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9. ABSTRACT

Technical assistance in seed program development for a developing country is aimed at creating a system whereby new varieties provided by national or international research agencies may make their intended contribution to production agriculture. To make the needed impact the seeds must arrive at the field varietably pure, of high viability, relatively weed free, in adequate quantities and at the proper time. Accomplishment of these goals requires development of not only physical capabilities but governmental policies and laws, and an infrastructure of dedicated and competent people at all levels of public and private participation in the program. This report describes the evolutionary development of a seed program in Costa Rica. The Seed Technology Lab at Mississippi State University assisted in planning a seed and grain laboratory at the University of Costa Rica and a seed drying, storage and processing facility. The MSU staff was involved in: feasibility studies, preparation of specifications, assistance in preparation of a seed law, staff development and training, and design and construction of processing facilities. The seed program in Costa Rica is now developed in the areas of seed testing and seed processing-drying capability to the point that they should be a leader in training and demonstrations for other parts of Latin America.

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REPORT TO AID/W
AND USAID/COSTA RICA

MISS STATE TA 77-06
PN-AAF-607

SEED PROGRAM
CONSULTATION AND REVIEW

IN
COSTA RICA



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

SEED TECHNOLOGY LABORATORY
MISSISSIPPI STATE UNIVERSITY
MISSISSIPPI STATE, MISSISSIPPI



ARDA

TABLE OF CONTENTS

	<u>Page</u>
ACKNOWLEDGEMENTS-----	i
REPORT SUMMARY-----	11
BACKGROUND-----	1
CURRENT SITUATION-----	3
Seed and Grain Laboratories-----	3
Foundation Seed Prospect-----	5
Private Sector-----	6
Consejo Nacional de Produccion-----	8
Recommendations for Future Relations-----	10
APPENDIX I-----	12
List of Reports to USAID Concerning Seed Program in Costa Rica	
APPENDIX II-----	13
Basic Plan View and Elevation of Seed Facility Barranca, Costa Rica	
APPENDIX III-----	17
Activities Associated with Barranca Seed Facility	
APPENDIX IV-----	20
Subject Outline of Drying, Seminar, Aug. 31, 1977	

Acknowledgements

On a project of this size it is impossible to thank everyone who has been of help. We wish to express special thanks to Mr. Jim Hawes, RDO, USAID/Costa Rica for support and especially assignment of his only transportation facilities for a part of the visit. Stra. Maruja Jimenez secretary to Mr. Hawes, has been of great assistance over a period of several visits to Costa Rica.

At CNP, Ing. Raul Guillott and his staff were most helpful and cooperative in the effort at Barranca. Drs. Echandi and Faeth are always most generous with their time with advice and information concerning the program.

In all our visits to many countries we have never had the services of a more courteous, careful and obliging driver than Rafael, chauffeur for Mr. Hawes.

