UNITED STATES AGENCY for INTERNATIONAL DEVELOPMENT

USAID

CAIRO, EGYPT

DIR/CS
UNIT 64902
APO AE 09839-4902

December 20, 1992

DUPLICATE ORIGINAL

Dr. J.H. Dodds
Managing Director, ABSP
416 Plant and Soil Sciences Bldg.
Michigan State University
East Lansing, Michigan 48824

Subject: **Cooperative Agreement No. 263-0152-A-00-3036-00**

Dear Dr. Dodds:

Pursuant to the authority contained in the Foreign Assistance Act of 1961 and the Federal Grant and Cooperative Agreement Act of 1982, as amended, the Agency for International Development (hereinafter referred to as "A.I.D.") hereby provides to Michigan State University (hereinafter referred to as "MSU" or "Recipient") the sum set forth in Section 1C.2. of Attachment 1 of this Cooperative Agreement to provide financial support for the program described in Attachment 2 of this Cooperative Agreement entitled "Program Description."

This Cooperative Agreement is effective as of the date od this letter and funds obligated hereunder shall be used to reimburse the Recipient for allowable program expenditures for the period set forth in Section 1B. of Attachment 1 of this Cooperative Agreement.

The total estimated amount of this Cooperative Agreement is the amount set forth in Section 1C.1. of Attachment 1, of which the amount set forth in Section 1C.2. is hereby obligated. A.I.D. shall not be liable for reimbursing the Recipient for any costs in excess of the obligated amount. However, subject to Section 1C.4. of Attachment 1, additional funds may be obligated by A.I.D. until such time as the obligated amount may equal the total estimated amount of this Cooperative Agreement.

This Cooperative Agreement is made to the Recipient on the condition that the funds will be administered in accordance with the terms and conditions as set forth in the attachments listed under my signature below. These attachments, together with your proposal dated September 1, 1992 which is also incorporated herein by reference, constitute the entire Cooperative Agreement document and hereby it is agreed to by your organization.

Please acknowledge receipt and acceptance of this Cooperative Agreement by signing all copies of this Cover Letter. Retain one copy for your files and return the remaining copies, including the one stamped "ORIGINAL", to the undersigned.

Sincerely yours,

Leonel T. Pizarro
Agreement Officer

Attachments:

1. Schedule
2. Program Description
3. ~~Standard~~ Provisions
4. Special Provision entitled "Restrictions on Lobbying"
5. A.I.D. Eligibility Rules (total procurement value > $250K)

ACKNOWLEDGED:

MICHIGAN STATE UNIVERSITY

BY: _____

TYPED NAME: RICHARD L. HOWE

TITLE: Assistant Director Contract & Grant Administration

DATE: JAN 0 5 1993

# FISCAL DATA

## A. GENERAL

A.1. Total Estimated A.I.D. Amount: $1,540,262.00
A.2. Total Obligated A.I.D. Amount: $ 776,889.00
A.5. Project No.: 263-0152.05-3
A.6. Project Officer: Nasr Rohaiem
A.6. A.I.D. Project Office: AGR/A
A.7. Funding Source: USAID/CAIRO
A.8. Tax I.D. No.: 38-600-5984 W
A.9. DUNS No.: 05-334-3976
A.10. LOC No.: 72-00-1331

## B. SPECIFIC

B.1.(a) PIO/T No.:263-0152.05-3-92095
B.1.(b) Appropriation: 72-112/31037
B.1.(c) Allotment: N/A
B.1.(d) BPC: QES29223263KG13
B.1.(e) Amount: $776,889.00

**ATTACHMENT 1**

## SCHEDULE

### 1A. PURPOSE OF COOPERATIVE AGREEMENT

The purpose of this Cooperative Agreement is to provide financial support for the program described in Attachment 2 of this Cooperative Agreement entitled "Program Description."

### 1B. PERIOD OF COOPERATIVE AGREEMENT

**1B.1.** The effective date of this Cooperative Agreement is the date of the Cover Letter and the estimated completion date is September 30, 1994. Funds obligated hereunder shall be used to reimburse the Recipient for allowable program expenditures incurred by the Recipient in pursuit of program objectives at any time during the period beginning October 1, 1992 (see Section 1D.4. below) and ending on the estimated completion date.

**1B.2.** However, because this Cooperative Agreement is incrementally funded (see Section 1C.4. below), funds obligated hereunder are only anticipated to be sufficient for program expenditures through September 30, 1993.

### 1C. AMOUNT OF COOPERATIVE AGREEMENT AND PAYMENT

**1C.1.** The total estimated amount of this Cooperative Agreement for its full period, as set forth in Section 1B.1. above, is $1,540,262.00.

**1C.2.** A.I.D. hereby obligates the amount of $776,889.00 as partial funding of the total estimated amount set forth in Section 1C.1. above for program expenditures during the indicated period set forth in Section 1B. above. Notwithstanding said total estimated amount, A.I.D. shall not be liable for reimbursing the Recipient for any costs in excess of the obligated amount, except as specified in paragraph (f) of the Standard Provision of this Cooperative Agreement entitled "Revision of Grant Budget" (see also Section 1C.4. below).

**1C.3.** Payment shall be made to the Recipient in accordance with procedures set forth in the Standard Provision of this Cooperative Agreement entitled "Payment - Letter of Credit," as shown in Attachment 3.

**1C.4.** As indicated in Section 1C.2. above, this Cooperative Agreement is partially funded. Until such time as the obligated amount (see Section 1C.2. above) shall equal the total estimated amount (see Section 1C.1. above) of this Cooperative Agreement,

additional increments of funds may be obligated by A.I.D. under this Cooperative Agreement (by a Cooperative Agreement modification), subject to availability of funds, possible evaluation of the program, program priorities at the time, and the requirements of the Standard Provisions of this Cooperative Agreement entitled "Revision of Grant Budget" and, if applicable (see Section 1K.2. for applicability) "Cost Sharing (Matching)," as set forth in Attachment 3.

**1D. COOPERATIVE AGREEMENT BUDGET**

**1D.1.** The following is the Budget for the total estimated amount of this Cooperative Agreement (see Section 1C.1. above) for its full period (see Section 1B. above). The Recipient may not exceed the total estimated amount or the obligated amount of this Cooperative Agreement, whichever is less (see Sections 1C.1. and 1C.2., respectively, above). Except as specified in the Standard Provision of this Cooperative Agreement entitled "Revision of Grant Budget," as shown in Attachment 3, the Recipient may adjust line item amounts as may be reasonably necessary for the attainment of program objectives.

**1D.2.** Budget

**ABSP CO-OP AGREEMENT BUDGET $ ( 2 YEARS ) Continued.**

| INNOVATIVE ACTIVITIES | Year 1 | Year2 | TOTAL |
|---|---|---|---|
| Intellectual Property | | | |
| 1. Consultancies | 13,000 | 12,000 | 25,000 |
| ABC Memberships | 2,600 | 0 | 2,600 |
| Secretarial Assistant | 20,000 | 20,000 | 40,000 |
| Financial Assistant | 20,000 | 20,000 | 40,000 |
| Associate Network Specialist | 35,000 | 35,000 | 70,000 |
| Operation / Office Expenses | 15,000 | 15,000 | 30,000 |
| Overhead * | 46,350 | 45,900 | 92,250 |
| **Subtotal ( direct cost plus overhead)** | 151,950 | 147,900 | **299,850** |
| **Subtotal ( for four projects.Maize,Potato, Cucurbit and Tomato) **** | 624,939 | 615,473 | **1,240,412** |

Total Year 1 (PIO/T) **776,889**

**GRAND TOTAL for CO-OP AGREEMENT** **1,540,262**

* Overhead (45%) for Innovative Activities, excluding ABC membership. Other overheads covered in each proposal.

** Subtotal for 4 projects includs indirectcosts @ the rates as stated in the Grantee's proposed budget & which is hereby incorporated to this agreement.

ABSP CO-OP AGREEMENT BUDGET (2 YEARS)

| Research* | | Year 1 | Year 2 | TOTAL |
|---|---|---|---|---|
| Maize Transformation (Insect Resistance) | MSU | 161,350 | 149,350 | 310,700 |
| Potato Resistance (PTM Resistance) | MSU | 123,250 | 123,250 | 246,500 |
| Cucurbit Transformation | MSU/Cornell | 152,625 | 152,625 | 305,250 |
| Tomato Transformation (Virus Resistance) | Scripps | 187,714 | 190,248 | 377,962 |
| GRAND TOTAL: | | 624,939 | 615,473 | 1,240,412 |

**Detailed budget pages included in each proposal**

**1D.3.** Inclusion of any cost in the budget of this Cooperative Agreement does not obviate the requirement for prior approval by the Agreement Officer of cost items designated as requiring prior approval by the applicable cost principles (see the Standard Provision of this Cooperative Agreement set forth in Attachment 3 entitled "Allowable Costs") and other terms and conditions of this Cooperative Agreement, unless specifically stated in Section 1I. below.

**1D.4.** Notwithstanding the effective date of this Cooperative Agreement as shown in Section 1B. above, and subject to the Standard Provision of this Cooperative Agreement entitled "Allowable Costs," costs incurred by the Recipient in pursuit of program objectives on or after the earliest date set forth in Section 1B. above shall be eligible for reimbursement hereunder. Such costs are included in the Cooperative Agreement Budget shown above.

## 1E. REPORTING

### 1E.1. Financial Reporting

**1E.1.(a)** Financial reporting requirements shall be in accordance with the Standard Provision of this Cooperative Agreement entitled "Payment - Letter of Credit," as shown in Attachment 3.

**1E.1.(b)** All financial reports shall be submitted to A.I.D., Office of Financial Management, PFM/FM/CMPD/DCB, Room 700 SA-2, Washington, D.C. 20523-0209. In addition, three copies of all financial reports shall be submitted to the A.I.D. Project Office specified in the Cover Letter of this Cooperative Agreement, concurrently with submission of the Quarterly Technical Reports (See Section 1E.2. below).

**1E.1.(c)** The frequency of financial reporting and the due dates of reports shall be as specified in the Standard Provision of this Cooperative Agreement referred to in Section 1E.1.(a) above.

### 1E.2. Program Performance Planning and Reporting

(Defining the program performance planning and reporting requirements is the responsibility of the A.I.D. Project Officer. The following quarterly, special, final, DNA, participant training, and care of laboratory animals reports are generally standard requirements. Note that performance/technical reports are generally required to be submitted in the same frequency and for the same period as the financial reports described in Section 1E.1. above, which are usually quarterly. Thus, quarterly performance/technical reports are generally required, and with few exceptions, must be included in the cooperative agreement. See paragraph 1N4 of HB 13 for exceptions. Other reporting requirements are at the discretion of the A.I.D. Project Officer. Nevertheless, some non-standard reports have become common requirements, and are therefore set forth below for suggestion to/decision by the A.I.D. Project Officer. These should not be considered all-encompassing or always appropriate, since the planning and reporting requirements must reflect both the nature of the program and the A.I.D. Project Officer's information needs for each cooperative agreement on a case-by-case basis. The program performance planning and reporting requirements are the means by which the A.I.D. Project Officer fulfills his/her monitoring responsibilities, and are often the basis for subsequent project evaluations)

**1E.2.(a)** Project Implementation Plan

Not later than sixty (60) days from the effective date of this Cooperative Agreement (see Section 1B. above), the Recipient shall prepare and submit to the A.I.D. Project Officer specified in the

Cover Letter of this Cooperative Agreement five (5) copies of a project implementation plan, with critical path indicators (as described in Appendix 9A of A.I.D. Handbook 3), for the full term of this Cooperative Agreement.

