for winter 1984-85.

## 5.3. SEBIN SEED FARM

The Sebin Seed Farm, designated as a foundation seed farm, is comprised of 345 acres in Yamethin Township, Mandalay Division. This farm lies about 10 miles south of the Chaungmagyi Seed Farm. A total of 290 acres are considered cultivable.

A total of $480,369.99 had been spent by January, 1985, for tractors, farming implements, trucks, spare parts, tools, generator, pumps, pesticide and soil kits, etc.

Work is continuing on the electrical installation which is expected to be completed in 1985. Power at the present time is from a 2-KW diesel generator. In the future, power will be supplied from the high tension lines running across the farm by dropping the voltage of 33 kV by transformer to 11 kV, then by another transformer to 400 V, which will be split then into 3 phases of 220 V, to be used for the seed plant operation, machinery and domestic purposes.

A 3.04-mile canal is planned, of which 0.7 mile already had been constructed by April, 1985, as well as 0.8 mile drainage ditches. The source of water for irrigation is the Thitson Dam, which is about seven miles from the farm. A total of 90 acres of land have been rough-leveled. A 1-mile on-farm road has been constructed.

Potable water is being supplied from a shallow, hand-dug well. Another well was drilled to a depth of 975 feet, but the drill stem was broken. There is no retrieving equipment. The two drill sections and bit remain, therefore this well is not in use.

Several research trials have been conducted at the Sebin Seed Farm, including groundnut variety trials, sunflower pollination trials, fertilizer trials for groundnuts and sunflowers, and soybean variety and observation trials. Two groundnut variety trials and two sunflower pollination trials were established during the winter 1984-85 season.

The 1984 hand pollination trials produced 200 percent greater yield than natural pollination by wild bees. Forty-five beehives were brought to the farm for pollinating the winter 84-85 crop, and these beehives are to remain on the farm to aid pollinating in the future.

The following buildings had been completed by April, 1985:

Office building
1 Staff quarters, 2-unit
Water tank, elevated
Water tank, ground
Implement storage bldg.
2 Drying floors

It is anticipated that the following buildings will be completed during 1985-86:

Guest house
Officers' quarters
1 Staff quarters, 2-unit
3 Staff quarters, 4-unit
Barracks
Dining hall
Maintenance shop
Parts store
2 Fert. storage bldgs.
1 Insecticide store
Processing bldg.
Conditioned storage bldg.
Ventilated storage bldg.
Laboratory and office
Generator house

*Fig. 8. The main office has been completed at the Sebin Seed Farm.*

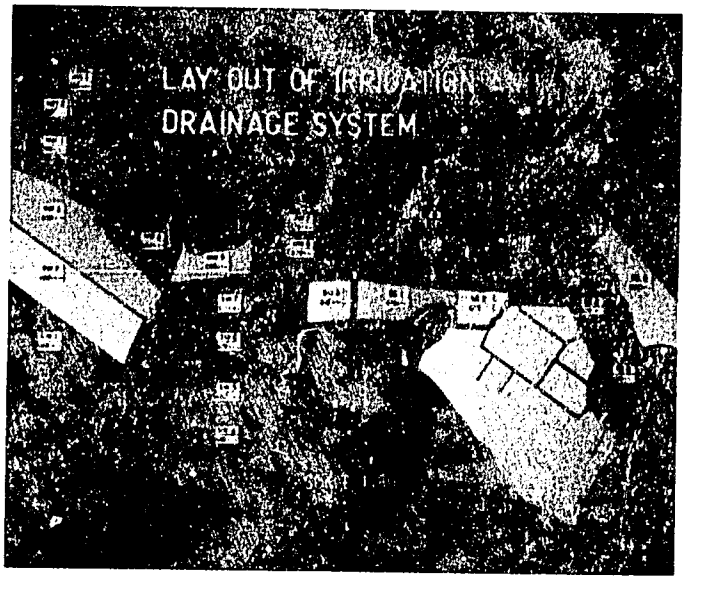



*Fig. 9. The layout of the irrigation and drainage system at the Sebin Seed Farm.*

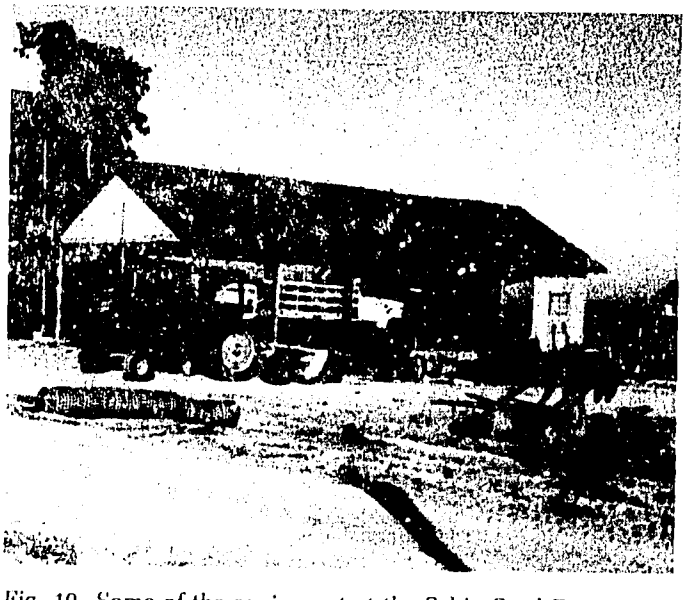


*Fig. 10. Some of the equipment at the Sebin Seed Farm.*

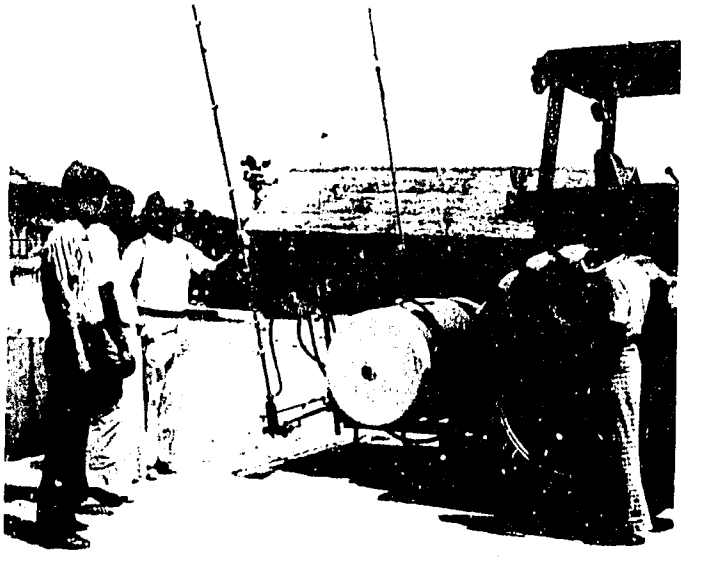


*Fig. 11. U Ni, Expeditor/MOPP, U Tin Myint, Farm Manager; and Dr. William Chappell, Weed Control Specialist, inspecting spray equipment at the Sebin Seed Farm.*

*Fig. 12. Construction of the guest house, Sebin Seed Farm.*

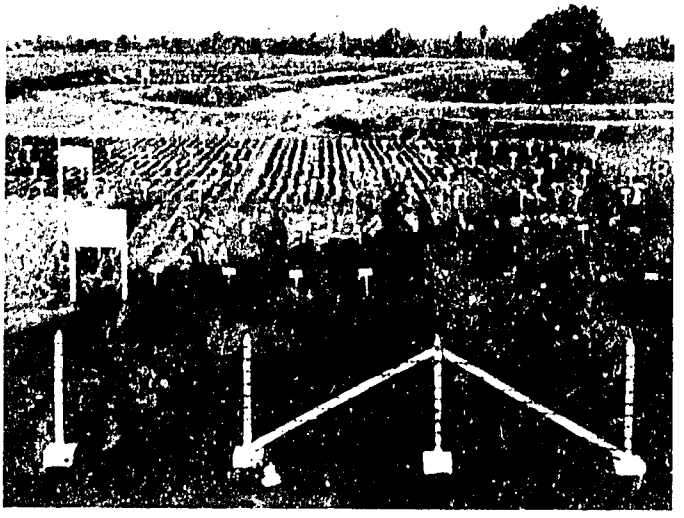


*Fig. 13. Maize and groundnut trials were conducted at the Sebin Seed Farm to determine which varieties produce the highest yields.*

*Fig. 14. U Tin Myint and staff members inspecting a groundnut variety trial at the Sebin Seed Farm.*

*Fig. 15. U Tin Myint, Farm Manager; U Siang Uk, Deputy Project Director/MOPP, and Dr. Charles Simkins, Agricultural Development Officer/USAID, discussing sunflower production with staff members at the Sebin Seed Farm.*

Foundation seed has been produced as indicated in the following:

| Year | Crop | Acres Sown | Acres Harvested | Yield Baskets per Acre | Total Yield Baskets* |
|---|---|---|---|---|---|
| 82-83 | Sunflower | 102 | 68 | 17.79 | 1,210 |
| | Sesame | 20 | 9 | 2.44 | 22 |
| 83-84 | Sunflower | 110 | 61 | 15.26 | 931 |
| | Sesame | 20 | 16 | 5.44 | 87 |
| | Groundnut | 50 | 38 | 20.00 | 760 |
| 84-85 (Estimate) | Sunflower | 110 | 74 | 27.30 | 2,020 |
| | Sesame | 65 | 29 | 5.03 | 146 |
| | Groundnut | 50 | 43 | 23.02 | 990 |

*One basket of sunflower seed weighs 32 pounds.
One basket of sesame weighs 54 pounds.
One basket of unshelled groundnuts weighs 25 pounds.

The projected planting plan for 1985-86 for the Sebin Seed Farm is as indicated below:

| Crop | Variety | Season | Acres to be Sown | Estimated Yield/Acre Baskets* |
|---|---|---|---|---|
| Sunflower | Sunfola | Monsoon | 60 | 31 |
| Sunflower | Sinshwekya | Monsoon | 10 | 35 |
| Sunflower | Chakinskij | Monsoon | 10 | 35 |
| **Sunflower: Total** | | **Monsoon** | **80** | **31** |
| Sesame | Sinyadana | Monsoon | 15 | 5 |
| Sesame | Hnyanni | Monsoon | 5 | 5 |
| **Sesame: Total** | | **Monsoon** | **20** | **5** |
| Groundnuts | Sinpadetha | Monsoon | 30 | 32 |
| **Groundnuts: Total** | | **Monsoon** | **30** | **32** |
| Sunflower | Sunfola | Winter | 70 | 45 |
| Sunflower | Sinshwekya | Winter | 25 | 45 |
| Sunflower | Chakinskij | Winter | 25 | 45 |
| **Sunflower: Total** | | **Winter** | **120** | **45** |
| Sesame | Sinyadana | Winter | 30 | 8 |
| Sesame | Hnyanni | Winter | 20 | 8 |
| **Sesame: Total** | | **Winter** | **50** | **8** |

*One basket of sunflower seed weighs 32 pounds.
One basket of sesame seed weighs 54 pounds.
One basket of unshelled groundnuts weighs 25 pounds.

*Fig. 16. Land was leveled and irrigated at the Sebin Seed Farm so that 50 acres of sunflower could be planted for the 1984-85 winter season.*

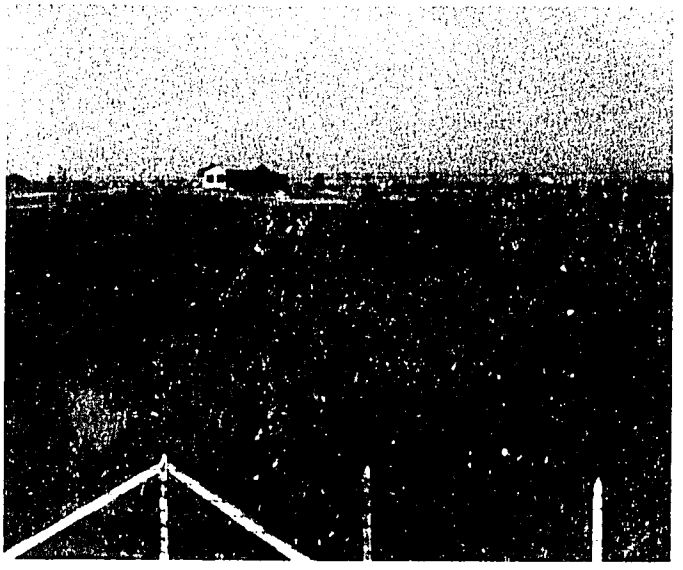


*Fig. 17. Fifty acres of sunflower were grown for foundation seed during the winter 1984-85 season at the Sebin Seed Farm.*

*Fig. 18. Sesame seed planter developed at the Sebin Seed Farm.*

## 5.4. KYAUNGSU SEED FARM

The Kyaungsu Seed Farm lies in Kyauktaga Township, Pegu Division, approximately 100 miles norththeast of Rangoon. This farm is comprised of 880 acres, of which 800 have been considered cultivable. The Kyaungsu Seed Farm was designated as one of the two farms to produce certified seed.

A total disbursement of $209,341.45 had been made by the USAID by January, 1985, for trucks and agricultural equipment, including tractors, culivating equipment, spare parts, generator, etc.

A total of 250 acres had been made cultivable by January, 1985, and the remaining 550 acres are expected to be made ready during 1985 and 1986, before termination of the Project.

Plans have been developed that more than half the acreage will be used for groundnuts, and the remainder divided among sesame, sunflower and soybeans.

Electrical installation is to be started in 1986, the source of power being the 11 kV distribution line in Penwegon, approximately 3 miles from the farm load center.

The following buildings had been completed by March 31, 1985:

Office building
Training hall
2 Staff quarters (2-unit)
Water tank, ground
Fertilizer storage
Insecticide storage
2 Drying floors

These buildings are expected to be completed during 1985-86:

Guest house
Officers' quarters
2 Staff quarters (2-unit)
Staff quarters (4-unit)
Barracks
Dining hall
Maintenance shop
Parts store
Implement shed
Processing building
Conditioned storage
Ventilated storage
Laboratory and office
Generator house
Tractor shed

Two miles of on-farm road had been completed by April, 1985, as well as 0.7 mile fencing and 2 miles of drainage ditches.

No surface water is available for irrigation. It is expected, eventually, that tube wells will be drilled. Potable water is available. Electric power is produced by a generator.

*Fig. 19. U Siang Uk, Deputy Project Director/MOPP, and U Maung Maung, Deputy Farm Manager, inspecting a field of sunflowers for maturity at the Kyaungsu Seed Farm.*

*Fig. 20. U Maung Maung, Deputy Farm Manager, U Ba Thaung, Agronomist/MOPP, and U Hla Myint, Township Manager, Daik-U, showed Dr. William Flinn, Executive Director/MUCIA, the progress being made at the Kyaungsu Seed Farm.*

The Kyaungsu Seed Farm has produced seed as follows:

| Year | Crop | Acres Sown | Acres Harvested | Yield Baskets per Acre* | Total Yield Baskets* |
|---|---|---|---|---|---|
| 82-83 | Groundnut | 37 | 24 | 25.42 | 610 |
| 83-84 | Groundnut | 110 | 80 | 22.90 | 1,832 |
| | Sunflower | 65 | 40 | 8.75 | 350 |
| 84-85 | Groundnut | 127 | 119 | 39.75 | 4,730 |
| (Estimate) | Sunflower | 14 | 13 | 24.00 | 312 |

*One basket of unshelled groundnuts weighs 25 pounds.
One basket of sunflower seed weighs 32 pounds.

The 1985-86 production plan for the Kyaungsu Seed Farm is as follows:

| Crop | Variety | Season | Acres to be Sown | Estimated Yield/Acre Baskets* |
|---|---|---|---|---|
| Groundnuts | Magwe (11) | Monsoon | 45 | 31 |
| Groundnuts | Magwe (12) | Monsoon | 5 | 31 |
| **Groundnuts Total** | | **Monsoon** | **50** | **31** |
| Rice | Pegulonthwe | Monsoon | 50 | 60 |
| Rice | Eyalonthwe | Monsoon | 50 | 60 |
| Rice | Shwewahtun | Monsoon | 50 | 89 |
| **Rice Total** | | **Monsoon** | **150** | **70** |
| Groundnuts | Sindpadetha (2) | Winter | 100 | 35 |
| Groundnuts | Magwe (10) | Winter | 70 | 35 |
| Groundnuts | Magwe (12) | Winter | 30 | 35 |
| **Groundnuts Total** | | **Winter** | **200** | **35** |
| Sunflower | Sunfola | Winter | 200 | 22 |
| **Sunflower Total** | | **Winter** | **200** | **22** |

*One basket of unshelled groundnuts weighs 25 pounds.
One basket of sunflower seed weighs 32 pounds.

*Fig. 21. U Ba Thaung, Agronomist/MOPP, U Hla Myint, Daik-U Township Manager, and Dr. Frank Calhoun, Campus Coordinotor, Texas A & M University, at the Kyaungsu Seed Farm.*

*Fig. 22. Dr. Charles Simkins, Agricultural Development Officer, USAID, inspecting a field of sunflowers produced for seed at the Kyaungsu Seed Farm.*

## 5.5. THITCHO SEED FARM

The Thitcho Seed Farm, designated for certified seed, is the largest of all the seed farms involved in the Maize and Oilseeds Production Project, having 3,111 acres. The Thitcho farm is located in Nattalin Township, Pegu Division, approximately 120 miles northwest of Rangoon. At least 2,200 acres of the total acreage are considered to be cultivable.

The USAID had disbursed $209,341.45 for trucks, tractors, implements, spare parts, tools, etc., before the end of January, 1985.

The following buildings were completed before April 1, 1985:

Office building
Guest house
3 Staff quarters (2-units)
Water tank, elevated
Water tank, ground
Ventilated storage
Tractor shed
Fertilizer store
Drying floor

The following buildings are estimated to be completed during 1985-86:

Training hall
Officers' quarters
2 Staff quarters (2-units)
Staff quarters (4-units)
Barracks
Dining hall
Maintenance shop
Parts store
Implement storage
Insecticide store
Processing building
Conditioned storage
Laboratory and office
Generator house

The Thitcho Seed Farm is located 9 miles from Nattalin. A road is under construction at the present time, of which approximately two and a half miles had been completed by April, 1985. An on-farm road of 0.5 mile had been constructed. Fencing was nearly completed, with 4.4 mile finished and 1.5 mile under construction.

Several research trials have been conducted at the Thitcho Seed Farm on soybeans, maize and sunflowers. One observation trial included 178 different soybean cultivars sent by INTSOY in 1984. Selection of soybean seed for increase has been based on results of INTSOY variety trials in previous years.

The Thitcho farm had drainage problems on some areas which have been studied and a 0.5 mile drainage ditch had been constructed by April, 1985.

Seed production on the Thitcho Seed Farm is listed below:

| Year | Crop | Acres Sown | Acres Harvested | Yield Baskets per Acre* | Total Yield Baskets* |
|---|---|---|---|---|---|
| 82-83 | Maize | 292 | 261 | 20.28 | 5,293 |
| | Groundnut | 110 | 62 | 23.53 | 1,459 |
| 83-84 | Maize | 850 | 692 | 22.67 | 15,688 |
| | Groundnut | 75 | 69 | 30.61 | 2,112 |
| 84-85 | Maize | 1,050 | 884 | 32.15 | 28,419 |
| (Estimate) | Groundnut | 90 | 85 | 20.00 | 1,710 |

**One basket of shelled maize weighs 55 pounds.*
*One basket of unshelled groundnut weighs 25 pounds.*

Maize and groundnuts will be produced for certified seed at the Thitcho Seed Farm in 1985-86 as follows:

| Crop | Variety | Season | Acres to be Sown | Estimated Yield/Acre Baskets* |
|---|---|---|---|---|
| Maize | Shewa (8) | Monsoon | 800 | 42 |
| **Maize Total** | | **Monsoon** | **800** | **42** |
| Groundnuts | Magwe (12) | Monsoon | 40 | 32 |
| Groundnuts | Magwe (10) | Monsoon | 60 | 32 |
| **Groundnuts Total** | | **Monsoon** | **100** | **32** |
| Maize | Shewa (8) | Winter | 800 | 38 |
| **Maize Total** | | **Winter** | **800** | **38** |
| Groundnuts | Sinpadetha (2) | Winter | 100 | 35 |
| Groundnuts | Magwe (10) | Winter | 200 | 35 |
| **Groundnuts Total** | | **Winter** | **300** | **35** |

**One basket of shelled maize weighs 55 pounds.*
*One basket of unshelled groundnuts weighs 25 pounds.*

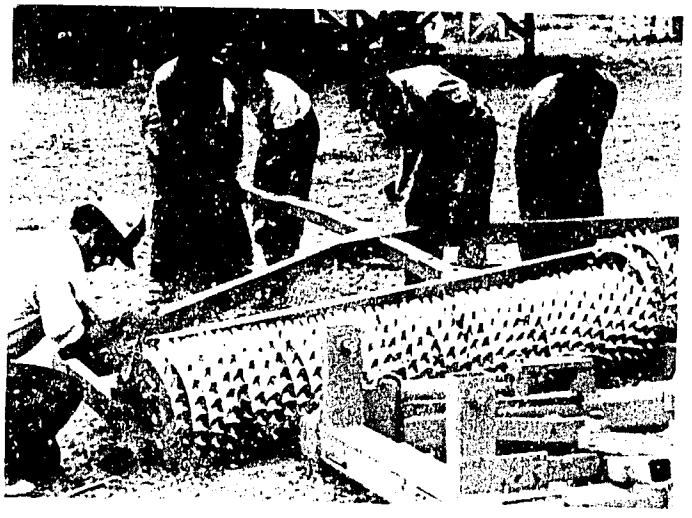


*Fig. 23. Mr. Ross Hagan, Water Management Specialist; U Than Htun, Deputy Farm Manager, and Mr. Lester Kocourek, Agricultural Consultant, assisting in assembling equipment at the Thitcho Seed Farm.*

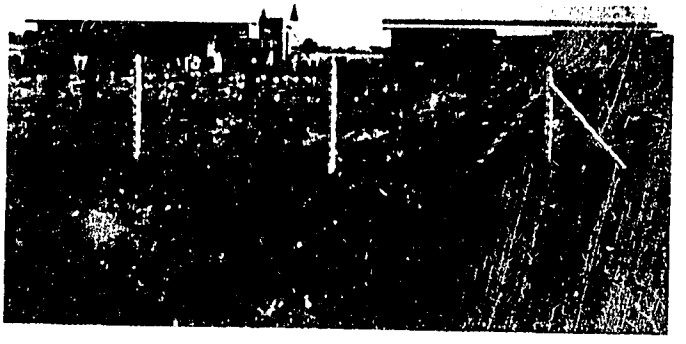


*Fig. 24. The office and laboratory at the Thitcho Seed Farm.*

*Fig. 25. Maize seed production at the Thitcho Seed Farm.*

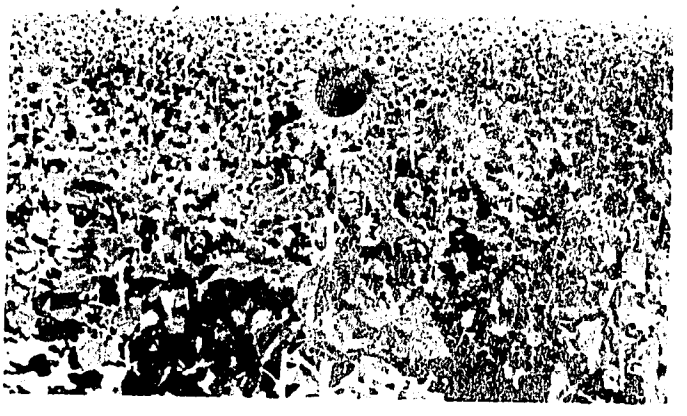


*Fig. 26. Seed production of the Sunfola variety of sunflower at the Thitcho Seed Farm.*

