AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D C 20523

BIBLIOGRAPHIC INPUT SHEET

FOR AID USE ONLY

1. SUBJECT CLASSIFICATION

A. PRIMARY
Food production and nutrition — AN1J-0000-G116

B. SECONDARY
Agricultural engineering and structures--Central African Empire

2 TITLE AND SUBTITLE
Central Africa Republic Seed Project; Report to USAID/Yaounde and AID/W

3. AUTHOR(S)
Dougherty, G.M.

4. DOCUMENT DATE	5. NUMBER OF PAGES	6. ARC NUMBER
1976	32p.	ARC

7. REFERENCE ORGANIZATION NAME AND ADDRESS
Miss.State

8. SUPPLEMENTARY NOTES *(Sponsoring Organization, Publishers, Availability)*
(In TA 76-05)

9. ABSTRACT

10. CONTROL NUMBER
PN-AAG-407

11. PRICE OF DOCUMENT

12. DESCRIPTORS
Seed production
Storage
Test facilities
Central African Empire

13. PROJECT NUMBER
931020300

14. CONTRACT NUMBER
AID/ta-C-1219 GTS

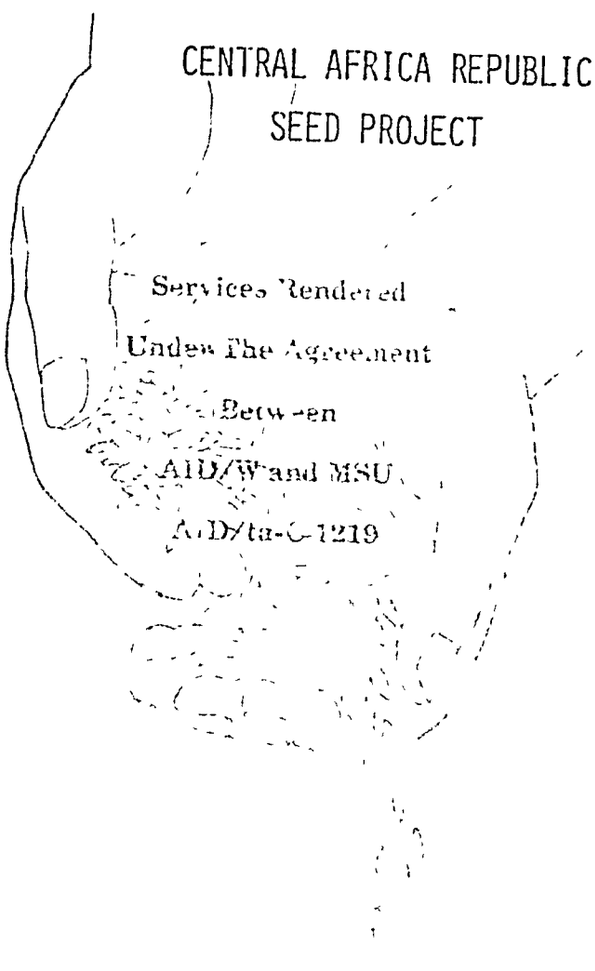
15. TYPE OF DOCUMENT

AID 590-1 (4-74)

REPORT TO USAID/YAOUNDE

TA 76-05

CENTRAL AFRICA REPUBLIC
SEED PROJECT



Services Rendered
Under The Agreement
Between
AID/W and MSU
AID/ta-C-1219

SEED TECHNOLOGY LABORATORY
MISSISSIPPI STATE UNIVERSITY
MISSISSIPPI STATE, MISSISSIPPI

REPORT TO USAID/YAOUNDE

AND AID/W

ON

CENTRAL AFRICA REPUBLIC SEED PROJECT

Services Rendered
Under the Contract
Between
AID/W and MSU
AID/ta-C-1219

SEED TECHNOLOGY LABORATORY
MISSISSIPPI STATE UNIVERSITY
MISSISSIPPI STATE, MISSISSIPPI

MAY, 1976

TABLE OF CONTENTS

REPORT SUMMARY

TITLE:	Report to USAID/Yaounde and AID/W on Central Africa Republic Seed Project
CONTRACT:	Services under AID/ta-C-12-19
CONSULTANT:	G.M. Dougherty, Assistant Professor of Agronomy Seed Technology Laboratory, Mississippi State University
PERIOD OF REPORT:	19 April - 3 May, 1976

SUMMARY

The Government of Central Africa Republic, the United Nations Development Program and the Agency for International Development have jointly undertaken development of a modest seed multiplication project. U.S. project inputs include: technical advisory assistance; training of Central African personnel and commodity support.

Some of the commodities recommended for purchase, as a U.S. project input, had been supplied by the UNDP. To eliminate duplication, the U.S. Embassy, Bangui and USAID/Yaounde requested technical assistance to re-evaluate existing equipment procurement lists and make recommendations and prepare specifications for seed testing, processing, drying and storage equipment requiring purchase.

Specifications of seed testing and handling equipment needed are included in the report. These items are estimated to cost $46,582 CIF, port of entry.

Recommendations

1. A portion of unspent project funds budgeted for equipment purchases be used to install additional electrical circuits in the testing laboratory and the seed processing-drying building
2. Funds budgeted for new seed storage warehouse construction be used to renovate an existing storage structure and repair the seed processing-drying building.
3. Project funds, designated for equipment purchases and new construction remaining after renovation, repair and equipment installation work has been completed, be used at the descretion of the Director of the Seed Project with approval of USAID/Yaounde to insure operation of the Seed Project.