**1E.2.(b)** Annual Workplans

**1E.2.(b)(1)** Not later than sixty (60) days following the effective date of this Cooperative Agreement (see Section 1B. above), the Recipient shall prepare and submit to the A.I.D. Project Officer specified in the cover letter of this Cooperative Agreement five (5) copies of a draft workplan which outlines the schedule of activities under the first year of this Cooperative Agreement. Thereafter, the Recipient shall submit five (5) copies of a draft annual workplan covering each successive year of this Cooperative Agreement not later than sixty (60) days prior to the start of the second and each subsequent year. Based on collaborative review, a final annual workplan will be approved by the A.I.D. Project Officer within thirty (30) days of the submission of the draft annual workplan.

**1E.2.(b)(2)** The annual workplan shall include the following information:

**1E.2.(b)(2)(A)** A list of activities to be undertaken during the workplan period, including testing at the various locations.

**1E.2.(b)(2)(B)** A statement of how the activities relate to the outputs and research priorities.

**1E.2.(b)(2)(C)** A projected beginning timeframe for the activities to begin.

**1E.2.(b)(2)(D)** A project ending timeframe for the completion of the activity.

**1E.2.(b)(2)(E)** A projected expenditure of person-months of input for each activity.

**1E.2.(b)(2)(F)** The projected stage of research or the projected outputs at the end of the annual workplan.

**1E.2.(b)(2)(G)** A statement indicating the provisions for complying will all relevant regulations dealing with biotechnology and genetically engineered biological products.

**1E.2.(c)** Quarterly Reports

The Recipient shall submit five (5) copies of brief quarterly program performance reports, which coincide with the financial reporting periods described in Section 1E.1. above, to the A.I.D.

8

Project Office specified in the Cover Letter of this Cooperative Agreement. In addition, two copies shall be submitted to A.I.D., PPC/CDIE/DI, Washington, DC 20523-1802. These reports shall be submitted within 30 days following the end of the reporting period, and shall briefly present the following information:

**1E.2.(c)(1)** A comparison of actual accomplishments with the goals established for the period, the findings of the investigator, or both. If the output of programs can be readily quantified, such quantitative data should be related to cost data for computation of unit costs.

**1E.2.(c)(2)** Reasons why established goals were not met, if applicable.

**1E.2.(c)(3)** Other pertinent information including the status of finances and expenditures and, when appropriate, analysis and explanation of cost overruns or high unit costs.

**1E.2.(d)** Special Reports

Between the required program performance reporting dates, events may occur that have significant impact upon the program. In such instances, the Recipient shall inform the A.I.D. Project Officer as soon as the following types of conditions become known:

**1E.2.(d)(1)** Problems, delays, or adverse conditions that will materially affect the ability to attain program objectives, prevent the meeting of time schedules and goals, or preclude the attainment of work units by established time periods. This disclosure shall be accompanied by a statement of the action taken, or contemplated, and any A.I.D. assistance needed to resolve the situation.

**1E.2.(d)(2)** Favorable developments or events that enable time schedules to be met sooner than anticipated or more work units to be produced than originally projected.

**1E.2.(d)(3)** If any performance review conducted by the Recipient discloses the need for change in the budget estimates in accordance with the criteria established in the Standard Provision of this Cooperative Agreement entitled "Revision of Grant Budget," the Recipient shall submit a request for budget revision to the Agreement Officer and the A.I.D. Project Officer specified in the Cover Letter of this Cooperative Agreement.

**1E.2.(e)** Annual Activity Reports

Within thirty (30) days following the annual anniversary date of this Cooperative Agreement, the Recipient shall submit to the A.I.D. Project Office specified in the cover letter of this Cooperative Agreement five (5) copies of an annual technical

progress report which will be a description of the past year's activities, including technical, scientific, managerial, and fiscal information. The report shall include, both for each field site or subcontractor/subrecipient individually and for project activities as a whole, a review of program and problems to date, and a discussion of technical and managerial issues significant to the success or failure of this Cooperative Agreement. The report will also address regulatory issues related to the project. Although principally a technical document, it nevertheless must include pertinent statistics or quantitative information regarding the project and its activities. An Impact Analysis Report will be appended to this report, which will be considered an instrument for Technology Transfer. The Impact Analysis Report will summarize and provide a feedback system for measurement and evaluation of the impact of the Recipient's activities in the public and private sector. The impact analysis will generally be qualitative in nature, and quantified only as appropriate. The Annual Activity Report shall also include an annual expenditure report corresponding to each annual workplan (see Section 1E.2.[b] above). These expenditure reports will cover A.I.D. and, if applicable, cost-sharing amounts by budget line item (see Section 1D.2. above) and by estimated distribution amongst project components, e.g., research, training, technical assistance, technology transfer, information dissemination, or networking.

**1E.2.(f)** Technical and Research Reports and Publications

The Recipient shall summarize technical and research activities of the project in reports, and distribute such reports to the appropriate USAID Missions, LDCs, and host country and international institutions in order to encourage use of the technology developed. Such reports will be completed within 60 days after completion of the activity. Journal articles and other publications are encouraged. See also Section 1I. of this Cooperative Agreement pertaining to publications.

**1E.2.(g)** Environmental Impact

If it appears that outputs of this project will result in an adverse environmental impact, the Recipient shall notify the A.I.D. Project Officer prior to implementation, in order to allow for orderly preparation of an environmental impact statement. The Recipient shall assure that appropriate U.S. Government and/or host country procedures are followed.

**1E.2.(h)** Trip Reports

Within 30 days following the completion of each international trip, the Recipient shall submit 3 copies of a trip report summarizing the accomplishments of the trip to the A.I.D. Project Officer specified in the cover letter of this Cooperative Agreement. If

several individuals are travelling together to one site, a single report representing the group will suffice. The report shall include the purpose of the trip, technical observations, suggestions and recommendations, overall impressions of the site situation (if appropriate), and a list of persons visited with their title and organization affiliation.

**1E.2.(i)** Training Reports

**1E.2.(i)(1)** If the Standard Provision entitled "Participant Training" applies to this Cooperative Agreement (see Section 1K. for applicability), the Recipient shall comply with reporting and information requirements of the Standard Provision of this Cooperative Agreement entitled "Participant Training," as well as Chapters 5 and 24 of A.I.D. Handbook 10.

**1E.2.(i)(2)** The Recipient shall also provide five (3) copies of quarterly training reports to the A.I.D. Project Officer, covering this Cooperative Agreement. The report shall include the following information:

- Total number of new trainees during the period; and
- The following information for each LDC trainee:
  - name
  - citizenship
  - gender
  - training site
  - beginning and ending dates of training
  - purpose of training
  - type of training activities
  - source of funding

**1E.2.(i)(3)** The Recipient shall provide ten (3) copies of all training manuals produced under this Cooperative Agreement to the A.I.D. Project Officer.

**1E.2.(j)** Care of Laboratory Animals

If the Standard Provision entitled "Care of Laboratory Animals" applies to this Cooperative Agreement (see Section 1K. for applicability), the Recipient shall include the certificate required by paragraph (c) of said Standard Provision in all of its reports which pertain to the use of laboratory animals.

**1E.2.(k)** Research Involving Recombinant DNA

If any research involving recombinant DNA is being funded hereunder, the Recipient shall comply with the reporting requirements set forth in Section 1I.2.(d) of this Cooperative Agreement.

**1E.2.(l)** Final Report

Within 90 days following the estimated completion date of this Cooperative Agreement (see Section 1B. above), the Recipient shall submit five (5) copies of a final report to the A.I.D. Project Office specified in the cover letter of this Cooperative Agreement. In addition, two copies shall be submitted to A.I.D., PPC/CDIE/DI, Washington, DC 20523-1802. It will cover the entire period of the Cooperative Agreement and include all information shown in Sections 1E.2.(b) through 1E.2.(f) above.

**1F. SUBSTANTIAL INVOLVEMENT UNDERSTANDINGS**

(List the specific areas of program performance in which A.I.D. will be substantially involved, indicating the nature of the involvement [normally an A.I.D. approval] and the party[ies] within A.I.D. to be involved. Defining the technical areas in which A.I.D. will be substantially involved is the responsibility of the A.I.D. Project Officer, although, depending on the nature of the program and/or involvement, it may be necessary or desirable for the Agreement Officer to include his/her involvement. Some substantial involvement understandings have become common, and are therefore set forth below for suggestion to/decision by the A.I.D. Project Officer. These should not be considered all-encompassing or always appropriate, since the substantial involvement understandings must reflect the operational procedures for each cooperative agreement on a case-by-case basis. The importance of the substantial involvement understandings must not be underestimated, since they are what distinguishes a cooperative agreement from a grant, and are the only means by which A.I.D. may be substantially involved in what would otherwise be a grant. At the same time, A.I.D. involvement cannot be so substantial as to constitute a contract.)
It is understood and agreed that A.I.D. will be substantially involved during performance of this Cooperative Agreement as follows:

**1F.1.** Annual Workplan - The A.I.D. Project Officer will be consulted during the development of the annual workplans and have the right of final approval of all areas of the workplan where A.I.D. funds are included.

**1F.2.** Workplan Revisions - The A.I.D. Project Officer will be consulted and have the right of approval for revisions of the annual workplan which involves the use of A.I.D. funds.

**1F.3.** Field Visits - Pursuant to the standard provision of this Cooperative Agreement entitled "Air Travel and Transportation," the A.I.D. Project Officer must provide advance approval of all international travel.

**1F.4.** Field Activities - The A.I.D. Project Officer will be involved in, and must approve, the selection of sites, methodologies and strategies to be used in field activities funded under this Cooperative Agreement.

**1F.5.** Consultants - The A.I.D. Project Officer must approve, in advance, the selection of consultants retained by the Recipient.

**1F.6.** Participants - Where A.I.D. funds are used, the A.I.D. Project Officer must approve, in advance, the selection of technical trainees or scientists for participation in training activities.

**1F.7.** Principal Investigator - The A.I.D. Project Officer must approve, in advance, the selection of the principal investigator and any alternate.

**1F.8.** Subcontracts and Subagreements - The A.I.D. Project Officer must approve, in advance, the terms of reference or scope of work of all subcontracts and subagreements awarded by the Recipient. If required by Paragraphs (b)(5) or (b)(6) of the Standard Provision entitled "Revision of Grant Budget," or the Standard Provision entitled "A.I.D. Eligibility Rules for Goods and Services," the Agreement Officer must approve subcontracts (see the Standard Provision entitled "Procurement of Goods and Services") and subagreements (see the Standard Provision entitled "Subagreements").

**1F.9.** Technical Advisory Group (TAG) - A.I.D. will be involved and have right of final approval in scheduling meetings and reviews of the Technical Advisory Group.

