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REPORT SUMMARY

ON

PLANT AND SEED MATERIALS

PASA TA (AJ) 2-69 (USDA/ARS)
U. S. DEPARTMENT OF AGRICULTURE

July 1, 1973 - June 30, 1974

Submitted to

Agency for International Development
Department of State
Washington, D. C.

REPORT SUMMARY

A. 1. Project Title and Contract Number: Plant & Seed Materials RSSA USDA 4-74.

2. Principal Investigator, Contractor and Mailing Address: H. L. Hyland, Plant Introduction Officer, Germplasm Resources Laboratory, Agricultural Research Center-West, Beltsville, Maryland 20705.

3. Contract Period (as amended): July 1, 1973 to June 30, 1974.

4. Period covered by Report: January 1, 1973 to December 31, 1973.

5. Total A.I.D. funding of contract to date: Complete data not available. Contract has been operational since 1955 with initial funding of approximately $60,000. Budgets have been equivalent or greater since that date. Additional data may be available from IPD, ARS, Hyattsville.

6. Total expenditures and obligations through previous contract year: FY-73 budget $112,525.

7. Total expenditures and obligations for current year: Under present ARS organization, funding is divided between Beltsville, Maryland, and Gainesville, Florida. The latter covers the edible yam program under the RSSA at Mayaguez, Puerto Rico. FY-74 budget for both locations is $60,000.

8. Estimated expenditures for next contract year: FY-75 should be budgeted for approximately $60,000. An additional $30,000 could be utilized for maintenance of

coffee collection at Miami, Florida on standby basis, and routine propagation and distribution of new collections of rust resistant lines.

B. Narrative Summary of Accomplishments and Utilization

This RSSA covers procurement and distribution of experimental quantities of crop plant materials requested by Mission personnel abroad and the collecting, evaluating, and distribution activities related to an expanded collection of edible yams at the Federal Experiment Station, Mayaguez, Puerto Rico. The ARS headquarters for the Project completed 91 shipments to 28 countries and included 5,393 varieties and/or selections (See Attachment A). These data do not cover program related activities where partial supervision and guidance was given covering small grain cereal nurseries, sorghums, and millets, and pulse legume procurement and exchanges. Reports pertaining to field observations were relatively few, and provided rather inconclusive but potentially promising data (See paragraph E "Dissemination and Utilization of Results").

The yam improvement program in Puerto Rico was extremely productive, although more liaison seems desirable with AID Missions abroad, outlining the contributions that can be made to local food programs through use of improved varieties. 310 accessions were obtained through direct exploration in the Southeast Asia and Pacific environs, mostly Dioscorea alata.

The entire collection now consists of 689 accessions representing 9 better known species. Additional explorations are not planned. Preliminary distribution of the more desirable clones have been sent to 17 cooperators and more planned for early 1974. Many publications appeared during the past year and are available to interested Mission technicians. A more complete report of these activities appear as Attachment B.

Although AID support funds for coffee propagation, maintenance and distribution were terminated June 30, 1973, a special group of 17 lines collected in Brazil, and resistant to the devastating rust, Hemileia vastatrix, were handled in accordance with earlier AID/USDA procedures. Seedlings were grown at the Glenn Dale, Maryland quarantine station and distributed in late December 1973 to collaborators in Colombia, Costa Rica, Ecuador, Guatemala and Panama. This collection may be identified for future reference under numbers, P.I. 385221 through 385237.

1973 ANNUAL REPORT
SEED AND PLANT MATERIALS
BELTSVILLE, MARYLAND

A. General Background

Technical missions supporting agricultural improvement programs, along with other disciplines, have been most active since the termination of WWII. As plans developed, an integral part was the testing and utilization of exotic crop germplasm to aid the improvement of indigenous cultivars or varieties. Many of the latter were low yielding, poor quality, and susceptible to the ravages of plant pests, including both diseases and insects. Most mission programs have been directed toward LDC's and thus a natural approach for potentially valuable germplasm was through agencies in those countries having well organized crop research and improvement facilities. Such activity for the U.S. has been conducted under a program of plant introduction administered by the Agricultural Research Service (ARS), USDA. This agency now known as the Germplasm Resources Laboratory (GRL) has had 75 years experience in the field and was a logical choice for contracting special service to help agricultural technicians with specific field assignments.