*Fig. 27. Disc plow at the Thitcho Seed Farm.*

*Fig. 28. Crushed rock being rolled into the new road between the Thitcho Seed Farm and Nattalin.*

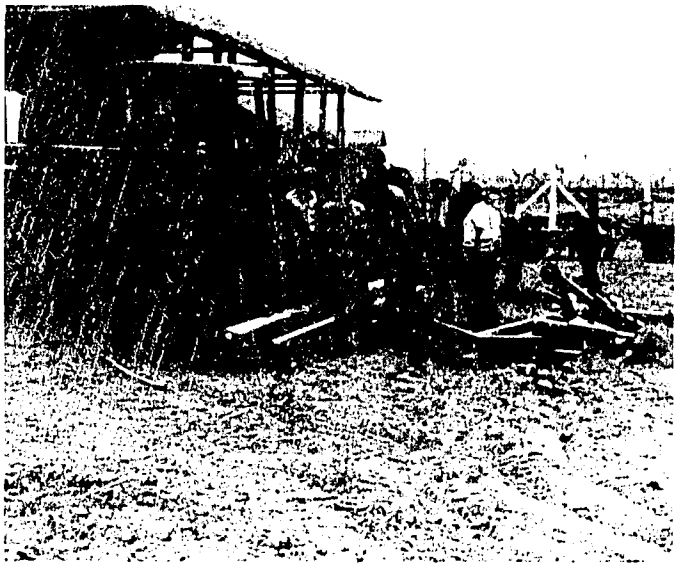


*Fig. 29. Mr. Ross Hagan, Water Management Specialist; Mr. Matthew Peart, Agricultural Consultant; Mr. Lester Kocourek, Agricultural Consultant; U Soe Win, Farm Manager, and U Siang Uk, Deputy Project Director, at the Thitcho Seed Farm.*

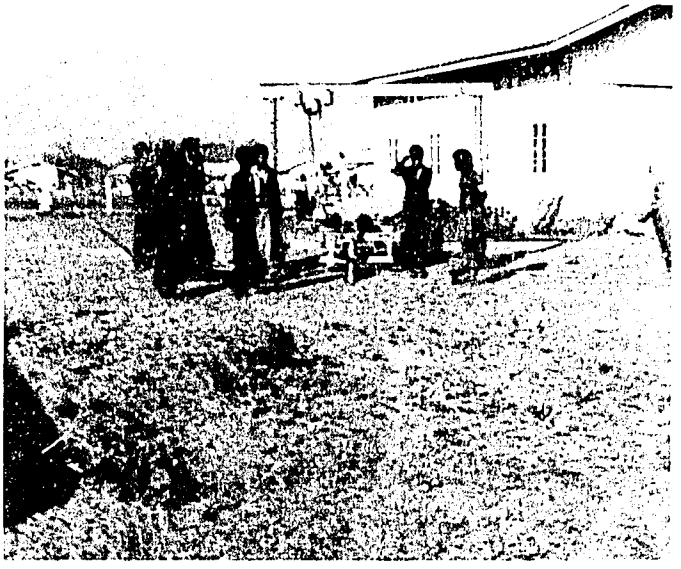


*Fig. 30. Hoist used for assembling tractor implements at the Thitcho Seed Farm.*

*Fig. 31. Dr. William Chappell, Weed Control Specialist, conducting a training course on weed control at the Thitcho Seed Farm.*

# 6. WAKEMA IRRIGATION SCHEME

An irrigation scheme was designed to provide electrified irrigation facilities in the Wakema Township of the Irrawaddy Division, located in the delta region, about 65 air miles from Rangoon. The main objective is to introduce the use of electric pump irrigation methods in order to have sufficient water to produce oilseed crops during the dry season.

This area receives 100 to 120 inches of rain annually, fairly evenly distributed over the six month period of the monsoon season. Yields in the dry season without irrigation are low compared with monsoon yields and can be increased greatly with supplemental irrigation and water management practices. Using proper irrigation methods, crop failures should be eliminated, yields should be at least 50 percent more, and the fertilizer applied should be used more efficiently.

The Agriculture Corporation published a detailed description of this project in a report dated October 6, 1982. It was planned to install fifty 5-horsepower low-lift pumps along a short section of the Lanthamine River, to raise the water a maximum of six feet; power would be gained by constructing multiple taps in the existing Wakema-Kyonmange 11 kV circuits, then using transformers to drop to 400 V.

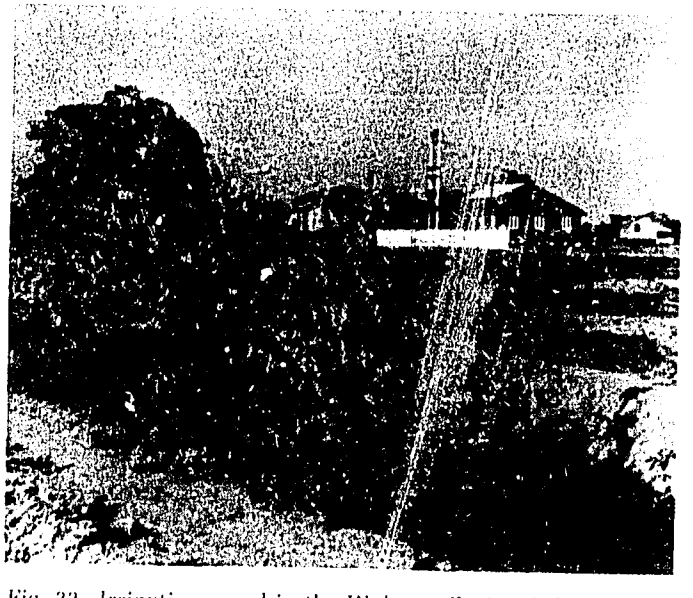


*Fig. 32. Irrigation canal in the Wakema Project Scheme.*

A two thousand acre pilot electric pump irrigation scheme has been established in Wakema Township. Two systems are being utilized in this scheme, one using movable pumps, and the other using fixed pumps. Work was started on the main canal for a fixed pump and canal system in 1984 and more than 5,000 feet were rough shaped during April and May. The canal was completed and the laterals built in time to irrigate for the 1984-85 dry season.

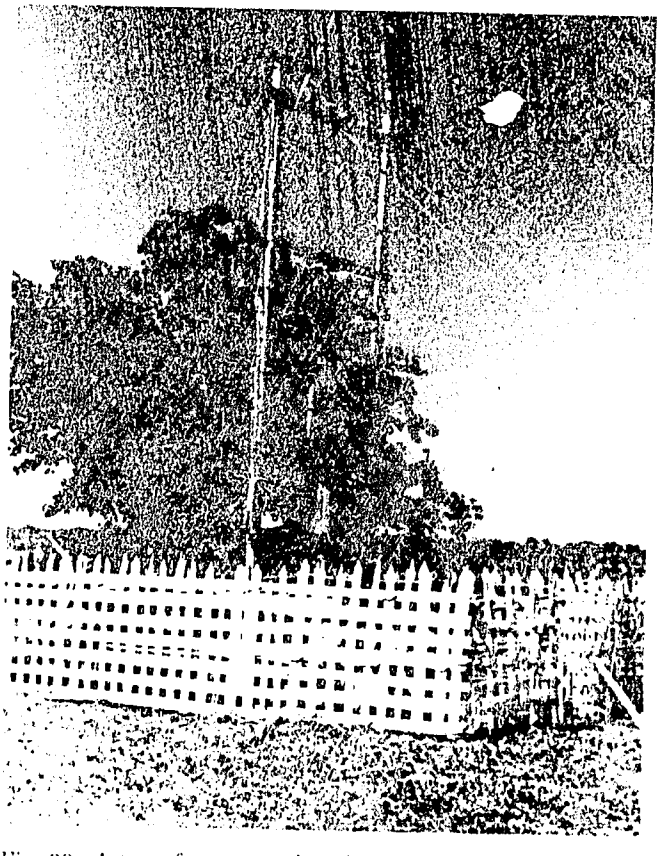


*Fig. 33. A transformer used to drop power from 11 kV to 400 V in Wakema Township.*

*Fig. 34. A movable electric pump for irrigation in the Wakema Irrigation Scheme.*

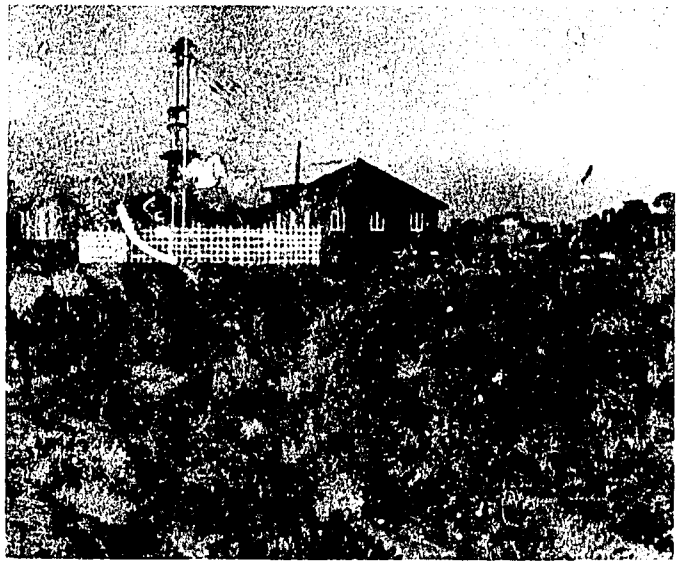


*Fig. 35. Gravity feed irrigation resulting from the use of electric pumps in the Wakema Irrigation Scheme.*

*Fig. 36. U Tin Hlaing, General Manager/Extension, Agriculture Corporation; Dr. E.T. Bullard, MUCIA Team Leader; and Mr. Charles Ward, USAID Representative, inspecting a field of sesame grown for seed in the Irrawaddy Division.*

*Fig. 37. U Mya Maung, Project Director, MOPP; U Tin Hlaing, General Manager/Extension, Agriculture Corporation; and U Kyaw Htein, Deputy Minister of Agriculture and Forests, inspecting the Wakema Irrigation Scheme.*

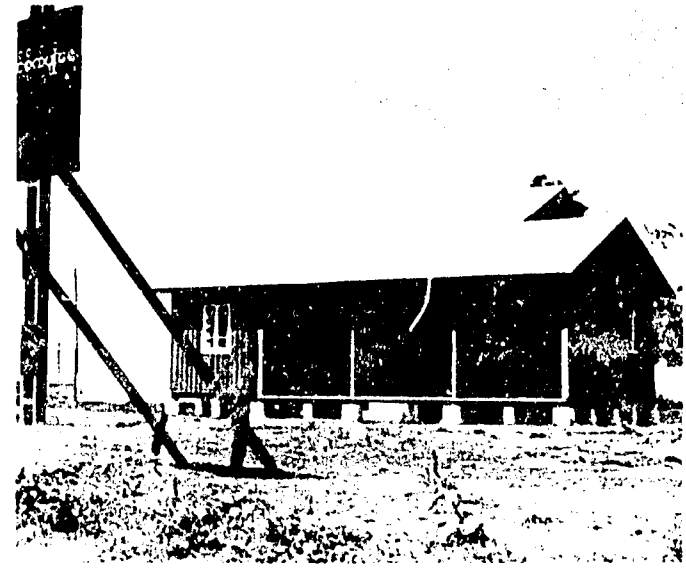


*Fig. 38. Office for the Wakema Irrigation Scheme, Irrawaddy Division.*

Electric pumps for 420 acres were installed before January, 1985. Four hundred acres of sesame and 20 acres of sunflower were planted for the dry 1984-85 season in Wakema Township.

# 7. PRODUCTION

The principal objective of the Maize and Oilseeds Production Project is the increase of production of maize and other oilseed crops, particularly groundnuts, sesame and sunflower, in 28 townships (geographically, 26 townships) of Burma. In addition, it was determined that soybeans were to be included on a pilot basis.

The total production target increases for the project areas, established by the Project Grant Agreement, are:

| | |
|---|---|
| Maize production | 228,000 MT |
| Groundnut production | 258,000 MT* |
| Sesame production | 25,000 MT |
| Sunflower production | 53,000 MT |
| Soybean production | 12,000 MT |

**87,000 MT to be attributable directly to Project acres, and the remainder, indirectly attributable to other groundnut acreage throughout Burma through the spread of rhizobium inoculation technology.*

It was determined that these goals should be achieved by adoption of high-yielding inputs and improved farming practices by an estimated 200,000 farm families in the 28 project township areas. Approximately 1.2 million acres are involved directly with the Project, and an additional 1.5 million acres are expected to benefit from the spread effect of nitrogen-fixing rhizobium inoculation technology on groundnuts and soybeans.

Sesame has been one of Burma's most important crops for many years, second only to rice. In 1981, oilseed crops, principally sesame and groundnuts, comprised approximately 19.5 percent of the total sown acreage in Burma. The groundnut crops have been third, maize has been grown mostly for direct consumption, and it has been only in the past few years that sunflowers have gained any significance, having been introduced into Burma in the 1970's.

It was estimated in the Project Grant Agreement that during the four crop years corresponding to 1982-83, 1983-84, 1984-85 and 1985-86, total acreage planted to maize, groundnuts, sesame and sunflower in the 28 townships (geographically, 26) should reach 338,600 by the 1985-86 crop year. By the same time, 20,000 acres of soybeans should have been planted. Table 5 indicates the anticipated acreages for each of the oilseed crops in the Intensive and Extensive Townships for the duration of the Project, according to the Project Paper.

Production already has been increased significantly in the areas designated for the Maize and Oilseeds Production Project. Tables 6 and 7 are indicative of crop production achieved. Table 8 indicates percentage achievements through the 1984-85 crop year.

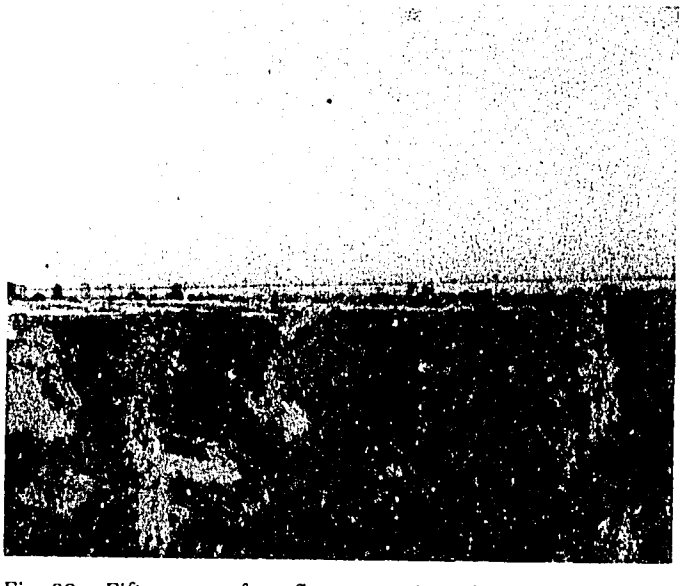


*Fig. 39. Fifty acres of sunflowers at the Sebin Seed Farm.*

**Table 5. Estimated Acreages of Maize Oilseed Crops for the 8 Intensive Townships and 20 Extensive Townships for the Duration of the Maize and Oilseeds Production Project. (Source: Project Grant Agreement.)**

| Crop | Intensive Township | Acreage 82-83 | 83-84 | 84-35 | 85-86 | Total |
|---|---|---|---|---|---|---|
| Maize | Zalun | 12,000 | 15,000 | 18,000 | 20,000 | 65,000 |
| Maize | Taze | 20,000 | 25,000 | 28,000 | 30,000 | 103,000 |
| Maize | Lewe | 10,000 | 15,000 | 20,000 | 25,000 | 70,000 |
| Maize | Pyinmana | 15,000 | 20,000 | 25,000 | 30,000 | 90,000 |
| **Maize Total** | | **57,000** | **75,000** | **91,000** | **105,000** | **328,000** |
| Groundnut | Daik-U | 22,500 | 25,000 | 27,500 | 30,000 | 105,000 |
| Groundnut | Yandoon | 15,000 | 17,000 | 19,000 | 20,000 | 71,000 |
| **Groundnut Total** | | **37,500** | **42,000** | **46,500** | **50,000** | **176,000** |
| Sesame | Moulmeingyun | 34,000 | 36,000 | 38,000 | 40,000 | 148,000 |
| **Sesame Total** | | **34,000** | **36,000** | **38,000** | **40,000** | **148,000** |
| Sunflower | Yamethin | 15,000 | 20,000 | 25,000 | 30,000 | 90,000 |
| **Sunflower Total** | | **15,000** | **20,000** | **25,000** | **30,000** | **90,000** |
| **Intensive Townships Total** | | **143,500** | **173,000** | **200,500** | **225,500** | **742,000** |
| Maize | Letpadan | — | — | — | 3,200 | 3,200 |
| Maize | Maubin | — | — | — | 3,200 | 3,200 |
| Maize | Kanbalu | — | 9,600 | 11,200 | 12,000 | 32,800 |
| Maize | Tatkon | — | — | — | 6,000 | 6,000 |
| **Maize Total** | | **—** | **9,600** | **11,200** | **42,400** | **45,200** |
| Groundnut | Kyauktaga | 3,200 | 4,000 | 4,000 | 4,000 | 15,200 |
| Groundnut | Tatkon | — | — | 6,000 | 6,000 | 12,000 |
| Groundnut | Singu | — | 6,800 | 6,800 | 6,800 | 20,400 |
| Groundnut | Myaung | — | 10,000 | 10,000 | 10,000 | 30,000 |
| Groundnut | Magwe | 30,000 | 30,000 | 30,000 | 30,000 | 120,000 |
| Groundnut | Natmauk | — | — | — | 14,400 | 14,400 |
| **Groundnut Total** | | **33,200** | **50,800** | **56,800** | **71,200** | **212,000** |
| Sesame | Maubin | — | — | 6,000 | 8,000 | 14,000 |
| Sesame | Kyaunggone | — | — | 3,200 | 4,000 | 7,200 |
| Sesame | Wakema | 12,000 | 14,000 | 15,000 | 16,000 | 57,000 |
| Sesame | Okpo | — | 8,000 | 8,000 | 8,000 | 24,000 |
| Sesame | Henzada | — | — | 3,000 | 4,000 | 7,000 |
| Sesame | Myittha | 3,000 | 4,000 | 4,000 | 4,000 | 15,000 |
| Sesame | Kyaukse | 10,000 | 10,000 | 10,000 | 10,000 | 40,000 |
| **Sesame Total** | | **25,000** | **36,000** | **49,200** | **54,000** | **164,200** |
| Sunflower | Kyauktaga | — | — | 5,000 | 6,000 | 11,000 |
| Sunflower | Budalin | — | — | — | 4,000 | 4,000 |
| Sunflower | Pyawbwe | — | 2,800 | 3,600 | 4,000 | 10,400 |
| **Sunflower Total** | | **—** | **2,800** | **8,600** | **14,000** | **25,400** |

*continued on next page*

| Crop | Extensive Township | Acreage 82-83 | 83-84 | 84-85 | 85-86 | Total |
|---|---|---|---|---|---|---|
| Extensive Townships Total | | 58,200 | 99,200 | 125,800 | 163,600 | 446,800 |
| Extensive Township Total | | 58,200 | 99,200 | 125,800 | 163,600 | 446,800 |
| Intensive Township Total | | 143,500 | 173,000 | 200,500 | 225,000 | 742,000 |
| Grand Total (Townships) | | 201,700 | 272,200 | 326,300 | 388,600 | 1,188,800 |

**Table 6. National Production of Maize and Oilseed Crops. (Source: Annual Plans and Actual Production of Maize and Oilseed Crops in Burma. 1977-78 to 1982-83. Maize and Oilseeds Production Project. Agriculture Corporation. March 1983. Also various other MOPP reports and records, including revised 1982-83 data.)**

| Year Crop | Acres Sown | Acres Harvested | Yield per Acre Baskets* | Yield per Acre Pounds | Production Baskets* | Production Pounds |
|---|---|---|---|---|---|---|
| MAIZE: | | | | | | |
| 77-78 | 207,513 | 195,500 | 15.43 | 849 | 3,016,095 | 165,885,000 |
| 78-79 | 224,498 | 205,716 | 14.97 | 823 | 3,079,509 | 169,373,000 |
| 79-80 | 250,591 | 247,341 | 20.50 | 1,128 | 5,070,491 | 278,877,000 |
| 80-81 | 374,327 | 357,021 | 18.68 | 1,027 | 6,667,826 | 366,730,000 |
| 81-82 | 380,684 | 347,347 | 23.78 | 1,308 | 8,259,951 | 454,297,000 |
| 82-83 | 422,034 | 335,828 | 28.55 | 1,570 | 9,588,071 | 527,344,000 |
| 83-84 | 513,358 | 446,766 | 27.77 | 1,527 | 12,408,265 | 682,455,000 |
| 84-85** | 602,962 | 526,556 | 27.36 | 1,505 | 14,422,760 | 793,252,000 |
| GROUNDNUT: | | | | | | |
| 77-78 | 1,481,263 | 1,391,822 | 29.42 | 736 | 110,946,284 | 1,023,657,000 |
| 78-79 | 1,377,715 | 1,290,866 | 26.65 | 666 | 34,406,188 | 860,155,000 |
| 79-80 | 1,200,379 | 1,126,123 | 26.80 | 670 | 30,177,200 | 754,430,000 |
| 80-81 | 1,271,131 | 1,209,904 | 31.89 | 797 | 38,591,019 | 964,775,000 |
| 81-82 | 1,477,687 | 1,372,283 | 36.82 | 920 | 50,532,711 | 1,263,318,000 |
| 82-83 | 1,411,695 | 1,334,716 | 36.34 | 908 | 48,498,064 | 1,212,451,000 |
| 83-84 | 1,384,603 | 1,294,238 | 36.22 | 906 | 116,878,607 | 1,171,965,000 |
| 84-85** | 1,597,466 | 1,532,185 | 38.37 | 959 | 58,786,162 | 1,469,654,000 |

*One basket of shelled maize weighs 55 pounds.
One basket of unshelled groundnuts weighs 25 pounds.
**Estimated data.