## 1G. PROCUREMENT AND (SUB)CONTRACTING

### 1G.1. Applicability

This Section 1G. applies to the procurement of goods and services by the Recipient (i.e., contracts, purchase orders, etc.) from a supplier of goods and services (see the Standard Provisions of this Cooperative Agreement entitled "Procurement of Goods and Services" and "AID Eligibility Rules for Goods and Services"), and not to assistance provided by the Recipient (i.e., a [sub]grant or

subagreement) to a subrecipient (see the Standard Provision of this Cooperative Agreement entitled "Subagreements").

**1G.2.** Requirements

In addition to other applicable provisions of this Cooperative Agreement, the Recipient shall comply with paragraph (b)(2) of the Standard Provision of this Cooperative Agreement entitled "AID Eligibility Rules for Goods and Services," concerning total procurement value of more than $250,000 under this Cooperative Agreement. Further thereto, the following is (are) the Authorized Geographic Code(s):

**1G.2.(a)** Authorized Geographic Codes

**1G.2.(a)(1)** Source, Origin, and Componentry of Goods and Commodities

**1G.2.(a)(1)(A)** Source, Origin, and Componentry

Except as specified in Sections 1G.2.(a)(1)(B) and 1G.2.(a)(1)(D) below, all goods/commodities shall have their source and origin in the U.S. (000) and/or Egypt (935), and shall meet A.I.D.'s componentry requirements, except as the Agreement Officer may otherwise agree in writing (see also Section 1G.2.[a][4] below).

**1G.2.(a)(1)(B)** Exception for Purchase/Procurement Transactions not Exceeding $5,000

If the proposed purchase/procurement transaction does not exceed $5,000 excluding transportation costs, paragraph (b)(1) of the Standard Provision of this Cooperative Agreement entitled "AID Eligibility Rules for Goods and Services" shall apply in lieu of Section 1G.2.(a)(1)(A) above.

**1G.2.(a)(1)(C)** Local Cost Financing

If, pursuant to Sections 1G.2.(a)(1)(A) or 1G.2.(a)(1)(B) above, the cooperating country is authorized for source and origin purposes, the Standard Provision of this Cooperative Agreement entitled "Local Cost Financing" will apply. Pursuant to said Standard Provision, indigenous goods and imported shelf items provided by local suppliers are eligible for local cost financing in quantities up to the total estimated cost of this Cooperative Agreement, subject to the restrictions stated in said Standard Provision, and Chapter 18 of Supplement B to A.I.D. Handbook 1, which, as may from time to time be amended, is incorporated herein as a part of this Cooperative Agreement by reference.

**1G.2.(a)(1)(D)** Restricted Goods

Notwithstanding the foregoing, the restricted goods listed in paragraph (a)(3) of the Standard Provision of this Cooperative Agreement entitled "AID Eligibility Rules for Goods and Services," and, if applicable (see Section 1G.2.[a][1][C] above or Section 1K. below for applicability), paragraph (e) of the Standard Provision entitled "Local Cost Financing," must be specifically approved by the Agreement Officer, except to the extent that such approval may be provided in Section 1I. below.

**1G.2.(a)(2)** Eligibility of Commodity-Related Services

**1G.2.(a)(2)(A)** Ocean Transportation

The eligibility of ocean transportation services is determined by the flag registry of the vessel. Notwithstanding the Standard Provision of this Cooperative Agreement entitled "Ocean Shipment of Goods," ocean shipping financed hereunder shall, except as the Agreement Officer may otherwise agree in writing, be financed only on flag vessels of the United States (A.I.D. Geographic Code 000). If the Agreement Officer approves the use of non-U.S. flag vessels, the Standard Provision of this Cooperative Agreement entitled "Ocean Shipment of Goods" will apply. Notwithstanding any of the foregoing, commodities shipped by a transportation medium owned, operated, or under the control of any country not included in A.I.D. Geographic Code 935 (see Section 1G.2.[a][4][B] below) are ineligible for A.I.D. financing hereunder, regardless of whether such transportation costs are financed hereunder. Moreover, commodities are ineligible for A.I.D. financing hereunder if shipped on a vessel which A.I.D. has designated as ineligible, regardless of whether such transportation costs are financed hereunder. Commodities are also ineligible for A.I.D. financing hereunder if shipped under an ocean charter that has not received prior approval of the Agreement Officer, regardless of whether such transportation costs are financed hereunder.

**1G.2.(a)(2)(B)** Dead Freight

Transportation costs attributable to dead freight are not eligible for A.I.D. financing.

**1G.2.(a)(2)(C)** Despatch and Demurrage

If the Recipient finances the delivery costs beyond the port of loading, the Recipient must refund to A.I.D. all despatch earned at the port of unloading. Demurrage costs are ineligible for A.I.D. financing.

**1G.2.(a)(2)(D)** Air Transportation

The eligibility of air travel and transportation services is determined by the flag registry of the aircraft. The Standard Provision of this Cooperative Agreement entitled "Air Travel and Transportation" applies. Commodities are ineligible for A.I.D. financing hereunder if shipped under an air charter that has not received prior approval of the Agreement Officer, regardless of whether such transportation costs are financed hereunder.

**1G.2.(a)(2)(E)** Marine Insurance

The Authorized Geographic Code for marine insurance is the same as is set forth in Section 1G.2.(a)(3)(B) below. Paragraph (c) of the Standard Provision of this Cooperative Agreement entitled "AID Eligibility Rules for Goods and Services" applies. If the Cooperating Country is authorized for the placement of marine insurance but discriminates against any marine insurance company authorized to do business in any state of the United States, failure to insure all A.I.D.-financed commodities with U.S. insurance companies shall render the commodities ineligible for A.I.D. financing hereunder.

**1G.2.(a)(2)(F)** Other Delivery Services

No special eligibility requirements pertain to other delivery services (such as export packing, loading, commodity inspection services, and services of a freight forwarder) except that citizens or firms of any country not included in Geographic Code 935 (see Section 1G.2.[a][4][B] below) are ineligible as suppliers of delivery services, and non-U.S. citizens lawfully admitted for permanent residence in the U.S. are eligible regardless of their citizenship.

**1G.2.(a)(2)(G)** Incidental Services

Incidental services are defined as installation or erection of A.I.D.-financed equipment or the training of personnel in the maintenance, operation, and use of such equipment. No special eligibility requirements pertain to incidental services except that citizens or firms of any country not included in Geographic Code 935 (see Section 1G.2.[a][4][B] below) are ineligible as suppliers of incidental services, and non-U.S. citizens lawfully admitted for permanent residence in the U.S. are eligible regardless of their citizenship.

**1G.2.(a)(2)(H)** Local Cost Financing

If, pursuant to this Section 1G.2.(a)(2), the cooperating country is authorized for commodity-related services, the Standard Provision of this Cooperative Agreement entitled "Local Cost

Financing" will apply. Pursuant to said Standard Provision, services provided by local suppliers are eligible for local cost financing in quantities up to the total estimated cost of this Cooperative Agreement, subject to the restrictions stated in said Standard Provision, and Chapter 18 of Supplement B to A.I.D. Handbook 1, which, as may from time to time be amended, is incorporated herein as a part of this Cooperative Agreement by reference.

**1G.2.(a)(3)** Nationality of Supplier

**1G.2.(a)(3)(A)** Suppliers of Goods and Commodities

Except as specified in Section 1G.2.(a)(3)(C) below, the suppliers of goods and commodities shall have their nationality in the U.S. or Egypt, except as the Agreement Officer may otherwise agree in writing.

**1G.2.(a)(3)(B)** Suppliers of Services (Other Than Commodity-Related Services)

Except as specified in Section 1G.2.(a)(3)(C) below, the suppliers of services (other than commodity-related services, as described in Section 1G.2.[a][2] above) shall have their nationality in the U.S or Egypt, except as the Agreement Officer may otherwise agree in writing.

**1G.2.(a)(3)(C)** Government Owned Organizations

Notwithstanding the foregoing, a Government Owned Organization, i.e., a firm operated as a commercial company or other organizations (including nonprofit organizations other than public educational institutions) which are wholly or partially owned by governments or agencies thereof, are not eligible as suppliers of goods and commodities, commodity-related services, or services (other than commodity-related services), except as the Agreement Officer may otherwise agree in writing.

**1G.2.(a)(3)(D)** Local Cost Financing

If, pursuant to this Section 1G.2.(a)(3), the cooperating country is authorized for supplier nationality purposes, the Standard Provision of this Cooperative Agreement entitled "Local Cost Financing" will apply. Pursuant to said Standard Provision, local suppliers are eligible for local cost financing of indigenous goods, imported shelf items, and services in quantities up to the total estimated cost of this Cooperative Agreement, subject to the restrictions stated in said Standard Provision, and Chapter 18 of Supplement B to A.I.D. Handbook 1, which, as may from time to time be amended, is incorporated herein as a part of this Cooperative Agreement by reference.

**1G.2.(a)(4)** Definitions

**1G.2.(a)(4)(A)** Source, Origin, Componentry, and Nationality of Supplier

Source, origin, componentry requirements, and supplier nationality are defined in Chapter 5 of A.I.D. Handbook 1, Supplement B, which, as may be amended from time to time, is incorporated herein as a part of this Cooperative Agreement by reference (see also Attachment 5 of this Cooperative Agreement which reflects the substance of Chapter 5 of A.I.D. Handbook 1, Supplement B as of the effective date of this Cooperative Agreement).

**1G.2.(a)(4)(B)** A.I.D. Geographic Codes

A.I.D. Geographic Codes are defined in Appendix D of A.I.D. Handbook 18, which, as may be amended from time to time, is incorporated herein as a part of this Cooperative Agreement by reference (see also Attachment 5 of this Cooperative Agreement which reflects the substance of Appendix D of A.I.D. Handbook 18 as of the effective date of this Cooperative Agreement).

**1G.3.** Approvals

Inclusion of costs in the budget of this Cooperative Agreement for the purchase of nonexpendable equipment obviates neither the requirement of Section J.13. of OMB Circular A-21 (for educational institutions) or Section 13 of Attachment B of OMB Circular A-122 (for nonprofit organizations other than educational institutions) for prior approval of such purchases by the Agreement Officer, nor any other terms and conditions of this Cooperative Agreement, unless specifically stated in Section 1I. below.

**1G.4.** Title to Property

Title to property acquired hereunder shall vest in the Recipient, subject to the requirements of the Standard Provision of this Cooperative Agreement entitled "Title To and Use of Property (Cooperating Country Title)" regarding use, accountability, and disposition of such property, except to the extent that disposition of property may be specified in Section 1I. below.

**1H. INDIRECT COST RATES**

**1H.1.** Pursuant to the Standard Provisions of this Cooperative Agreement entitled "Negotiated Indirect Cost Rates - Predetermined" and "Negotiated Indirect Cost Rates - Provisional," a predetermined indirect cost rate or rates shall be established for each of the Recipient's accounting periods which apply to this Cooperative Agreement. Pending establishment of predetermined indirect cost

rates for the initial period (12/20/92 - 09/30/94), provisional payments on account of allowable indirect costs shall be made on the basis of the following negotiated provisional rate(s) applied to the base(s) which is (are) set forth below:

| Type | Rate | Base |
|---|---|---|
| On-Campus/Home Office | 45% | 1/ |
| Off-Campus/Off-Site | 24% | 1/ |

1/ **Base of Application:**
Modified total direct cost which includes salaries and wages, fringe benefits, materials supplies and services, travel and the first $25,000.00 of each subgrant and subcontract. It excludes purchases or improvements to land, or sites or buildings, scholarships, fellowships, equipment, amounts exceeding the first $25,000.00 on each subgrant and subcontract and cyclotron utility expenses.