Report Summary

TITLE: Seed Program Consultation and Review in Costa Rica

CONTRACT: MSU/AID-ta-C-1219

REPORT NO: TA 77-06

AUTHORS: A.H. Boyd, Associate Agronomist

J.M. Beck, Research Associate

Seed Technology Laboratory

MAFES

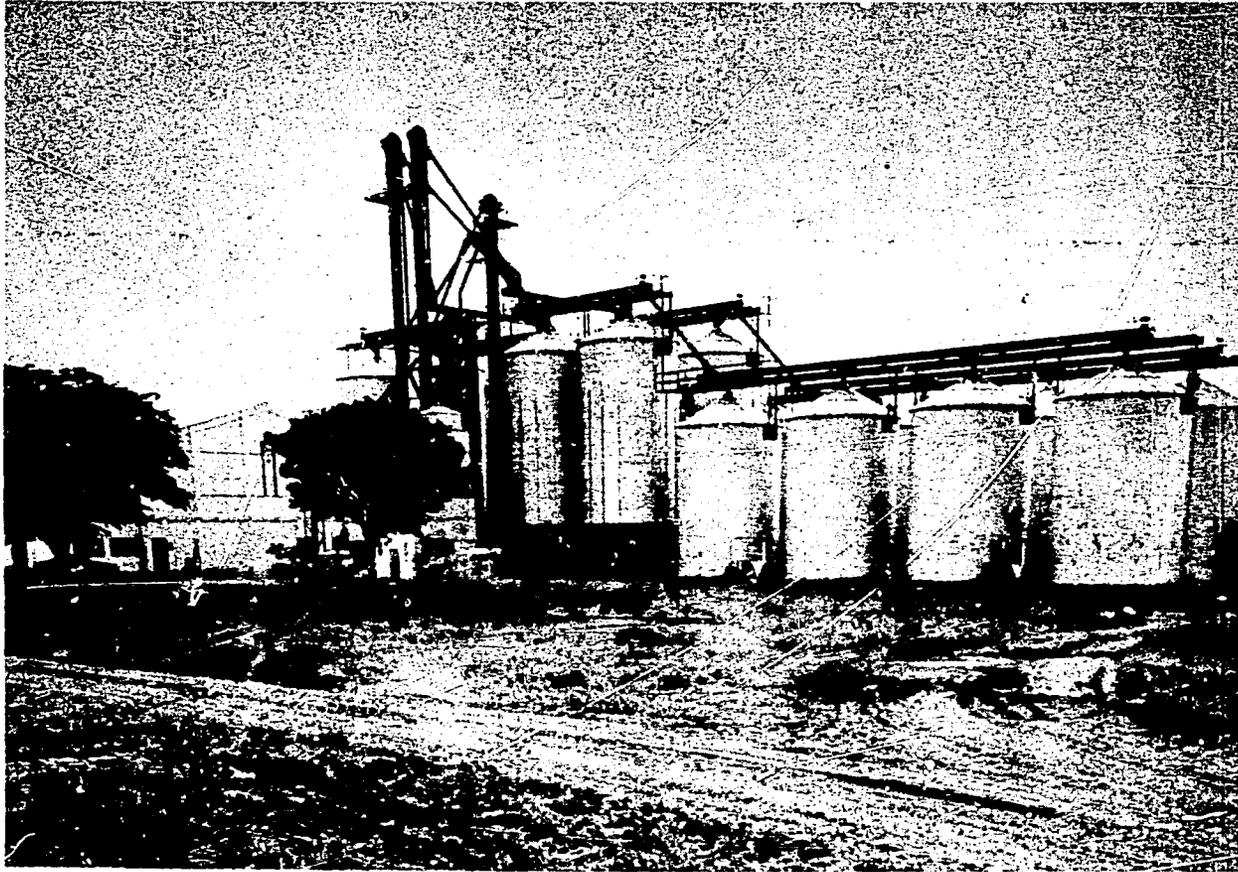
Mississippi State University

PERIOD: 8 Aug-2 Sept. 1977

Summary

1. This consulting was undertaken at the request of USAID/Costa Rica to assist Consejo Nacional de Produccion (CNP) in start-up and staff training for the new drying facility and other agencies as needed.
2. The seed program in Costa Rica has evolved over a period of years through sustained effort of many people in USAID, MSU/STL, GOOCR and UCR. It is now attaining a stature whereby they can assist in training of people for other similar programs in Latin America.
3. The seed and grain laboratory at UCR shows very good progress in teaching and research.
4. The foundation seed project is now receiving funding for facilities and should be supported with staff also.
5. The private sector is showing a healthy development. This should be encouraged by the National Seed Commission and GOOCR agencies.

6. The drying and storage part of the CNP seed facility at Barranca was started. There were some operational problems (Appendix III) but not much more than usual for a facility of this size. Seed were received for drying and operational procedures established.
7. Preliminary discussions were held concerning a seed technology short course to be jointly presented in August 1978. It is expected that this effort will continue.