*continued on next page*

| Year Crop | Acres Sown | Acres Harvested | Yield per Acre Baskets* | Yield per Acre Pounds | Production Baskets* | Production Pounds |
|---|---|---|---|---|---|---|
| SESAME: | | | | | | |
| 77-78 | 2,696,095 | 1,496,651 | 3.03 | 164 | 4,535,868 | 249,473,000 |
| 78-79 | 3,086,408 | 2,366,609 | 3.62 | 195 | 8,555,435 | 470,549,000 |
| 79-80 | 2,563,013 | 1,558,520 | 2.88 | 154 | 4,488,462 | 248,865,000 |
| 80-81 | 3,230,821 | 1,761,810 | 3.64 | 200 | 6,416,160 | 352,889,000 |
| 81-82 | 3,385,471 | 1,909,184 | 3.84 | 211 | 7,340,196 | 403,711,000 |
| 82-83 | 3,402,776 | 2,311,822 | 3.50 | 189 | 8,087,486 | 436,724,000 |
| 83-84 | 3,308,366 | 1,901,801 | 4.44 | 240 | 8,441,648 | 455,849,000 |
| 84-85** | 3,603,720 | 2,226,200 | 4.26 | 230 | 9,473,339 | 511,603,000 |
| SUNFLOWER: | | | | | | |
| 77-78 | 89,105 | 84,295 | 15.92 | 509 | 1,341,980 | 42,943,000 |
| 78-79 | 136,158 | 122,183 | 12.81 | 410 | 1,565,000 | 50,080,000 |
| 79-80 | 83,474 | 54,656 | 16.64 | 532 | 909,476 | 29,103,000 |
| 80-81 | 142,740 | 121,163 | 18.70 | 598 | 2,266,343 | 72,523,000 |
| 81-82 | 257,930 | 229,175 | 21.23 | 679 | 4,866,306 | 155,722,000 |
| 82-83 | 271,293 | 226,762 | 21.46 | 687 | 4,868,580 | 155,776,000 |
| 83-84 | 347,135 | 315,537 | 24.81 | 794 | 7,828,907 | 250,525,000 |
| 84-85** | 396,656 | 356,474 | 28.28 | 905 | 10,079,421 | 322,541,000 |

*One basket of sesame seed weighs 54 pounds.
One basket of sunflower seeds weight 32 pounds.
**Estimated data

**Table 7. Summary of Crop Production by Intensive and Extensive Townships for Crop years 1982-83, 1983-84 and 1984-85, Using 1981-82 as a Base Crop Year for Comparison.**

| Crop | Year | Acres Sown | Yield Pounds/Acre | Production MT | Increase in MT over Base Year |
|---|---|---|---|---|---|
| Maize | 81-82 | 57,000 | 1,380 | 32,050 | — |
| | 82-83 | 55,870 | 2,271 | 49,700 | 17,650 |
| | 83-84 | 84,530 | 2,259 | 77,483 | 45,443 |
| | 84-85 | 93,030 | 2,114 | 78,385 | 46,335 |
| Groundnut | 81-82 | 70,700 | 967 | 29,500 | — |
| | 82-83 | 71,940 | 1,152 | 36,877 | 7,374 |
| | 83-84 | 92,665 | 1,274 | 52,117 | 22,617 |
| | 84-85 | 105,514 | 1,296 | 60,471 | 30,971 |
| Sesame | 81-82 | 59,000 | 245 | 5,891 | — |
| | 82-83 | 61,130 | 504 | 12,058 | 6,167 |
| | 83-84 | 72,291 | 410 | 12,342 | 6,451 |
| | 84-85 | 87,405 | 451 | 15,626 | 9,735 |
| Sunflower | 81-82 | 15,000 | 669 | 4,349 | — |
| | 82-83 | 15,000 | 1,280 | 8,290 | 3,941 |
| | 83-84 | 23,375 | 1,104 | 10,425 | 6,076 |
| | 84-85 | 40,208 | 1,167 | 19,294 | 14,945 |

Table 8 presents the total production of each crop and the percentages achieved toward the Project target, from the beginning of the Project through crop year 1984-85.

**Table 8. Production Achieved Through Crop-Year 1984-85.**

| | Quantitative Goal Increased Production | Achieved Through Crop Year 1984-85 | Percent Achieved |
|---|---|---|---|
| Maize | 228,000 MT | 109,428 MT | 48 |
| Groundnuts | 87,000 MT | 60,962 MT | 70 |
| Sesame | 25,000 MT | 22,353 MT | 89 |
| Sunflower | 53,000 MT | 24,962 MT | 47 |

Average yields of oilseed crops have been increased throughout the span of the Project. This was indicated in the USAID Mid-Term Evaluation Report, February 1, 1985, as presented in Table 9.

**Table 9. Average Crop Yields in Pounds per Acre.**

| Crop | National Average 1970-80 | National Average 1981-84 | MOPP Townships 3 Years | High Tech. Sites | Prize Winning Farmers |
|---|---|---|---|---|---|
| Maize | 845 | 1,500 | 2,251 | 5,109 | 17,844 |
| Groundnuts | 716 | 993 | 1,287 | 1,786 | 11,071 |
| Sesame | 175 | 232 | 451 | 542 | 2,409 |
| Sunflower | 554 | 788 | 1,317 | 1,811 | 7,137 |

Maize has been targeted in six intensive Townships in the Mandalay, Sagaing and Irrawaddy Divisions, with a target area of 105,000 acres; also, two extensive Townships in the Sagaing and Pegu Divisions, for 24,400 acres.

Three intensive Townships in the Mandalay, Pegu and Irrawaddy Divisions, having a total area of 50,000 acres, were designated as target areas for groundnuts, as well as five extensive Townships in the Mandalay, Pegu, Sagaing, and Magwe Divisions.

Sesame has been targeted for an area of 40,000 acres in one intensive Township in the Irrawaddy Division, as well as a total area of 54,000 acres in four extensive Townships of the Irrawaddy Division and two extensive Townships in the Mandalay Division.

The target areas for sunflowers include two intensive Townships in the Mandalay Division, one extensive Township in the Sagaing Division and two extensive Townships in the Pegu Division, having a total of 44,000 acres.

Total acreages harvested and yields for maize, groundnuts, sesame and sunflowers have increased steadily through the three crop years since the beginning of the Maize and Oilseeds Production Project in 1982.

While acreage has expanded and production has increased for the project commodities, there are still technical production problems that need to be recognized and overcome.

## 7.1. GROUNDNUTS

In variety trials that have been conducted on groundnuts, Yezin 2 has given the best yields. This variety should be recommended until other varieties can produce consistently higher yields.

One line from ICRISAT, designated as ICGS (E)-14, yielded more than Yezin 2 in a variety trial that was conducted at the Kyaungsu Seed Farm. More extensive testing will be required before this cultivar can be recommended. Robut is a high yielding variety but is late (120 to 140 days).

Fertilizer trials have been conducted but yield data are not available at the present time. In most areas where groundnuts are produced, the groundnuts probably would respond to 200 pounds of gypsum, 80 pounds of phosphate, and the seeds should be inoculated with rhizobium at the rate of one packet (225 grams) per acre.

If drainage is a problem during the monsoon season, the groundnuts can be planted two rows to a bed, spaced 18 inches apart. The plants should be 4 to 8 inches apart. This system also can be used for irrigated groundnuts. The seeding rate varies from 25 to 50 pounds per acre, depending on the germination of the seed being planted.

It is advisable to rotate groundnuts with other crops to reduce the incidence of disease caused by fungi and bacteria, as well as to take advantage of the residual fertilizer.

Herbicide trials should be conducted to determine the best means of weed control as maximum yields can be attained only in a weed-free environment.

## 7.2. SESAME

In variety trials that have been conducted at the ARI/Yezin, Red Sesamum 25/160, Moehnan, Methila, Oro, Sinyadana-1 and Magwe 7/9 were the highest yielding varieties.

Spacing trials have been conducted, with the result that a spacing of 15 inches by 4 inches produced the highest yield for the Red Sesamum 25/160 and Sinyadana-1 varieties. The best spacing for the variety, Kyimashaung, was 15 inches by 2 inches, or 15 inches by 4 inches. The highest yields for the Oro variety were from spacings of 25 inches by 2 inches, or 12 inches by 4 inches.

The highest yields were obtained when 50 pounds of nitrogen were applied on one trial but the yield data were not significant over the check plot at the 5% level. It may be necessary to apply more than 50 pounds of nitrogen per acre but trials will be needed to determine the economic returns. Until more reliable data are available and soil tests have been conducted, it probably is advisable to apply 112 pounds of urea and triple superphosphate, and 28 pounds of muriate of potash per acre.

## 7.3. MAIZE

The most limiting factor for increased production of maize is the insufficient quantity of fertilizer available to maximize yields. The nitrogen source (urea) is the most limited for nonleguminous crops throughout the country, while phosphate and potassium sources (TSP and MOP, respectively) also are in short supply for some crops and/or soil types. The value of using improved seeds and varieties will depend to a great extent on the amount of fertilizer used. Only with the proper amounts of fertilizer will the improved varieties be able to perform appreciably better than the current varieties and thereby make use of their higher genetic potential.

Excessive weed growth in the early stages of growth is reducing yields by competition with the crop for soil nutrients, water, and light. This situation aggravates the shortage of fertilizer by making it even less available to the crop. Such competition is of most concern for early monsoon (in Upper Burma) and winter plantings (Upper and Lower Burma) as it is during these two planting periods that most of the maize is produced.

Herbicide use on maize during the monsoon season may be the only means of controlling weed growth if the wet conditions prevent hand weeding. Early weed control by hand weeding or herbicide application is one method of boosting production without increasing fertilizer rates.

Research conducted in the late 70's at the ARI/Yezin indicated that the herbicide use was more economical (lower cost per acre) than hand weeding of maize. The key to effective weed control is early control before weeds can utilize appreciable amounts of water and soil nutrients. The Agriculture Corporation of the SRUB should seriously consider emphasizing herbicide use in the early stages of growth in order to increase the yield potential.

Efforts must be continued to introduce and to develop new varieties specifically suited to Burmese soils and climate. The introduction of and increase of new varieties requires several years; consequently, efforts must be made now to increase seed of higher quality varieties for use by farmers in two to four years.

The use of hybrids for increasing production should be viewed as a long-term possibility, but only when proper facilities are available for storage, processing and transportation. The hybrids should be planted in areas having a very high yield potential, and in order to attain maximum yields, the optimum amounts of fertilizers must be applied. Hybrids have one distinct disadvantage as the farmers cannot replant the seed. Hybrid seed must be newly produced by knowledgeable technicians every year, and sold to the farmers on a yearly basis.

High quality seed is necessary for improving maize production. More high quality seed can be produced if incentives are offered to the farmers. A program should

be developed and initiated which will provide premium prices paid to farmers who produce high quality seed, using strict quality control and storage recommendations. Such a program, under the auspices of the Ministry of Cooperatives, has been used several years in production of groundnut seed in Burma.

## 7.4. SUNFLOWER

Sunflower populations in farmers' fields are currently too high. Worldwide sunflower research indicates that in rainfed sunflower production, populations should be maintained at 17,000 to 22,000 plants per acre. In sandy soils or areas of low rainfall and low residual moisture (Upper Burma), populations should range from 12,000 to 18,000 plants per acre. Irrigated sunflower will produce well with populations of 23,000 to 30,000 plants per acre. There is very little or no advantage in planting over 30,000 plants per acre. Higher populations are detrimental because the stalks are weaker and plants grow taller, both of which can lead to more plants falling over. The more dense populations also encourage more disease. A concerted effort must be made to instruct farmers about the correct populations to plant sunflower. The lower seeding rates also will increase the amount of yield available for oil.

The use of hybrid sunflower for increased production is a long-term possibility, specifically for areas with very high production potential, i.e., irrigated soils. Hybrids have a greater yield potential but more fertilizer must be applied in order to achieve the higher yields. The hybrid seed cannot be replanted by farmers and must be produced by qualified technicians and distributed on a yearly basis. Plans should be made for production of any appreciable quantity of seed only when storage, processing and transportation requirements have been completed, probably in about five years.

Current varieties of sunflower would benefit greatly by bee pollination. An active beekeeping program would increase sunflower production by 10 to 20 percent. A valuable result of a good beekeeping program would be the increased honey production. Large numbers of bees are required for sunflower hybrid seed production. Hybrids, however, are not as dependent on bees for high production in farmers' fields.

The Maize and Oilseeds Production Project does not currently have the capacity to produce sufficient seed for a quarter of Burma's farmers in sunflower and maize. A program of incentives, using quality control, is a feasible means for producing a sufficient quantity of high quality seed so that production can be increased.

# 8. TOWNSHIPS

Burma has seven Divisions and seven States, these being comprised of a total of 314 Townships, 127 of which are rural and are subdivided into Village Tracts.

The Maize and Oilseeds Production Project is involved with 28 Townships as target areas. Actually, there are 26 Townships, geographically, with two of the Townships having two programs each. Reference is made, generally, to 28 Townships.

The 28 Townships are divided into two categories, intensive and extensive, depending usually on the production inputs. Extension personnel are located at an average of 5 production camps per Township, and it is through this sytem that production inputs and information are handled.

It was designated in the Project Grant Agreement that "8 intensive Townships, identified as having the highest potential for increased agricultural production, will receive concentrated inputs of fertilizer, improved seed and intensified services of extension personnel. Where needed, special emphasis will also be given to irrigation and/or water management."

According to the Project Grant Agreement: "20 extensive Townships, identified as also having high potential for maize and oilseeds, will receive lesser amounts of inputs and services. While improved seed will be available for these townships, limits on fertilizer availability will require that the rate of fertilizer application be reduced by approximately one-half on Project acres in the extensive townships. Also, fewer extension personnel, trained specifically in the Project crops, will be available."

The Project Grant Agreement also specifies: "Within each intensive township there will also be approximately five (5) high technology sites or a total of approximately forty (40) such sites. Each site will have access to about five acres chosen from among participating farm units, or about 200 acres in all eight intensive townships. Extension staff of the Agriculture Corporation, assisted by researchers from the Agricultural Research Institute in Yezin, and with technical guidance from AID experts, will use the high technology sites for on-farm field testing of new technologies, and to analyze benefits, costs and implementation constraints at local levels." These high technology sites (HTS) are used for field tests and demonstrations of closely monitored applications of production inputs. Results are used for future recommendations.

Tables 10 through 13 indicate the progress of production in the intensive and extensive Township areas under the Maize and Oilseeds Production Project for crop-years 1981-82 through 1984-85.

*Fig. 40. U Kyaw Htain, Deputy Minister of Agriculture and Forestry, addressing Division and Township Managers at an annual meeting.*

*Fig. 41. Dr. Charles Simkins, USAID Agricultural Development Officer, and Dr. Ervin T. Bullard, MUCIA Team Leader, inspecting groundnuts at a High Technology Site in Singu Township.*

**Table 10. Maize and Oilseeds Production Project: Maize Production in Six Intensive Townships and Two Extensive Townships for Crop-Years 1981-82 through 1984-85.**

| Township | Year | Acres Sown | Acres Harvested | Yield/Acre Pounds | Yield/Acre Baskets* | Production MT | Production Baskets |
|---|---|---|---|---|---|---|---|
| **INTENSIVE:** | | | | | | | |
| Taze | 81-82 | 20,000 | 16,000 | 785.40 | 14.28 | 5,701 | 228,528 |
| | 82-83 | 20,008 | 13,701 | 1,901.90 | 34.58 | 11,821 | 473,826 |
| | 83-84 | 21,563 | 16,595 | 1,921.15 | 34.93 | 14,460 | 579,615 |
| | 84-85 | 21,465 | 16,735 | 2,090.00 | 38.00 | 15,865 | 635,930 |
| Tatkon | 81-82 | 7,500 | 7,125 | 1,713.80 | 31.16 | 5,538 | 222,000 |
| | 82-83 | 7,199 | 6,839 | 2,674.65 | 48.63 | 8,295 | 332,500 |
| | 83-84 | 9,250 | 9,000 | 2,860.00 | 52.00 | 11,676 | 468,000 |
| | 84-85 | 14,206 | 12,920 | 1,925.00 | 35.00 | 11,281 | 452,200 |
| Lewe | 81-82 | 7,500 | 7,125 | 1,640.10 | 29.82 | 5,301 | 212,500 |
| | 82-83 | 7,507 | 7,130 | 2,585.00 | 47.00 | 8,361 | 335,130 |
| | 83-84 | 8,707 | 8,371 | 3,000.25 | 54.55 | 11,392 | 456,638 |
| | 84-85 | 10,498 | 9,553 | 2,008.00 | 36.50 | 8,699 | 348,680 |
| Pyinmana | 81-82 | 10,000 | 9,500 | 1,939.30 | 35.26 | 8,358 | 335,000 |
| | 82-83 | 9,156 | 8,698 | 2,750.00 | 50.00 | 10,850 | 434,900 |
| | 83-84 | 12,025 | 11,424 | 3,028.85 | 55.07 | 15,695 | 629,120 |
| | 84-85 | 17,150 | 15,840 | 2,035.00 | 37.00 | 14,621 | 586,080 |
| Zalun | 81-82 | 12,000 | 11,637 | 1,354.65 | 24.63 | 7,151 | 286,652 |
| | 82-83 | 12,000 | 11,880 | 1,925.00 | 35.00 | 10,373 | 415,800 |
| | 83-84 | 13,000 | 12,748 | 1,925.00 | 35.00 | 11,131 | 446,180 |
| | 84-85 | 14,500 | 13,775 | 2,420.00 | 44.00 | 15,121 | 606,100 |
| Maubin | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | 1,205 | 1,182 | 1,540.00 | 28.00 | 826 | 33,096 |
| | 84-85 | 4,000 | 3,860 | 2,640.00 | 48.00 | 4,622 | 185,280 |
| **INTENSIVE TOTAL:** | | | | | | | |
| | 81-82 | 57,000 | 51,387 | 1,375.00 | 25.00 | 32,050 | 1,284,680 |
| | 82-83 | 55,870 | 48,248 | 2,270.95 | 41.29 | 49,700 | 1,992,156 |
| | 83-84 | 65,750 | 59,320 | 2,422.00 | 44.04 | 65,180 | 2,612,649 |
| | 84-85 | 81,819 | 72,683 | 2,130.00 | 38.72 | 70,210 | 2,814,270 |
| **EXTENSIVE:** | | | | | | | |
| Kanbalu | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | 18,780 | 16,281 | 1,660.45 | 30.19 | 12,303 | 493,151 |
| | 84-85 | 10,000 | 7,880 | 1,952.50 | 35.50 | 69,789 | 279,740 |
| Letpadan | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | — | — | — | — | — | — |
| | 84-85 | 1,211 | 1,142 | 2,268.75 | 41.25 | 1,175 | 47,110 |

| Township | Year | Acres Sown | Acres Harvested | Yield/Acre Pounds | Yield/Acre Baskets* | Production MT | Production Baskets |
|---|---|---|---|---|---|---|---|
| **EXTENSIVE TOTAL:** | | | | | | | |
| | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | 18,780 | 16,281 | 1,660.45 | 30.19 | 12,303 | 493,151 |
| | 84-85 | 11,211 | 9,022 | 1,993.00 | 36.23 | 8,154 | 326,850 |
| **MAIZE TOTAL:** | | | | | | | |
| | 81-82 | 57,000 | 51,387 | 1,375.00 | 25.00 | 32,050 | 1,284,680 |
| | 82-83 | 55,870 | 48,248 | 2,270.95 | 41.29 | 49,700 | 1,992,156 |
| | 83-84 | 84,530 | 75,601 | 2,259.40 | 41.08 | 77,483 | 3,105,800 |
| | 84-85 | 93,030 | 81,705 | 2,114.00 | 38.44 | 78,364 | 3,141,120 |

*One basket of shelled maize weighs 55 pounds.