**Treatment of Fringe benefits:**
Fringe Benefits applicable to direct salaries and wages are treated as direct costs.

For further details on these rates see Rate Agreement with the Department of Health and Human Services dated July 29, 1988.

**1H.2.** Rates for subsequent periods shall be established in accordance with the Standard Provision of this Cooperative Agreement entitled "Negotiated Indirect Cost Rates - Predetermined."

## 1I. SPECIAL PROVISIONS

### 1I.1. Limitations on Reimbursement of Costs of Compensation for Personal Services and Professional Service Costs

#### 1I.1.(a) Employee Salaries

Except as the Agreement Officer may otherwise agree in writing, A.I.D. shall not be liable for reimbursing the Recipient for any costs allocable to the salary portion of direct compensation paid by the Recipient to its employees for personal services which exceed the highest salary level for a Foreign Service Officer, Class 1 (FS-1), as periodically amended.

**1I.1.(b)** Consultant Fees

Compensation for consultants retained by the Recipient hereunder shall not exceed, without specific approval of the rate by the Agreement Officer: either the highest rate of annual compensation received by the consultant during any full year of the immediately preceding three years; or the maximum rate of a Foreign Service Officer, Class 1 (FS-1) (as periodically amended), whichever is less. A daily rate is derived by dividing the annual compensation by 2,087 and multiplying the result by 8.

**1I.2.** Compliance With Federal Guidelines and Regulatory Procedures Pertaining to Recombinant DNA

**1I.2.(a)** The Recipient shall implement any research activities under this Cooperative Agreement which involve recombinant DNA in accordance with:

**1I.2.(a)(1)** The National Institutes of Health Guidelines for Research Involving Recombinant DNA Molecules;

**1I.2.(a)(2)** Procedures issued by the U.S. Department of Agriculture (USDA), the Environmental Protection Agency (EPA), or other appropriate Federal agency;

**1I.2.(a)(3)** A.I.D.'s environmental procedures; and

**1I.2.(a)(4)** Such other Federal guidelines and procedures as may apply during the course of research.

**1I.2.(b)** The Recipient cannot commence testing in any foreign location until written approval for such testing is obtained from the A.I.D. Project Officer and the government of the country where testing is planned. Testing shall be conducted in accordance with all applicable regulations of that country.

**1I.2.(c)** In addition, and prior to commencement of any such testing, the Recipient shall make a judgement and communicate same to the A.I.D. Project Officer as to whether the regulations, procedures, or facilities of the country in question are adequate to ensure testing in an environmentally sound manner. In the event such judgement is that they are not, the Recipient and the A.I.D. Project Officer will consult and agree on the conditions to be applied to the testing which will have such environmental effect.

**1I.2.(d)** Reports submitted to A.I.D. under this Cooperative Agreement will address regulatory issues as noted above related to the activity.

1I.3. Publications

1I.3.(a) The Recipient agrees to provide one copy of the manuscript of any proposed publication to the A.I.D. Project Officer not later than submission to the publisher, and to give serious consideration to any comments received from the A.I.D. Project Officer.

1I.3.(b) In the case of publication of any of the reports described in Section 1E.2. of this Cooperative Agreement, A.I.D. reserves the right to disclaim endorsement of the opinions expressed. For other publications, A.I.D. reserves the right to dissociate itself from sponsorship or publication. In both cases, the Recipient will consult with the A.I.D. Project Officer as to the nature and extent of any A.I.D. disclaimer of endorsement or dissociation from sponsorship or publication.

1I.3.(c) If A.I.D. does not choose to disclaim endorsement or dissociate itself from sponsorship or publication, the Recipient shall, in accordance with the Standard Provision of this Cooperative Agreement entitled "Publications," acknowledge A.I.D. support as follows:

> "This publication was made possible through support provided by the Office of USAID/CAIRO/AGR/A, under Cooperative Agreement No. 263-0152-A-00-3036-00."

1I.3.(d) In addition to providing one copy of all published works and lists of other written work produced under this Cooperative Agreement to the A.I.D. Project Officer, as required by paragraph (h) of the Standard Provision of this Cooperative Agreement entitled "Publications," the Recipient shall also provide two copies of such publications and lists to A.I.D., PPC/CDIE/DI, Washington, D.C. 20523-1802.

1I.4. Equipment and Other Capital Expenditures

1I.4.(a) Requirement for Prior Approval

Pursuant to Sections 1D.3. and 1G.3. above and the Standard Provisions of this Cooperative Agreement entitled "Allowable Costs" and "Revision of Grant Budget," and by extension, Section J.13. of OMB Circular A-21, the Recipient must obtain A.I.D. Agreement Officer approval for the following:

**1I.4.(a)(1)** Purchase of General Purpose Equipment, which is defined as an article of nonexpendable tangible personal property, the use of which is not limited only to research, medical, scientific, or other activities [e.g., office equipment and

furnishings, air conditioning equipment, reproduction and other equipment, motor vehicles, and automatic data processing equipment, having a useful life of more than two years and an acquisition cost of $500 or more per unit);

**1I.4.(a)(2)** Purchase of Special Purpose Equipment, which is defined as an article of nonexpendable tangible personal property, which is used only for research, medical, scientific, or other technical activities, and which has a useful life of more than two years and an acquisition cost of $1,000 or more per unit); and

**1I.4.(a)(3)** Other Capital Expenditures, which is defined as the cost of the asset, including the cost to put it in place).

**1I.4.(b)** Approvals

In furtherance of the foregoing, the Agreement Officer does hereby provide approval for the following purchases, which shall not be construed as authorization to exceed the total estimated amount or the obligated amount of this Cooperative Agreement, whichever is less : N/A

**1I.4.(c)** Exception for Automation Equipment

Any approval for the purchase of automation equipment which may be provided in Section 1I.4.(b) above or subsequently provided by the Agreement Officer is not valid if the total cost of purchases of automation equipment (e.g., computers, word processors, etc.), software, or related services made hereunder will exceed $100,000. The Recipient must, under such circumstances, obtain the approval of the Agreement Officer for the total planned system of any automation equipment, software, or related services.

**1I.4.(d)** Compliance with A.I.D. Eligibility Rules

Any approvals provided in Section 1I.4.(b) above or subsequently provided by the Agreement Officer shall not serve to waive the A.I.D. eligibility rules described in Section 1G. of this Cooperative Agreement, unless specifically stated.

**1I.4.(a)(1)** General Purpose Equipment, which is defined as an article of nonexpendable tangible personal property which is usable for other than research, medical, scientific or technical activities, whether or not special modifications are needed to make them suitable for a particular purpose (e.g., office equipment and furnishings, air conditioning equipment, reproduction and printing equipment, motor vehicles, and automatic data processing equipment), having a useful life of more than two years and an acquisition cost of $500 or more per unit); and

**1I.4.(a)(2)** Special Purpose Equipment, which is defined as an article of nonexpendable tangible personal property, which is used only for research, medical, scientific, or technical activities (e.g., microscopes, x-ray machines, surgical instruments, and spectrometers), and which has a useful life of more than two years and an acquisition cost of $5,000 or more per unit).

**1I.4.(b)** Approvals

"N/A"

**1I.4.(c)** Exception for Automation Equipment

Any approval for the purchase of automation equipment which may be provided in Section 1I.4.(b) above or subsequently provided by the Agreement Officer is not valid if the total cost of purchases of automation equipment (e.g., computers, word processors, etc.), software, or related services made hereunder will exceed $100,000. The Recipient must, under such circumstances, obtain the approval of the Agreement Officer for the total planned system of any automation equipment, software, or related services.

**1I.4.(d)** Compliance with A.I.D. Eligibility Rules

Any approvals provided in Section 1I.4.(b) above or subsequently provided by the Agreement Officer shall not serve to waive the A.I.D. eligibility rules described in Section 1G. of this Cooperative Agreement, unless specifically stated.

**1I.5.** Restricted Goods

Pursuant to Section 1G. above, paragraph (a)(3) of the Standard Provisions of this Cooperative Agreement entitled "AID Eligibility Rules for Goods and Services," and, if applicable (see Section 1K. below for applicability), paragraph (e) of the Standard Provision of this Cooperative Agreement entitled "Local Cost Financing," the Agreement Officer's approval is required for purchase of the restricted goods described therein. In furtherance thereof, the Agreement Officer does hereby provide such approval to the extent set forth below. The Agreement Officer's approval is required for purchases of such restricted goods if all of the conditions set forth below are not met by the Recipient. Any approval provided below or subsequently provided by the Agreement Officer shall not serve to waive any terms and conditions of this Cooperative Agreement unless specifically stated.

**1I.5.(a)** Agricultural Commodities

Agricultural commodities may be purchased provided that they are of U.S. source (generally, the country from which the commodities are shipped) and origin (generally, the country in which the commodities are mined, grown, or produced) and purchased from a U.S. supplier, except that wheat, rice, corn, soybeans, sorghums, flour, meal, beans, peas, tobacco, hides and skins, cotton, vegetable oils, and animal fats and oils cannot be purchased under any circumstances without the prior written approval of the Agreement Officer.

**1I.5.(b)** Motor Vehicles

Motor vehicles, if approved for purchase under Section 1I.4.(b) above or subsequently approved by the Agreement Officer, must be of U.S. manufacture and must be of at least 51% U.S. componentry. The source of the motor vehicles, and the nationality of the supplier of the vehicles, must be in accordance with Section 1G.2. above. Motor vehicles are defined as self-propelled vehicles with passenger carriage capacity, such as highway trucks, passenger cars and busses, motorcycles, scooters, motorized bicycles, and utility vehicles. Excluded from this definition are industrial vehicles for materials handling and earthmoving, such as lift trucks, tractors, graders, scrapers, and off-the-highway trucks.

**1I.5.(c)** Pharmaceuticals

Pharmaceuticals may be purchased provided that all of the following conditions are met: (1) the pharmaceuticals must be safe and efficacious; (2) the pharmaceuticals must be of U.S. source and origin (see Section 1G. above); (3) the pharmaceuticals must be of at least 51% U.S. componentry (see Section 1G. above); (4) the pharmaceuticals must be purchased from a supplier whose nationality is in the U.S. (see Section 1G. above); (5) the pharmaceuticals must be in compliance with U.S. Food and Drug Administration (FDA) (or other controlling U.S. authority) regulations governing United States interstate shipment of pharmaceuticals; (6) the manufacturer of the pharmaceuticals must not infringe on U.S. patents; and (7) the pharmaceuticals must be competitively procured in accordance with the procurement policies and procedures of the Recipient and the Standard Provision of this Cooperative Agreement entitled "Procurement of Goods and Services."

**1I.5.(d)** Pesticides

Pesticides may only be purchased if the purchase and/or use of such pesticides is for research or limited field evaluation by or under the supervision of project personnel. Pesticides are defined as substances or mixtures of substances: intended for preventing destroying, repelling, or mitigating any unwanted insects, rodents,

nematodes, fungi, weeds, and other forms of plant or animal life or viruses, bacteria, or other micro-organisms (except viruses, bacteria, or other micro-organisms on or living in man or other living animals); or intended for use as a plant regulator, defoliant, or dessicant.