Completed Drying, Storage and Processing Facility - CNP, Barranca, Costa Rica.

Seed Program Consultation
and Review in Costa Rica
8 Aug-2 Sept 1977
A.H. Boyd and J.M. Beck

Background

Technical assistance in seed program development for a developing country is aimed at providing a system whereby new varieties provided by national or international research agencies may make their intended contribution to production agriculture. To make their needed impact the seeds must arrive at the field varietably pure, of high viability, relatively weed free, in adequate quantities and at the proper time.

Accomplishment of these goals requires development of not only physical capabilities but governmental policies and laws, and an infrastructure of dedicated and competent people at all levels of public and private participation in the program. Costa Rica is an example of the evolutionary - not revolutionary - development of a seed program.

The first contacts between Mississippi State University, Seed Technology Laboratory (MSU/STL) and Costa Rica were in the late 1950's when Ings. Alberto Vargas and Carlos Hermann attended the Latin American Seed Technology Course in Chillan, Chile in 1958, a year earlier Ing. Vargas had attended the Summer Seed Improvement Short Course for Foreign Students at MSU/STL. After these contacts there were some preliminary plans for a processing facility prepared but not enough interest in seeds was developed to carry the project through.

As is often the case in a developing situation, not much happened until people with an appreciation for the problems rose within their own organization to a position of influence and responsibility. In 1970 the Government of Costa Rica (GCCR) in cooperation with USAID/Costa Rica began plans for development of a total seed program. It is significant

to note that at this time Ing. Vargas was head of the department of Agronomy of the Ministry of Agriculture (MAG) and Ing. Hermann was a member of the board of directors of the Consejo Nacional de Produccion(CNP).

Mr. Milton Lau who was rural development officer at the time requested assistance from MSU/STL in planning a seed and grain laboratory at the University of Costa Rica (UCR) and a seed drying, storage and processing facility for CNP to be constructed at Barranca. It was Mr. Lau's appreciation of the many ramifications of a seed program and his support of, in fact insistence on, the many additional consulting visits to Costa Rica which allowed us the continuity to assist with coordinated development of the program. Later RDO's Travis King and James Hawes added their support and interest to the program. Early in the program Dr. Ronald Echandi emerged as a leader in the program and has from the beginning been in charge of the seed and grain laboratory (CIGRAS) at UCR and secretary of the National Seed Committee.

The staff of MSU/STL has been actively involved since 1970 in consulting for:

1. Feasibility Studies
2. Preparation of specifications for seed and grain laboratories.
3. Assistance in preparation of a seed law.
4. Staff development and training.
5. Design and construction of CNP and MAG processing facilities.

Appendix I presents a list of the reports on consulting visits made by MSU/STL staff.

The primary purpose of this visit was to provide assistance in start-up of the drying and bulk storage part of the CNP facility. However, the program has advanced to a point where consulting visits will be less frequent in the future so this opportunity was taken to review various

parts of the program.