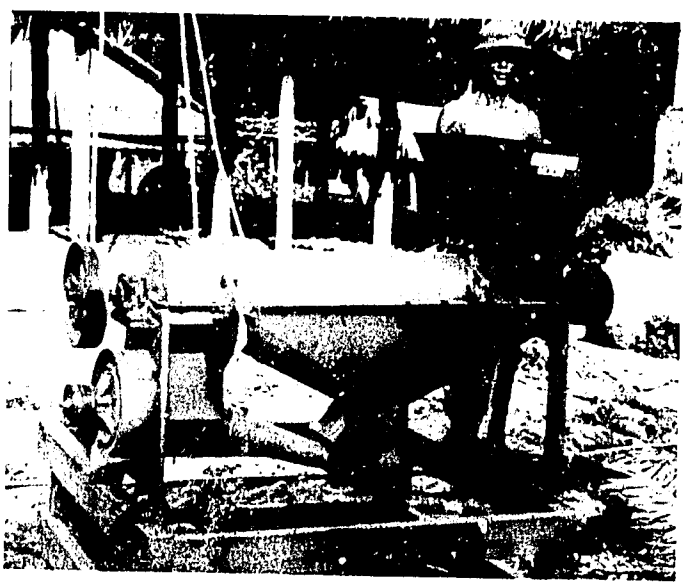


*Fig. 42. A corn sheller on a farm in Pyinmana Township.*

*Fig. 43. U Ba Thaung, Assistant Project Director, MOPP; Dr. E.T. Bullard, MUCIA Team Leader; U Thein Pe, Deputy Farm Manager; and U Sein Win, Assistant Farm Manager; inspecting groundnuts at the Chaungmagyi Seed Farm.*

**Table 11. Maize and Oilseeds Production Project: Groundnut Production in Three Intensive Townships and Five Extensive Townships for Crop-Years 1981-82 through 1984-85.**

| Township | Year | Acres Sown | Acres Harvested | Yield/Acre Pounds | Yield/Acre Baskets* | Production MT | Production Baskets |
|---|---|---|---|---|---|---|---|
| **INTENSIVE:** | | | | | | | |
| Singu | 81-82 | 7,500 | 7,165 | 975 | 39.00 | 3,170 | 279,435 |
| | 82-83 | 17,239 | 16,848 | 1,353 | 54.10 | 10,339 | 911,452 |
| | 83-84 | 17,053 | 16,200 | 1,500 | 60.00 | 11,022 | 972,000 |
| | 84-85 | 17,253 | 15,952 | 1,550 | 62.00 | 11,216 | 989,030 |
| Daik-U | 81-82 | 15,000 | 14,700 | 993 | 39.70 | 6,620 | 583,645 |
| | 82-83 | 12,043 | 11,633 | 1,127 | 45.07 | 5,947 | 524,298 |
| | 83-84 | 14,000 | 13,840 | 1,391 | 55.63 | 10,999 | 769,920 |
| | 84-85 | 16,000 | 15,848 | 1,400 | 56.00 | 10,054 | 887,490 |
| Yandoon | 81-82 | 15,000 | 14,250 | 956 | 38.25 | 6,182 | 545,060 |
| | 82-83 | 10,114 | 9,608 | 1,125 | 45.00 | 4,904 | 432,360 |
| | 83-84 | 11,000 | 10,780 | 1,081 | 43.25 | 5,287 | 466,235 |
| | 84-85 | 12,500 | 12,248 | 1,205 | 48.20 | 6,695 | 590,360 |
| **INTENSIVE TOTAL:** | | | | | | | |
| | 81-82 | 37,500 | 36,115 | 975 | 38.99 | 15,973 | 1,408,140 |
| | 82-83 | 39,396 | 38,089 | 1,226 | 49.05 | 21,190 | 1,868,110 |
| | 83-84 | 42,053 | 40,820 | 1,352 | 54.09 | 25,047 | 2,208,155 |
| | 84-85 | 45,753 | 44,048 | 1,400 | 56.00 | 27,982 | 2,466,880 |
| **EXTENSIVE** | | | | | | | |
| Magwe | 81-82 | 30,000 | 28,000 | 958 | 38.30 | 12,164 | 1,072,400 |
| | 82-83 | 29,344 | 29,165 | 1,050 | 42.00 | 13,894 | 1,224,930 |
| | 83-84 | 30,000 | 29,200 | 1,125 | 45.00 | 14,905 | 1,314,000 |
| | 84-85 | 30,000 | 29,810 | 1,150 | 46.00 | 15,554 | 1,371,260 |
| Kyauktaga | 81-82 | 3,200 | 3,140 | 963 | 38.50 | 1,371 | 120,890 |
| | 82-83 | 3,200 | 3,140 | 1,200 | 48.00 | 1,710 | 150,720 |
| | 83-84 | 5,200 | 5,050 | 1,251 | 50.05 | 2,867 | 252,752 |
| | 84-85 | 6,480 | 6,415 | 1,275 | 51.00 | 3,711 | 327,170 |
| Myaung | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | 11,412 | 11,150 | 1,475 | 59.00 | 7,462 | 657,850 |
| | 84-85 | 13,281 | 12,811 | 1,450 | 58.00 | 8,428 | 743,040 |
| Natmauk | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | 4,000 | 3,977 | 1,025 | 41.01 | 1,850 | 163,096 |
| | 84-85 | 4,000 | 3,980 | 1,125 | 45.00 | 2,032 | 179,100 |
| Tatkon | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | — | — | — | — | — | — |
| | 84-85 | 6,000 | 5,802 | 1,050 | 42.00 | 2,764 | 243,680 |

| Township | Year | Acres Sown | Acres Harvested | Yield/Acre Pounds | Yield/Acre Baskets* | Production MT | Production Baskets |
|---|---|---|---|---|---|---|---|
| **EXTENSIVE TOTAL:** | | | | | | | |
| | 81-82 | 33,200 | 31,140 | 958 | 38.32 | 13,535 | 1,193,290 |
| | 82-83 | 32,544 | 32,305 | 1,065 | 42.58 | 15,604 | 1,375,650 |
| | 83-84 | 50,612 | 49,377 | 1,209 | 48.36 | 27,084 | 2,387,698 |
| | 84-85 | 59,761 | 58,818 | 1,217 | 48.70 | 32,489 | 2,864,250 |
| **GROUNDNUT TOTAL:** | | | | | | | |
| | 81-82 | 70,700 | 67,255 | 967 | 38.68 | 29,508 | 2,601,430 |
| | 82-83 | 71,940 | 70,394 | 1,152 | 46.08 | 36,794 | 3,243,760 |
| | 83-84 | 92,665 | 90,197 | 1,329 | 53.17 | 52,131 | 4,595,853 |
| | 84-85 | 105,514 | 102,866 | 1,296 | 51.83 | 60,471 | 5,331,130 |

*One basket of unshelled groundnuts weighs 25 pounds.*

**Table 12. Maize and Oilseeds Production Project: Sesame Production in One Intensive Township and Six Extensive Townships for Crop-Years 1981-82 through 1984-85.**

| Township | Year | Acres Sown | Acres Harvested | Yield/Acre Pounds | Yield/Acre Baskets* | Production MT | Production Baskets |
|---|---|---|---|---|---|---|---|
| **INTENSIVE:** | | | | | | | |
| Moulmeingyun | 81-82 | 34,000 | 29,874 | 249 | 4.61 | 3,373 | 137,700 |
| | 82-83 | 34,000 | 29,400 | 508 | 9.40 | 6,771 | 276,388 |
| | 83-84 | 36,000 | 33,998 | 390 | 7.22 | 6,012 | 245,431 |
| | 84-85 | 38,150 | 35,500 | 460 | 8.52 | 7,410 | 302,460 |
| **INTENSIVE TOTAL** | | | | | | | |
| | 81-82 | 34,000 | 29,874 | 249 | 4.61 | 3.373 | 137,700 |
| | 82-83 | 34,000 | 29,400 | 508 | 9.40 | 6,771 | 276,388 |
| | 83-84 | 36,000 | 33,998 | 390 | 7.22 | 6,013 | 245,431 |
| | 84-85 | 38,150 | 35,500 | 460 | 8.52 | 7,410 | 302,460 |
| **EXTENSIVE** | | | | | | | |
| Myittha | 81-82 | 3,000 | 2,700 | 281 | 5.20 | 344 | 14,025 |
| | 82-83 | 3,000 | 2,600 | 648 | 12.00 | 765 | 31,200 |
| | 83-84 | 6,658 | 4,734 | 324 | 6.00 | 696 | 28,404 |
| | 84-85 | 6,205 | 3,286 | 378 | 7.00 | 784 | 23,000 |
| Kyaukse | 81-82 | 10,000 | 9,000 | 259 | 4.80 | 1,058 | 43,175 |
| | 82-83 | 10,000 | 8,700 | 594 | 11.00 | 2,345 | 95,700 |
| | 83-84 | 10,000 | 8,970 | 571 | 10.58 | 2,324 | 94,860 |
| | 84-85 | 12,000 | 7,800 | 540 | 10.00 | 1,911 | 78,000 |
| Wakema | 81-82 | 12,000 | 11,400 | 216 | 4.00 | 1,117 | 45,600 |
| | 82-83 | 14,130 | 12,063 | 399 | 7.38 | 2,180 | 88,991 |
| | 83-84 | 14,000 | 13,300 | 405 | 7.50 | 2,443 | 99,750 |
| | 84-85 | 15,000 | 14,230 | 486 | 9.00 | 3,137 | 128,070 |
| Maubin | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | 2,633 | 2,475 | 324 | 6.00 | 364 | 14,850 |
| | 84-85 | 8,000 | 7,680 | 356 | 6.60 | 1,242 | 50,700 |
| Henzada | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | 3,000 | 2,940 | 378 | 7.00 | 504 | 20,580 |
| | 84-85 | 5,000 | 4,800 | 432 | 8.00 | 941 | 38,400 |
| Kyaunggone | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | — | — | — | — | — | — |
| | 84-85 | 3,050 | 3,010 | 308 | 5.70 | 420 | 17,160 |
| **EXTENSIVE TOTAL:** | | | | | | | |
| | 81-82 | 25,000 | 23,100 | 240 | 4.45 | 2,518 | 102,800 |
| | 82-83 | 27,130 | 23,363 | 499 | 9.24 | 5,289 | 215,891 |
| | 83-84 | 36,291 | 32,419 | 430 | 7.97 | 6,332 | 258,444 |
| | 84-85 | 49,255 | 40,806 | 443 | 8.21 | 8,216 | 335,330 |
| **SESAME TOTAL** | | | | | | | |
| | 81-82 | 59,000 | 52,974 | 245 | 4.54 | 5,891 | 240,500 |
| | 82-83 | 61,130 | 52,763 | 504 | 9.33 | 12,061 | 492,279 |
| | 83-84 | 72,291 | 66,417 | 410 | 7.39 | 12,345 | 503,875 |
| | 84-85 | 87,405 | 76,306 | 451 | 8.36 | 15,626 | 637,790 |

**One basket of sesame seed weighs 54 pounds.*

**Table 13. Maize and Oilseeds Production Project: Sunflower Production in Two Intensive Townships and Three Extensive Townships for Crop-Years 1981-82 through 1984-85.**

| Township | Year | Acres Sown | Acres Harvested | Yield/Acre Pounds | Yield/Acre Baskets* | Production MT | Production Baskets |
|---|---|---|---|---|---|---|---|
| **INTENSIVE:** | | | | | | | |
| Yamethin | 81-82 | 7,500 | 7,168 | 669 | 20.90 | 2,175 | 149,810 |
| | 82-83 | 7,500 | 7,139 | 1,280 | 40.00 | 4,145 | 285,565 |
| | 83-84 | 10,575 | 9,500 | 1,120 | 35.00 | 4,826 | 332,500 |
| | 84-85 | 13,008 | 10,639 | 1,216 | 38.00 | 5,870 | 404,280 |
| Pyawbwe | 81-82 | 7,500 | 7,168 | 669 | 20.90 | 2,175 | 149,810 |
| | 82-83 | 7,500 | 7,139 | 1,280 | 40.00 | 4,145 | 285,565 |
| | 83-84 | 10,000 | 8,700 | 1,216 | 38.00 | 4,420 | 304,500 |
| | 84-85 | 16,000 | 15,600 | 1,298 | 40.56 | 9,184 | 632,740 |
| **INTENSIVE TOTAL:** | | | | | | | |
| | 81-82 | 15,000 | 14,336 | 644 | 20.13 | 4,350 | 299,620 |
| | 82-83 | 15,000 | 14,278 | 1,280 | 40.00 | 8,290 | 571,130 |
| | 83-84 | 20,575 | 18,200 | 1,120 | 35.00 | 9,246 | 637,000 |
| | 84-85 | 29,008 | 26,239 | 1,265 | 39.52 | 15,052 | 1,037,020 |
| **EXTENSIVE** | | | | | | | |
| Budalin | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | 2,800 | 2,620 | 992 | 31.00 | 1,179 | 81,220 |
| | 84-85 | 4,600 | 4,268 | 967 | 30.22 | 1,872 | 129,000 |
| Okpo | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | — | — | — | — | — | — |
| | 84-85 | 300 | 266 | 832 | 26.00 | 100 | 6,920 |
| Kyauktaga | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | — | — | — | — | — | — |
| | 84-85 | 6,300 | 5,670 | 880 | 27.50 | 2,263 | 155,710 |
| **EXTENSIVE TOTAL:** | | | | | | | |
| | 81-82 | — | — | — | — | — | — |
| | 82-83 | — | — | — | — | — | — |
| | 83-84 | 2,800 | 2,620 | 992 | 31.00 | 1,179 | 81,220 |
| | 84-85 | 11,200 | 10,204 | 915 | 28.60 | 4,236 | 291,830 |
| **SUNFLOWER TOTAL** | | | | | | | |
| | 81-82 | 15,000 | 14,336 | 669 | 20.90 | 4,349 | 299,620 |
| | 82-83 | 15,000 | 14,728 | 1,280 | 40.00 | 8,290 | 571,130 |
| | 83-84 | 23,375 | 20,820 | 1,104 | 34.50 | 10,425 | 718,220 |
| | 84-85 | 40,208 | 36,443 | 1,167 | 36.46 | 19,288 | 1,328,850 |

**One basket of sunflower seed weighs 32 pounds.*

*Fig. 44. U Tin Hlaing, General Manager/Extension, Agriculture Corporation, Dr. E.T. Bullard, MUCIA Team Leader, Dr. Charles Simkins, USAID Agricultural Development Officer and Mr. Charles Ward, USAID Representative to Burma, inspecting a field of sesame grown for seed in the Irrawaddy Division.*

*Fig. 45. Sunfola sunflower field.*

Tables 14 through 17 indicate the acreages and average yields for the High Technology Sites in the Intensive townships.

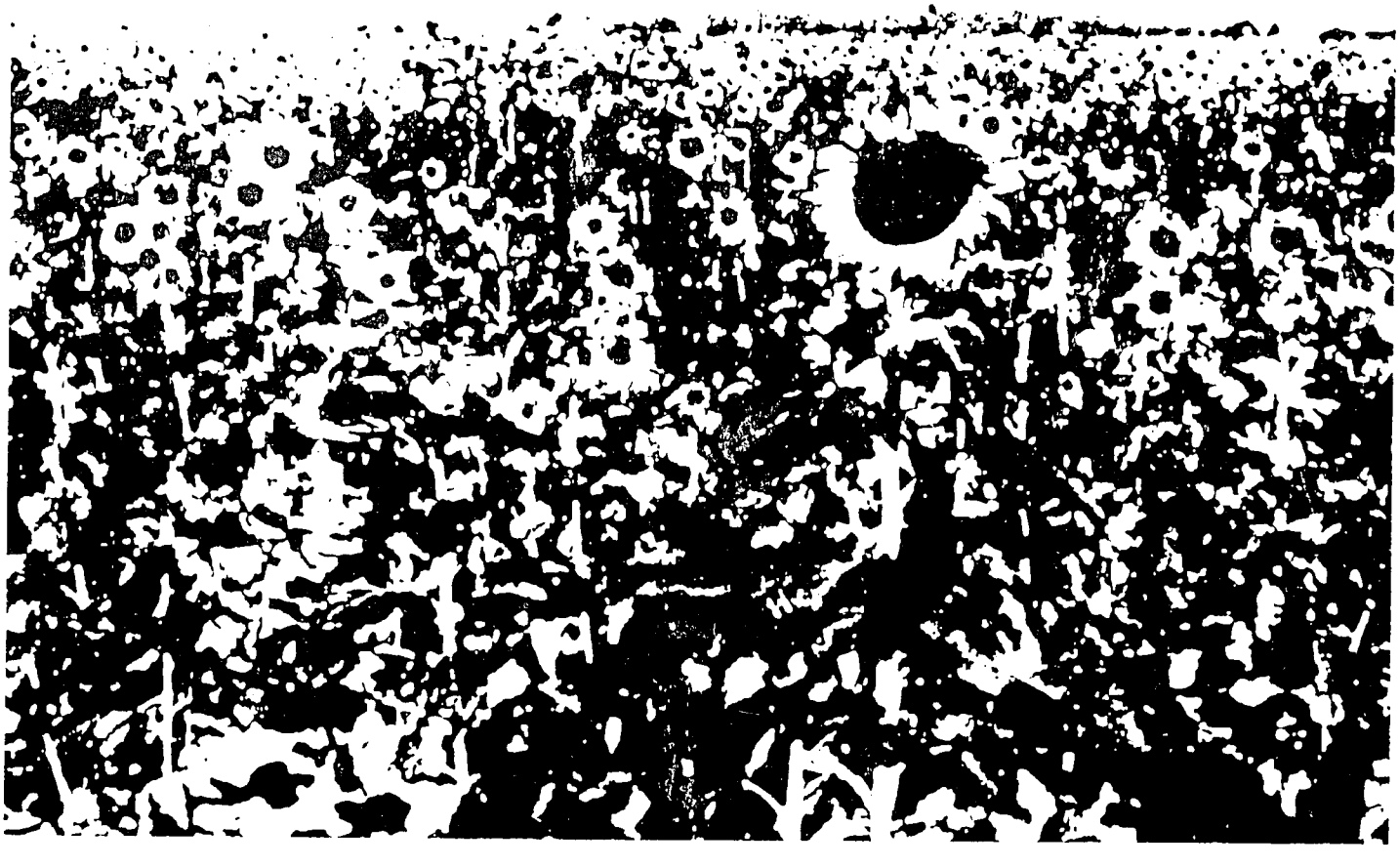


**Table 14. Maize and Oilseeds Production Project: Maize Production at High Technology Sites in Intensive Townships for Crop-Years 1982-83 through 1984-85.**

| Township/HTS | Year | Number of HTS Sites | Number of Acres | Yield Pounds/Acre |
|---|---|---|---|---|
| Taze | 82-83 | 4 | 20 | 3,006 |
| | 83-84 | 5 | 50 | 4,546 |
| | 84-85 | 4 | 20 | 5,156 |
| Kanbalu | 82-83 | — | — | — |
| | 83-84 | 5 | 50 | 6,221 |
| | 84-85 | 2 | 10 | 3,108 |
| Tatkon | 82-83 | — | — | — |
| | 83-84 | 4 | 20 | 5,940 |
| | 84-85 | 4 | 20 | 2,970 |
| Pyinmana | 82-83 | 4 | 20 | 3,658 |
| | 83-84 | 5 | 25 | 8,565 |
| | 84-85 | 4 | 20 | 5,577 |
| Lewe | 82-83 | 3 | 15 | 4,554 |
| | 83-84 | 4 | 40 | 6,215 |
| | 84-85 | 4 | 20 | 6,039 |
| Zalun | 82-83 | — | — | — |
| | 83-84 | 4 | 20 | 3,069 |
| | 84-85 | 4 | 20 | 4,081 |
| Maubin | 82-83 | — | — | — |
| | 83-84 | 2 | 10 | 3,080 |
| | 84-85 | 4 | 20 | 2,825 |

**Table 15. Maize and Oilseeds Production Project: Groundnut Acreages and Yields at High Technology Sites for Crop-Years 1982-83 through 1984-85.**

| Township/HTS | Year | Number of HTS Sites | Number of Acres | Yield Pounds/Acre |
|---|---|---|---|---|
| Magwe | 82-83 | — | — | — |
| | 83-84 | 3 | 30 | 1,876 |
| | 84-85 | 2 | 10 | 1,495 |
| Natmauk | 82-83 | — | — | — |
| | 83-84 | 1 | 10 | 1,713 |
| | 84-85 | 2 | 20 | 1,498 |
| Tatkon | 82-83 | — | — | — |
| | 83-84 | 2 | 20 | 1,291 |
| | 84-85 | 2 | 20 | 1,483 |
| Singu | 82-83 | 3 | 15 | 1,833 |
| | 83-84 | 4 | 20 | 1,976 |
| | 84-85 | 4 | 20 | 1,736 |
| Myaung | 82-83 | — | — | — |
| | 83-84 | 2 | 10 | 1,425 |
| | 84-85 | 2 | 10 | 1,525 |
| Daik-U | 82-83 | 4 | 20 | 1,661 |
| | 83-84 | 2 | 10 | 1,548 |
| | 84-85 | 4 | 20 | 1,661 |
| Yandoon | 82-83 | 3 | 15 | 1,940 |
| | 83-84 | 3 | 15 | 1,878 |
| | 84-85 | 4 | 20 | 1,948 |

**Table 16. Maize and Oilseeds Production Project: Sesame Acreages and Yields at High Technology Sites for Crop-Years 1982-83 through 1984-85.**

| Township/HTS | Year | Number of HTS Sites | Number of Acres | Yield Pounds/Acre |
|---|---|---|---|---|
| Myittha | 82-83 | 1 | 5 | 1,199 |
| | 83-84 | 1 | 5 | 1,372 |
| | 84-85 | 2 | 10 | 1,588 |
| Kyaukse | 82-83 | 1 | 5 | 972 |
| | 83-84 | 1 | 5 | 1,053 |
| | 84-85 | 1 | 5 | 864 |
| Moulmeingyun | 82-83 | 3 | 15 | 1,000 |
| | 83-84 | 4 | 20 | 854 |
| | 84-85 | 4 | 20 | 824 |
| Wakema | 82-83 | — | — | — |
| | 83-84 | 2 | 10 | 767 |
| | 84-85 | 2 | 10 | 783 |
| Henzada | 82-83 | — | — | — |
| | 83-84 | — | — | — |
| | 84-85 | 2 | 10 | 594 |
| Maubin | 82-83 | — | — | — |
| | 83-84 | 2 | 10 | 389 |
| | 84-85 | 2 | 10 | 581 |
| Kyaunggone | 82-83 | — | — | — |
| | 83-84 | — | — | — |
| | 84-85 | 2 | 10 | 543 |

**Table 17. Maize and Oilseeds Production Project: Sunflower Acreages and Yields at High Technology sites for Crop-Years 1982-83 through 1984-85.**

| Township/HTS | Year | Number of HTS Sites | Number of Acres | Yield Pounds/Acre |
|---|---|---|---|---|
| Budalin | 82-83 | — | — | — |
| | 83-84 | — | — | — |
| | 84-85 | 2 | 10 | 1,120 |
| Pyawbwe | 82-83 | 1 | 5 | 2,560 |
| | 83-84 | 2 | 20 | 924 |
| | 84-85 | 3 | 15 | 1,441 |
| Yamethin | 82-83 | 3 | 15 | 1,490 |
| | 83-84 | 3 | 15 | 2,437 |
| | 84-85 | 3 | 15 | 1,724 |
| Okpo | 82-83 | — | — | — |
| | 83-84 | — | — | — |
| | 84-85 | 1 | 5 | 1,440 |

A comparison was made between the HTS yields per acre and the township average yields in the MOPP Review, January 1985, Appendix H, showing that for the three crop years, 1982 to 1984, yields were increased for all the crops concerned, using high technology practices. The value of the increased crop yields are at least three times the cost of the fertilizer used.

The average yields per acre for each crop grown at the High Technology Sites are presented in Table 18 for crop years 1982-83 through 1984-85. The comparison of yields between High Technology Sites and Township averages, as stated in the USAID Evaluation Report, February 1, 1985, follows in Table 19. The Evaluation Report also presented information concerning the monetary value of the average yield increases for the four crops involved, of the High Technology sites over the Township averages, for three crop years from 1982-83 through 1984-85, which is in Table 20.