ACKNOWLEDGEMENTS

The author wishes to acknowledge the excellent cooperation of USAID/ Yaounde and the U.S Embassy, Banqui, Central Africa Republic. Mr. M. Ford, Project Officer, USAID/Yaounde and Mr. R. Gribbon, Economic Officer, U.S. Embassy, Banqui were especially helpful during the consultation period.

The author is particularly appreciative of the assistance given by Mr. A. De Valck, Director, FAO/UNDP Seed Project. He served as an advisor and traveling companion, as well as being a warm and gracious host.

George M. Dougherty

REPORT TO USAID/YAOUNDE AND AID/W
On
CENTRAL AFRICA REPUBLIC SEED PROJECT

19 April - 3 May, 1976

FORWARD

The Gover ment of Central African Republic (GOCAR) requested the Agency for International Development (AID) to participate with it and the United Nations Development Program (UNDP) in the expansion and the equipping of seed facilities as well as development of seed breeding and multiplication services. The GOCAR and UNDP requested AID for assistance in financing agricultural production machinery, seed processing and testing equipment, as well as providing the services of an agricultural machinery specialist The AID agreed to provide assistance to the joint GOCAR/UNDP seed multiplication project in areas of: commodity support; training for Central African personnel; technical advisory assistance.

TERMS OF REFERENCE

Subsequent to the approval of the project some equipment items recommended in the project for procurement have been provided by other sources. To eliminate duplication of equipment, the U.S. Embassy, Banqui, CAR and USAID/Yaounde requested technical assistance to: evaluate existing equipment procurement lists and prepare detailed specifications and cost estimates for seed testing and processing equipment requiring procurement

The assistance requested, following approval by AID/W, was provided by Mississippi State University under the MSU-AID/ta-C-1219 Contract

CURRENT SITUATION AND RECOMMENDATIONS

The AID seed project is a joint undertaking with the UNDP/FAO to establish a seed-production, -testing, -drying, -processing, -storage capacity at the Grimari Agricultural Center. The current project is considered the first of a two-phase activity to produce, multiply and distribute sufficient quantities of improved quality peanut, rice, sorghum and corn seed to the rural farm population. The combined inputs of AID, UNDP/FAO and the GOCAR are designed to permit in phase 2 the multiplication and distribution of seed through an additional four sub-Centers at Bambari, Poumbaindi, Gouroman and Soumbe.

Revitalization of the Grimari Center as a first phase activity is based on the assumption the Center will play a major role in the GOCAR system of agriculture institutions and that other agricultural institutions will cooperate and work with the Center. In the 1960's the Grimari Center was an INRAT seed multiplication station. Operations practically ceased, however, with the departure of French research professionals in 1970.

Since 1970, although the Grimari Center remained opened and continued to

function, at a much reduced level, seed quality and crop yields have degenerated. Reasons for the degeneration in seed quality and yields although complex, can be basically traced to the departure of the French technicians. There is no formal seed-production, -distribution system functioning in the CAR at present. Restoration of seed multiplication activities at Grimari by providing agricultural machinery, processing and testing laboratory equipment is a primary objective of the project.

A. Grimari Agricultural Center

At present, the Center has 150 hectares of arable land. Each year, on a rotational basis, 75 has is fallowed. Seventy-five hectares is used for field trials and production, i.e., 45 ha. cotton, 30 ha. food crops. The four year rotation is cotton, food crop, fallow, fallow. Seed production in 1976 was limited to 25.5 hectares It was reported an additional 200 hectares, on or near the Center, could be made available for production purposes. Seed production projections (Table 1) are based on the assumption additional land will be available in 1977

Table 1. Seed production schedule at Grimari Agricultural Center.[1/]

CROP	MT/Year Cleaned Seed					
	1976	1977	1978	1979	1980	1981
Peanuts	20	42 5	42.5	42.5	42.5	42.5
Rice	30+	30+	90	90	90	90
Corn	---	4	4	4	4	4

[1/] Information supplied by A. De Valck, Director, Seed Project.

Success of the effort to produce seed will depend on the quality of the seed produced. Establishment of a seed testing laboratory at the Grimari Center is considered necessary. Mr. Menier an FAO/UNDP seed control expert, presently in the CAR, will supervise seed testing operations and be responsible for providing on-the-job training for Central African personnel. Training will get underway as soon as personnel are in place and the necessary equipment is acquired. The CAR has provided a room to be used as a testing laboratory. Located in the Center's administrative building, the room has approximately $26M^2$ work area for technical operations; additional space is available for the laboratory's administrative personnel.

The testing laboratory is to be equipped to draw samples of seed and test them for moisture, purity and germination. The AID/project has budgeted $15,000 (PIO/C 676-0001-4-60018) to purchase quality control equipment and supplies. Equipment and supplies recommended for procurement (Table 2) is estimated to cost approximately $8,800, CIF port of entry. Specifications are

Table 2. SEED TESTING LABORATORY EQUIPMENT AND SUPPLIES
(PASA/C [illegible]70-0001 4-00018)

Item No.	Description	Number Required	Estimated[1/] Cost
1.	Seed Germinator	2	$ 1,200
2.	Seed Divider	1	500
3.	Seed Blower	1	700
4.	Seed Moisture Tester	1	900
5.	Oven	1	500
6.	Seed Trieurs	2	70
7.	Purity Workboard	1	60
8.	Sling Psychrometer	2	200
9.	Sample Pans	12	55
10.	Sample Bottles	50	60
11.	Spear Envelopes	1,000	60
12.	Germination Towels	10,000	150
13.	Germination Blotters	2,500	450
14.	Thermometers	12	50
15.	Grain Scale	1	75
16.	Forceps	12	30
17.	Desk Lamps	2	180
18.	Hand Screens	(1 set)24	240
19.	Scoops	12	20
20.	Scoops	3	15
21.	Jute Twine	50	50
22.	Sample Pans	12	10
23.	Hygrothermograph	1	530
24.	Sample Bags	1,000	100
25.	Spear Envelopes	2,000	100
	TOTAL		$ 6,395
	Crating, Ocean Transportation	(30%)	1,892
	Inland Freight	(10%)	630
	GRAND TOTAL		$ 8,827

[1/] Estimated, FOB Supplier.

provided (Appendix 1) for all items appearing in Table 2. Names and addresses of possible suppliers are provided in Appendix 2.