**1I.5.(e)** Rubber Compounding Chemicals and Plasticizers

Rubber compounding chemicals and plasticizers may only be purchased with the prior written approval of the Agreement Officer.

**1I.5.(f)** Used Equipment

Used equipment may only be purchased with the prior written approval of the Agreement Officer.

**1I.5.(g)** Fertilizer

Fertilizer may be purchased if it is either purchased in the U.S. and used in the U.S., or if it is purchased in the cooperating country with local currency for use in the cooperating country. Any fertilizer purchases which do not comply with these limitations must be approved in advance by the Agreement Officer.

**1I.6.** Limitation on Use of Funds

**1I.6.(a)** The Recipient shall not utilize funds provided by A.I.D. for any testing or breeding feasibility study, variety improvement or introduction, consultancy, publication, conference or training in connection with the growth or production in countries other than the United States of an agricultural commodity for export which would compete with a similar commodity grown or produced in the United States.

**1I.6.(b)** The reports described in Section 1E.2. shall contain a statement indicating the projects or activities to which United States funds have been attributed, together with a brief description of the activities adequate to show that United States funds have not been used for the purpose in Section 1I.6.(a) above.

**1I.6.(c)** The Recipient agrees to refund to A.I.D. upon request an amount equal to any United States funds used for the purposes prohibited by Section 1I.6.(a) above.

**1I.6.(d)** No funds provided by A.I.D. under this Cooperative Agreement shall be used to provide assistance, either directly or indirectly, to any country ineligible to receive assistance pursuant to the Foreign Assistance Act as amended, related appropriations acts, or other statutes and Executive Orders of the United States (also see the Standard Provision of this Cooperative Agreement entitled "Ineligible Countries").

(While DBA and medical evacuation insurance is not required for cooperative agreements, the Recipient may propose to purchase such insurances for its overseas travelers. If so, add the following)

**1I.7.** Defense Base Act (DBA) and/or Medical Evacuation Insurance

Pursuant to Section J.16. of OMB Circular A-21 (for educational institutions) or Section 18 of Attachment B of OMB Circular A-122 (for nonprofit organizations other than educational institutions), the Recipient is authorized to purchase DBA and/or medical evacuation insurance under this Cooperative Agreement. If DBA insurance is purchased, it shall be purchased from the insurance company or agent with which A.I.D. has a contract to provide DBA insurance for A.I.D. contracts. The Agreement Officer will provide the name, address, and telephone number of such insurance company or agent upon request.

**1I.8.** Disposition of Property

With reference to Sections 1G.4. and 1I.4.(b) above, disposition of nonexpendable property acquired hereunder shall be as follows: "Cooperating Country Title", Clause 022.0 of the Optional Standard Provisions of this Agreement.

**1I.9.** Care of Laboratory Animals Outside the U.S.

It is understood and agreed that the Recipient shall comply with the Standard Provision of this Cooperative Agreement entitled "Care of Laboratory Animals" for activities outside the U.S. to the maximum practical extent. To the extent that the Recipient is unable to comply with said Standard Provision for activities outside the U.S., it is understood and agreed that the Recipient shall comply with the following principles for the utilization, care, and transportation of vertebrate animals used in testing, research, and training:

**1I.9.(a)** The transportation, care, and use of animals should be in accordance with the Animal Welfare Act (7 U.S.C. 2131 et seq.) and other applicable Federal laws, guidelines, and policies (for guidance throughout these principles, the Recipient is referred to the Guide for the Care and Use of Laboratory Animals prepared by the Institute of Laboratory Animals Resources, National Research Council).

**1I.9.(b)** Procedures involving animals shall be designed and performed with due consideration of their relevance to human or animal health, the advancement of knowledge, or the good of society.

**1I.9.(c)** The animals selected for a procedure should be an appropriate species and quality and the minimum number required to obtain valid results. Methods such as mathematical models, computer simulation, and in vitro biological systems must be considered.

**1I.9.(d)** Proper use of animals, including the avoidance or minimization of discomfort, distress, and pain when consistent with sound scientific practices is imperative. Unless the contrary is established, investigators shall consider that procedures which cause pain or distress in human beings may cause pain and distress in other animals.

**1I.9.(e)** Procedures with animals that may cause more than momentary or slight pain or distress shall be performed with appropriate sedation, analgesia, or anesthesia. Surgical or other painful procedures shall not be performed on unanesthetized animals paralyzed by chemical agents.

**1I.9.(f)** Animals that would otherwise suffer severe or chronic pain or distress that cannot be relieved shall be painlessly killed at the end of the procedure, or, if appropriate, during the procedure.

**1I.9.(g)** The living conditions of animals shall be appropriate for their species and contribute to their health and comfort. Normally, the housing, feeding, and care of all animals used for biomedical purposes must be directed by a veterinarian or other scientist trained and experienced in the proper care, handling, and use of the species being maintained or studied. In any case, veterinary care shall be provided as indicated.

**1I.9.(h)** Investigators and other personnel shall be appropriately qualified and experienced for conducting procedures on living animals. Adequate arrangements shall be made for their in-service training, including the proper and humane care and use of laboratory animals.

**1I.9.(i)** Where exceptions are required from these principles, the decisions shall not rest with the investigators directly concerned, but shall be made, with due regard to Section 1I.9.(b) above, by an appropriate review group such as an institutional animal research committee. Such exception shall not be made solely for the purpose of teaching or demonstration.

## 1J. RESOLUTION OF CONFLICTS

Conflicts between any of the Attachments of this Cooperative Agreement shall be resolved by applying the following descending order of precedence:

Attachment 1 - Schedule
Attachment 3 - Standard Provisions
Attachment 4 - Special Provision entitled "Restrictions on Lobbying"
Attachment 5 - A.I.D. Eligibility Rules

Attachment 2 - Program Description

**1K. STANDARD PROVISIONS**

The Standard Provisions set forth as Attachment 3 of this Cooperative Agreement consist of the following Standard Provisions denoted by an "X" which are attached hereto and made a part of this Cooperative Agreement:

**1K.1.** Mandatory Standard Provisions For U.S., Nongovernmental Grantees

( X ) Allowable Costs (November 1985)
( X ) Accounting, Audit, and Records (September 1990)
( X ) Refunds (September 1990)
( X ) Revision of Grant Budget (November 1985)
( X ) Termination and Suspension (May 1986)
( X ) Disputes (November 1989)
( X ) Ineligible Countries (May 1986)
( X ) Debarment, Suspension, and Other Responsibility Matters (March 1989)
( X ) Nondiscrimination (May 1986)
( X ) U.S. Officials Not to Benefit (November 1985)
( X ) Nonliability (November 1985)
( X ) Amendment (November 1985)
( X ) Notices (November 1985)

**1K.2.** Additional Standard Provisions For U.S., Nongovernmental Grantees

( X ) Payment - Letter of Credit (November 1985)
( ) Payment - Periodic Advance (January 1988)
( ) Payment - Cost Reimbursement (November 1985)
( X ) Air Travel and Transportation (November 1985)
( X ) Ocean Shipment of Goods (May 1986)
( X ) Procurement of Goods and Services (November 1985)
( X ) AID Eligibility Rules for Goods and Services (November 1985)
( X ) Subagreements (November 1985)
( X ) Local Cost Financing (November 1988)
( X ) Patent Rights (November 1985)
( X ) Publications (November 1985)
( ) Negotiated Indirect Cost Rates - Predetermined (May 1986)

( X ) Negotiated Indirect Cost Rates - Provisional (May 1986)
( X ) Regulations Governing Employees (November 1985)
( ) Participant Training (May 1986)
( ) Voluntary Population Planning (August 1986)
( X ) Protection of the Individual as a Research Subject (November 1985)
( X ) Care of Laboratory Animals (November 1985)
( X ) Government Furnished Excess Personal Property (November 1985)
( ) Title To and Use of Property (Grantee Title) (November 1985)
( ) Title To and Care of Property (U.S. Government Title) (November 1985)
( X ) Title To and Care of Property (Cooperating Country Title) (November 1985)
( ) Cost Sharing (Matching) (November 1985)
( ) Use of Pouch Facilities (November 1985)
( X ) Conversion of United States Dollars to Local Currency (November 1985)

Program Description

## SUMMARY

**Project Goal:** To mutually enhance U.S. and Egyptian institutional capacity for the use and management of biotechnology research to develop environmentally compatible, improved germplasm.

**Project Purpose:** (1) To foster and increase the capacity of the Egyptian agricultural sector in biotechnology through the establishment of linkages with advanced laboratories in the U.S.; and (2) To establish and develop improved germplasm for varietal selections and future commercialization.

**Project Components**

MSU/NAGEL transformation of maize for stem borer resistance.

MSU/Cornell/NAGEL transformation of cucurbits for virus resistance.

Scripps/NAGEL transformation of tomato for virus resistance.

MSU/NAGEL potato tuber moth resistant potato on locally important varieties.

U.S. Industry-based biotechnology management study tour.

Training of scientists at U.S. universities/research institutes.

Association of Biotechnology Companies (ABC) memberships.

Biosafety/intellectual property consultation.

Egyptian inventors listed where appropriate on U.S. patents.

Electronic communications capability.

Containment facility.

ICARDA workshop.

## BACKGROUND

### Development of the ABSP Core Project

The Office of Agriculture, located within A.I.D.'s central Bureau for Research and Development, has recently designed and implemented a new project in agricultural

biotechnology entitled "Agricultural Biotechnology for Sustainable Productivity" (ABSP). The project is targeted towards the mutual benefits of the Agency's client countries and agricultural biotechnology initiatives in the United States. The project differs from traditional assistance projects in that it has included mechanisms to significantly engage the technical and managerial resources of both the U.S. public and private sectors, in one integrated program, which is aimed at: (1) increasing human capacity in agricultural biotechnology in both the public and private sectors of less developed countries; (2) stimulating the development of the indigenous biotechnology private sector within client countries through direct interaction with the U.S. agricultural biotechnology industry; (3) the promotion of better cooperation and establishment of linkages between the public and private sectors in less developed countries for agricultural biotechnology research; and (4) the development of genetically improved, environmentally sustainable germplasm with relevance for local markets.

The ABSP project provides direct support for research and development activities in the form of grants to the U.S. public and private sectors and LDC institutions for research to address production constraints in A.I.D.'s client countries. In addition, it provides indirect support for private sector involvement (both U.S. and LDC) in agricultural research, through funding activities in intellectual property, biosafety, networking and the establishment of downstream commercial linkages for product development. The ABSP project is multi-disciplinary. It provides support for: (1) human resource development via long-term, postdoctoral training; (2) constraint-oriented, as opposed to commodity-based, biotechnology research and development located within both public and private sector U.S. institutions; (3) internships or expert consultation, for increased capability in intellectual property and regulatory review of genetically-engineered products and on management-based seminars within private U.S. biotechnology firms; (4) networking through regional and international conferences, trade association memberships, newsletters, directories, LDC laboratory support and database linkages; (5) product development via an incentive-based system for funding field testing and commercialization activities for promising products of laboratory research.