Fertilizers were applied at the following rates (pounds per acre) at the HTS sites:

| | Urea (lb.) | TSP (lb.) | MP (lb.) |
|---|---|---|---|
| Maize | 168 | 112 | 56 |
| Groundnut | 28 | 224 | 112 + 1 bag rhizobium |
| Sesame | 112 | 56 | 28 |
| Sunflower | 112 | 56 | 56 |

**Table 18. Average Yields for Maize, Groundnuts, Sesame and Sunflowers Grown at the High Technology Sites for Crop-Years 1982-83, 1983-84 and 1984-85.**

| Crop | Year | No. of Townships | No. of Sites | No. of Acres | Average Yield Pounds/Acre |
|---|---|---|---|---|---|
| Maize | 82-83 | 3 | 11 | 55 | 3,665 |
| | 83-84 | 7 | 29 | 215 | 5,637 |
| | 84-85 | 7 | 26 | 130 | 4,339 |
| Groundnut (Monsoon) | 82-83 | — | — | — | — |
| | 83-84 | 3 | 6 | 60 | 1,654 |
| | 84-85 | 3 | 6 | 50 | 1,491 |
| Groundnut (Winter) | 82-83 | 3 | 10 | 50 | 1,796 |
| | 83-84 | 4 | 11 | 55 | 1,771 |
| | 84-85 | 4 | 14 | 70 | 1,745 |
| Sesame | 82-83 | 3 | 5 | 25 | 1,034 |
| | 83-84 | 5 | 10 | 50 | 815 |
| | 84-85 | 7 | 15 | 75 | 823 |
| Sunflower | 82-83 | 2 | 4 | 20 | 1,758 |
| | 83-84 | 2 | 5 | 35 | 1,572 |
| | 84-85 | 4 | 9 | 45 | 1,464 |

*Fig. 46. U Siang Uk, Deputy Project Director, MOPP, discussing weed control for maize in Tatkon Township.*

**Table 19. Yield Differences Between Average Yields on High Technology Sites on Farmers' Fields and Township Averages.**

| Crop | Year | Avg. Yield/HTS Pounds/Acre | Avg. Yield/Township Pounds/Acre | Increased Yield Pounds/Acre |
|---|---|---|---|---|
| Maize | 82-83 | 3,410 | 2,271 | 1,139 |
| | 83-84 | 5,270 | 2,259 | 4,011 |
| | 84-85* | 3,905 | 2,202 | 1,703 |
| Average | | 4,528 | 2,244 | 2,284 |
| Groundnuts | 82-83 | 1,800 | 1,152 | 648 |
| | 83-84 | 2,100 | 1,274 | 826 |
| | 84-85* | 1,825 | 1,398 | 427 |
| Average | | 1,908 | 1,275 | 634 |
| Sesame | 82-83 | 702 | 504 | 198 |
| | 83-84 | 497 | 410 | 87 |
| | 84-85* | 567 | 446 | 121 |
| Average | | 589 | 453 | 135 |
| Sunflower | 82-83 | 1,744 | 1,280 | 464 |
| | 83-84 | 1,856 | 1,104 | 752 |
| | 84-85* | 2,240 | 1,473 | 767 |
| Average | | 1,947 | 1,286 | 661 |

**1984-85 monsoon crop only.*

**Table 20. Value of Yield Increases of High Technology Sites over Township Averages for Three years, 1982 to 1984, Inclusive. (Source: USAID Evaluation Reports, February 1, 1985.)**

| Yield Increase | Gross Value of Yield Increase | Fertilizer Cost | | Net Value of Yield Increases | | |
|---|---|---|---|---|---|---|
| Crop and Pounds/Acre | Kyat | Subsidized Kyat | Free Kyat | Subs. Kyat | Free Kyat | Free $ |
| MAIZE: 2,284 | 1,028 | 40 | 171 | 988 | 857 | 98 |
| GROUNDNUT: 634 | 1,420 | 98 | 355 | 1,322 | 1,065 | 122 |
| SESAME: 135 | 285 | 13 | 61 | 272 | 224 | 25 |
| SUNFLOWER: 661 | 1,031 | 20 | 86 | 1,011 | 945 | 109 |

1. Assumed values:

| | |
|---|---|
| Maize | K 0.45 per pound |
| Groundnut | K 2.24 per pound |
| Sesame | K 2.11 per pound |
| Sunflower | K 1.56 per pound |

K 8.70 = $1.00

2. Subsidized fertilizer prices:

| | |
|---|---|
| Urea | K 0.18 per pound |
| Triple superphosphate (TSP) | K 0.39 per pound |
| Muriate of potash (MP) | K 0.27 per pound |

3. "Free" market fertilizer prices:

| | |
|---|---|
| Urea | K 1.3 per pound |
| Triple superphosphate (TSP) | K 1.3 per pound |
| Muriate of potash (MP) | K 0.9 per pound |

4. Fertilizer rates of HTS *in excess* of the rate for Intensive Townships:

| Crop | Urea | TSP | MP |
|---|---|---|---|
| Maize | 56 lb | 56 lb | 28 lb |
| Groundnut | 28 lb | 168 lb | 112 lb + 1 bag rhizobium |
| Sesame | 28 lb | 0 lb | 28 lb |
| Sunflower | 28 lb | 0 lb | 56 lb |

The farmers have received instruction on fertilizer application in the Intensive Townships, generally using the following number of pounds per acre:

| Crop | Urea | TSP | MP |
|---|---|---|---|
| Maize | 112 lb | 56 lb | 28 lb |
| Groundnuts | 28 lb | 56 lb | 0 lb |
| Sesame | 84 lb | 56 lb | 0 lb |
| Sunflower | 84 lb | 56 lb | 0 lb |

Typical rates in the Extensive Townships have been:

| | | |
|---|---|---|
| Maize | 84 lb Urea | 28 lb TSP |
| Groundnuts | 14 lb Urea | 56 lb TSP |
| Sesame | 56 lb Urea | 28 lb TSP |
| Sunflower | 56 lb Urea | 56 lb TSP |

# 9. MAIZE AND OILSEED CROPS

In order to gain highest possible yields of maize and oilseed crops, it is necessary to make recommendations based on reliable results of research trials.

Since there was a scarcity of such information available, several trials have been set up for the various crops.

Maize variety and hybrid trials were established in 1984 at the Thitcho and Chaungmagyi Seed Farms to determine which varieties and hybrids produce the highest yields. The following were used in this trial:

| | |
|---|---|
| HYCORN 9 | hybrid |
| Shewar 4 | variety |
| Shewar 8 | variety |
| Shewar 9 | variety |

Groundnut variety trials were set up in 1984 at the Chaungmagyi and Sebin Seed Farms to determine what varieties produce the highest yields under different environmental areas, using:

No. 15626
Taiwan MH 026
Tainung 2
RCM—387
Natal Common
Tainan 9
Moket
Panjab
Yezin 2
M—10

Another groundnut variety trial was carried out at the Kyaungsu Seed Farm in 1984, using 34 varieties.

There was a sesame variety trial in 1984 at the Sebin Seed Farm, using the following varieties:

Oro
Improved Baco
Eva
Margo
UCR-3-RA-12
Yoru—77
Hnyun Ni

A fertilizer trial on sesame also was carried out in 1984 at the Sebin Seed Farm, to determine if there were yield responses to nitrogen, phosphorus and potassium, using various rates of urea, triple superphosphate and muriate of potash.

Sunflower variety and hybrid trials were established in 1984 at the Sebin, Chaungmagyi and Kyaungsu Seed Farms, to determine which varieties produced the highest yields under different environmental areas. The following were used:

Hysun 31
Husun 32
Sunfola
Chernianka
Peredovik

Pollination trials were carried out in 1984 at the Sebin and Chaungmagyi Seed Farms, using the following types of pollination:

1. Rubbing the heads together to pollinate
2. Hand pollinating with a leaf
3. Hand pollinating with a brush
4. Insect pollination

Maize variety trials were carried in 1984-85 at the Chaungmagyi and Sebin Seed Farms, to determine which varieties would produce the highest yields, using seed received from the Agricultural Research Institute:

| | |
|---|---|
| IPB Var 1 | |
| Guarare (1) 8128 | |
| Across 7940 | |
| Ferke (1) 7928 | |
| Poza Rica 7940 | |
| Suwan 2 (S) C5, F2 | |
| La Calera (1) 7728—(1) | (Shewar 1) |
| Indonesian Early | (Shewar 4) |
| Across 7835 | (Shewar 8) |
| Pichilingue 7835 | (Shewar 9) |
| Tatkon X 1 | |

A groundnut variety trial was planted at the Kyaungsu Seed Farm in September, 1984, to determine the best yielding varieties, using 32 lines selected for earliness at ICRISAT, also Yezin 2.

Maize variety trials were set up in 1985 at the Applied Research Division (ARD) farm at Heho in Shan State and at an ARD farm in Chin State, using seed received from CIMMYT in Mexico:

Across 8149
Across 8121
Across 7842
Across 8047
Across 7948
Across 8134
Sids 8344
Suwan 1

Maize fertilizer trials were carried out at the four MOPP seed farms in 1985 to determine what plant nutrients increase the yields, using:

Urea
Triple superphosphate
Muriate of potash
Zinc
Magnesium sulfate
Manganese sulfate

Fertilizer trials were set up for maize for the monsoon 1985 season at the Thitcho and Caungmagyi Seed Farms to determine the optimum levels of N and P to apply, using urea and triple superphosphate at different rates.

Early monsoon weed control trials were set up for maize in 1985 at the Thitcho and Chaungmagyi Seed Farms, using:

Atrazine 4L
Atrazine 4L + Dual
Atrazine 4L + Lasso
Atrazine 4L + Crop oil

Groundnut variety trials were set up in 1985 at the ARD farm at Magwe and at the Agricultural Research Institute, Yezin, to determine which are the best producing varieties under different environmental conditions, using:

NC 6
NC 7
NC 17404
NC 8
NC 2
Yezin 2
M-10
M-12

Groundnut fertilizer trials were put out in 1985 at the Chaungmagyi, Sebin, Kyaungsu and Thitcho Seed Farms, in order to try to determine the optimum levels of triple superphosphate to apply at these locations, using:

Urea
Triple superphosphate
Muriate of potash
Gypsum
Zinc sulfate
Magnesium sulfate
Manganese sulfate
Rhizobium

A sesame fertilizer trial was established at the Sebin Seed Farm in 1985 to determine the optimum level of nitrogen for sesame production at that location, using various levels of urea.

Another fertilizer trial on sesame was put out at the Sebin Seed Farm in 1985, using various levels of urea, triple superphosphate and muriate of potash.

A weed control experiment for sesame is being carried out at the Sebin Seed Farm during the monsoon 1985 season, to determine the most economical way to control weeds, using:

Treflan
Dual
Lasso
Surflan 4
Blaser
Basagran
Hand weeding
Check

Pollination trials on sunflowers were carried out at the Sebin and Chaungmagyi Seed Farms in 1985 to determine if yield can be increased economically by hand pollination, using the following systems for pollinating:

1. A.M.
2. P.M.
3. A.M. and P.M.
4. A.M. every other day
5. P.M. every other day
6. A.M. and P.M. every other day
7. Insect pollination (Check)

Fertilizer trials on sunflowers were carried out in 1985 to determine which plant nutrients increase yields, using:

Urea
Triple superphosphate
Muriate of potash
Zinc
Magnesium sulfate
Manganese sulfate

---

Two oilseed crop observation trials were established in 1985 at the Sebin Seed Farm. Trial 1 was to determine which varieties of mustard and rape produced the highest yields and Trial 2 was to determine the highest yielding safflower variety. The following varieties were used:

| | | | |
|---|---|---|---|
| **Trial 1:** | **Black Mustard** | | **USSR 29-316** |
| | **Black Mustard** | | **Hungary 36-460** |
| | **Indian Mustard** | **Gangi 2094** | **Czechoslovakia** |
| | **Indian Mustard** | **Neosypajuscajasja** | **USSR** |
| | **Indian Mustard** | **23486** | **India** |
| | **Rape** | | **Austria 35-217** |
| | **Rape** | **Midas** | **Canada** |
| | **Rape** | **Korina** | **West Germany** |
| | **Rape** | **Norin 16** | **Japan** |
| **Trial 2:** | **Safflower** | | **USA/USDA 19-130** |
| | **Safflower** | **Gila** | **USA/USDA** |
| | **Safflower** | | **USA/USDA 19-128** |

Tables 21 through 45, which follow, present yield data on various experimental trials.

**Table 21. Yield Data from Soybean Variety Trial at the Agricultural Research Institute, Yezin, 1981-82.**

| No. | Variety | Pounds Per Acre[1] | Baskets* Per Acre |
|---|---|---|---|
| 1 | 20280-11-11 | 920 | 12.8 |
| 2 | 50106-4-7 | 643 | 8.9 |
| 3 | 7207-1 | 518 | 7.2 |
| 4 | 7024-2 | 482 | 6.7 |
| 5 | Clark 63 | 402 | 5.6 |
| 6 | 11-4 | 286 | 4.0 |
| 7 | Multivar 80 | 214 | 3.0 |
| 8 | 7024 | 179 | 2.5 |
| 9 | UPL-S4-2 | 125 | 1.7 |
| 10 | 30050-2-17 | 89 | 1.2 |

*One basket of soybeans weighs 72 pounds.

[1]Yields are low due to a lack of precipitation during the growing season.
NOTE: Trials conducted by Shirley Smellie—ARI.

**Table 22. Yield Data from Soybean Variety Trial at the Agricultural Research Institute, Yezin, 1982-83.**

| No. | Variety | Pounds Per Acre[1] | Baskets* Per Acre |
|---|---|---|---|
| 1 | 30290-11-11 | 881 | 12.2 |
| 2 | Shwemyaingpale | 864 | 12.0 |
| 3 | 7024-2 | 786 | 10.9 |
| 4 | Soyae-Bali | 768 | 10.7 |
| 5 | 11-4 | 668 | 9.3 |
| 6 | 50106-4-7 | 647 | 9.0 |
| 7 | Clark-63 | 618 | 8.6 |
| 8 | 7207-1 | 461 | 6.4 |
| 9 | 7024-3 | 402 | 5.6 |
| 10 | KB Soybean | 267 | 3.7 |
| 11 | Multivar 80 | 248 | 3.4 |
| 12 | UPL-S4-2 | 231 | 3.2 |

*One basket weighs 72 pounds.

[1]Yields are low due to a lack of precipitation during the growing season.
NOTE: Trials conducted by Shirley Smellie—ARI.

**Table 23. Yield Data from Soybean Variety Trial at the Agricultural Research Institute, Yezin, 1982-83.**

| No. | Variety | Pounds Per Acre[1] | Baskets* Per Acre |
|---|---|---|---|
| 1 | AGS 129 | 1,263 | 17.5 |
| 2 | AGS 130 | 1,171 | 16.3 |
| 3 | G. 2261 | 1,158 | 16.1 |
| 4 | G. 9646 | 1,132 | 15.7 |
| 5 | AGS 17 | 764 | 10.6 |
| 6 | Shwemyaingpale | 655 | 9.1 |
| 7 | AGS 62 | 446 | 6.2 |
| 8 | AGS 66 | 194 | 2.7 |

*One basket weighs 72 pounds.

[1]Yields are low due to a lack of precipitation during the growing season.
NOTE: Trials conducted by Shirley Smellie—ARI.

**Table 24. Soybean Variety Trial. Agricultural Research Institute, Yezin, 1982-83.**

| No. | Variety | Pounds Per Acre[1] | Baskets* Per Acre |
|---|---|---|---|
| 1 | Jupiter | 1,148 | 15.9 |
| 2 | ACC. 2120 | 1,109 | 15.4 |
| 3 | AGS-2 | 1,013 | 14.1 |
| 4 | Shwemyaingpale | 908 | 12.6 |
| 5 | ST. 2 | 906 | 12.6 |
| 6 | Orba | 890 | 12.3 |
| 7 | 1-4 Tropicana | 878 | 12.2 |
| 8 | Improved Pelican | 868 | 12.1 |
| 9 | AGS-120 | 835 | 11.6 |
| 10 | Soybean (Red) | 632 | 8.8 |
| 11 | Soyae Bali | 623 | 8.7 |
| 12 | Tunia | 621 | 8.6 |
| 13 | ICAL-109 | 471 | 6.5 |
| 14 | 40142-0-54 | 452 | 6.3 |
| 15 | AGS-135 | 413 | 5.7 |
| 16 | Soybean (Lashio) | 361 | 5.0 |
| 17 | Soybean (Lashio) | 342 | 4.8 |
| 18 | Soybean (Lashio) | 328 | 4.6 |
| 19 | L-114 | 317 | 4.4 |
| 20 | G-9925 | 284 | 3.9 |
| 21 | AGS-130 | 284 | 3.9 |
| 22 | Shwewarlonethay | 280 | 3.9 |
| 23 | Soybean (Black) | 260 | 3.6 |
| 24 | G-9946 | 244 | 3.4 |
| 25 | G-9846 | 228 | 3.2 |
| 26 | 50269-7-6 | 209 | 2.9 |
| 27 | G-9645 | 175 | 2.4 |
| 28 | AGS-66 | 168 | 2.3 |
| 29 | AGS-62 | 145 | 2.0 |
| 30 | G-2261 | 80 | 1.1 |

*One basket weighs 72 pounds.

[1]*Yields are low due to a lack of precipitation during the growing season.*
*NOTE: Trials conducted by Shirley Smellie—ARI.*

**Table 25. Soybean Variety Trial. Agricultural Research Institute, Yezin, 1982-83.**

| No. | Variety | Pounds Per Acre | Baskets* Per Acre |
|---|---|---|---|
| 1 | Jupiter | 1,520 | 21.1 |
| 2 | AGS-135 | 1,119 | 15.5 |
| 3 | AGS-124 | 1,013 | 14.1 |
| 4 | AGS-19 | 1,004 | 13.9 |
| 5 | AGS-79 | 977 | 13.6 |
| 6 | AGS-65 | 900 | 12.5 |
| 7 | AGS-160 | 876 | 12.2 |
| 8 | Williams 82 | 840 | 11.7 |
| 9 | AGS-167 | 789 | 11.1 |
| 10 | AGS-162 | 750 | 10.4 |
| 11 | AGS-66 | 725 | 10.1 |
| 12 | AGS-143 | 659 | 9.2 |

*One basket weighs 72 pounds.

*NOTE: Trials conducted by Shirley Smellie—ARI.*

**Table 26. INTSOY Soybean Variety Trial. Agricultural Research Institute, Yezin, 1982-83 (Mean Yields).**

| No. | Variety | Pounds Per Acre | Baskets* Per Acre |
|---|---|---|---|
| 1 | Ecuador | 2,136 | 29.7 |
| 2 | Williams 82 | 2,041 | 28.3 |
| 3 | Jupiter | 2,037 | 28.3 |
| 4 | IGH 23 | 1,886 | 26.2 |
| 5 | ICAL 125 | 1,823 | 25.3 |
| 6 | Alamo | 1,782 | 24.8 |
| 7 | M.P. Pelican | 1,777 | 24.7 |
| 8 | UFV-1 | 1,762 | 24.5 |
| 9 | SIATS A 194 | 1,686 | 23.4 |
| 10 | ICAL 125 | 1,683 | 23.4 |
| 11 | Bossier | 1,593 | 22.1 |
| 12 | IGH 24 | 1,544 | 21.4 |
| 13 | ICAL 124 | 1,481 | 20.6 |
| 14 | ISRA 44A/73 | 1,430 | 19.9 |
| 16 | 7138 | 1,022 | 14.2 |

*One basket weighs 72 pounds.

*NOTE: Trials conducted by Shirley Smellie—ARI.*

**Table 27. Soybean Variety Trial. Agricultural Research Institute, Yezin, 1983-84.**

| No. | Variety | Pounds Per Acre | Baskets* Per Acre |
|---|---|---|---|
| 1 | Jupiter | 1,699 | 23.6 |
| 2 | AGS-129 | 1,348 | 19.1 |
| 3 | G-9645 | 1,168 | 16.2 |
| 4 | Shwemyaingpale | 1,114 | 15.5 |
| 5 | AGS-2 | 1,080 | 15.0 |
| 6 | G-9946 | 1,068 | 14.8 |
| 7 | Williams | 1,045 | 14.5 |
| 8 | AGS-12 | 987 | 13.7 |
| 9 | Improved Pelican | 982 | 13.6 |
| 10 | Williams 82 | 864 | 12.0 |
| 11 | AGS-130 | 842 | 11.7 |
| 12 | AGS-135 | 815 | 11.3 |
| 13 | G 9925 | 811 | 11.3 |
| 14 | AGS-58 | 807 | 11.2 |
| 15 | AGS-62 | 737 | 10.2 |
| 16 | G-9646 | 691 | 9.6 |
| 17 | AGS-66 | 650 | 9.0 |
| 18 | G-2261 | 624 | 8.7 |
| 19 | AGS-17 | 620 | 8.6 |
| 20 | Soybean (Lashio) | 302 | 4.2 |

*One basket weighs 72 pounds.

*NOTE: Trials conducted by Shirley Smellie—ARI.*

**Table 28. INTSOY Soybean Variety Trial. Agricultural Research Institute, Yezin, 1983-84 (Mean Yields).**

| No. | Variety | Pounds Per Acre[1] | Baskets* Per Acre | Kilograms Per Hectare |
|---|---|---|---|---|
| 1 | Statsa 194 | 684.0 | 9.5 | 777.32 |
| 2 | Braxton | 555.6 | 7.7 | 631.38 |
| 3 | Jupiter | 536.5 | 7.0 | 609.66 |
| 4 | AGSB | 478.4 | 6.6 | 543.69 |
| 5 | F75-9207 | 467.8 | 6.5 | 531.56 |
| 6 | SH1274 | 467.4 | 6.5 | 531.19 |
| 7 | EGSY 91-7 | 457.5 | 6.4 | 519.85 |
| 8 | Davis | 364.3 | 5.1 | 413.96 |
| 9 | ICA L-109 | 351.8 | 4.9 | 399.79 |
| 10 | 71-38 | 301.1 | 4.2 | 342.15 |
| 11 | IAC-6 | 286.9 | 4.0 | 326.07 |
| 12 | UFV-1 | 273.7 | 3.8 | 310.98 |
| 13 | Improved Pelican | 270.3 | 3.8 | 307.19 |
| 14 | ICA L-129 | 259.8 | 3.6 | 295.27 |
| 15 | ISRA/IRAT 44A/73 | 250.4 | 3.5 | 284.52 |
| 16 | IAC-8 | 197.5 | 2.7 | 224.38 |
| LSD 5% | | N.S. | N.S. | N.S. |

*One basket weighs 72 pounds.

[1]*Yields are low due to a lack of precipitation during the growing season.*
*NOTE: Trials conducted by Shirley Smellie—ARI.*

**Table 29. Groundnut Variety Trial. Chaungmagyi Seed Farm, Monsoon 1984.**

| | | Shelled Groundnuts | | Unshelled Groundnuts | |
|---|---|---|---|---|---|
| No. | Variety | Baskets* Per Acre | Pounds Per Acre[1] | Baskets** Per Acre | Pounds Per Acre |
| 1 | Tainan 9 | 5.11 | 258.25 | 15.52 | 287.99 |
| 2 | Panjab | 4.00 | 202.24 | 12.35 | 308.68 |
| 3 | RCM-387 | 3.63 | 183.57 | 12.69 | 317.25 |
| 4 | Tainung-2 | 3.57 | 180.46 | 10.80 | 270.09 |
| 5 | Taiwan MH 026 | 3.32 | 168.02 | 9.52 | 237.94 |
| 6 | Moket | 2.46 | 124.46 | 8.06 | 201.50 |
| 7 | Natal Common | 2.28 | 115.12 | 7.63 | 190.78 |
| 8 | M-10 | 1.54 | 77.79 | 4.97 | 124.33 |
| 9 | Yezin-2 | 0.80 | 40.45 | 2.49 | 62.16 |
| 10 | No. 15626 | 0.12 | 6.22 | 1.11 | 27.87 |
| LSD 5% | | 1.17 | 59.12 | 3.29 | 82.17 |
| LSD 1% | | 1.54 | 77.79 | 4.44 | 110.97 |

*One basket of shelled groundnuts weighs 52 pounds.
**One basket of unshelled groundnuts weighs 25 pounds.