Approximately $6,200 of the budgeted $15,000 is not needed for quality control equipment and supplies at the present time. This is because subsequent to preparation of the AID Seed Project Budget some laboratory equipment was provided by the UNDP/FAO Seed Project. A small portion of the $6,200 will be needed to purchase items such as stationary, trash containers, paper clips, etc., that should be procured from local suppliers. A larger portion will be needed to purchase supplies, and install additional electrical circuits in the testing laboratory. At present, there is only one electrical outlet in the laboratory for use with testing equipment. It is recommended that an additional six (6) double-outlets be provided. For unspent funds it is recommended they be used, at the discretion of the Seed Project Director with approval of USAID/Yaounde, as needed to insure operation of the seed testing laboratory.

Of no lesser importance than establishment of a testing laboratory is need at the Center of adequate facilities to dry, clean, treat and store the seed produced. Funding has been provided in the AID Seed Project to support these essential operations. Twenty thousand dollars ($20,000) has been budgeted (PIO/T 676-0001-3-60014) for construction of a 130 M^2 unconditioned seed storage warehouse and $62,000 (PIO/C 676-0001-3-60017) for procurement of drying, processing and storage equipment and supplies. These commodities are intended to complement what currently exists. At present there is, for seed drying, a sun-drying floor (540 M^2), a tower batch-type rice seed dryer and a perforated bin-wall batch-type peanut seed dryer, for seed storage, a 360 M^2 brick-wall structure. There is no seed cleaning and treating equipment nor conveying equipment to load and unload the seed dryers.

Climatic conditions during the harvest season (peanuts, rice and corn) necessitates seed drying by mechanical means (Tables 3 and 4). No single seed handling operation, after harvest, will have a greater influence on seed quality (germination) than seed drying. Existing facilities for drying peanuts and rice are adequate for quantities of seed currently being produced. There is no dependable system for drying ear corn. At present, ear corn (non-project production) is sun-or crib-dried, weather permitting. Since the production of corn for seed planting purposes is not anticipated to get underway during the first phase of the seed project additional drying facilities are not required immediately. It is recommended, however, that a dependable seed drying system for ear corn be installed before corn seed production gets underway. A tunnel-type sack or bag dryer is recommended for consideration. A sack dryer designed for 70-75 bags of seed should be adequate for the corn seed crop; it could also be used as a back-up system for drying rice and peanuts. Cost of a heater-fan unit for the dryer is estimated at $6,000, FOB Supplier. Cost of materials to construct the dryer (local fabrication) are estimated at $2,000. A dryer design can be provided by the Seed Technology Laboratory, Mississippi State University.

Climatic conditions may also result in reductions in seed germination during periods peanuts, rice and corn are stored. Levels of reduction experienced should not, however, seriously impair seed quality in terms of its value for planting purposes. Conditions do warrant the implementation of an effective storage insect control program to minimize losses in seed quality. It is recommended peanuts be stored in-the-shell (unshelled), and that peanut,

Table 3. Seed planting and harvesting schedule (Grimari)

Crop	MONTHS											
	J	F	M	A	M	J	J	A	S	O	N	D
Peanuts				ppp			hhh					
Rice						ppp					hhh	
Corn				ppp				hhh				
Sesame							ppp					hhh

P = Planting
H = Harvest

Table 4. Climatic conditions (Grimari)[1/]

	MONTHS											
	J	F	M	A	M	J	J	A	S	O	N	D
Temperature: (C^{O})												
Minimum	27	27	22	27	28	27	26	25	15	14	15	13
Mean	31	32	31	31	34	31	30	31	23	26	23	23
Maximum	35	37	32	35	41	35	34	34	30	31	32	33
Relative Humidity (%)												
6 a.m.	80	93	90	97	96	97	98	97	97	98	95	90
12 p.m. & 6 p.m.	60	60	65	71	72	75	80	84	80	82	80	70
Rainfall: (mm)	25	70	64	128	136	122	227	292	201	291	31	0

1/ Compiled from 1975 data.

rice and corn seed not be stored for a longer period than from harvest to the next planting season. Sesame seed would not be expected to store well under these climatic conditions.

The existing seed storage sturcture is in need of repair. As is, it is unsatisfactory for seed storage purposes. Repairs required include:

1. removal of wood bin and all non-essential 2nd floor vertical support columns and associated overhead cross-members
2. complete new concrete floor.
3. walling-in not needed door and window openings.
4. installation of three (3) new lightweight sliding doors.
5. installation of lighting fixtures and electrical circuits.
6. installation of roof-mounted ventilation fans
7. repairs to roof.
8. complete resurfacing of interior and exterior wall surfaces with concrete plaster to be followed with application of moisture-penetration retardant type paint

Costs of material to renovate the structure are estimated at between $4,000 and $5,000. Meterials would be obtained locally and work would be done by the Center's labor force under supervision of UNDP Seed Project personnel. Mr. A. De Valck, Director, UNDP Seed Project expressed confidence in being able to do the work required. Restored to satisfactory condition the 1500 M^3 structure would hold approximately 700 MT seed.