Since initiation of this service in 1955, there have been various organizational name changes, both in the Departments of State and Agriculture. However, the overall

objectives remain unchanged in that there is a continuous need for basic crop materials to be utilized in promoting increased production and better quality food in most LDC's. During the past 20 years, emphasis has shifted from one part of the world to another, depending upon political climates, emergency situations created by war, drought, or population explosion, and the ability of various countries and sectors in organizing and developing their own resources to sustain agricultural development.

There are several examples of successful projects in most of which, the Seed and Plant Materials PASA has played an active part. In earlier years disease free coffee and cacao germplasm collections were established in the western hemisphere and utilized extensively. Later, we became involved in the distribution of high lysine corn, sorghum and millets, pulse legumes, and most recently the edible yams. There is a continuous demand for forage, vegetable, fiber, and oilseed crops as developing countries become more qualified to conduct research programs for self sufficiency, as well as export income.

In meeting the ARS/PASA requirements of technicians in the field, a few problem areas persist that should be corrected and would result in better coordination. Emphasis must be placed upon reporting procedures through established channels. Within country activities by FAO specialists, Foundations, and Contract Teams should be communicated

covering the introduction of exotic germplasm. Shipping procedures, including recognition of local plant quarantine regulations, should be more clearly defined. Lead time on requests for experimental plant materials should be extended, if and when possible, and potential sources identified, if known.

We can assume most agricultural centers will develop along the lines of CIMMYT, IITA, CIAT, IRRI, ICRISAT, and AVRDC. Their activities in the introduction and distribution of germplasm conducted directly with GRL/ARS, and through other channels, must be more closely coordinated with AID programs and objectives to prevent needless duplication of effort and maintaining records for future reference.

We can anticipate the continuing need for technical assistance to developing countries and recognize that agricultural demands will receive priority. Therefore, efficient recording of observations and their utilization, along with ready access for use of future technicians, will determine the ultimate value of continuing the contract.

B. Project Objectives

The general purposes of this project are:

1. Provide AID missions and host governments with experimental quantities of seed and other plant propagating materials required to broaden the germplasm base available for use in LDC's crop improvement programs; and provide

associated technical advisory services as necessary.

2. To collate data reported by AID agriculturalists for future reference where applicable to new and/or existing programs in areas with similar environmental factors, or having comparable end use objectives.
3. Encourage the development of national and/or regional centers of plant introduction, collection, screening and varietal maintenence as part of a worldwide network of research in coordination with other organizations, including foundations and international agencies.

C. Relevance of Objectives

The project as basically designed provides a desirable long range program of agricultural crop research that will ultimately reflect in the overall economy of the country. The more agriculturally developed countries base their crop improvement upon experimental and expanded trials utilizing productive germplasm. The importance of recording data and preparing reports for future reference must be emphasized as a major contribution toward the successful implementation of the objectives. Potentially desirable crop varieties within a given political entity or restricted environments should be broadly tested under similar conditions, and all such data collated for the benefit of all interested agencies. Periodic and/or terminal reports covering U.S. contributed germplasm are

specific tools required for a well organized and a long range crop improvement program. Some method of continuity will increase the input efficiency.

D. Accomplishments to Date

Specific benefits from this long term project are difficult to cite due to lack of reports and/or a central coordinating agency. Since the inception of the program under ARS responsibility in 1955, records show that approximately 5,000 shipments of seed and plant materials, covering every known economic crop, have gone to 103 countries. The number of varieties and/or selections are conservatively estimated to be between 90,000 and 100,000. During the early years, ARS did receive an occasional terminal report prepared by Mission agriculturists, but more emphasis was placed generally on the overall economic importance of a potential crop, rather than what specific U.S. varieties might be contributing to improving that crop. There can be no doubt that there are excellent examples where U.S. derived germplasm is being used, even on an expanded scale, and most likely could be traced to the original ARS input of experimental lots. The situation can be improved only through proper orientation of the field technician as to his responsibility to report, along with regular periodic surveys by the responsible contracting agency to help in collecting such information.