[1]*Yields are low due to a lack of precipitation during the growing season.*

**Table 30. Groundnut Variety Trial. Sebin Seed Farm, Monsoon 1984.**

| No. | Variety | Shelled Groundnuts Baskets* Per Acre | Shelled Groundnuts Pounds Per Acre[1] | Unshelled Groundnuts Baskets** Per Acre | Unshelled Groundnuts Pounds Per Acre[1] |
|---|---|---|---|---|---|
| 1 | Yezin | 7.97 | 403.00 | 24.67 | 616.79 |
| 2 | M-10 | 7.72 | 390.13 | 24.14 | 603.50 |
| 3 | Panjab | 5.51 | 278.67 | 17.34 | 433.50 |
| 4 | Natal Common | 5.09 | 257.23 | 17.85 | 446.23 |
| 5 | Tainung-2 | 4.49 | 227.22 | 18.36 | 459.00 |
| 6 | Taiwan MH026 | 3.73 | 158.64 | 15.29 | 382.16 |
| 7 | Tainan 9 | 2.54 | 128.62 | 7.65 | 191.25 |
| 8 | Moket | 1.61 | 81.46 | 5.27 | 131.75 |
| 9 | RCM 387 | 1.36 | 68.59 | 4.93 | 123.25 |
| 10 | No. 15626 | 1.10 | 55.73 | 4.80 | 119.93 |

*One basket of shelled groundnuts weighs 52 pounds.
**One basket of unshelled groundnuts weighs 25 pounds.

[1]Yields are low due to a lack of precipitation during the growing season.

**Table 31. Maize Variety/Hybrid Trial. Sebin Seed Farm, 1984-85.**

| Variety or Hybrid | Pounds per Acre | Baskets* per Acre | Kilograms per Hectare |
|---|---|---|---|
| SD 5(S) CO-$F_1$ | 6,708 | 122 | 7,620 |
| KSX 2601 | 6,621 | 120 | 7,521 |
| KTX 2602 | 5,968 | 108 | 6,780 |
| Suwan 1(S) C9-$F_2$ | 5,663 | 103 | 6,433 |
| KS 6(S) CO-$F_2$ | 5,619 | 102 | 6,383 |
| Suwan 1(S) C8-$F_3$ | 5,532 | 100 | 6,284 |
| Suwan 2(S) C7-$F_2$ | 3,223 | 59 | 3,661 |
| KSX 2301 | 3,093 | 56 | 3,514 |
| KS 4(S) CO-$F_2$ | 2,004 | 36 | 2,277 |
| TFE-112 | 1,437 | 26 | 1,632 |
| LSD 5% | 2,148 | 39 | 2,440 |
| LSD 1% | 3,088 | 56 | 3,508 |
| CV = 21% | | | |

*One basket weighs 55 pounds.

**NOTE: Date planted:** November 3, 1984
**Irrigated:** Two times.
**Date harvested:** February 21, 1985
**Cooperators:** U Tin Myint, U Than Soe, Ma Si Si Tun, Dr. E.T. Bullard, and Mr. Ross E. Hagan

**Table 32. Groundnut Variety Trial. Yield of Shelled Groundnuts, Sebin Seed Farm, 1984-85.**

| Variety | Pounds per Acre | Baskets* per Acre | Kilograms per Hectare |
|---|---|---|---|
| Yezin-2 | 1,604 | 31 | 1,822 |
| Moket | 1,466 | 28 | 1,665 |
| Tainan 9 | 1,408 | 27 | 1,599 |
| Natal Common | 1,176 | 23 | 1,336 |
| M-10 | 1,154 | 22 | 1,311 |
| Panjab | 1,096 | 21 | 1,245 |
| Taiwan MHO-26 | 1,089 | 21 | 1,237 |
| Tainung | 806 | 15 | 916 |
| RCM 387 | 267 | 5 | 306 |
| LSD 5% | 494 | 9 | 561 |
| LSD 1% | 668 | 13 | 759 |
| CV = 30.2% | | | |

**One basket of groundnuts weighs 52 pounds.*

**NOTE: Date Planted:** October 29, 1984
**Irrigated:** Two times.
**Date Harvested:** March 24, 1985
**Cooperators:** U Tin Myint, U Than Soe, Ma Si Si Tun, Dr. E.T. Bullard, Mr. Ross E. Hagan

**Table 33. Groundnut Variety Trial. Yield of Unshelled Groundnuts, Sebin Seed Farm, 1984-85.**

| Variety | Pounds per Acre | Baskets* per Acre | Kilograms per Hectare |
|---|---|---|---|
| Moket | 1,927 | 77 | 2,186 |
| Tainan-9 | 1,837 | 73 | 2,087 |
| Yezin-2 | 1,800 | 72 | 2,045 |
| M-10 | 1,728 | 69 | 1,963 |
| Natal Common | 1,597 | 64 | 1,814 |
| Panjab | 1,496 | 60 | 1,699 |
| Taiwan MHO-27 | 1,452 | 58 | 1,649 |
| Tainung-2 | 1,104 | 44 | 1,254 |
| RCM 387 | 414 | 17 | 470 |
| LSD 5% | 595 | 24 | 676 |
| LSD 1% | 806 | 32 | 916 |
| CV = 27.5% | | | |

**One basket of unshelled groundnuts weighs 25 pounds*

**NOTE: Date planted:** October 29, 1984
**Irrigated:** Two times.
**Date harvested:** March 3, 1985
**Cooperators:** U Tin Myint, U Than Soe, Ma Si Si Tun, Dr. E.T. Bullard, Mr. Ross E. Hagan

**Table 34. INTSOY Soybean Variety Trial, 1984-85, Kyaungsu Seed Farm.**

| Variety | Yield Pounds/Acre* | Yield Baskets/Acre* |
|---|---|---|
| Williams 82 | 3,392 | 47 |
| Ecuador 2 | 1,187 | 16 |
| Jupiter R | 888 | 12 |
| LSD 5% | 866 | 12 |
| LSD 1% | 1,312 | 18 |

**Adjusted for stand*

**NOTE: Irrigated:** Two times.

**Table 35. Yield Data from the Maize Hybrid/Variety Trial Conducted at the Thitcho Seed Farm, 1984-85.**

| Variety or Hybrids | Pounds per Acre[1] | Baskets* per Acre | Kilograms per Hectare |
|---|---|---|---|
| Hycorn 9 | 1,462 | 27 | 1,667 |
| Shwe War 4 | 1,437 | 26 | 1,638 |
| Shwe War 8 | 1,328 | 24 | 1,514 |
| Shwe War 9 | 1,132 | 21 | 1,290 |
| LSD 5% | N.S. | N.S. | N.S. |
| CV = 30% | | | |

*One basket weighs 55 pounds.
[1]Yields are low due to a lack of precipitation during the growing season.

**NOTE: Date planted:** 11/84
**Date harvested:** 03/85
**Cooperators:** U Soe Win, U Than Tun, U Hla Win, E.T. Bullard, and Ross E. Hagan

**Table 36. Sunflower Yield and Cost/Benefit Analysis of a Pollination Trial Conducted at the Thitcho Seed Farm, 1984-85.**

| Pollination Treatment | Pounds per Acre[1] | Kilograms per Hectare | Baskets* per Acre | Seed Value Less Labor Cost** |
|---|---|---|---|---|
| Every other day in the afternoon | 1,238 | 1,411 | 39 | 2,936 |
| Every other day in the morning and afternoon | 1,176 | 1,341 | 37 | 2,855 |
| Morning | 1,182 | 1,347 | 37 | 2,781 |
| Afternoon | 1,163 | 1,326 | 36 | 2,740 |
| Morning and afternoon | 1,288 | 1,468 | 40 | 2,721 |
| Every other day in the morning | 1,051 | 1,196 | 33 | 2,494 |
| Insect pollination | 964 | 1,099 | 30 | 2,420 |
| LSD 5% | N.S. | N.S. | N.S. | N.S. |
| CV = 11.3% | | | | |

*One basket weighs 32 pounds.
**Based on a labor cost at 6.5 Kyats per day and a 7-hour day for 20 days for the pollinating period. Seed value was based on 80 Kyats per acre.
[1]Yields are low due to a lack of precipitation during the growing season.

**NOTE: Date Planted:** 29/11/84
**Date Harvested:** 16/03/85
**Cooperators:** U Soe Win, U Than Tun, U Hla Win, E.T. Bullard, and Ross E. Hagan

**Table 37. Yield of Sunflower Seed by Hand Pollination Compared with Insect Pollination, Thitcho Seed Farm, 1984-85.**

| Pollination Treatment | Pounds per Acre[1] | Baskets* per Acre | Kilograms per Hectare |
|---|---|---|---|
| Pollinated by hand in the morning and afternoon | 1,238 | 39 | 1,406 |
| Pollinated by hand in the afternoon | 1,201 | 38 | 1,364 |
| Pollinated by hand in the morning | 1,120 | 35 | 1,272 |
| Pollinated by insects | 965 | 30 | 869 |
| LSD<br>CV = 8.5% | 154 | 5 | 175 |

**One basket weighs 32 pounds.*
*[1]Yields are low due to a lack of precipitation during the growing season.*

**NOTE: Cooperators:** U Soe Win, U Than Tun, U Hla Win, E.T. Bullard, and Ross E. Hagan

**Table 38. Yield Data from a Soybean Variety Trial Conducted at the Thitcho Seed Farm, 1984-85.**

| Variety | Days to Maturity | Pounds per Acre | Baskets* per Acre | Kilograms per Hectare |
|---|---|---|---|---|
| Jupiter R | 100 | 550 | 7.6 | 624.8 |
| Ecuador 2 | 84 | 365 | 5.1 | 414.6 |
| William 82 | 76 | 152 | 2.0 | 161.3 |
| LSD 5% | | 131 | 1.8 | 148.8 |
| LSD 1% | | 201 | 2.8 | 228.3 |
| CV = 21% | | | | |

**One basket weighs 72 pounds.*

**NOTE: Date Planted:** 23/11/84
**Date Harvested:** 12/02/85 (William 82), 08/03/85 (Jupiter R), 20/02/85 (Ecuador 2)
**Cooperators:** U Soe Win, U Than Tun, U Hla Win, E.T. Bullard, and Ross E. Hagan

**Table 39. Yield Data from a Soybean Variety Trial Conducted at the Thitcho Seed Farm, 1984-85.**

| Varieties | Pounds per Acre[1] | Baskets* per Acre | Kilograms per Hectare |
|---|---|---|---|
| G 2120 | 2,004 | 27.8 | 2,285 |
| Jupiter | 1,634 | 22.7 | 1,863 |
| Ecuador 2 | 1,259 | 17.5 | 1,435 |
| UFV-1 | 884 | 12.3 | 1,008 |
| Ransom | 305 | 4.2 | 348 |
| William 82 | 305 | 4.2 | 348 |
| Hardee | 240 | 3.3 | 274 |
| Bragg | 205 | 2.8 | 234 |
| LSD 5% | 475 | 6.6 | 542 |
| LSD 1% | 645 | 9.0 | 735 |

*One basket weighs 72 pounds.
[1]Yields are low due to a lack of precipitation during the growing season.

**NOTE: Date planted:** November 1984
**Date harvested:** March 1985
**Cooperators:** U Soe Win, U Than Tun, U Hla Win, E.T. Bullard, and Ross E. Hagan

**Table 40. Yield Data of the Highest Yielding Lines from a Soybean Observation Trial, Thitcho Seed Farm, 1984-85.**

| Cultivar Line No. | Cultivar Name | Pounds per Acre[1] | Baskets* per Acre |
|---|---|---|---|
| 5058 | PR 141 (7) | 3,202 | 44 |
| 5006 | PR 21-42-3-X-6 | 3,132 | 44 |
| 5059 | PR 142 | 2,927 | 41 |
| 5048 | PR 13-66-4-B-3 | 2,723 | 38 |
| 5029 | PR 38-21-3-B-9 | 2,587 | 36 |
| 5025 | PR 143 (22) | 2,587 | 36 |
| 5149 | AGS 19 | 2,587 | 36 |
| 5151 | AGS 148 | 2,518 | 35 |
| 5073 | PR 143 (13) | 2,452 | 34 |
| 1062 | Mayo 80 | 2,452 | 34 |
| 5137 | F 82-7137 | 2,452 | 34 |
| 5033 | PR 27-15-3-B-1 | 2,383 | 33 |
| 5169 | TGX-742-05D | 2,383 | 33 |
| 5039 | PR21-35-1-X-2 | 2,383 | 33 |
| 1070 | DE 4 | 2,317 | 32 |
| 5171 | TGX-764-01D | 2,248 | 31 |
| 5179 | TGX-442-01D | 2,248 | 31 |
| 5148 | AGS 59 | 2,222 | 31 |
| 5139 | F 82-7824 | 2,178 | 30 |
| 5072 | PR 139 (10) | 2,178 | 30 |
| 5077 | PR 15-126-3-B-2 | 2,178 | 30 |
| 5119 | PR 143 (12) | 2,178 | 30 |
| | Ecuador 2 | 2,113 | 29 |
| | Jupiter R | 1,930 | 27 |
| | Williams 82 | 1,089 | 15 |
| | Davis | 1,059 | 15 |

*One basket weighs 72 pounds.
[1]Yields are low due to a lack of precipitation during the growing season.

**NOTE. Date planted:** Nov. 19-22, 1984
**Date harvested:** Feb. 5-Apr. 14, 1985
**Source:** INTSOY
**Cooperators:** U Soe Win, U Than Tun, U Hla Win, E.T. Bullard, and Ross E. Hagan

**Table 41. Yield Data from a Maize Fertilizer Trial at the Kyaungsu Seed Farm, 1984-85.**

| Urea Lbs/A* | Triple Super-phosphate Lbs/A | Muriate of Potash Lbs/A | Zinc Lbs/A | Manganese Lbs/A | Magnesium Lbs/A | Pounds per Acre[1] | Baskets** per Acre | Kilograms per Hectare |
|---|---|---|---|---|---|---|---|---|
| 0 | 177 | 0 | | | | 2,938 | 53.4 | 3,339 |
| 355 | 177 | 133 | 22 | | | 2,529 | 46.0 | 2,874 |
| 355 | 177 | 133 | | | | 2,484 | 45.2 | 2,823 |
| 355 | 177 | 133 | | 1 | | 2484 | 45.2 | 2,823 |
| 355 | 0 | 133 | | | | 2,428 | 44.1 | 2,759 |
| 355 | 177 | 133 | | | 20 | 2,291 | 41.7 | 2,603 |
| 355 | 177 | 0 | | | | 2,235 | 40.6 | 2,540 |
| 177 + 177 | 177 | 133 | | | | 2,201 | 40.0 | 2,501 |
| 355 | 0 | 0 | | | | 1,271 | 23.1 | 1,444 |
| 0 | 0 | 133 | | | | 987 | 17.9 | 1,122 |
| 0 | 0 | 0 | | | | 953 | 17.3 | 1,083 |
| 0 | 177 | 133 | | | | 817 | 14.9 | 928 |
| LSD 5% | | | | | | 923 | 16.9 | 1,062 |
| LSD 1% | | | | | | 1,253 | 22.8 | 1,428 |
| CV = 32.9% | | | | | | | | |

**177 + 177 indicates a split application of urea: one at planting, and one after one month.*
***One basket weighs 55 pounds.*
*[1]Yields are low due to a lack of precipitation during the growing season.*

**NOTE: Date planted:** 03/12/84
**Date harvested:** 26/03/85
**Cooperators:** U Thaung, U Maung Maung, Daw Tin Tin Aye, E.T. Bullard, and Ross E. Hagan

**Table 42. Interaction of Nitrogen and Phosphate on Maize, Kyaungsu Seed Farm, 1984-85.**

| Treatment | Yield of Maize in Baskets per Acre: Urea 0 lbs | Urea 355 lbs/Acre[1] | Average |
|---|---|---|---|
| TSP* 0 lbs | 18.2 | 33.6 | 25.9 |
| TSP 177 lbs/A | 34.1 | 42.9 | 38.5 |
| Average | 26.2 | 38.3 | |

**TSP is triple superphosphate.*
*[1]Yields are low due to a lack of precipitation during the growing season.*

There is a significant difference in yield between nitrogen levels and phosphate levels at the 5% level.

There is a significant interaction of nitrogen and phosphorus at the 1% level.

**Table 43. Interaction of Nitrogen and Potassium on Maize at the Kyaungsu Seed Farm, 1984-85.**

| Treatment | Yield in Baskets per Acre<br>Urea<br>0 lbs | Urea<br>355 lbs/A[1] | Average |
|---|---|---|---|
| MOP* 0 lbs | 35.4 | 31.9 | 33.7 |
| MOP 133 lbs/A | 16.4 | 44.7 | 30.6 |
| Average | 25.9 | 38.3 | |

**MOP is muriate of potash.*
*[1]Yields are low due to a lack of precipitation during the growing season.*

The yield resulting from an application of muriate of potash is significantly lower than the yield without potash at the 1% level.

There was no significant difference in yield between the different levels of nitrogen or the interaction of nitrogen and potassium.

**Table 44. Interaction of Phosphorus and Potassium on Maize at the Kyaungsu Seed Farm, 1984-85.**

| Treatment per Acre | Yield in Baskets per Acre<br>TSP 0 lb/A | TSP* 117 lbs/A[1] | Average |
|---|---|---|---|
| MOP** 0 lbs | 20.2 | 47.0 | 33.6 |
| MOP 133 lbs | 31.0 | 30.0 | 31.0 |
| Average | 25.6 | 38.5 | |

**TSP is triple superphosphate.*
***MOP is muriate of potash.*
*[1]Yields are low due to a lack of precipitation during the growing season.*

The yield resulting from the application of triple superphosphate is significantly higher at the 1% level.

There was no significant difference in yield between the different levels of muriate of potash or the interaction of phosphate and potassium.

**Table 45. Maize Cost Benefit Analysis on the Maize Fertilizer Trial Conducted at the Kyaungsu Seed Farm, 1984-85.**

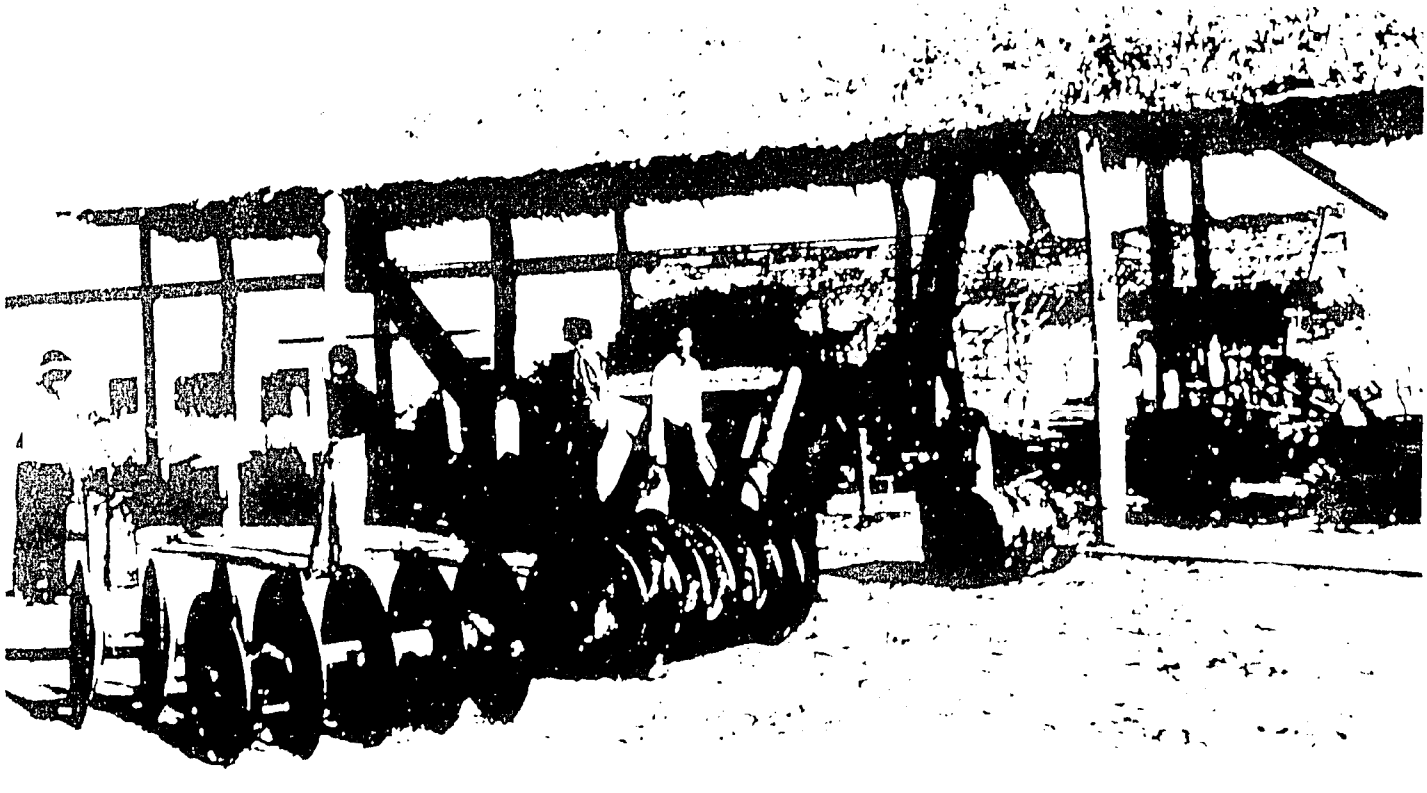
| Treatment* | Baskets** per Acre | Value of Maize in Kyats*** | Cost of Fertilizer in Kyats**** | Value of Maize Less Cost of Fertilizer in Kyats |
|---|---|---|---|---|
| TSP | 53.4 | 1,736.00 | 226.46 | 1,509.54 |
| U + MOP | 44.1 | 1,364.00 | 266.42 | 1,097.58 |
| U + TSP | 40.6 | 1,224.00 | 298.70 | 925.30 |
| U + TSP + MOP | 45.2 | 1,408.00 | 492.88 | 915.12 |
| U + U + TSP + MOP | 40.0 | 1,200.00 | 492.88 | 707.12 |
| U | 23.1 | 524.00 | 72.24 | 451.76 |
| O | 17.3 | 346.00 | 0 | 346.00 |
| MOP | 17.9 | 358.00 | 194.18 | 163.82 |
| TSP + MOP | 14.9 | 298.00 | 420.64 | -122.64 |

**U is 355 pounds of urea per acre.*
*TSP is 177 pounds of triple superphosphate per acre.*
*MOP is 133 pounds of muriate of potash per acre.*
*U + U is a split application of urea: 177 pounds at planting and 177 pounds applied one month after planting.*

***One basket weighs 55 pounds.*

****Value based on 20 baskets sold at 20 kyats, and balance sold at 40 kyats per basket.*

*****Cost of urea (112 pounds) at 18 kyats and balance at 25 kyats.*
*Cost of TSP (56 pounds) at 32.00 kyats and balance at 90 kyats.*
*Cost of MOP (20 pounds) at 29.20 kyats and balance at 29.20 kyats.*



Planting plans and instructions for experimental trials have been sent to the four seed farms and the ARD Farm at Magwe, for the 1985 monsoon season, as indicated:

**Chaungmagyi Seed Farm:**

| | |
|---|---|
| Maize | Weed control |
| Maize | Fertilizer |
| Groundnut | Fertilizer |

**Sebin Seed Farm:**

| | |
|---|---|
| Groundnut | Fertilizer |
| Groundnut | Weed control |
| Sesame | Fertilizer |
| Sesame | Weed control |
| Sunflower | Fertilizer |
| Sunflower | Weed control |

**Kyaungsu Seed Farm:**

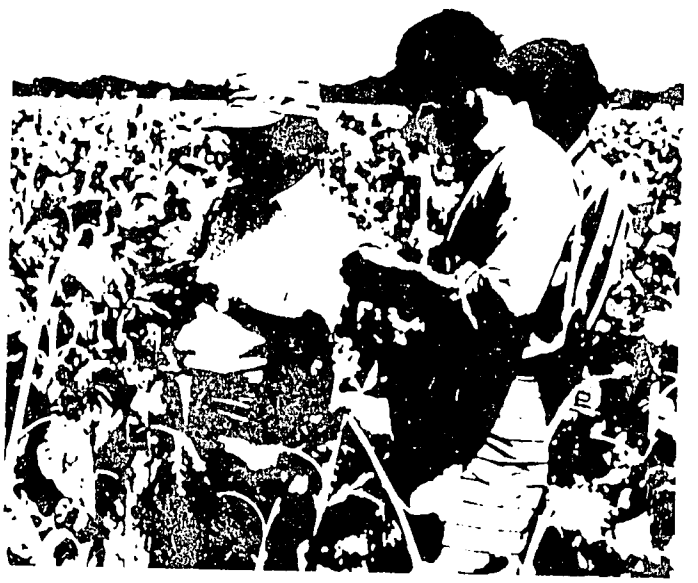
| | |
|---|---|
| Groundnuts | Fertilizer |
| Groundnuts | Weed control |

**Thitcho Seed Farm:**

| | |
|---|---|
| Maize | Fertilizer |
| Maize | Weed control |
| Groundnuts | Fertilizer |
| Groundnuts | Weed control |

**ARD Farm/Magwe:**

| | |
|---|---|
| Groundnuts | Fertilizer |
| Groundnuts | Weed control |
| Sesame | Fertilizer |
| Sesame | Weed control |



The planting schedules for 1985 are:

| Seed Farm | Crop | Monsoon No. Acres | Winter No. Acres |
|---|---|---|---|
| Chaungmagyi | Maize | 100 | 50 |
| Chaungmagyi | Groundnuts | 50 | 50 |
| Sebin | Groundnuts | 60 | |
| Sebin | Sesame | 50 | 50 |
| Sebin | Sunflower | 100 | 150 |
| Kyaungsu | Groundnuts | 100 | 350 |
| Kyaungsu | Sunflower | | 350 |
| Kyaungsu | Rice | 100 | |
| Thitcho | Maize | 100 | 550 |
| Thitcho | Groundnuts | 50 | 73 |
| Thitcho | Sunflower | | 90 |
| Thitcho | Rice | 40 | |

Dr. E.T. Bullard made a request in April, 1985, for seed of different varieties of niger to be sent from Nepal, so that it can be tested in Burma. He requested sesame seed in May, 1985, from the Yuma Mesa Station in Arizona, U.S.A., to be used in variety trials. Dr. Arlo Thompson brought sixty pounds of sunflower germ plasm in April, 1985, to be used in experimental trials.