Renovation of the existing storage structure was not, apparently, considered advisable by the AID Seed Project review team. They recommended and budgeted $20,000 for, construction of a new 490 M^3 structure. They concluded, costs in excess of $20 000 were to be borne by the UNDP Seed Project. At the present time the UNDP Project has no funds for construction. Furthermore, the UNDP Project Director expressed the opinion that a satisfactory, adequate sized, warehouse could not be constructed by a local contractor with available funds. There was no opportunity for the consultant to explore construction costs.

Considering the geographical location of the Grimari Center and the possible problems it presents to acquiring the services of an experienced construction contractor, it is recommended that funds budgeted in the AID Seed Project for new construction be used instead to renovate the existing seed storage warehouse. Major renovations could possibly be completed before new construction could even get started. Funds not spent on the warehouse could be used to repair the seed processing and drying equipment building for which there are, at present, no funds in either the AID or UNDP Seed Project.

Repair of the processing and drying equipment building is needed to prevent equipment damage. Wind-blown rain has already damaged the rice seed dryer. Repairs needed include:

1. construction of a concrete floor in area of building to be occupied by processing equipment.
2. walling-in not needed wall openings.
3. installation of three (3) new, lightweight, sliding doors.
4. installation of lighting fixtures and electrical circuits.
5. installation of roof-mounted ventilation fans.
6. repairs to roof.

Table 5. SEED PROCESSING, DRYING & STORAGE EQUIPMENT
(P10/C 676-0001-4-60017)

ITEM NO.	DESCRIPTION	NO REQ'D.		EST.[1] COST
1.	Seed Cleaner	1		4,500
2.	Peanut Cleaner	1		4,000
3.	Seed Treater	1		3,000
4.	Belt Conveyor	1		1,300
5.	Platform Scale	2		700
6.	Bag Trucks, 2-Wheel	6		630
7.	Bag Holders	4		240
8.	Grain Scoops	12		150
9.	Bag Holders	4		160
10.	Aluminum Baskets	12		120
11.	Seed Fumigant	6	tins	350
12.	Gas Masks	2		360
13.	Film Sheeting	3	rolls	240
14.	Twisters	12		50
15.	Loop End Wire Ties	4	rolls	220
16	Bag Needles	36		10
17.	Portable Blower	1		200
18.	Peanut Sheller	4		2,000
19.	Corn Sheller	6		240
20.	Elevator Assembly (62-75)	1		1,000
21.	Elevator Assembly (62-145)	1		2,000
22.	Belt Conveyor	1		900
23.	Seed Treatment	25	gallons	500
24.	Bag Trucks, Platform	4		1,040
25.	Grain Scales	1		850
26.	Grease Gun	2		30
27.	Insecticide	100	pounds	200
28.	Sprayers	3		130

[1] Estimated, FOB, Supplier

Total		$26,170
Crating & Ocean Freight	(40)	10,068
Inland Freight	(10)	2,517
Grand Total		$ 37,755

Costs of material to repair the structure are estimated at $3,000. Materials would be obtained locally and work would be done by the Center's labor force under supervision of UNDP Project personnel.

The seed processing plant is to be equipped to clean, treat and bag seed of peanut, rice and corn. There exists the possibility that sorghum and sesame seed may be added in the future. The AID project has budgeted $42,000 (PIO/C 676-0001-4-60017) to purchase seed processing, drying and storage equipment and supplies. Equipment and supplies recommended for procurement (Table 5) is estimated to cost approximately $38,000, CIF port of entry. Specifications are presented (Appendix 2) for all items appearing in Table 5. Names and addresses of possible suppliers are provided in Appendix 3.

Unspent funds budgeted for equipment purchases will be needed for equipment installation and the on-site construction of a surge bin for the seed treater. This bin should be constructed following equipment installation. It is recommended that following equipment installation unspent equipment purchase funds be used, at the discretion of the Seed Project Director with approval of USAID/Yaounde, to insure operation of the Center's seed program.

The AID Seed Project has funds budgeted for the purchase of commodities in addition to those covered in this report. These commodities include agricultural (production) machinery and a vehicle. Recommended purchase lists and specifications for these items of equipment are being prepared by USAID/Yaounde.

The Seed Project also authorizes the services of an Agricultural Machinery advisor. Need for an advisor with the qualifications set forth in PIO/T 676-0001-3-60013 was explored, at the request of AID/W. From information gained in discussions with U.S. Embassy (Bangui), USAID/Yaounde and UNDP/FAO Seed Project personnel and observations during 7 days at the Gerwari Center, it was concluded a need exists for a machinery advisor. Meeting qualification criteria set forth in the PIO/T is important. However, it is essential the advisor has, demonstrated, practical experience in the operation and maintenance of powered agricultural equipment and communication skills needed to train Central Africa personnel. These skills and experience outweigh the importance of having earned a degree in Agricultural Engineering.

APPENDICES

APPENDIX I.