Current Situation

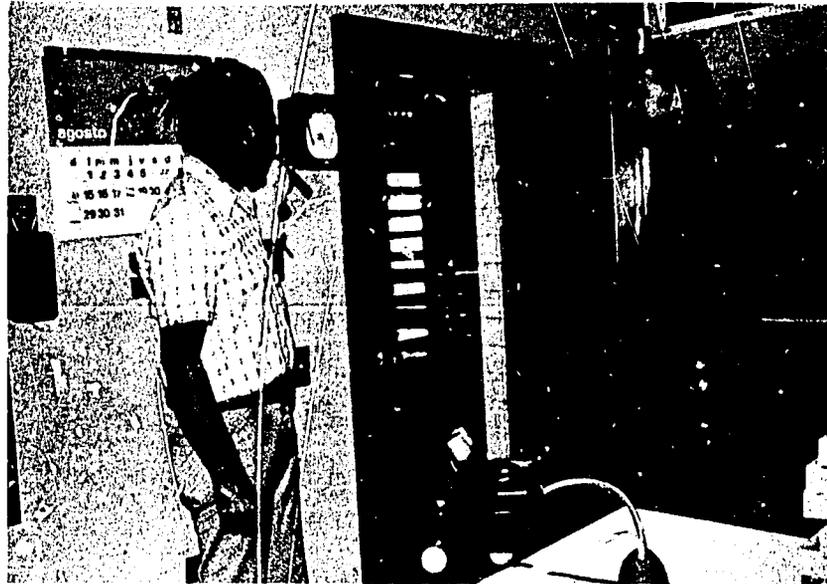
Seed Program Organization

The seed program has a good base in the seed law (Ley Para La Produccion, Certificacion y Comercio de Semillas en Costa Rica). This law which was enacted in August 1972, provides for establishment of the Comision Nacional de Semillas (National Seed Commission), its composition and responsibilities. In addition it provides basic definitions, authorizations for needed regulations and direction for necessary control functions.

The National Seed Commission is functioning as directed under the law. They have encountered many problems, mainly financial, in obtaining adequate support for enforcement and certification functions but have in general moved forward in a very professional manner. They are still in need of adequate inspectors to operate a good certification and control program.

Seed and Grain Laboratories

The University operated seed and grain laboratories (CIGRAS) which were constructed and furnished through a USAID loan have developed under the supervision of Dr. Ronald Echandi to the point where they are supplying training services for other parts of Latin America. Within the past year, three to six month on-the-job training programs have been accomplished for seed program workers from El Salvador, Panama, Honduras and other countries. In addition, in 1975 a seed seminar for Costa Rica was given in cooperation with MSU/STL and in 1976 an international seed pathology seminar was presented in cooperation with the Neergaard Institute.



Drs. Echandi (L.) and Boyd Inspect Walk-In Seed Germinator Chamber At CIGRAS.



Inside View of Walk-In Germinator Showing Racks And Seed Trays.

Since the original construction and furnishing by USAID loan funds the building and equipment have been augmented through their UCR and other international sources. The seed laboratory contains basic equipment needed for seed testing. Pictures on the following page show utilization of the laboratory and a specially designed "walk-in" germinator to satisfy needs for both research and service work by the laboratory.

Dr. Echandi has vigorously encouraged staff development and during the period of this consulting visit (Aug 1977) Dr. Jorge Faeth returned to resume duties as supervisor of the seed laboratory after completing the Ph.D. degree at MSU/STL. As head of CIGRAS Dr. Echandi is a designated member of the National Seed Commission. In this manner CIGRAS has an influence on policy making as well as technical services, research, and teaching in the seed program.

Foundation Seed Project

The function of a foundation seed project is to accept small amounts of seed from breeders, and increase those seed under careful supervision to a volume sufficient to pass on to seed producers. In this manner the project helps to insure a continuing supply of genetically desirable seed of good varieties and hybrids for production agriculture. Up to now the need for a project has been limited because neither the private sector nor CNP had production and processing facilities for multiplying such seed on a quality basis. Furthermore the frequent turnover in staff caused problems in a supply of new genetic material for increase. Both of the above problems appear to be well on the way to being solved. At least one public and three private seed processing facilities are now in operation and renewed efforts in plant breeding appear to be in

operation.