The managing director for the project is Dr. John Dodds. As managing director, Dr. Dodds will be responsible for overall management and coordination of all aspects of the project. He will be the primary liaison with A.I.D.'s project officer in the Office of Agriculture, and will be responsible for implementing and monitoring the network and innovative activities (IPR and biosafety internships, commercialization, etc.) components of the project. This cooperative agreement will be closely linked to the ABSP core cooperative agreement. Dr. Dodds will also have responsibility for the

management of A.I.D. mission-supported activities and the linkage and coordination of those activities with initiatives supported by the project's core funding.

Technical management for the MSU, Texas A&M, and Cornell research initiatives is assumed by Dr. Mariam Sticklen, who will be responsible for conducting research in her own laboratory and coordinating the research activities and progress among biotechnologists and breeders within other laboratories at MSU, as well as Texas A&M, Cornell and Scripps.

## Technical Focus of the MSU Core Program

Technical emphasis is on the use of recombinant DNA technology and crop transformation techniques to engineer agronomically important crops for resistance to a variety of pests and pathogens (predominantly insects and viruses). The expected outputs for this research are increased crop production through the availability of genetically resistant germplasm and decreased dependence on chemical pesticides. Research activities at the three institutions are identified to date as follows:

1. **Genetic engineering of potato for tuber moth resistance:** Institutional affiliations: MSU, CIP, principal investigator: Dr. Mariam Sticklen.

2. **Genetic engineering of sweet potato for weevil resistance:** Institutional affiliations: MSU, CIP; principal investigator: Dr. Mariam Sticklen.

3. **Genetic engineering of maize for stem borer resistance:** Institutional affiliations: MSU, Cornell, Texas A&M, CIMMYT; principal investigators: Dr. Mariam Sticklen (MSU), Dr. Roberta Smith (Texas A&M), Dr. Ray Wu (Cornell).

4. **Genetic engineering of cucurbits for potyvirus resistance:** Institutional affiliations: MSU; principal investigator: Dr. Rebecca Grumet.

## Additional Activities Supported by the Core-Funded ABSP Project

An additional focus of the ABSP project is to increase the capacity of the public and private sectors in less developed countries to competitively manage biotechnology. Support for these ancillary areas of the project, which include support for initiatives

in intellectual property, biosafety, networking and product development, are crucial to an integrated activity and development of a finished field-tested product.

[redacted]

## GOALS, PURPOSE AND EXPECTED OUTPUTS

### Project Goal

To "mutually enhance U.S. and Egyptian institutional capacity for the use and management of biotechnology research to develop environmentally compatible, improved germplasm."

### Project Purpose

(1) To foster and increase the capacity of Egyptian agricultural research in biotechnology through the establishment of linkages with advanced laboratories in the U.S.; and (2) to develop commercially viable, improved germplasm.

### Expected Outputs of [redacted] Project

### Technical

* Egyptian scientists/institutions listed as co-inventors in U.S. patents or with contractual licensed access to the following proprietary U.S. technologies:

    1. Genetically-engineered insect resistance in tropical varieties of maize, potato.

    2. Genetically-engineered virus resistance in cucurbits, tomato.

* Improved germplasm/products in potato, maize, tomato, cucurbits.

* Egyptian authorship on 4 technical, peer-reviewed publications.

* Construction of a containment facility for testing genetically engineered plants.

## Institutional

* At least ten Egyptian scientists cooperating in advanced agricultural biotechnology at U.S. universities.

* One industry-based management seminar series for Egyptian senior scientists/managers.

* Increased Egyptian institutional capacity in intellectual property and biosafety.

* Memberships for institutions established in Association of Biotechnology Companies.

* Egyptian Biotechnology Workshop.

## Project Administration

It is understood that this new cooperative agreement will place responsibility for the administrative and technical management of the project with MSU and with the ABSP managing director. A R&D/AGR/Washington project manager will be responsible for project oversight in relation to A.I.D. activities under the terms of agreement to monitor the project in cooperation with the responsible parties at Michigan State University.

An associate network specialist will be appointed to work on publications and workshops for Egypt. It is envisaged that the appointee will spend significant time in Egypt on these activities. The network specialist will also link the Egyptian activities to the core network program.

## Overhead (MSU)

An overhead rate of 45% will be applied to funds which are designated specifically for activities involving MSU or its participating university partners. This would include funding for training, supplies and network activities conducted by the ABSP management team at MSU, etc. An overhead rate of 45% will be applied to only the first $25,000 of any subcontract.

## [redacted]PROJECT COMPONENTS

### Research

Individual research proposals attached.

### Intellectual Property Consultation

John Barton, professor of law at Stanford University Law School and chief legal counsel to the ABSP project, will be supported be buy-in funds to advise in Egypt regarding existing policies with respect to biotechnology and plant variety protection and on the relationship of IPR to stimulation of local and foreign innovation and investment. Mr. Barton will also review the Intellectual Property Rights (IPR) components of all agreements established under ABSP for Egypt. Funding has been designated for a total of six weeks of consultation and in-country support for Mr. Barton and/or another suitably agreed upon expert.

### Biosafety Consultation

Funds have been designated to support regulatory consultation specifically in the areas of policy formation, implementation and enforcement and for the construction of containment facilities which could support testing of genetically engineered materials generated through research conducted under the ABSP project. These funds will support: (1) a specialist in the policy area; and (2) training to local scientists.

### Industry-Based Seminar Series

A series of industry-based seminars will be conducted to orient participants to the managerial and commercial concerns of biotechnology. Sites for these seminars are envisioned to include a private U.S. seed company, a large firm involved in agricultural biotechnology research and a small, entrepreneurial agricultural biotechnology company. These seminars are intended to acquaint Egyptian personnel with the procedural and managerial issues critical to the commercialization process. They are designed to effect an appreciation for the process involved in the transition of laboratory research to product development. Conversely, they are also intended to foster awareness within the U.S. private sector for the needs and potential applications of biotechnology to address LDC production constraints and opportunities and may promote collaborative linkages.

**Networking/Communications**

NAGEL already has an outstanding capacity in this area. Parties will work together to use these facilities for mutual benefit.

**Memberships in the Association of Biotechnology Companies**

NAGEL and Scripps will be granted life-of-project memberships to the ABC.

# Title Page
## Agricultural Biotechnology for Sustainable Productivity (ABSP)
## Egypt Cooperative Agreement

| Principal Investigators | Title | Address |
|---|---|---|
| Dr. M. B. Stickler:<br>signature | Asst. Professor<br>Research Director, ABSP | 202 Pesticide Res. Ctr.<br>Michigan State Univ.<br>East Lansing, MI 48824 |
| Dr. R. Grumet:<br>signature | Asst. Professor<br>Horticulture | 342 Plant & Soil Sciences<br>Michigan State Univ.<br>East Lansing, MI 48824 |
| Dr. D. Douches:<br>signature | Asst. Professor<br>Crop & Soil Science | 486 Plant & Soil Sciences<br>Michigan State Univ.<br>East Lansing, MI 48824 |
| Dr. R. Beachy:<br>*(signature on research proposal attached)* | Professor of Plant Biology,<br>Director, ILTAB | 10666 N. Torrey Pines Rd.<br>The Scripps Research Inst.<br>LaJolla, CA 92037 |
| Dr. M. Madkour<br>signature | Director, NAGEL | National Ag. Genetic Engr. Lab<br>9 Gamma St.<br>Giza, EGYPT |

## Management

| | | |
|---|---|---|
| Dr. J. H. Dodds:<br>signature | Managing Director, ABSP | 416 Plant & Soil Sciences<br>Michigan State University<br>East Lansing, MI 48824 |
| Dr. M. Madkour<br>signature | Director, NAGEL | National Ag. Genetic Engr. Lab<br>9 Gamma St.<br>Giza, EGYPT |
| Mr. R. L. Howe<br>signature | Asst. Director<br>Contracts & Grants Office | 302 Administration Bldg.<br>Michigan State University<br>East Lansing, MI 48824 |

# COMPOSITION OF RESEARCH GROUPS FROM NAGEL/EGYPT

**Prof. Dr. Magdy Madkour, Director/NAGEL**
**General Coordinator and Principal Investigator.**

(1) Maize Transformation (Insect Resistance) :-

- Dr. Hanaiya El-Itriby Co PI (Maize Breeder)
- Dr. Ebtissam Hussein (Molecular Geneticist)
- Dr. Mohamed Soliman (Molecular Biologist)
- Dr. Osama Momtaz (Bt-Molecular Biologist)

(2) Potato Transformation (Insect Resistance) :-

- Dr. Taymour Nasr El-Din Co PI (Tissue Cult. Specialist)
- Dr. Walid Elyassaki (Bt-Mol. Biologist)

(3) Cucurbit Transformation (Virus Resistance) :-

- Dr. Mahmoud Rifaat Co PI (Mol. Biologist)
- Dr. Handy El-Doweny (Cucurbit Breeder)
- Dr. Abdel-Hamed Sabek (Virologist)
- Dr. Ahmed Abou Salha (Tissue Culture Specialist)

(4) Tomato Transformation (Virus Resistance) :-

- Dr. Nagwa Aref Co PI (Virologist)
- Dr. Ahmed El-Bakry (Tissue Culture Specialist)
- Dr. Naglaa Abdallah (Molecular Biologist)

# TITLE : MAIZE TRANSFORMATION (Bt)

## IDENTIFICATION AND SIGNIFICANCE OF THE PROBLEM

Maize is one of the most important food crops in Egypt. The most devastating insect of maize in this country is lepidopteran corn borer ( ( *Ostrinia sp.*). In the U.S., the Monsanto team has produced a codon-modified btk transgenic U.S. genotype of maize. These transgenic plants are resistant to European corn borer (personal communication, Terry Stone, Monsanto Co.).

## LONG-TERM GOALS AND TECHNICAL OBJECTIVES

Our long-term goals are to produce Egyptian genotypes of maize resistant to insect pests via genetic engineering techniques. To reach these goals, we will include two phases, each for two years. The specific objectives under first phase are listed below.

1. Develop a reproducible and efficient regeneration system for Egyptian genotypes of maize from tassel, callus, and or cell suspension cultures.
2. Complete construction of a plasmid containing a wild type btk coding sequences under control of rice actin 1 5' sequences (promoter, intron, etc.).
3. Transform the in vitro-regenerable Egyptian genotype(s) of maize using the biolistic cell/tissue bombardment system.
4. Select putatively transgenic cell lines after bombardment via antibiotic therapy, regenerate plants, and screen putatively transgenic regenerants via the Southern blot hybridization of PCR-amplified genomic DNA .

## WORK PLAN

1. **Development of reproducible and efficient in vitro regeneration of Egyptian maize genotypes**

2. **Assembly of mini-genes containing btk gene driven by rice actin 1 5' regulatory sequences**

3. **Transformation of maize for insect resistance**

   3.1. Transformation of maize using Biolistic explant bombardment method followed by plant regeneration

   3.2. Antibiotic selection and PCR screening of putatively transformed plants

   Normally in each minigene constructed, there is a selectable marker gene (Ex. bar gene) included.