SEED TESTING LABORATORY EQUIPMENT SPECIFICATIONS

Item No.	Description	Number Req'd.
1.	Seed Germinator, stainless steel construction operational on 220 volt, 50 hz, 1 phase current. Complete with dial thermometer, automatic thermostat, thermopane plexiglass door, six (6) duraluminum trays 15" x 21", strip heaters. To be of double-wall cabinet construction, approx. size 24" (width), x 20" (depth), x 24" (height). Preferred Brand - Burrows Model 1880. Suppliers Burrows Equipment Company Seedburo Equipment Company	2
2.	Seed Divider, all wearing parts made of heavy brass or copper, chrome-plated throughout. Approximate dimensions 20" height x 14" width. Operational on 220 volt, 50 hz, 1 phase current. Preferred Brand - Gamet Precision Divider. Suppliers: Burrows Equipment Company Seedburo Equipment Company	1
3.	Seed Blower, Laboratory instrument on frame with casters, complete with 1½" and 3" column (with extension section) operable on 220 volt, 50 hz, 1 phase current. Preferred Brand - South Dakota Blower Model "B" Suppliers: E.L. Erickson Products Burrows Equipment Company Seedburo Equipment Company	1
4.	Seed Moisture Tester, operable on 220 volt, 50 hz, 1 phase current. Complete with 24 extra fuses and charts for testing peanuts, rice, corn, sorghum, sesame, soybean. Preferred Brand - Steinlite Model "G" Suppliers: Seedburo Equipment Company Burrows Equipment Company	1

Item No.	Description	Number Req'd.
5.	Air Oven, stainless steel construction, with precision controlled temperature to 218°C. Air intake valves on both sides of chamber (near bottom) metal damper on top of oven for control of air circulation, provision for mounting thermometers to measure inside temperature, all aluminum steel clad interior (not painted), heavy guage steel exterior with hammer loid finish. Circulation, gravity; approximate O.A. dimensions, 22" (width) x 18" (depth) x 24" (height). Complete with 3 shelves (2 adjustable; operational on 220 volt, 50 hz, 1 phase current with 6 extra thermometers. Preferred Brand - Cenco Constant Temperature Oven (Burrows No. 262) Suppliers: Burrows Equipment Company Seedburo Equipment Company	1
6.	Grain Probe, double-tube brass chrome plated; 39" (length); 7/8" (outside diameter), 3 openings without partitions. Preferred Brand - Burrows No. 536-A. Suppliers. Burrows Equipment Company Seedburo Equipment Company	2
7.	Illuminated purity workboard with 1 quart capacity seed drawer in front. Approximate dimensions 22" x 11" x 4". Operational on 220 volt, 50 hz, 1 phase current. Preferred Brand - Burrows No 1838. Suppliers. Burrows Equipment Company Seedburo Equipment Company	1
8.	Sling Psychrometer; with swivel handle and two 9" mercury filled gold backed etched thermometers with black markings. Range 120° to 120°F with 1° divisions. Thermometers mounted on metal back with swivel handle finished in baked enamel. Complete with: case, tables, directions, 24 extra wicks, 6 refill thermometers.	2

Item No.	Description	Number Req'd.
	Preferred Brand - Taylor 9-inch Sling Psychrometer. Suppliers: The Harry Alter Company Burrows Equipment Company Seedburo Equipment Company	
9.	Sample pans, triangular, heavy tin, dark blue enamel, 10" x 10" x 2½". Preferred Brand - Burrows Model 304. Suppliers: Burrows Equipment Company Seedburo Equipment Company	12
10.	Sample bottles, 1 quart size with 2" neck opening. Polyethylene, with enameled metal cap and gasket insert Preferred Brand - Burrows No. 367. Suppliers: Burrows Equipment Company Seedburo Equipment Company	50
11.	Spear Grain Envelopes, 12 oz., 6 x 10. Preferred Brand: None Supplier. Heinrich Envelope Company	1,000
12.	Germination Towels, 10" x 15" Supplier: Anchor Paper Company Dillard Paper Company	10,000 sheets (20 reams)
13.	Germination Blotters, 19" x 24" Steel Blue, cut to 6" x 12". Supplier: Anchor Paper Company	2,500 sheets (5 reams)

Item No.	Description	Number Req'd.
14.	Thermometers, General Laboratory Type, Range - 20 to 110°C; subdivisions 1°C; length 305 mm. Preferred Brand - Sargent-Welch No. S-80005B Suppliers: Sargent-Welch Scientific Company Scientific Products	12
15.	Gram Scales, polypropylene scoop 12" x 6" x 2½" (approximate). Cast aluminum alloy beam, self aligning agate bearings, relief etched stainless steel beams. Hollow ground steel pivots. Sensitivity - 0.1 gram Complete with weight set to increase capacity of balance to 2,610 grams. Preferred Brand - Burrows No. 1301. Suppliers. Burrows Equipment Company Seedburo Equipment Company	1
16.	Forceps, stainless steel, 4½" long, medium serrated point. Preferred Brand - Burrows No. 1826 Suppliers. Burrows Equipment Company Seedburo Equipment Company	12
17.	Dazor Fluorescent light, desk type with pedestal base. Complete with 24 extra tubes for operation on 220 volt, 50 hz, 1 phase current. Preferred Brand - Burrows No. 1844-D. Suppliers: Burrows Equipment Company Seedburo Equipment Company	2
18.	Set of 24 hand test screens 9" x 9" sized as follows: Round Hole: 6; 6½; 8; 12; 14; 16; 18; 20; 22; 24; 1/16. Slotted: 1/20 x 1/2; 1/16 x 1/2; 1/15 x 1/2; 1/14 x 1/2; 1/13 x 1/2; 1/12 x 1/2, 7 x 3/4; 8 x 3/4; 9 x 3/4; 10 x 3/4, 13 x 3/4.	1 set