Some encouragement has been found during the past year whereby a few field personnel recognize the value of reporting accomplishments. More progress is anticipated along the lines as indicated under Paragraph E (Dissemination and Utilization of Results). The report from Mayaguez, Puerto Rico (Attachment B) provides excellent data related to the accomplishments of that project.

E. Dissemination and Utilization of Results

The work objectives of this RSSA are more service oriented than research. The continuous procurement and distribution of experimental plant material constitutes the major activity, whereas the basic utilization of results applies to selecting the most desirable types or varieties for specific environments. Again, as indicated elsewhere in this report, data must be reported from field locations to become applicable. A few such reports received in 1973 follow, but there is little information that can be applied on a broad basis.

ETHIOPIA One of the more active projects in Ethiopia relates to the improvement of pulse legumes. Special attention has been given to beans and one of the few initial varieties supplied to date, only Canadian Wonder, a red bean, was the most consistent in favorable reactions

among the exotic types. Three local varieties, Ethiopia 10, Mexican 142, and Tengeru 16 proved consistently the best yielders in practically all locations. Preliminary data were given on Dolichos lablab and D. uniflorus. There were noticeable differences in yield and further evaluation is necessary. A recent report indicated that D. lablab carries very high drought resistance and may become one of the more important legumes to be screened. Seven varieties of Canadian field beans failed to show any significant superiority over the local strains. 319 lentils from the U.S. germplasm collection were screened for yield, vigor, disease, and range of maturity. Wide variation among the samples for these factors warrant additional testing. A search for forage legumes involved sweet clover and lespedeza sown with wheat in an attempt to establish a forage crop after removal of the wheat. The initial trial was a failure due to lack of sufficient moisture after the harvest.

NEPAL Many U.S. varieties of tobacco were supplied the mission during 1972-73 and excellent trials were established. However, a severe hail storm precluded obtaining final yield or quality data. Prior to the loss, field notes indicated that Virginia Gold, Coker 411, McNair 135, and Hicks were quite promising. Additional seed has been provided for follow-up trials. This mission has a very

active program in cooperation with FAO for cotton improvement. Numerous samples have been provided for this work, but little specific data have been reported to date.

NICARAGUA A large collection of pigeon peas supplied in 1972 failed to produce uniform stands, apparently due to either poor germination of the original seed, or some other factor. The small plant population passing through the flowering stage indicated a wide range in growth habits. These preliminary observations warrant additional testing and more experimental seed will be supplied as necessary. The mission was interested in trying guar. Three varieties developed by the Oklahoma Experiment Station were sent initially and preliminary data showed that Brooks was the most productive. 228 okra accessions were supplied by the Regional Plant Introduction Station, Experiment, Georgia, with most becoming badly infested with disease under the November planting. In July, a planting of Clemson Spineless gave a good rating and will be used in further trials. Among the entire collection were several accessions showing variation in performance, growth habits, and other factors, and these should serve as a basis for further testing.

THAILAND Much emphasis has been placed upon the testing of vegetable varieties and the few reports from the mission

indicated the tomato varieties Supermarket, Roma VF, Kalohi, Helini and Gamad are the most promising. It is interesting to note Hawaiian varieties among this group. Other vegetable varieties providing initial promise are Excel, Red Creole, and Texas Grano onions; Long Purple eggplant; and Clemson Spineless okra. Note the latter also holds promise in Nicaragua.

VIETNAM While this mission has a very large crop research program, and we are kept informed of new accessions brought into the country, very little data has been reported on crop performance. The Moana Sugar pea variety from Hawaii has received considerable attention. as well as soybean, No. 29, from Indonesia. A rather extensive program using U.S. tobacco varieties is, also, underway.