## EQUIPMENT AND FACILITIES

**Dr. Sticklen's equipment and facilities**

Sticklen's research facilities constitute a molecular biology and a plant tissue culture/genetic engineering laboratory. Sticklen's laboratory equipment include: two chemical fume hoods, two laminar flow hoods, a temperature and light/photoperiod controlled protoplast culture incubator, two pH meters, two microcentrifuges, two clinical centrifuges, an IEC-HNS II centrifuge, two Fisher incubators, refrigerators and freezers, a light inverted microscope, a Zeiss dissecting microscope with camera attachment, a Model G2 New Brunswick shaker, three minigel apparatuses, three Model HRH-High Resolution IBI electrophoresis apparatus, a Hoffer Scientific Mighty Small II SE 250 gel electrophoresis apparati, an IBI sequencing apparati, three Hoffer Scientific gel electrophoresis apparatus, an EC 600, an EC 452, and a FB 105 power supply, two stirring plates with temperature control, two Fotodyne UV transilluminator, a Fotodyne camera set, a Sorval RC-5B refrigerated superspeed centrifuge with GSA and SS-34 rotors, a sorval ultracentrifuge with four rotors, a New Brunswick model G76D water bath shaker, vortexes, analytical balances, an Eberbach Model 6140 shaker, a Ludlum Model 3 Radiation Survey Meter, a Savant speed-vac system (including a refrigerated trap, a centrifuge, a pump, and a gel dryer), a Revco -80 C freezer, a DuPont Biolistic™ microprojectile bombardment device and a hellium-mediated DNA delivery device, a model NVS-100 night vision device (with a Canon camera attachment) to observe the expression of luciferase gene in the transgenic plants.five MacIntosh computers, two laser printers, and one color printer. Dr. Sticklen's laboratory personnel presently is using a PCR machine from Dr. Whalon's laboratory. Mariam Sticklen's laboratory is licensed by the MSU Office of Radiation Safety for using ($^{32}P$, $^{35}S$, and $^{125}I$) radioisotopes (see letter under section 16: Permit Documents) and performing recombinant DNA techniques (see section 16: Permit Documents). Dr. Sticklen's laboratory and greenhouse have been inspected and licensed for performing genetic engineering of plants (see section 16: Permit Documents).

# ENGINEERING OF RESISTANCE TO GEMINIVIRUSES IN TOMATOES

The objective of the proposal research is to control geminiviruses devastating tomato crops in Egypt by genetic engineering. To achieve this goal requires that we first address several questions about (1) the viruses that infect tomatoes in Egypt; (2) the efficiency of the proposed genetic engineering strategies for non-conventional virus resistance and. (3) the transformation of the local varieties of tomato.

The coat protein mediated resistance (CP-MR) strategy has proven to be effective for developing resistance for all viruses tested to date (Beachy et al., 1990). Therefore, there is no reason to exclude the approach for developing resistance against geminiviruses. There are other alternative strategies that may be applied to geminiviruses ; this project will combine different strategies to develop a high level of protection of resistance against geminiviruses in tomatoes. Transgenic tomato plants can be developed with little difficulty using *Agrobacterium tumefaciens*. The engineered resistance will be monogenic for each type of strategy employed and therefore easily transferred to other tomato varieties. A particular transgenic variety can be crossed with other genotypes to introduce the genes for resistance into many different cultivars.

The proposed project will include the following research:

1 - Evaluation of the relative importance of the two gemini viruses reported thus far in Egypt, i.e. the tomato yellow leaf curl virus (TYLCV-E) and the beet curly top virus (BCTV-E).

2 - Production of polyclonal antibodies specific to TYLCV-E.

3 - Determination of the molecular variability of TYLCV-E and/or BCTV-E in Egypt.

4 - Isolation of the coat protein gene and of the replicase gene of the major virus(es).

5 - Engineering of chimaeric genes with the coding sequences of the coat protein and of the modified replicase of the TYLCV (and/or BCTV) for expression in transgenic tomato plants.

6 - Transformation of locally grown tomato varieties with one and/or multiple genes: molecular characterization of transgenic plant lines.

7 - Challenge of the produced transgenic tomatoes with the target virus to evaluate resistance .

The products of the project will be :

1 - Serological and molecular diagnostic tools.

2 - DNA techniques for building chimaeric genes.

3 - Chimaeric genes for transformation.

4 - Transformation techniques for selected cultivars of Egyptian tomatoes.

5 - Transgenic tomato plants of selected Egyptian cultivars.

6 - Publications.

ILTAB stands for International Laboratory for Tropical Agricultural Biotechnology and is located in The Scripps Research Institute in San Diego : ILTAB has currently 2500 sq.ft. of laboratories available for molecular biology and tissue culture. All the major equipment necessary for virology, genetic engineering and tissue transformation is available. Growth and climatic chambers are available for the plant biotechnology activity and greenhouses approved by USDA for manipulations of transgenic plants are available and will be expanded in a near future. The laboratory has the permission for handling cDNA technologies and a permit has been issued by the USDA-APHIS of Californian for working with TYLCV-E DNA. The scientific environment of ILTAB/TSRI is very intense and all the expertise in plant and protein engineering can be found. There are 18 persons working on tropical programs and in the fields of molecular biology, virology, gene expression, tissue culture and transformation. The different programs are developed on rice, cassava, tomato, sweet potato and other programs are being to be developed on other crops. Furthermore, TSRI comprises 1200 researchers and technicians in the fields of molecular biology, structural studies, immunology and chemistry.

# DEVELOPMENT OF POTATO TUBER MOTH RESISTANCE IN POTATO: GERMPLASM FOR EGYPT

**PRINCIPAL INVESTIGATORS**

David S. Douches, Department of Crop and Soil Sciences

Edward J. Grafius, Department of Entomology

Mariam Sticklen, Departments of Crop and Soil Sciences and Entomology

**PROJECT DURATION:** September 1992 - September 1994

## PROJECT SUMMARY

The cultivated potato is an important export crop in Egypt, but production is constrained by infestations of the Lepidopteran insect, the Potato Tuber Moth (PTM) (*Phthorimaea operculella*). To control the PTM, integrated and sustainable approaches must be designed and host plant resistance is the major component of these schemes. Efforts to breed resistance to PTM have not been realized at this time, however, Sticklen's research team has developed transgenic potatoes which carry the Bt gene for resistance to Lepidopteran insects such as PTM. The use of genetic engineering techniques holds promise to efficiently achieve potato cultivars that are adapted to Egyptian growing conditions and carry the Bt gene for resistance to PTM.

The potato is an important crop in Egypt with production mainly directed toward the home market and export to Western Europe. The harvested potato crop is used mainly for table consumption directly out of the field and out of storage. The potato tuber moth (*Phthorimaea operculella*) is the most important potato pest in the Middle East and North Africa with losses as high as 86% despite the use of insecticides (Von Arx et al., 1987). To address this problem the farmers can apply synthetic insecticides but they can easily become trapped in costly pesticide treadmills as the insect develops resistance to these chemicals. Moreover, many of the synthetic insecticides are not registered for use in Europe, thus are not usable control options if the potatoes are destined for export and should not be used if these products can lead to environmental and human health hazards.

specific objectives:

1. Use insect resistent (Bt) transgenic potatoes as parental material in the MSU potato breeding program to combine Bt-based resistance to PTM with other important agronomic traits. Nagel already has transgenic material with resistance to PVX and PVY, these will also be used.

2. To develop an efficient system to regenerate and transform potatoes carrying the Bt gene for resistance to the potato tuber moth (PTM) that are adapted to the Middle East.

3. Conduct field trials to test the agronomic potential of these transgenic potatoes in Michigan and conduct laboratory and greenhouse studies to test the efficacy of Bt-based resistance to PTM in U.S. and Egypt.

4. Conduct RFLP analysis to study inheritance of Bt genes. Evaluate resistance in hybrid populations, then correlate resistance and RFLP data.

5. Identify potential breeding populations that hold promise to select advanced material adapted to Egyptian growing conditions.

## Research Arrangement

Research leaders Douches, Grafius, and Sticklen will manage individuals of a four-person research staff according to appointment breakdown described below. This team is committed to developing and maintaining an integrative research approach. One of the designated Egyptian postdoctoral candidates will focus upon the transformation of Bt-based PTM resistance in the cultivated potato in Sticklen's laboratory. The other Egyptian postdoctoral candidate will conduct research on either breeding or entomology aspects of projects as defined by the incumbent's research background and will be under the supervision of either Douches or Grafius. The U.S. postdoctoral candidate will coordinate field trials, insect feeding studies, and breeding and genetics components. It is our goal that the three candidates maintain strong interactive/collaborative linkages so that the goals are achieved in a timely manner. The research technician will provide support for the field, greenhouse, and laboratory studies. This candidate should have training in breeding and agronomy or entomology, tissue culture, and statistics.

# DEVELOPMENT OF VIRUS RESISTANT CUCURBIT CROPS VIA CONVENTIONAL BREEDING AND GENETIC ENGINEERING APPROACHES

Infection by viruses is a major factor limiting production of cucurbit crops (cucumbers, squashes, melons) in many parts of the world, including the middle east (Davis and Mizuki, 1987; Nameth et al. 1985; Davis, 1986; Al-Musa, 1989). These crops are subject to severe losses due to infection by several viruses including: cucumber mosaic virus (CMV) and at least three potyviruses, watermelon mosaic virus (WMV), the watermelon strain of papaya ringspot virus (PRV-W), and zucchini yellow mosaic virus (ZYMV). Crop losses of 50 - 100% frequently have been reported. We propose to use a combination of conventional and genetic engineering approaches to develop cultivars of cucurbit crops with increased resistances to these viruses.

## GENETIC ENGINEERING OF CUCURBIT CROPS FOR POTYVIRUS RESISTANCE

### Specific Objectives

1. Cross breeding of US materials to Egyptian materials.
2. Develop and/or optimize transformation and regeneration systems for specific cucurbit crops or genotypes of value for Egyptian production.
3. Incorporate the ZYMV potyvirus CP gene into these genotypes, verify transformation, expression of the gene, and inheritance as a normal Mendelian trait.
4. Test for resistance to ZYMV and other cucurbit potyviruses.

### Rationale

One of the areas in which molecular genetic approaches to crop improvement holds the most promise is the genetic engineering of virus resistance (reviews: Beachy et al. 1990; Grumet, 1990). The engineering of resistance in these cases has been facilitated greatly by the ability to use viral-encoded, rather than host-encoded genes as a source of resistance genes. Several groups have successfully used viral coat protein (CP) genes from a variety of viruses and have demonstrated that the plants expressing CP had increased virus resistance. This approach has been used to confer resistance to cucumber mosaic virus (Cuozzo et al.

1988; Quemada et al. 1991) and more recently, to potyviruses including soybean mosaic virus (Stark and Beachy, 1989), potato virus Y (Kaniewski et al. 1990), tobacco etch virus (Lindbo and Dougherty, 1992), and papaya ringspot virus (Ling et al.1991).

A major focus of the Grumet laboratory is the genetic engineering of resistance to the potyviruses that infect cucurbit crops. Zucchini yellow mosaic virus (ZYMV) in particular is a new and highly aggressive virus. It was first reported in Europe in 1981 (Lisa et al.) and has since spread throughout the world. It has been described as a major threat to cucurbit production, the need for ZYMV-resistant cultivars has been emphasized (Davis and Mizuki, 1987).