Item No.	Description	Number Req'd.
	Wire Mesh: 6 x 24; 17 x 17. Preferred Brand - Ferrell-Ross (A.T. Ferrell) hand test screens. Suppliers: Ferrell-Ross Burrows Equipment Company	
19.	Scoop, all-purpose, plastic, for dry or liquid products. Capacity - 3 quarts. One piece construction, high quality polyethylene. Preferred Brand - Burrows No. 1729. Supplier: Burrows Equipment Company Seedburo Equipment Company	12
20.	Scoop, cast aluminum, non-corroding, 5 1/8" x 8½" bowl measurements. Preferred Brand - Burrows No. 1702. Suppliers: Burrows Equipment Company Seedburo Equipment Company	3
21.	Jute wrapping twine, 3 ply, 485 ft. per pound, ½ pound per ball. Preferred Brand - McMaster-Carr No. 1936T21 Suppliers: McMaster-Carr.	50 balls
22.	Sample Pans, tin plate, 4 quart capacity. Preferred Brand - Burrows No. 342. Suppliers: Burrows Equipment Company Seedburo Equipment Company	12
23.	Hygrothermograph; daily recording type, 800 daily charts, instruction booklet and special ink. Preferred Brand - Bendix Model 594. Suppliers: Burrows Equipment Company Seedburo Equipment Company	1

Item No.	Description	No. Req'd.
24.	Sample bags: polyethylene, 6" x 13", 6 mil thickness. Complete with 2,000, 6" ties. Preferred Brand - Burrows No. 360. Suppliers: Burrows Equipment Company Seedburo Equipment Company	1,000
25.	Spear Grain Envelopes, 8 oz., 5 x 8. Preferred Brand - None Suppliers: Heinrich Envelope Company	2,000

APPENDIX II. SEED PROCESSING, DRYING AND STORAGE EQUIPMENT SPECIFICATIONS

Item No.	Description	Number Req'd.
1	Seed Cleaner, cleans and elevates up to 100 bushels grain (2.5 MT) per hour. Wood construction, screen size 34-inch x 42-inch. Complete with: a) brushes for bottom screen and roll feed hopper b) bagging auger with two-way bagger, auger adapter and dri·· c) 8-foot vertical feed elevator and drive for No. 27 d) spout from elevator to hopper of cleaner e) one-bushel hopper with flow-control slide for feed elevator f) twenty-four (24) screens sized as follows: Round hole: 6,6½,8,12,14,16,18,20,22,24,1/16 Slotted: 1/20 x 1/2, 1/16 x 1/2, 1/15 .. 1/2, 1/14 x 1/2, 1/13 x 1/2, 1/12 x 1/2, 7 x 3/4, 8 x 3/4, 9 x 3/4, 10 x 3/4, 13 x 3/4 Wire Mesh· 17 x 17, 6 x 24 g) brushes and parts for installing brushes under top screen h) type "B" variable-speed drive for fan (factory installed) i) drive and motor of required horsepower operable on 220 volt, 1 phase, 50 hz. j) start-stop push button control station k) replacement parts not to exceed $300 Preferred Brand· Ferrell-Ross (A.T. Ferrell) Model No. 27 Suppliers: Ferrell-Ross, Crippen Mfg. Company	1
2	Peanut seed cleaner, portable, 2.5 to 3.0 MT per hour capacity. Approximate size 5 M^3; weight 500 kg. Complete with drives and gasoline engine of required horsepower (4 h.p. approx.), sieves for Virginia and Spanish type peanuts, and replacement parts not to exceed $300. Preferred Brand: Siscoma Model "DAROU" Suppliers: Siscoma	1

Item No.	Description	Number Req'd.
3	Seed treater, treats seed for complete seed protection with Mist-O-Matic method. Up to 350 bushel small grain (8 MT) per hour. Complete with: a) 4-foot film coater with variable speed drive b) two-way bagger attachment c) set of treatment application cups for slurry and liquid formulated products d) drive and motors operable on 220 volt, 50 hz. 1 phase current e) start-stop push button control station f) replacement parts not to exceed $300 Preferred Brand: Gustafson Model SS-1HC Suppliers: Gustafson Mfg. Company Mercator Corporation	1
4	Belt conveyor, 28 ft. length (8.4 M) with flights. Portable, aluminum construction; up to 500 bushel (corn) (12 MT) per hour capacity. Complete with drives and motor of required horsepower (3/4) operable on 220 volt, 50 hz., 1 phase current; start-stop push button control station; replacement parts not to exceed $150. NOTE: Conveyor to be used to load peanut dryer (unshelled peanuts) Preferred Brand: Burrows Series 2500 Suppliers: Burrows Equipment Company Seedburo Equipment Company	1
5	Platform scales, for general utility weighing; portable. Double-beam construction; 1,000 lbs. (454 Kg) capacity. Scale to be calibrated in metric units of measurement. Preferred Brand: Fairbanks-Morse No. 1180 Suppliers: Burrows Equipment Company Seedburo Equipment Company	2
6	Bag truck, 2-wheel, with 22.8 cm (9-inch) nose; 20.3 cm (8-inch) wheels; rubber tires; 1.2 m (48-inch) handles; roller bearings. Preferred Brand: Minneapolis Bag Truck Suppliers: Burrows Equipment Company Seedburo Equipment Company	6