F. Statement of Expenditures and Obligations

The proposed expenditure for FY-75 as controlled fro ARS/Beltsville and Gainesville, Florida (Mayaguez) will be as follows. Salary increases have been projected in these figures, but overhead costs are not available at this time. The best general estimate would be as follows

Personnel	
Mayaguez, Puerto Rico	23,500
Beltsville, Maryland	21,000
Travel	
Beltsville	500
Mayaguez	500
Supplies and Material	500
Transportation (Shipping)	
Beltsville	2,000
Mayaguez	2,000
Miscellaneous	1,000
TOTAL	51,000

(net to program)

(ATTACHMENT A)

1973 EXPERIMENTAL SEED SHIPMENTS
US/AID MISSIONS

Date	Item	Quantity
	Afghanistan	
1/9	Jojoba (Simmondsia chinensis)	15 pounds
1/12	Peanuts - Dixie Runner	3 "
1/22	" - Va 56R	" "
1/26	Wheat - Winter Rust Nursery	750 samples
2/8	Brassica - oilseeds	3 - 50 pound lots
2/12	Tomatoes	5 packets
3/30	Peanuts	3 varieties
5/3	Cotton	2 "
8/21	Vegetables	27 "
9/6	Barley	4 "
	Beans	3 "
	Rye	4 "
9/11	Vegetables	7 "
9/17	Barley	2 "
	Rye	2 "
	Bolivia	
2/26	Cotton	3 varieties
11/15	Soybeans	1 "
	Botswana	
10/5	Safflower	7 varieties
	Brassica - oilseeds)	5 "
	Sesame	12 "
	Castorbean	6 "
	Flax	14 "
	Brazil	
1/15	Eragrostis superba	5 pounds
11/19	Soybeans	94 packets
11/21	"	3 varieties
	Costa Rica	
1/9	Rice	44 varieties
	Ecuador	
8/31	Forage species	282 accessions

El Salvador

3/5	Roselle	6 varieties
4/24	Castorbean	3 "

Ethiopia

1/15	Bean	7 varieties
3/9	Kenaf	2 "
3/29	Pennquad buckwheat	1 "
	Guar	3 "
4/19	Bean	9 "
5/15	Pangola grass	1 "
5/22	Coastal bermudagrass	100 clones
6/1	Alfalfa	1 variety
6/2	Vicia faba	98 accessions
6/22	Barley	31 varieties
11/19	Kenaf	100 grams ea.-6 var.

Ghana

2/14	Soybeans	1 variety

Kenya

1/23	Cassia (Herbarium specimens)	3 packets
2/15	Peanut	1 variety
	Cowpea	1 "
3/29	Sudangrass (hybrid)	2 "
	Sorghum sudan (hybrid)	2 "
	Standard sudangrass	3 "

Laos

2/14	Cowpea	1 variety
	Peanut	1 "
	Sorghum	1 "
	Soybean	1 "

Liberia

4/9	Cowpea	1 variety
	Soybean	1 "
	Peanut	1 "
9/19	Potato	2 "
9/21	One crossing block (bread wheat set)	1 "
12/7	Sorghum	11 lines

Morocco

1/11	Wheat	2 sets of seed
1/17	Barley	43 samples
5/11	Soybean	10 varieties
9/25	Sugarcane	3 "
12/4	"	2 "

Nepal

2/16	Cottonseed	3 varieties
	"	2 "
2/26	"	3 "
4/27	"	3 "
5/15	"	9 "
5/21	Potato	3 "
6/6	"	14 "
6/7	Cottonseed	1 "
6/4	"	9 "
6/11	Kenaf	9 "
	Tobacco	25 "
6/28	Cottonseed	3 "
7/20	"	2 "
11/21	Barley	3 "

Nicaragua

3/15	Cowpea	37 accessions

Niger

4/20	Peanuts	10 varieties

Nigeria

2/14	Peanut	1 variety

Pakistan

2/27	Jacaranda seed	1 variety
5/25	Cotton	2 "
9/18	Corn	1 "
10/2	Cotton	18 "

Paraguay

1/29	Wheat - Winter Rust Nursery	750 samples (2 sets)

Philippines

1/12	Sorghum	9 varieties
2/28	Grape	11 "
3/7	"	6 "
4/13	Sorghum	17 lines
5/10	"	9 varieties
6/11	"	110 samples
10/23	Citrus	1 variety

Senegal

10/23	Grass (black grama)	1 variety
12/7	Alfalfa	1 "