# 10. PUBLICATIONS

A number of extension type publications have been written by the long-term MUCIA contract employees on maize, groundnuts, sesame, sunflower, irrigation and experimental design. The publications listed in Table 46 have been released, some of which have been translated into Burmese, as indicated.

**Table 46. Maize and Oilseeds Production Project: Publications in English and Burmese.**

| Title | English | Burmese | Date |
|---|---|---|---|
| Sunflower Production<br>Extension Bulletin No. 1<br>By Ervin T. Bullard | X | X | April 1985 |
| Maize Production<br>Extension Bulletin No. 2<br>By Ervin T. Bullard | X | X | Feb. 1985 |
| Increasing Yield of Oilseed Crops Through Soil Management<br>Extension Bulletin No. 3<br>By Ross E. Hagan | X | | May 1984 |
| Maize: Soil and Water Requirements<br>Extension Bulletin No. 4<br>By Ross E. Hagan | X | | June 1984 |
| Assessing Crop Water Needs<br>Extension Bulletin No. 5<br>By Ross E. Hagan | X | | Oct. 1984 |
| Groundnut Production<br>Extension Bulletin No. 6<br>By Ervin T. Bullard | X | X | Sept. 1984 |
| Sesame Production<br>Extension Bulletin No. 7<br>By Ervin T. Bullard | X | X | June 1984 |
| Sunflower Soil and Water Requirements<br>Extension Bulletin No. 8<br>By Ross E. Hagan | X | | June 1984 |
| Land Planning<br>Extension Bulletin No. 9<br>By Ross E. Hagan | X | | Nov. 1984 |
| Post Harvest Handling and Storage of Corn and Oilseeds<br>Extension Bulletin No. 10<br>By George W. Otey | X | | Dec. 1984 |
| Furrow Irrigation, Part I (WMS No. 3)<br>Extension Bulletin No. 11<br>By Ross E. Hagan | X | | (In draft) |
| Research Trial Management and Data Analysis<br>Extension Bulletin No. 12<br>By Ross E. Hagan | X | | (In draft) |
| Furrow Irrigation, Part II (WMS No. 4)<br>Extension Bulletin No. 13<br>By Ross E. Hagan | X | | (In draft) |

# 11. EVALUATION

The U.S. Agency for International Development made a mid-term evaluation of the Maize and Oilseeds Production Project during January, 1985. The evaluating team consisted of Mr. Douglas R. Pickett, Team Leader, Rural Sociologist/Anthropologist, ASIA/TR/ARD of USAID/Washington; Dr. Lloyd R. Frederick, Soil Microbiologist, S&T Bureau, USAID/Washington; Dr. Stanley Krause, Agricultural Economist, Development Associates, Inc.; and Dr. Wilfredo De Rafols, Oilseeds Technology Specialist and Agricultural Engineer, Development Associates, Inc.

The purpose of the evaluation was: (1) "to assess the continuing validity and relevance of the project and to suggest such modifications as may be required to increase the likelihood that the project will achieve its objectives;" (2) "to assess the effects of external and unanticipated actions and/or events on the project;" and (3) "to assess the performance of the project with respect to the objective set for it at the outset and to determine what, if any, adjustments or modifications in inputs or outputs are required to improve project effectiveness."

The evaluating team visited the four Maize and Oilseed Production Project seed farms, production camps and farms in six of the Intensive Townships and eleven of the Extensive Townships, the Agriculture Research Institute in Yezin, and the new rhizobium inoculant production facility site in Maymyo. Two members of the team visited the Wakema Irrigation Scheme.

The Mid-Term Evaluation Report prepared by the evaluating team, dated February 1, 1985, states in its Summary of Findings, "Although accomplishments to date vary considerably across outputs and inputs, the evaluation team finds that overall progress is excellent and believes the project to be well on its way to a highly successful conclusion."

Some of the specific points made concerning progress toward targets were:

1. Crop production: Maize, 51.2 percent; Groundnuts, 73.8 percent; Sesame, 82.6 percent; Sunflower, 50.9 percent.
2. Edible oil production: 33 percent.
3. M.S. degree students: 16 of 25.
4. Ph.D. degree students: 0 of 5.
5. Short-term training overseas: 40 percent.
6. Production of seed by seed farms to meet Project needs: 7 percent.
7. Project funding: Burma, 52 percent; U.S.A., 57 percent.
8. Procurement of fertilizer: U.S.A., 88 percent; Burma, 70 percent.
9. Delivery of equipment and materials to seed farms: 68.93 percent.

It was pointed out also in the USAID Evaluation Report that the following had been accomplished since the onset of the Project:

1. Direct contribution to farm income: kyats, 672 million; US dollars, 82 million.
2. Increased production of vegetable oil: 35,101 to 41,139 MT. Percentage of target: 30.6 to 35.8 percent.
3. Value of increased groundnut production (estimating 35% sold to Cooperatives at controlled prices): kyats, 308.9 million; US dollars, 37.5 million.
4. Value of increased maize production (estimating 50% sold on free market): kyats, 127.00 million; US dollars, 15.85 million.
5. Increase in areas harvested in Townships: Maize, 67 percent; Groundnuts, 44 percent; Sesame, 28 percent; Sunflower, 122 percent.

The USAID evaluation team pointed out several constraints having an effect on the progress of the Project, such as serious shortages of cement, construction materials, fertilizers, electric power, diesel fuel, and gasoline; lack of irrigation facilities; scarcity of valid research data; also, difficulties in transportation and communication.

Briefly, some of the recommendations made by the evaluation team were to:

1. Continue crop production and general project activities as planned.
2. Plan a program of applied research, mainly at the seed farms.
3. Conduct tests of oil content on varieties tested.
4. Continue development of seed farms. Improve land leveling and preparation, as well as irrigation and drainage systems.
5. Training programs on maintenance for all MOPP equipment, agricultural, seed processing, irrigation, vehicles, etc.
6. Continue development of facilities for production and distribution of rhizobium inoculant.
7. Continue efforts to expedite clearances by Customs.
8. Supply contract personnel with appropriate expertise.
9. Select and process personnel for appropriate short-term training as soon as possible, so that the training can be useful during the remaining project life.

# 12. COMMODITIES

One of the most important commodities required to obtain the goals of the Project is fertilizer. The Project has imported from the U.S.A. the following approximate amounts of fertilizer:

| | | |
|---|---|---|
| 1982-83 | Triple superphosphate | 10,000 MT |
| 1983-84 | Urea | 10,388 MT |
| 1984-85 | Triple superphosphate | 15,000 MT |

The government of the Socialist Republic of the Union of Burma has provided:

| | |
|---|---|
| Urea | 15,794 MT |
| Muriate of potash | 2,789 MT |

The distribution of the fertilizer to the Maize and Oilseeds Production Project from the beginning of the Project to January, 1985, is listed in Table 47.

**Table 47. Fertilizer Distribution to Maize and Oilseeds Production Project Townships.**

| Crop | Year | Acres Sown | Metric Tons Fertilizer Urea | Triple Superphosphate | Muriate of Potash |
|---|---|---|---|---|---|
| Maize | 82-83 | 55,870 | 2,793 | 1,397 | 629 |
| | 83-84 | 84,530 | 3,991 | 1,879 | 824 |
| | 84-85 | 91,164 | 4,419 | 2,140 | 1,001 |
| | TOTAL | 231,564 | 11,202 | 5,416 | 2,454 |
| Groundnuts | 82-83 | 71,940 | 695 | 1,799 | |
| | 83-84 | 92,665 | 844 | 2,316 | |
| | 84-85 | 102,300 | 931 | 2,558 | |
| | TOTAL | 266,905 | 2,470 | 6,673 | |
| Sesame | 82-83 | 61,130 | 1,951 | 1,190 | |
| | 83-84 | 74,924 | 2,255 | 1,354 | |
| | 84-85 | 87,405 | 3,378 | 1,569 | |
| | TOTAL | 223,459 | 7,584 | 4,113 | |
| Sunflower | 82-83 | 15,000 | 562 | 376 | |
| | 83-84 | 23,375 | 549 | 555 | |
| | 84-85 | 33,600 | 735 | 735 | |
| | TOTAL | 71,975 | 1,846 | 1,666 | |
| The 4 Crops | 82-83 | 203,940 | 6,001 | 4,762 | 629 |
| | 83-84 | 275,494 | 7,639 | 6,104 | 824 |
| | 84-85 | 314,969 | 9,463 | 7,002 | 1,001 |
| | TOTAL | 793,903 | 23,103 | 17,868 | 2,454 |

The commodities ordered to date are listed in Tables 48 and 49, which follow. The farm machinery imported for the Project is listed in Table 50.

**Table 48. Commodities Purchased for the Maize and Oilseeds Production Project, 1982 and 1983.**

| PIO/C No. | Item | Amount (US $) |
|---|---|---|
| 40003 | Fertilizer, TSP, 10,000 metric tons | $ 3,700,000 |
| 20006 | Fertilizer, TSP, 15,000 metric tons | 5,527,500 |
| 20010 | Fertilizer, Urea | 2,574,194 |
| 20016 | Office and Household Equipment/Singapore | 74,865 |
| 20017 | Vehicles, 3 Suburbans | 59,000 |
| 20019 | Seed Farm Equipment | 223,200 |
| 20020 | Rhizobium Equipment | 48,439 |
| 20025 | Office and Visual Aid Equipment (Int. Twps.) | 55,000 |
| 20026 | Seed Farm Equipment (Sebin and Chaungmagyi) | 484,188 |
| 20027 | Seeds | 7,000 |
| 20028 | Research Equipment (ARI/Yezin) | 79,091 |
| 20029 | Pumps—Seed Farms (Intensive Twps.) | 115,000 |
| 20030 | Sunflower Seed | 16,346 |
| 20031 | Generator, 130 KW | 59,469 |
| 20032 | Generating Set 130 KW (162.5 KVA) | 70,000 |
| 20033 | Push Planters (Townships) | 54,684 |
| 20034 | Trucks (7 ton to 8 ton) | 289,072 |
| 20035 | Transformer (ARI/Yezin) | 10,601 |
| 20036 | Submersible Pumps and Necessary Items | 87,993 |
| 20037 | Engineer Tools (ARI/Yezin) | 18,342 |
| 20038 | Hand Plot Tools, Shop Tools, Vehicle Spare Parts, Shop Tools for MOPP Miscellaneous | 49,785 |
| 20039 | [illegible]re Parts for Copier | 12,000 |
| 20040 | Surveying Instruments | 2,800 |
| 20041 | Farm Equipment and Seed | 539,692 |
| TOTAL | | $14,158,261 |

**Table 49. Commodities Purchased for the Maize and Oilseeds Production Project, 1984 and 1985.**

| PIO/C No. | Item | Amount (US $) |
|---|---|---|
| 30039 | Household Equipment | $ 30,000 |
| 30042 | Propeller Pumps for Wakema | 227,925 |
| 30043 | Threshers | 115,000 |
| 30044 | Laboratory and Field Equipment | 17,000 |
| 30045 | Pickup Trucks | 54,000 |
| 30046 | Seed Cleaners | 16,000 |
| 30047 | Appropriate Technology (Farm Implements) | 1,300,000 |
| 30048 | Shop Equipment and Supplies | 92,000 |
| 30049 | Electrical & Power Distribution (Wakema) | 365,000 |
| 30050 | Household & Office Equipment and Supplies | 25,600 |
| 30051 | Equipment Spares and Accessories | 73,000 |
| 30052 | Seeds (Sunflower) | 38,500 |
| 30053 | Seed Plant (Storage Equipment) | 347,000 |
| 30054 | Seed Plant Equipment | 496,000 |
| 30055 | Electric Pumps (Centrifugal) | 111,000 |
| 30056 | Sedans (2) | 36,900 |
| 30064 | Field & Instructional Equipment | 3,900 |
| 1983-84 SUBTOTAL | | 3,348,825 |
| 1982-83 SUBTOTAL | | 14,158,261 |
| GRAND TOTAL (1982-84) | | $17,507,086 |

**Table 50. Imported Farm Machinery Received by the MOPP Seed Farms before March 31, 1985. (Number and Status of Machinery.)**

| Item | Chaungmagyi | Sebin | Kyaungsu | Thitcho |
|---|---|---|---|---|
| 4050 John Deere tractor | 2 | 2 | 1 | 1 |
| 4250 John Deere tractor | — | — | 1 | 1 |
| Caldwell ripper-subsoiler | — | — | 1 | 1 |
| John Deere 20 ft. Model 50 Toolbar | — | — | 1 | 1 |
| John Deere 15 ft. Model 50 Toolbar | 2 | 2 | — | — |
| Davis 5 furrow disc plow | 1 | 1 | 1 | 1 |
| AMCO disk harrow | — | — | 1 | 1 |
| Bush Hog disk harrow | 1 NHCU | 1 NHCU | — | — |
| Schmeizer "Til n Pak" | 1 | 1 | 1 | 1 |
| John Deere 1010 field cultivator | 1 | 1 | 1 | 1 |
| B & W Implement Cultimulch | 1 | 1 | — | 1 MPO |
| Northwest Equip. tiller-bedder | — | — | 1 HI | 1 HI |
| Gandy fertilizer spreader | 1 | 1 | 1 | 1 |
| John Deere Flexiplanter | 1 | 1 | 1 | 1 |
| John Deere 33 vegetable planter | 1 | 1 | 2 | — |
| Alloway bed cultivator | 1 NFA | 1 NFA | 1 MPU | 1 NFA |
| John Deere 825 row-crop cultivator | 1 NFA | 1 NFA | 1 NFA + 1 MPU | 2 NFA |
| John Deere FM 4 row-crop cultivator | — | 1 + 5 | — | — |
| Broyhill boom sprayer | 1 | 1 | 1 MPU | 1 |
| Broyhill nurse tank | 1 | 1 | 1 | 1 |
| Hobbs peanut digger | 1 | 1 | 2 | 1 |
| Hobbs peanut combine | 1 MPU | — | 1 | — |
| New Idea 1-row corn picker | 1 | — | — | 1 |
| New Idea 2-row corn picker | 1 MPU | — | — | 1 |
| Towner disc border maker | 1 MPU | 1 MPU | 1 | 1 MPU |
| Eversman 329 land plane | 1 | 1 | 1 | 1 |
| Bush Hog rear tractor blade | 1 MPU | 1 NHCO | — | — |
| Caldwell Atlas back blade | — | — | 1 HHC | 1 HHC |
| Caldwell Atlas S-7 rotary cutter | — | — | 1 | 1 |
| Bush Hog 307 rotary cutter | 1 MPU | 1 | — | — |
| Bush Hog front end loader | 1 MPU | 1 MPU | — | — |
| Dual front end loader | — | — | 1 | 1 MPU |
| Bush Hog post hole digger | — | 1 | — | 1 MPU |

| NOTE: | | | |
|---|---|---|---|
| | NHCU | Needs Hydraulic Couplers | Unoperable |
| | MPO | Missing Parts | Operable |
| | HI | Hitch incompatible with 4250 tractor | |
| | NFA | Needs to be Field Adjusted | |
| | MPU | Missing Parts | Unoperable |
| | HHC | Needs Hydraulic Hoses and Couplers | Operable |
| | NHCO | Needs Hydraulic Couplers | Operable |

COMMENTS:

1. The five FM-4 row-crop cultivators (unassembled) at the Sebin Seed Farm are not presently needed. It is unlikely that they will be used as long as the Alloway and John Deere 825 rear-mounted cultivators continue to function. The FM-4 is a front-mounted cultivator which requires 2 hours to mount and 2 hours to dismount.

2. The two John Deere Model 33 vegetable planters at the Kyaungsu Seed Farm should not be assembled until there is need for their use.

Expenditures of the government of the Socialist Republic of the Union of Burma, through December, 1984, were:

| Item | Kyat | US $ |
|---|---|---|
| Fertilizer cost | | 3,474,920.00 |
| Fertilizer movement | 9,272,590.00 | 1,287,860.00 |
| Construction | 16,854,220.00 | 2,340,860.00 |
| Equipment and movement | 11,130,290.00 | 1,545,870.00 |
| Office equipment and vehicles | 5,150,240.00 | 715,310.00 |
| Staff pay and other project costs | 12,997,740.00 | 1,805,240.00 |
| TOTAL | 55,405,080.00 | 11,170,060.00 |

NOTE: These figures are based on the rate of US $ 1.00 = K 7.20.

*Fig. 47. U Mya Maung, Project Director/MOPP; Dr. William Flinn, Executive Director/MUCIA; and Dr. Charles Simkins, Agricultural Development Officer/USAID, inspecting MOPP fertilizer storage facilities.*

# 13. RHIZOBIUM

In 1977-78, the Ministry of Agriculture of the Union of the Socialist Republic of Burma became interested in using rhizobium in order to lower the use of urea fertilizers.

Leguminous crops, including groundnuts, soybeans and pulses, have a capability of establishing symbiotic relationships with bacteria of the *Rhizobium* genus. These bacteria live on the plant roots of leguminous plants and transform atmospheric nitrogen into ionic forms which can be used by the plants, thus reducing legume reliance on soil and nitrogen fertilizer. Legumes also may contribute residual soil nitrogen to crops grown in rotation.

Research on rhizobium was instigated at the Agricultural Research Institute at Yezin. Rhizobia were isolated under laboratory conditions and inoculum resulting from cowpea rhizobium was developed. It was demonstrated that peat inoculum with this rhizobium produced significant increases in yields of chickpeas and mung beans.

Inoculum production at the Agriculture Research Institute, has increased steadily since 1978. During the 1981-82 crop season, 60 metric tons of groundnut inoculum and 55 metric tons of chickpea inoculum were distributed to farmers.

It was stipulated in the Project Grant Agreement that a functional rhizobium production facility should be developed and that local nitrogen-fixing inoculum production should reach an estimated 3 million pounds per year by year five of the Maize and Oilseeds Production Project. This will result in reducing requirements for urea fertilizer, compared with what requirements would have been without the use of rhizobium inoculant.

The USAID and MOPP, recognizing the potential of legume inoculants for the production of groundnuts and soybeans, have assisted by providing the necessary training, equipment and supplies. A new rhizobium inoculant facility has been developed at the Agricultural Research Institute, Yezin, replacing the original facility in the Plant Pathology building there.

Current production is more than 600,000 packets (250 grams each) per year, providing sufficient inoculant for about 40 percent of all legume oilseeds grown in the country. Approximately 217,210 packets were distributed outside Project Township areas in 1984-85, contributing to greater overall groundnut production.

Scientists from Burma and other countries undertook internships with NIFTAL in 1983. Dr. Robert J. Davis, Soil Mirobiologist, Head of the Outreach Section in Hawaii, and Dr. Douglas Beck, Soil Scientist, NIFTAL contract, Thailand, visited Burma three times to assist the local staff with the production of rhizobium.

The USAID contracted with the University of Hawaii in 1975 to implement a project to help farmers in foreign countries increase production of high protein foods, with reduced dependency on nitrogen fertilizer. This is accomplished by ensuring that nitrogen fixed biologically by legumes is maximized and used to the fullest extent possible in tropical cropping systems.

This USAID contract drew on expertise of the College of Tropical Agriculture and Human Resources, University of Hawaii, for the establishment of an interdisciplinary unit called Nitrogen Fixation by Tropical Agricultural Legume (NIFTAL), dedicated to the application of technologies based on biological nitrogen fixation to international development goals.

The objective of NIFTAL is to disseminate NIFTAL research output and transfer professional skills and technical information for research, extension and production enterprises required to access and use of technologies based on biological nitrogen fixation for crop production in the tropics.

When Dr. Robert J. Davis and Dr. Douglas Beck visited the Agriculture Research Institute they made suggestions for reorganization of use of the facilities established for rhizobium production. They also observed field trials and groundnut plantings in intensive production townships with U Hla Than, Plant Pathologist/ARI. The laboratory has been improved for maintaining stock cultures and producing starter cultures, as well as facilities for conducting quality control procedures, such as plant infection testing and serological identification.

U Hla Than, Daw Nwe Nwe Aung, and Daw Khin San Wai, all of ARI, have attended NIFTAL intensive training courses in rhizobium technology.