Item No.	Description	Number Req'd.
7	Bag holders, easily adjusted to any height or width of sack, released by simple movement of spring. Complete with six (6) replacement springs. Preferred Brand: Universal Bag Holder Suppliers: Burrows Equipment Company Seedburo Equipment Company	4
8	Grain scoop, lightweight, aluminum alloy (10 ga.) corrugated, open-back bowl, with western type wide mouth. Preferred Brand. Burrows Model No. 963 (standard) Size 14 Suppliers: Burrows Equipment Company Seedburo Equipment Company	12
9	Bag holders, of galvanized steel lock formed with shut off slide. Overall height approx. 10-inch; intake to be 8-inch square. Preferred Brand: Gripmaster Bag Holder Suppliers. Burrows Equipment Company Seedburo Equipment Company	4
10	Aluminum baskets, 1.5 bushel capacity. Preferred Brand: Burrows No. 1725 Seedburo No 172-1½ Suppliers: Burrows Equipment Company Seedburo Equipment Company	12
11	Seed fumigant, Aluminum Phosphide formulated with amonium carbonate and hard pharmaceutical paraiffin. Tablets (3 grams); packed 30 tablets in a tube, 6 tubes per tin. Preferred Brand: Phostoxin Suppliers: Phostoxin Sales, Inc.	6 tins

Item No.	Description	Number Req'd.
12	Gas mask, short style, compact protection against nuisance concentrations of gases. Black natural rubber face piece with wide-angle lenses. Canisters screw on for leak-proof fit and easy changing. Complete with ten (10) extra canisters for protection against phosphine gas. Preferred Brand: McMaster-Carr No. 5492 Suppliers: McMaster-Carr Supply Company	2
13	Film sheeting, polyethylene, 6 mil thickness. Clear 20 ft. x 100 ft. roll. Preferred Brand: McMaster-Carr No. 8553 K21 Suppliers: McMaster-Carr Supply Company	3 rolls
14	Pistol grip twister, aluminum handle. Preferred Brand: Burrows No. 1504 Seedburo No. 220 Suppliers: Burrows Equipment Company Seedburo Equipment Company	12
15	Loop end wire ties, 5,000 ties per roll, 17 ga., 10-inch length. Preferred Brand: Burrows No 1500 Suppliers: Burrows Equipment Company Seedburo Equipment Company	4 rolls
16	Bag needles, curved solid-eye, 5-inch length. Preferred Brand: Burrows No. 1403 Seedburo No. 354 Suppliers: Burrows Equipment Company Seedburo Equipment Company	36
17	Portable blower, with blower nozzle attached and 50 ft. standard cable. Operable on 220 volt, 50 hz , 1 phase current. Preferred Brand: Tornado No. 860	1

Item No.	Description	Number Req'd.
	Suppliers: Burrows Equipment Company Seedburo Equipment Company	
18	Peanut sheller, portable, hand operated, 100 kg. per hour. Complete with interchangeable grills for Virginia and Spanish type peanuts. Preferred Brand: Siscoma Type "Alternative Sheller for Peanuts" Suppliers: Siscoma	4
19	Corn sheller, hand operated, 8 to 14 bushel per hour capacity. Preferred Brand: Burrows No. 1415 Seedburo No. 116 Suppliers. Burrows Equipment Company Seedburo Equipment Company	6
20	Elevator, belt-bucket type: 15 ft. (4.5 M) discharge height; 75 bushel (1.7 MT) per hour capacity at belt speed of 82-98 FPM. All metal construction; complete with required belting, buckets, splicing, assembling hardware and: a) dump hopper b) adjustable 6-inch elbow with transitions c) two (2) loose flanges d) ten ft. (10') section, 6-inch dia. rigid spouting (12 ga.) flanged both ends e) three (3) clamp rings f) start-stop push button control station g) drive and motor operable on 220 volt, 50 hz., 1 phase h) replacement parts not to exceed $150 Preferred Brand: Universal Model B2-75 "Easy Dump" Suppliers: Universal Industries Mercator Corporation NOTE: Elevator (item 20) to be used with the seed treater	1

Item No.	Description	Number Req'd.
21	Elevator, belt-bucket type: 20 ft. (6.0 M) discharge height; 175 bushels (3.5 MT) per hour capacity at belt speed of 110-125 ft. per minute (FPM). All metal construction; complete with required belting, buckets, splicing, assembling hardware and. a) two (2) dump hoppers b) two-way valve, 6-inch dia. with adapter and transitions c) two (2) adjustable elbow, 6-inch dia. d) two (2) 10 ft. sections 6-inch rigid spouting (12 ga.) flanged both ends e) three (3) clamp rings f) three (3) loose flanges g) start-stop push button control station h) bottom boot cleanout with 4" legs i) drive and motor operable on 220 volt, 50 hz., 1 phase current j) replacement parts not to exceed $150 Preferred Brand: Universal C2-175 "Easy Dump" Suppliers: Universal Industries Mercator Corporation NOTE. Elevator (item 21) used to load and unload rice dryer Elevator to be placed in existing floor pit next to the rice dryer. Bottom of elevator to be 1M below floor level.	1
22	Belt conveyor; 20 ft. length (6 M) with flights. Portable aluminum construction; up to 500 bushel (corn) (12 MT) per hour capacity Complete with drives and gasoline engine of required horsepower; replacement parts not to exceed $200. Preferred Brand: Burrows Series 2500 Suppliers: Burrows Equipment Company Seedburo Equipment Company NOTE: Conveyor (item 22) used to load peanut cleaner	1
23	Seed Treatment, fungicide (flowable) for use with rice seed. Preferred Brand. Gustafson Vitavax "R" Flowable Fungicide Suppliers: Gustafson Manufacturing Company	25 gallons