Tanzania

3/27	Pearl millet	1 variety

Thailand

2/15	Peanut	1 variety
	Cowpea	1 "
4/13	Pecan	2 "
5/25	Dioscorea alata (yam)	5 " - 15 lbs.
7/20	Soybean	1 "
8/23	Capsicum spp.	8 accessions
11/15	Sweet potatoes	3 "

Tunisia

3/22	Forage grasses	8 accessions
6/4	Sorghum (hybrid)	3 varieties
	Corn	4 varieties

Turkey

1/12	Rice	1 variety
1/26	Wheat - Winter Rust Nursery	750 samples
8/24	" " " "	750 "

Uruguay

1/15	Sorghum	4 varieties

Vietnam

5/1	Soybean	1 variety
5/17	Peanut	1 "

Zaire

8/24	Soybean	6 varieties
	Peanut	8 "

ATTACHMENT B

1973 ANNUAL REPORT
YAM IMPROVEMENT PROGRAM
MAYAGUEZ, PUERTO RICO

A. General Background

A recognition of the fact that tropical roots and tubers provide the calories and serve as staff of life for a large proportion of the population of the tropics has led to increased efforts to develop these crops to their full potential. The yam was selected as the most neglected of the tropical roots and tubers, and the crop most needing attention. It was recognized that this crop exists chiefly in a primitive state, and had never been systematically collected, evaluated, and distributed.

B. Project Objectives

Assemble edible root crops, especially yams for evaluation, selection, and distribution as disease-free propagating stock for USAID missions.

C. Relevance of Objectives

It became obvious in the early stages of the program that good yams could hardly be distributed until it was possible to define a good yam. Therefore, a serious program of investigation was begun to learn as much as possible about all facets of edible yams. This program, supported in part by USAID, and in part by the Federal Experiment Station, Mayaguez, Puerto Rico, has drawn on many disciplines and the collaboration of

many investigators. Current plans call for 3 1/2 more years of work with the edible yams.

D. Accomplishments to Date

Yams are seasonal in growth habit. The normally yearly cycle begins in March and extends through the following February. Since analyses of data and writeup lag somewhat behind the harvest, an annual report based on a calendar year is not feasible. The results reported here do not include those of the experimental plantings of 1973 since harvesting will not be completed before early spring 1974.

A collecting trip was made between May 31 and July 3, 1973. Because of the vast size of the area covered, extensive field collection was out of the question. Most of the accessions were obtained through cooperators who in some cases devoted considerable time and effort to obtaining yam cultivars in their areas. The success of this trip is directly related to the enthusiastic support of these individuals. The regions visited and the number of accessions obtained, by species, is listed on the following page.

Visited	Cooperator	Total	D. alata	D. esculenta	D. bulbifera	D. pentophylla	D. hispida	Others
Trivandrum, India	Dr. C. A. Ninan	20	19	1				
Kuala Lumpur, Malaysia	Dr. Bryan Lowry	10	10					
Bogor, Indonesia	Dr. Setijati Sastripradja	81	50	9	5	5	11	1
College, Laguna, Philippines	Dr. Azucena Carpena	20	19	1				
Port Moresby, Papua New Guinea	Mr. Arthur Charles	8	4	4				
Keravat, New Britain, PNG	Mr. Michael Bourke	107	45	50	6	6		
Malaita, British Solomon Islands	Mr. David Gollifer	28	9	9	8	2		
Nausori, Fiji	Mr. Paran Sivan	36	36					
Total		310						

The findings of the trip merit preliminary comments at this time. The wide variety of germplasm collected revises our concepts of the nature of the lesser yam, D. esculenta, enlarges our understanding of D. alata, and contributes to our appreciation of the nature and variability of the other three species. Among the varieties obtained, many D. alata and D. esculenta types appear to be superior to common cultivars seen in other parts of the world. No single region appears to have a monoply on either variation or good varieties, and re-distribution of selected cultivars among the regions collected would

Solomon Islands. The varieties of D. alata and D. esculenta obtained were of relatively narrow range of germplasm, but of very high quality.