**Cucumbers**

The ADS report indicates that some virus resistant cucumbers were already coming into use by 1983, and except for Beit Alpha MR with its inadequate level of cucumber mosaic (CMV) resistance, the improved varieties were gynoecious proprietary hybrids which in spite of high yields, were not widely accepted because of high seed cost and higher proportion of cull fruits. Work is essentially complete on an open-pollinated Beit Alpha with resistance of powdery mildew (PMR) and much improved resistance to CMV. The addition of resistance to three potyviruses is in progress and could be completed rather quickly if pushed.

The benefit of breeding PMR cucumbers could extend far beyond Egypt and include the U.S. Marketmore 76, Poinsett 76, and most proprietary hybrids have adequate PMR for most field conditions and along with this has gone a moderate level of downy mildew resistance (DMR). DMR is much more difficult to evaluate and breeders in both the U.S. and Europe are not satisfied with present levels of resistance as seen in the field. No one knows whether the high correlation between PMR and DMR that exists when comparing susceptible with moderately resistant varieties will hold when dealing with higher levels of PMR. Egypt has severe DM in its fall crops and offers an unusual opportunity for research. Preliminary tests in Egypt gave some grounds for thinking that Cornell cucumbers with higher PMR may also have higher DMR.

Recent correspondence suggests an emphasis on cucumbers grown under protected cultivation. Resistance to the mildews may be more important than to viruses in this situation.

## Melons

There was good progress in breeding melons for PMR and viral resistance as of 1985, but attention was shifted to salinity tolerance, and we know little about further progress on original objectives. Egyptian melons have been of different type than those grown in Europe or the U.S., but there are some recent indications of flexibility, especially if melons are to be grown for export with protected cultivation. PMR and DMR are clearly important and from the start made earlier it seems likely that PMR melons could be ready for trial in a year or two. Virus resistance is of unknown status, but work recently begun at Cornell on shipping types shows that potyvirus resistance can be moved into any type of melon rather quickly. Dr. Provvidenti has found an isolate of ZYM in Egypt which overcomes the original source of resistance. If this pathotype is prevalent, it may be necessary to find a better source of resistance than the one now in wide usage.

## Squash

The predominant squash grown in Egypt is essentially a grey zucchini (Cucurbits pepo). This species has no useful resistance to any disease and urgently needs viral and mildew resistance. From interspecific hybridization at Cornell a gene for PMR has been transferred to C. pepo and can be moved readily to any squash in that species. I understand from Dr. El Downy that this is well along if not complete for the Egyptian zucchini. Genes for viral resistance have been more difficult to transfer, but some progress had been made in Egypt by 1985 and much more has been done at Cornell since then. PMR squash should be ready for field trials in a year or two. It is difficult to say how long viral resistance would take but is so important that it should be pursued vigorously.

## Watermelons

Resistance to viral diseases is the prime need in this very important crop. Resistance to fusarium wilt is already in use and it is the only cucurbit where mildew and CMV are not important. Sources of resistance to

potyviruses are available and good progress was being made in 1985. There seems to be little work going on elsewhere in the world toward this objective except for a limited amount at Leesburg, Florida. The most advanced material from earlier work in Egypt should be planted and evaluated before it loses viability.

## Suggested Approach

1. Make a fall 1992 planting of the most advanced germplasm from earlier work in Egypt and from recent work at Cornell and elsewhere. This is the season when mildews are most serious and virus diseases have built up in prevalence. Sometime from mid-October to mid-November, Provvidenti and Munger should go to Egypt for one-two weeks to help evaluate the existing germplasm and help make plans for future work.

2. The field plantings suggested above could provide material for a national workshop on cucurbit improvement. This should involve scientists from the universities, some of whom have requested seed of the wild or unusual species that have been sources of resistance. This suggests that they need to be informed of the status of resistance transfer to avoid starting again unnecessarily. There is evidence that even within the MOA, scientists do not know what others are doing with cucurbits.

3. While it is desirable that most of the cucurbit breeding be done in Egypt to insure adaptability and to strengthen scientific capabilities there, some funding of work in the U.S. would speed the program. We have had no outside funding for the work done so far at Cornell. During the summer months, it is too hot in Egypt for diseases such as mildews and CMV, but it is the best time in the U.S. Egyptian scientists could work with U.S. colleagues during the summer months to gain experience and maximize progress.

NATIONAL AGRICULTURAL GENETIC
ENGINEERING LABORATORY

| | |
|---|---|
| PO | Potato Transf. |
| TM | Tomato Transf. |
| CU | Cucurbit Transf. |
| MZ | Maize Transf. |

# NEED ASSESSMENT FOR EQUIPMENT

| ITEM No | ITEM DESCRIPTION | QTY. ON HAND | REPLACEMENT | ADDITION | QTY. NEEDED | PROJECT |
|---|---|---|---|---|---|---|
| 1 | DNA SEQUENCE READER | | | 1 | 1 | MZ |
| 2 | SPECTROPHOTOMETER (SCANING) | | | 1 | 1 | PO |
| 3 | PULSE FIELD ELECTROPHORESIS | | | 2 | 2 | CU |
| 4 | DNA SYNTHESIZER, FULLY AUTOMATED | | | 1 | 1 | TM |
| 5 | LAMINAR FLOW HOOD | 3 | | 3 | 3 | MZ/CU/PO |
| 6 | MICROPLATE READER (KINETIC ELISA) | 1 | | 1 | 1 | TM/CU |
| 7 | FREEZER, ULTRA LOW, UPRIGHT MOD | | 1 | 2 | 3 | MZ/CU/TM |
| 8 | CRUSHED-ICE MACHINE | 1 | | 1 | 1 | CU |
| 9 | MICROCENTRIFUGE, EPPENDDORF | 3 | | 3 | 3 | TM/CU/PO |
| 10 | GROWTH CHAMBER | | | 2 | 2 | MZ |
| 11 | INCUBATOR, SHAKING | | 1 | 1 | 2 | PO/TM |
| 12 | POWER SUPPLY, SEQUENCING | 1 | | 3 | 3 | MZ/PO/TM |
| 13 | STERILYZER, AUTOMATIC | | | 1 | 1 | MZ |
| 14 | CENTRIFUGE, HIGH SPEED | 2 | | 1 | 1 | CU |
| 15 | ELISA PLATE AUTOMATIC WASHER | | | 1 | 1 | TM |
| 16 | SPEED VAC | 1 | | 1 | 1 | PO |

NATIONAL AGRICULTURAL GENETIC
ENGINEERING LABORATORY

| | |
|---|---|
| PO | Potato Transf. |
| TM | Tomato Transf. |
| CU | Cucurbit Transf. |
| MZ | Maize Transf. |

# NEED ASSESSMENT FOR EQUIPMENT.

| ITEM No | ITEM DESCRIPTION | QTY. ON HAND | REPLACEMENT | ADDITION | QTY. NEEDED | PROJECT |
|---|---|---|---|---|---|---|
| 17 | WATER DEIONIZER | 1 | 1 | 1 | 1 | MZ |
| 18 | WATER STILL, DOUBLE | 1 | | 1 | 1 | PO |
| 19 | GEL DRYER (HIGH-CAPACITY) | | | 2 | 2 | MZ/CU |
| 20 | HOMOGENIZER (HIGH SPEED) | | | 1 | 1 | PO |
| 21 | INCUBATOR | 3 | 1 | 1 | 2 | TM/CU |
| 22 | HYBRIDIZATION OVEN | | | 1 | 1 | CU |
| 23 | VACUUM OVEN | 1 | | 1 | 1 | PO |
| 24 | BALANCE, ANALYTICAL ELECTRONIC | 1 | | 1 | 1 | MZ |
| 25 | BALANCE, TOP LOADING | 2 | | 2 | 2 | MZ/PO |
| 25 | CIRCULATING WATER BATH | 1 | | | 2 | MZ/CU |
| 26 | pH/mV METER | 3 | 1 | 1 | 2 | TM/PO |
| 27 | SLAB GEL ELECTROPHORESIS UNIT | | | 3 | 3 | CU/PO/TM |

AID 1350-1
(3-87)

*PIO/T

AGENCY FOR
INTERNATIONAL DEVELOPMENT

PROJECT IMPLEMENTATION
ORDER/TECHNICAL
SERVICES

1. Cooperating Country: EGYPT

Page 1 of 2 pages

2. PIO/T No.: 263-0152.05-3-92095

3. Original or Amendment No.: 1

4. Project Activity No. and Title
NATIONAL AGRICULTURAL RESEARCH PROJECT (NARP)
Management/New Initiatives Component
Agricultural Biotechnology for
Substainable Productivity Project Element

DISTRIBUTION

REC'D CS 27 OCT 1992

5. Appropriation symbol: 72-112/31037

6. Budget Plan Code: QES29223263KG13

7. Obligation Status
_X_Administrative Reservation _X_Implementing Document

8. Project Assistance Completion Date (Mo.,Day,Yr.): 9/30/92

9. Authorized Agent: DIR/CS/ISAID/CAIRO

10. This PIO/T is in full conformance whith PRO/AG No. 263-0152 Date 5-May-92

11a. Type of Action and Governing AID Handbook
_X_AID Contract (HB 14) __AID Grant or Cooperative Agreement (HB 13) __ PASA/RSS (HB 12) __ Other

11b. Contract/Grant/Cooperative Agreement PASA/RSSA/Reference Number (If this is an amendment)

12. Estimated Financing (A detailed budget in support of column (2) is attached as Attachment No. ____

| | | 1) Previous Total | 2) Increase | 3) Decrease | 4) Total to Date |
|---|---|---|---|---|---|
| Maximum AID Financing Available | A. Dollars | 0 | 776,889 | | 776,889 |
| | B. U.S. Owned Local Currency | | | | |

13. Mission References

14A. Instructions to Authorized Agent

DIR/CS is requestted to negotiate a Cooperative Agreement with Michigan State University for the implementation of the project entitled Agricultural Biotechnology for Substainable productivity. Funding assistance under this agreement shall be incremental over a 24-month life of activity period beginning October 1, 1992 and ending with the NARP PACD of Sept. 30, 1994. USAID funding is initially approved for the Research and Innovative activities, with the exception of the greenhouse activity and the Regional workshop pending further clarification.

(Please, see Continuation Page)

14B. Address of Voucher Paying Office

15. Clearances-include typed name, office symbol, telephone number and date for all clearances

A. The project Officer certifies that the specifications in the statement of work of program description are technically adequate
ROBERT RESSEGUIE, (A)OD/AGR/A — Phone Number — Date 10/20/92

B. The Statement of work or program description lies within the purview of the initiating office and approved agency programs
for AZIZA HELMY, PDS/PS — Date 10/25

C. Nasr Rohaiem — Date 10/26/92

D. Funds for the services requested are available
LUCY AWAD, FM/FA — Date 10/26

E. — Date

16. For the Cooperating Country: The terms and conditions set forth herein are hereby agreed to

Signature: SIGNED APPROVED DOCUMENT — Date _____
Title: ON FILE

17. For the Agency for International Development
Signature: DOUGLAS CLARK — 10/27/92
Title: Associate Director, Ag. Resources

*See HB 3. Sup.A APPC. Att B. for preparation instructions NOTE: The completed form contains sensitive information whose unauthorized disclosure may subject an employee to disciplinary action

51