Item No.	Description	Number Req'd.
24	Platform bag trucks; 4-wheel, steel frame-hardwood deck 36" x 60". Heavy steel armored pockets, locked, bolted both ways. Push handles removable or can be locked in place. All wheels to have roller bearings. Heavy duty, double ball bearing swivel castors. Load capacity of 2500 pounds (1 MT). Preferred Brand: Burrows Model 1055-A Suppliers: Burrows Equipment Company Seedburo Equipment Company	4
25	Grain inspection scale, 4-chart reading 500 grams x 5 grams; readable to 1 gram Complete with gram weight set consisting of: 1-2 kg.; 2-1 kg.; 1-500 gm. Preferred Brand: Toledo 3710 Suppliers: Burrows Equipment Company Seedburo Equipment Company	1
26	Grease gun, cast iron pump head with jam-proof toggle mechanism to prevent binding and bending of plunger. Reloads by suction, filler pump or with standard 14½ ounce cartridge. Barrel dia 2½-inches; length 22½-inches. Complete with nozzle for Hyd. Fittings. Preferred Brand: McMaster-Carr No. 1056 K1 Suppliers: McMaster-Carr Supply Company	2
27	Insecticide, Methoxychlor, wettable powder formulation Preferred Brand. Marlate 50 Suppliers E.I. DuPont de Nemours & Co Inc.	100 pounds
28	Sprayer, compression type to be used to spray insecticide. Stainless steel tank, 3-gallon capacity. Complete with 12-inch pump of seamless brass tubing; 3 ft. chemical resistant hose, spray nozzle; fan spray cap. Preferred Brand: McMaster-Carr No. 75271? Suppliers: McMaster-Carr Supply Company	3

NOTE: Some items in equipment specification list requires electric motors. Horsepower of motors required are as follows.

Item 1 (seed treater)----------1 h.p.
Item 3 (seed treater) 3 motors:
 one----------3/4 h.p.;
 two----------1/3 h.p.
Item 4 (conveyor)----------3/4 h.p.
Item 17 (blower)----------1½ h.p.
Item 20 (elevator)----------1/3 h.p.
Item 21 (elevator)----------1/3 h.p.

APPENDIX III. SUPPLIER INDEX

Companies listed below are potential suppliers of the items shown in "Equipment Specification" list. The referenced items may be available from sources in addition to those listed.

Anchor Paper Company
430 Broadway
St. Paul, Minnesota 55101 U.S.A.

Burrows Equipment Company
1316 Sherman Avenue
Evanston, Illinois 60204 U.S.A.

Crippen Manufacturing Company
Alma, Michigan 48801 U.S.A.

Dillard Paper Company
200 Peters Street, Southwest
Atlanta, Georgia 30300 U.S.A.

E.I. Dupont de Nemours & Company
Biochemical Department
Willmington, Deleware 19898 U.S.A.

E.L. Erickson Products
Brookings, South Dakota 57006 U.S.A.

Ferrell-Ross
Drawer 26468
Oklahoma City, Oklahoma 73126 U.S.A.

Gustafson Manufacturing Company
6600 S. County Road 18
Hopkins, Minnesota U.S.A.

Heinrich Envelope Company
925 Lane Avenue North
Minneapolis, Minnesota 55422 U.S.A.

McMaster Carr Supply Company
P.O. Box 4355
Chicago, Illinois 60680 U.S.A

Mercator Corporation
P.O. Box 142
Reading, Pennsylvania 19600 U.S.A.

Phostoxin Sales, Inc.
2221 Poplar Boulevard
Alhambra, California 91800 U.S.A.

Sargent-Welch Scientific Company
5915 Peeler Street
Dallas, Texas 75235 U.S.A.

Scientific Products
1210 Leon Place
Evanston, Illinois 60200 U.S.A.

Seedburo Equipment Company
1022 West Jackson Boulevard
Chicago, Illinois 60607 U.S.A.

Siscoma
P.O Box 3214
Dakar, Senegal

The Harry Alter Company
2399 South Archer Avenue
Chicago, Illinois 60616 U.S.A.

Universal Industries
516 Grand Boulevard
Cedar Falls, Iowa 50613 U.S.A.

DAILY ITINERARY AND CONTACTS

April 19	Departed Mississippi State University.
April 20	Arrived Paris (overnight).
April 21	Arrived in Central Africa Republic.
April 22	Met with U.S. Ambassador Mr. A. Quainton and Mr. P. Gribbon, Economic Officer, U.S. Embassy, Banqui, Central Africa Republic. Discussions with Mr. M. Ford, Project Officer, USAID/Yaounde and Mr. A. DeValck, Director, FAO/UNDP Seed Project in the CAR.
April 23	In Banqui. Arrangements made to obtain visa for Cameroon and for reissuance of airline tickets to include stopping in Yaounde.
April 24	Traveled to Grimari Seed Multiplication Station.
April 25	In Grimari. Visited seed facilities. Discussions with Mr. A. De Valck.
April 26	In Grimari. Met with Mr. E. Kossi, Sous-Prefet. Discussed Seed Testing Laboratory equipment needs with Mr. A. De Valck.
April 27	In Grimari. Discussed Processing, Drying and Storage equipment needs with Mr. A. De Valck.
April 28	In Grimari. Consolidation of notes preparation of preliminary equipment purchase recommendation lists.
April 29	Traveled to Banqui.
April 30	Traveled to Yaounde, Cameroon. Met with Mr. J. Koehring, RDO and Mr. M Ford, Project Officer, USAID/Yaounde.
May 1	In Yaounde. Discussion with Mr. M Ford and preparation of equipment specifications.
May 2	Departed Cameroon for the U.S.
May 3	Arrived Mississippi State University.