*Fig. 48. Rhizobium bacteria have developed numerous nodules on groundnut roots, which result in nitrogen fixation.*

Rhizobium inoculant distribution in Project areas for groundnuts during the 1983-85 period is listed below:

| | |
|---|---|
| 1982-83 | 7,825 pounds |
| 1983-84 | 20,000 pounds |
| 1984-85 | 26,226 pounds |

All of the new equipment supplied by this Project for the legume inoculation production unit, laboratory and the quality control room, is in operation and functioning well at the present time.

The raw peat from Maymyo in the Mandalay Division or from the Heho valley in Shan State, is sun-dried, then ground. This is sterilized in a baking room at 300 to 400 degrees Centigrade for one hour, or steamed at 125 degrees C for three hours.

A drum-type fermentor was developed in 1982-83 for the fermentation process for multiplying the rhizobium. A yeast extract is used as a medium for research purposes, while chickpea broth is used for commercial production being comprised of 75 grams of chickpea seed, 1.5 grams of cane sugar and 1,000 milliliters of water. The rhizobium is multiplied in the fermentor for five days, then aerated before mixing the suspension with sterilized peat in a mixer. The blend consists of 3 grams of peat for each milliliter of rhizobium suspension.

The rhizobium inoculum is packaged (250 grams each) and stored at 17 to 20 degrees Centigrade in an air conditioned room. The inoculant is distributed to the Township officers of the Agriculture Corporation and later sold to the farmers.

Australian soil microbiologists have provided the Agriculture Research Institute with another strain of *Rhizobium*, Isareli strain 297/A, for groundnuts, mung beans and lima (or butter) beans. Strain CC119Z is used for chickpeas.

A second rhizobium inoculation production facility is planned for Maymyo since there is a source of peat at this location. Maymyo also has a cooler climate which should minimize the need for air conditioning in the storage buildings. It is expected that, with this plant in operation, the target of 3 million packets of inoculant per year, will be reached.

Efforts also are being made at the present time to improve the transportation, distribution and storage facilities.

Tables 51 through 56 indicate the distribution and utilization of rhizobial peat inoculants for various leguminous species for the crop years 1981-82 through 1985-86.

*Fig. 49. A farmer at a High Technology Site in Singu Township showing a groundplant with an abundance of nodules on the roots, which result in nitrogen fixation.*

*Fig. 50. Dr. Robert J. Davis conducting a workshop on Rhizobium production.*

**Table 51. Utilization of Rhizobial Peat Inoculants for Some Leguminous Crops in 1981-82 (Acre-Packs).**

| State or Division | Groundnut | Lima Bean | Chick Pea | Mung Bean | Total |
|---|---|---|---|---|---|
| Kachin | 11,000 | — | — | — | 11,000 |
| Karen | 2,400 | — | — | — | 2,400 |
| Sagaing | 101,350 | 40,000 | 88,800 | 6,000 | 206,150 |
| Pegu | 22,710 | — | 38,560 | 200 | 61,470 |
| Magwe | 40,000 | 10,000 | 50,000 | 1,000 | 101,000 |
| Mandalay | 36,700 | 35,000 | 603,000 | 4,720 | 136,720 |
| Mon | 2,000 | — | — | — | 2,000 |
| Rakhine | — | — | — | — | — |
| Rangoon | 5,209 | — | 1,550 | 450 | 7,209 |
| Irrawaddy | 47,886 | — | 8,540 | 5,130 | 61,556 |
| Kayah | 1,000 | — | — | — | 1,000 |
| Shan | — | 100 | — | — | 100 |
| TOTAL | 270,225 | 55,100 | 247,750 | 17,500 | 590,605 |

**Table 52. Utilization of Rhizobial Peat Inoculants for Some Leguminous Crops in 1982-83 (Acre-Packs).**

| State or Division | Groundnut | Lima Bean | Chick Pea | Total |
|---|---|---|---|---|
| Kachin | 3,000 | — | — | 3,000 |
| Karen | 100 | — | — | 100 |
| Kayah | 1,000 | — | — | 1,000 |
| Sagaing | 106,000 | 10,000 | 86,000 | 202,000 |
| Pegu | 24,000 | — | 20,973 | 44,973 |
| Magwe | 46,850 | 28,200 | 49,820 | 124,870 |
| Mandalay | 119,650 | 25,550 | 67,800 | 213,000 |
| Mon | 5,000 | — | — | 5,000 |
| Rakhine | 958 | — | — | 958 |
| Rangoon | 7,910 | — | — | 7,910 |
| Shan | 10,430 | — | — | 10,430 |
| Irrawaddy | 140,000 | — | 10,000 | 150,000 |
| TOTAL | 464,898 | 63,750 | 234,953 | 763,241 |

**Table 53. Utilization of Rhizobial Peat Inoculants for some Leguminous Crops in 1983-84 (Acre-Packs).**

| State or Division | Groundnut | Lima Bean | Chick Pea | Mung Bean | Green Gram | Soybean | Sultapyu | Total |
|---|---|---|---|---|---|---|---|---|
| Kachin | 4,200 | — | — | — | — | — | — | 4,200 |
| Kayah | 1,200 | — | — | — | — | — | — | 1,200 |
| Sagaing | 62,550 | 8,118 | 56,596 | 2,275 | 100 | — | 396 | 130,035 |
| Pegu | 42,200 | — | 34,860 | 1,550 | 10 | 10 | — | 78,630 |
| Magwe | 63,175 | 9,910 | 30,455 | — | — | — | 100 | 103,640 |
| Mandalay | 104,220 | 23,650 | 32,375 | 275 | 50 | — | 350 | 160,915 |
| Mon | 1,100 | — | — | — | — | — | — | 1,100 |
| Shan | 31,300 | — | — | — | — | — | — | 31,300 |
| Rangoon | 23,000 | — | 3,000 | 2,400 | 200 | — | — | 28,600 |
| Irrawaddy | 62,626 | 3,250 | 20,231 | 27,000 | 2,000 | 2,000 | — | 117,107 |
| TOTAL | 395,571 | 44,928 | 177,512 | 33,500 | 2,360 | 2,010 | 846 | 656,727 |

**Table 54. Utilization of Rhizobial Peat Inoculants for some Leguminous Crops in 1984-85 (Acre-Packs).**

| State or Division | Groundnut | Lima Bean | Chick Pea | Sultapyu | Total |
|---|---|---|---|---|---|
| Kachin | 4,300 | — | — | — | 4,300 |
| Kayah | 1,200 | — | 500 | — | 1,700 |
| Karen | 5,500 | — | — | 750 | 6,250 |
| Rakhine | 500 | — | — | — | 500 |
| Sagaing | 72,750 | 11,670 | 51,425 | 400 | 136,245 |
| Pegu | 37,281 | — | 28,906 | — | 66,187 |
| Magwe | 81,910 | 10,690 | 29,170 | 145 | 121,915 |
| Mandalay | 112,190 | 17,500 | 29,550 | 375 | 159,615 |
| Mon | 2,000 | — | — | — | 2,000 |
| Rangoon | 6,200 | — | 1,750 | — | 7,950 |
| Shan | 18,850 | — | 1,446 | — | 20,296 |
| Irrawaddy | 62,000 | 3,100 | 13,950 | — | 79,050 |
| TOTAL | 404,681 | 42,960 | 156,695 | 1,670 | 606,008 |

**Table 55. Utilization of Rhizobial Peat Inoculants for Some Leguminous Crops, 1985-86 (Projected) (Acre-Packs).**

| State or Division | Groundnut | Chick Pea | Lima Bean | Sultani | Total |
|---|---|---|---|---|---|
| Kachin | 3,200 | — | — | — | 3,200 |
| Kayah | 2,000 | 400 | — | — | 2,400 |
| Karen | 5,000 | — | — | 1,000 | 6,000 |
| Sagaing | 89,500 | 56.900 | 6,340 | 760 | 153,500 |
| Pegu | 39,100 | 32,600 | — | — | 71,700 |
| Magwe | 105,100 | 26,970 | 11,000 | — | 143,170 |
| Mandalay | 102,840 | 36,250 | 28,500 | 1,000 | 168,590 |
| Mon | 4,000 | — | — | 500 | 4,500 |
| Rangoon | 8,800 | 400 | — | 1,330 | 10,530 |
| Shan | 19,000 | — | — | — | 19,000 |
| Irrawaddy | 47,600 | 6,950 | 2,900 | 200 | 57,650 |
| TOTAL | 426,140 | 160,470 | 48,840 | 4,790 | 640,240 |

# 14. CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE ACTIVITIES

The goal of the Maize and Oilseeds Production Project is to increase production of oilseeds and maize in 28 Townships of rural Burma. Project success is being realized through the provision of human and natural resources, as well as agricultural inputs and equipment, by the Socialist Republic of the Union of Burma and U.S. Government through the United States Agency for International Development.

To date, the Midwest Universities Consortium for International Activities (MUCIA) and Texas A & M University have provided technical assistance (five long-term technicians and 21 short-term consultants) to work with the local Maize and Oilseeds Production Project (MOPP) staff. Long-term, short-term and on-the-job training programs have been conducted, as well as English training, in order to improve staff capability, and over fifteen students have come to the U.S.A. to work on M.S. degrees. MUCIA staff members have also written thirteen extension bulletins, four of which have been translated into Burmese.

Additionally, four seed farms were established to provide high quality seed, a new production facility for rhizobium was developed, and another one was planned. Several plot designs were also developed and translated into Burmese for trials that were conducted at the four farms.

The results of such inputs have been impressive. Overall rhizobium production has increased nine-fold, and total acreage harvested and per-acre yields for maize, groundnuts, sesame and sunflowers have increased steadily through the three crop years since the beginning of the Project in 1982. Thus far a foundation for sustaining higher production levels has been established, but in order to ensure the continuing success of the Project, continued development work will be needed. Some of the major areas for future activities are listed below.

## 14.1. RESEARCH

In order to make valid recommendations for crop production, it is necessary to have reliable research information for the crops involved. At the present time, such information based on replicated trials for the target areas is lacking. While experimental trials have been established on the MOPP seed farms, at the ARI/Yezin, and the ARD farm at Magwe, research trials must continue to be conducted for varieties, fertilizers, weed control, etc., for maize and all the oilseed crops.

Fertilizer trials are especially important to determine the optimum usage in order to obtain high economic yields. The value of improved varieties and hybrids will be limited unless the optimum amounts of fertilizer can be applied.

More trials on herbicides are also needed as weeds constitute one of the most critical problems in the production of maize and the other oilseed crops of this Project. Weeds compete strongly with the young plants for soil nutrients, light and water, thus decreasing the amount of fertilizers available for the crops.

Extensive use of rhizobial peat inoculants should be encouraged as a means of increasing production of leguminous crops, as well as decreasing dependency on urea fertilizer. The residual effect of the nitrogen also is valuable for other crops in a rotation system.

Research trials should also be conducted for improved varieties, and when feasible, hybrids, to determine which will increase production. Finally, research must be carried out to determine the most effective ways to eliminate disease problems and those caused by insects, rodents and other pests.

## 14.2. CONSTRUCTION AND MACHINERY

Of major importance to the success of any project, is the timely construction of buildings or other structures and efficient maintenance of existing machinery. Unfortunately, buildings, on-farm canals and other structures scheduled for construction have suffered from time delays due mostly to a shortage of cement, and many machine operators have not been fully trained. This state of affairs has negatively affected Project progress.

For example, due to delays in construction, equipment ordered for the two controlled storage buildings and one seed processing plant will have to be stored until the buildings have been completed. Thus, the equipment has not been available for use, hampering the progress of the Project so that it is unlikely that targets in seed production can be achieved. Regularly scheduled meetings should be held with Construction Corporation personnel to discuss progress, building constraints, and time delays, and provision should be made for supplying cement when needed.

In the area of water management, the lack of cement has also caused temporary earth canals to become quickly riddled by rodents, resulting in extensive water losses. A significant amount of work is required before each irrigation to repair the damage. If cement cannot be had in a timely manner to construct canals, a program of rodent control should be established to reduce the damage.

Due to the lack of well-trained machine operators, ef-

ficiency is often very low, resulting in excessive time and fuel being consumed for each operation. The services of U.S. Farm Management consultants should be obtained to give on-the-job training to the machinery operators during the appropriate times in the crop season. Further, the present fuel storage system, using 55 gallon U.S. drums, results in degradation of fuel quality. Fuel should be stored on the farms in bulk tanks that have proper drains and dispensing apparatus.

## 14.3. PARTICIPANT TRAINING

An important element of the Project is long-term participant training in the U.S. for 36 select candidates. For several reasons, it is doubtful that this objective can be realized. Delays in receiving the names of candidates have created problems for the USAID and MUCIA in gaining university acceptance for the candidates, as most U.S. universities request that applications be received six months in advance of the registration date. To eliminate this bottleneck, participants for long-term training should be selected and approved two years in advance of the training program. Also, an alternate candidate should be named for each fellowship in case the designated candidate is not able to begin his studies for any reason.

All candidates for study in the U.S. or elsewhere should take a TOEFL test as soon as they have been selected in order to determine the level of English language proficiency. The test is usually given two or three times a year. If the candidate scores below 550, intensive English language training should be provided until a score of 500 can be achieved. Application should be made to the university as soon as the candidate attains a score of at least 500, but not later than six months before the registration date. The alternate candidates also should take the TOEFL and any necessary intensive English language training required to pass the test.

Because of the individualized needs of each of the candidates, great care should be taken in selecting the U.S. land grant university which can provide the type of training required. A schedule should be developed so that the original transcripts and required documents are sent to the universities to be processed in a timely manner. All candidates for M.S. degrees should be scheduled for 30 months, while Ph.D. candidates should be scheduled for a minimum of 48 months. Even with these time periods, extensions should be available with approval.

In the management of these training programs, senior officials, when unavailable for whatever reason, should delegate authority to someone who can act upon and approve training programs and authorize and release telegrams pertaining to students. Also, all personnel involved in approving candidates should be present at all meetings that involve long-term participant training. The importance of timing in processing the participants' portfolio cannot be overstressed. Delays and last minute changes may often mean that the candidates' application cannot be approved until the following semester or year.

## 14.4. TECHNICAL ASSISTANCE

The provision of short-term technical assistance at critical points during the conduct of the Project has been essential to Project success. Delays in obtaining clearances for short-term technicians have created problems for MUCIA and the technicians involved, as well as making it difficult for the MOPP and local MUCIA personnel to arrange schedules so that the technicians can be in Burma at the appropriate time. In order to obtain the services of well qualified technicians, clearances must be granted expeditiously, as those who are best qualified often have numerous opportunities and must plan accordingly. Also, the types of technicians, length of consultancy, detailed job description, and travel requirements should be decided well in advance. Meetings for making selections should include the people who will be involved in obtaining clearances, thus assuring their understanding of the necessity for arranging clearances promptly.

## 14.5. MANAGEMENT AND ADMINISTRATION

The progress of any project depends on adequate communication among all personnel responsible for implementing the project. Regularly scheduled meetings attended by key personnel are necessary for such communication to take place. Such meetings should be held every quarter to include USAID, MOPP and MUCIA personnel, as well as those senior officers of the Agriculture Corporation who are involved with the Project. Meetings should be scheduled for a specific date and time. For those who are unable to attend, authority should be delegated to a replacement. These procedures should apply to the regularly scheduled monthly meetings to include the Managing Director of the Agriculture Corporation and the General Manager for Planning and Extension/AC, as well as USAID, MOPP and MUCIA personnel.

To enhance communication, weekly meetings should also be held between the senior officers of the MOPP and the MUCIA personnel to discuss Project planning, implementation, progress and constraints. Again, these meetings should be regularly held and those unable to attend should send a delegate with the authority to make decisions and take action.

## 14.6. TRAVEL

A lack of gasoline has had a limiting effect on travel to Project sites at critical times. Funds should be budgeted and arrangements should be made to ensure sufficient gasoline for the foreign technicians and senior MOPP personnel to make at least one trip every month to whatever Project areas are currently most im-

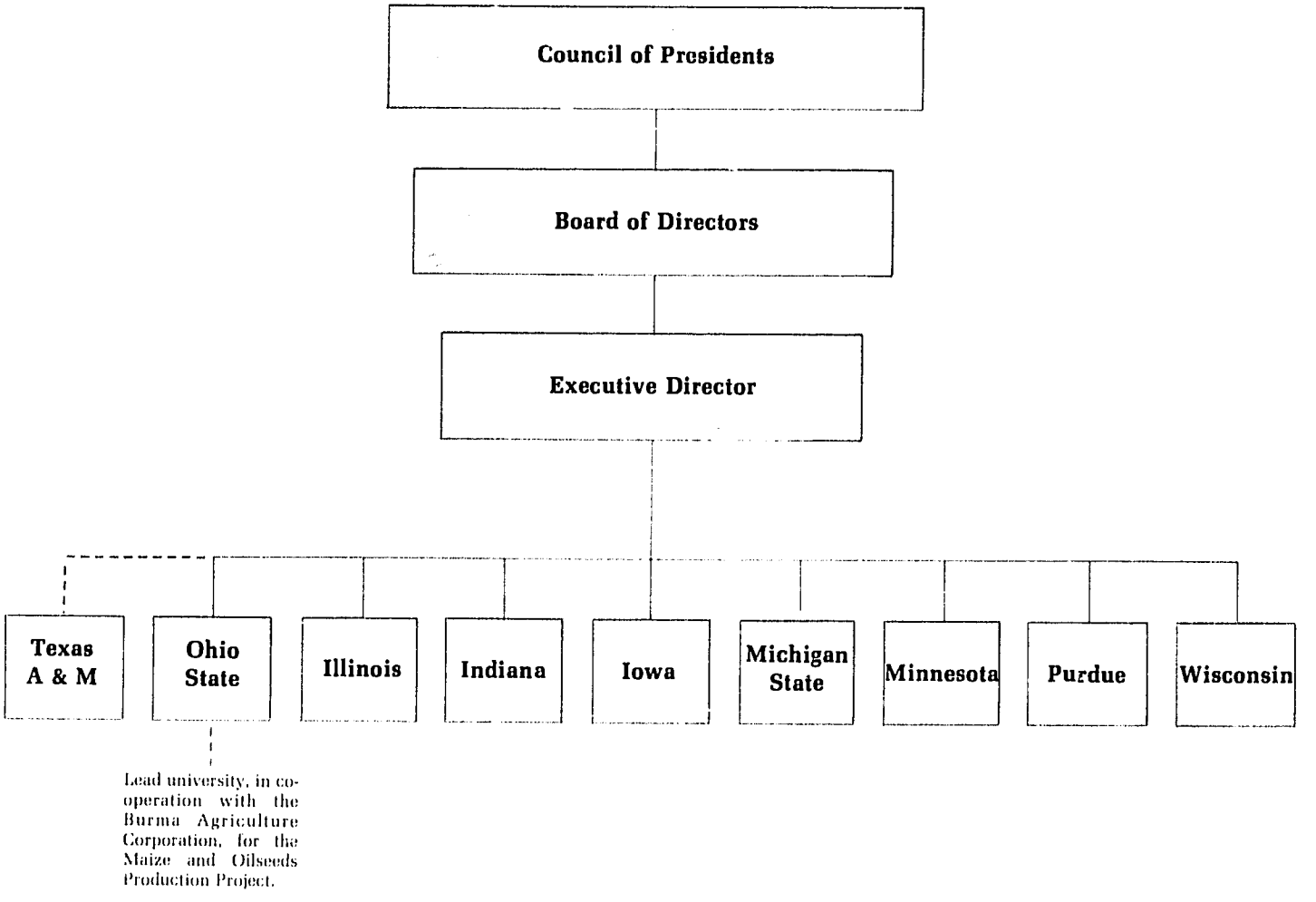
portant to those involved. Such trips are especially important during the planting and harvesting seasons, providing opportunities for observation of progress as well as on-the-job training. Sufficient gasoline is also essential for trips for short-term consultants so that they can work to full capacity without delays.

## 14.7. CUSTOMS CLEARANCE

A major constraint to efficient Project implementation has been the inability to expeditiously clear commodities from Customs. Customs formalities and unanticipated duties and taxes have caused many commodities to remain in Customs for varying periods of time up to nine months. Projected time frames for accomplishing many Project objectives have had to be extended because of the unavailability of the commodities. All commodities should be exempt from duties and taxes as stated in the Project Grant Agreement and arrangements should be made for removing commodities from Customs within one week of arrival into the country. The success of the Project can only be enhanced by such actions.

The Maize and Oilseeds Production Project has accomplished much to date. All of the personnel involved with this Project can have a sense of satisfaction that they have made a positive contribution to enhancing agriculture in Burma. If the programs begun are sustained and if the needed changes described above are made, there is good assurance that the gains made in the Project will be sustained well beyond the life of the Project itself.

# MIDWEST UNIVERSITIES CONSORTIUM FOR INTERNATIONAL ACTIVITIES, INC.




The Midwest Universities Consortium for International Activities, Inc. (MUCIA) is the oldest and most experienced of the several consortia involved in international development and education. MUCIA began in 1964 with four universities—Illinois, Indiana, Michigan State, and Wisconsin. Minnesota joined in 1969, Ohio State in 1975, Iowa in 1977, and Purdue in 1985. MUCIA is the only incorporated offspring of a group of American universities that received International Training and Research grants from the Ford Foundation in the 1960s, and the *raison d'etre* rested in large part on the ability of the universities to do some things that one university could not do.

Since the expiration of the Ford grant in the mid 1970s, MUCIA has acted as a contractor for large scale technical assistance contracts and other educational programs. These contracts are carefully chosen from two areas: long-term institution building projects and educational exchanges of faculty.

For example, the technical assistance contracts have expanded beyond agriculture into fields such as education, business, medicine, public administration, engineering, mathematics, and basic sciences, with projects funded by AID, the World Bank, the Asian Development Bank, and host countries. These contracts emphasize cooperation with institutions such as the University of the West Indies and the Caribbean Regional Agricultural Extension Services, in the Leeward Islands; the Faculties of Commerce of Dhaka, Chittagong and Rahshahi Universities in Bangladesh; the University of Indonesia, Gadjah Mada University, Andalas University and North Sumatra in Indonesia; and the Institut Teknologi, Mara, Malaysia.

Successful projects have been completed with La Molina University in Peru, Tribhuran University in Nepal, Addis Ababa University in Ethiopia, and the Medical School of Chiangmai University in Thailand, and the Agricultural Institute at Bogor in Indonesia. Even though projects are completed, MUCIA maintains long-term relationships with its sister institutions.

MUCIA also has thirteen general agreements with institutions throughout the world, which are intended to facilitate communication and exchange of faculty and students. The most recently active of these are with the Moscow State University, USSR; and the Universidad Autonoma de Madrid, Spain. The Executive Office has also held discussions and is developing proposals for exchanges with the French consortium, Mission Interuniversitaire de Coordinacion des Echanges Franco-Americans (MICEFA); with the Dutch consortium, Netherlands Universities Foundations for International Cooperation (NUFFIC), and also with the Korean Advanced Institute of Science and Technology (KAIST).