Fiji. The varieties of D. alata obtained represent a range of types, many with high horticultural value.

Germplasm Collection-Mayaguez
January, 1974

D. alata	299
D. bulbifera	33
D. cayenensis	54
D. dumetorum	15
D. esculenta	95
D. hispida	10
D. pentaphylla	4
D. rotundata	161
D. tritida	5
Other species	13
Total	689

The number of accessions continues to change during the process of becoming acquainted with the materials. We find duplication, for example, which reduces the number of varieties. We also find differences within varieties, which leads to new accession numbers. Lists of varieties available, and their characteristics will be given to cooperators on request. Naturally, not all species and varieties have been equally evaluated as of this date.

No new expeditions will be made to collect yams. The collection cannot be maintained indefinitely. As we finish

appear to be desirable. Some comments on the individual regions follow:

India. A medium amount of variability was seen, including many large coarse-fleshed varieties of D. alata, and small tubered varieties of D. esculenta. Very few varieties appear to have superior horticultural value.

Malaysia. Few varieties were seen and these represent a limited range of germplasm. First truly wild D. esculenta varieties were found.

Indonesia. A wide variety of accessions was obtained of primitive and superior varieties of all principal species. This suggests that Indonesia is a center of diversity of yam germplasm. The collections, principally from Java, probably represent only a fraction of the germplasm of the entire country. Further collection and local evaluation appears desirable.

Philippine Islands. Variability with respect to species and varietal types appears to be quite limited, and superior varieties known elsewhere are conspicuously absent.

Papua New Guinea. The great range of new tuber types seen suggest that these islands represent a center of diversity of D. alata and D. esculenta. We believe that through collections from the principal yam-growing regions we have now received most of the common varieties now used. Many of these varieties are expected to have special value.

evaluations of a particular species, we shall reduce the collection to retain only selected varieties. Serious reduction of the collection will begin in 1974. Both selected and unselected materials are distributed to cooperators on request during February and March of each year.

Evaluation. Systems for the evaluation of the principal species have been developed. All varieties on hand are passing through an evaluatory program that includes observations of dormancy, growth habits, characteristics of foliage, virus and other disease symptoms and resistances, local adaptation, tuber size, shape, yield, nutritional value, starch characteristics, value as processed flour, as feed, cooking qualities, consumer appeal, storability, and propagation from stem cuttings, bulbils, and small tuber pieces. We cannot make all of these evaluations ourselves, and we are, therefore, cooperating with individuals in various widespread locations.

The evaluation of D. alata varieties has been extended due to the acquisition of new varieties of superior quality. The best D. alata varieties will be tested for yields under the best agronomic practices for another two years. Some of these are now ready for distribution. A bulletin on D. alata will be written in early 1974.

Our collection of D. esculenta now includes all forms of this species. We are confident that these will be useful throughout the tropics. The evaluation will not be finished

until 1976.

The collection of D. bulbifera has also reached a sufficient size and state of development for final evaluation. Work with this species has been terminated, and only a few selections will be kept.

The principal task that remains is the evaluation of the African species, especially the D. rotundata-D. cayenensis complex. This work will take the full 3 1/2 years still allotted to the program. The newly developed collection of African species was first grown in 1972, and full notes were made. Virus diseases are the principal problems encountered with this collection.

Nutritional status. Studies have shown that yams are relatively high in total protein, but that the protein is lacking in cystine and methionine. Varietal differences permit selection in some cases. All studies of amino acids and proteins are published or are in press. Current studies through three cooperators emphasize the biological value of yam proteins, and the overall value of yams as food.

Animal feeds. Some of the larger, coarser yams can probably produce as much starch per acre as cassava, and perhaps some varieties might be useful as animal feeds. We are selecting possible varieties that can be handled by machine, measuring yields, and beginning to test through cooperators

value as feed. Preliminary results suggest that raw yams are not easily digested. Drying at 58°C does not remedy this problem, but boiling does. We suspect that yams contain an amylase inhibitor.

Agronomic program. Perhaps in developing new methodology for the production of yams we have met our greatest challenge. We can conceive of methods suitable for modern agriculture, but as yet, we have not developed a package of recommended practices. Some possibilities under test, where preliminary results were obtained in 1972 and 1973 include:

1. Production of seed yams by a separate agronomic system.
2. Mechanized planting.
3. Stakeless culture, or culture with living supports.
4. Dense planting.
5. Mineral fertilizer rates and application times.
6. Mechanical harvest.

New agronomic practices must be related to varieties. Suitable varieties of D. alata are now on hand, and were used for the 1972 and 1973 plantings. In these studies, we are nearing a stage where recommendations can be made, and we are planning the polishing up operations.

Dormancy and storage. Ethrel is useful in stimulating germination of yams. Confirming studies have been made and final studies are now being planned. Times, rates, and

tolerances have to be worked out.

Genetics and breeding. Although we remain alert to the possibility of improving yams by breeding, we feel that conventional techniques will not be useful. Few yams flower and opportunities for cross pollination are practically nil. These generalizations may not apply to D. rotundata, D. cayenensis, and D. trifida. Furthermore, yams have already been highly selected by primitive people.

E. Dissemination and Utilization of Results

Distribution of Yams to other countries from FES, Mayaguez, P.R. up to January 1, 1974. A large number of requests will be filled in February 1974.

Azucena Carpena,
University of the Philippines

16 varieties

H. A. Chesney,
Georgetown, Guayana

4 varieties

M. L. Degras,
Guadeloupe, West Indies

21 varieties

Robert J. Dingwall
Missouri Botanical Gardens

2 varieties

M. V. Dizes
O.R.S.T.O.M.,
Abidjan, Ivory Coast

11 varieties

Dr. James Manor
CIAT, Cali, Columbia

4 varieties

Office of Agric. Development
Thailand

5 varieties

Miss Angelina Oppong
Crops Research Institute
Kumasi, Ghana

14 varieties

Mr. Godfrey-Sam-Aggrey
Mjala University College
Freetown, Sierra Leone

7 varieties

Mr. Jan J. Smit
O.R.S.T.O.M.,
Abidjan, Ivory Coast

2 varieties

Dr. E. V. Doku,
Lagon, Ghana

7 varieties

M. R. Dumont
IRAT, Parakou, Dahomey

3 varieties

U. V. Ebong
Moor Plantation
Ibadan, Nigeria

16 varieties

Dr. L. T. Empig
Los Banos, Philippines

7 varieties

Jorge Tenreiro
Institute Investigacao Agron.
Angola

3 varieties

M. R. Vandevenne
INRAT, Bouake, Ivory Coast

14 varieties

D. B. Williams
University of W.I., Trinidad

9 varieties

Publications Related to Edible Yams

Martin, F. W. 1972. Yam Production Methods. USDA Agricultural Research Service Production Research Report No. 147. 17 pp.

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Martin, F. W., and Thompson, A. E. 1973. Protein content and amino acid balance of yams. Jour. Agric. Univ. Puerto Rico. 57:78-83.

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F. Statement of Expenditures and Obligations (FY-75)

The Federal Experiment Station will finance research aspects of the yam program, and AID will be asked to finance costs related to the original research mission as follows:

Maintenance of yam collection, multiplication	
1/2 salary of field assistant	6800
1/2 salary of two laborers	6500
Evaluation of the collection, selection	
1/3 salary of laboratory assistant	3000
1/4 salary of professional scientist	7200
International distribution, including descriptive literature	2000
Travel	500
Total	26,000

G. Work Plans

1. The evaluation of all minor species will be finished.
2. A descriptive list of selected varieties will be prepared and distributed.
3. This list will be circulated to USAID and other official contacts.
4. Selected varieties will be distributed to interested cooperators.
5. Newly selected varieties will be multiplied.
6. Selection of D. rotundata and D. cayenensis will be continued in yield trials.

7. Some collections will be reduced to selected materials only.
8. Agronomic trials will emphasize weed control methods.
9. The entire D. rotundata and D. cayenensis collections will be heat-treated to try to destroy virus, and all virus infected materials from this point on will be destroyed.
10. Four to six new publications will be written.
11. Several of the agronomic and physiological aspects of the program will be brought to a close.