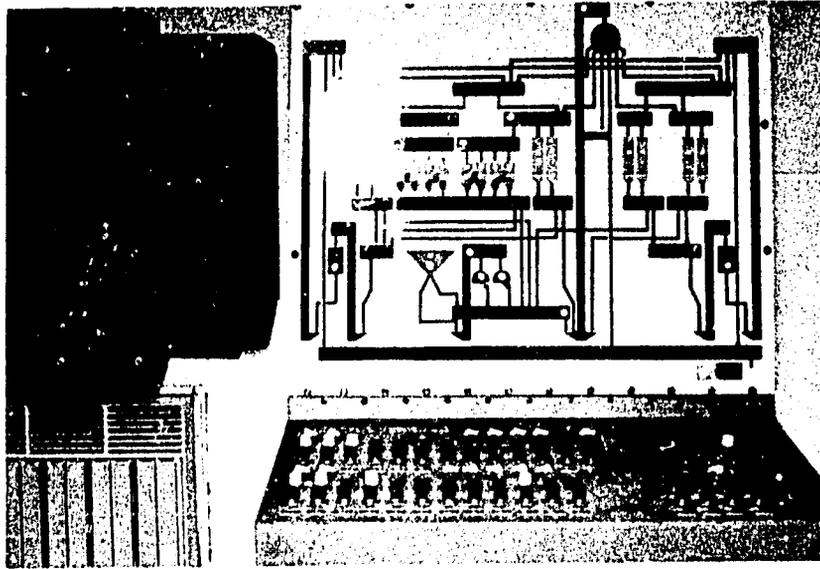
Physical facilities have been limited for seed drying storage, or processing at experiment station Jimenez at Tobago which is the major foundation seed production station. Previous recommendations for construction have been acted on by MAG with the result that bids for drying equipment and conditioned storage warehouses construction will be opened in November 1977. While this project is only beginning in any real sense, its initiation is timely in that it coincides with a new surge of interest in and physical capability for seed production and distribution by the private sector and CNP.

The manager of this project must be carefully selected and trained by MAG because he must be technically competent and also have the ability to interact with farmer-contractors, private sector customers, and CNP seed program managers for sales and distribution of foundation seed. He must also maintain close contact with plant breeders because his project serves to support the plant breeding program by relieving the breeder of production and distribution problems.

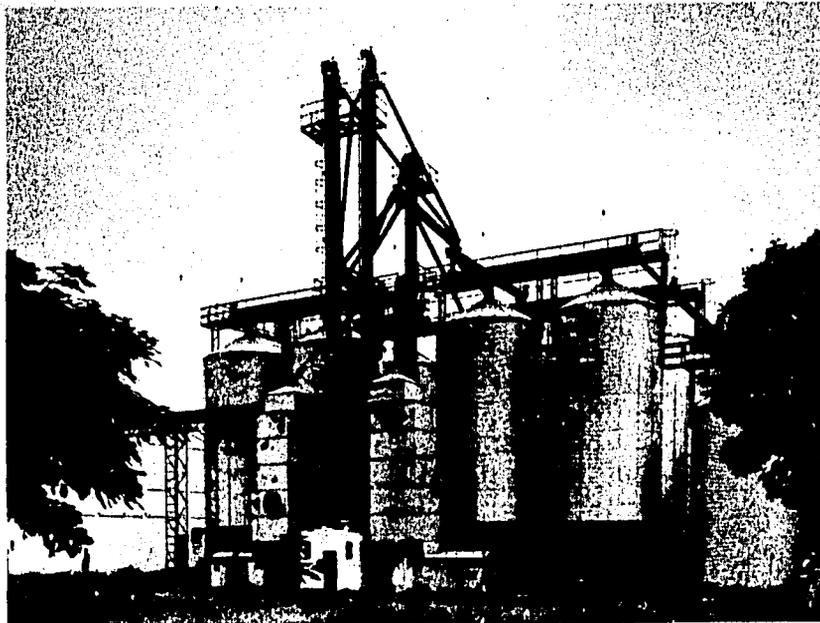
Private Sector

At the beginning of this effort there was almost no private sector seed industry. Many farmers saved their own seed or depended wholly on CNP to furnish their seed needs. There was some localized "across the fence" movement of seed, mostly rice, among farmers.

Currently there at least three private seed companies dealing primarily in rice in the country. Discussions with private farmers indicated interest by several in building a cooperative facility or developing several small facilities on individual farms. There did not appear to be much interest in hybrid corn seed production due to the



Control Panel For Drying And Storage At CNP Seed Facility Barranca.



Dryers And Associated Working Bins And Conveyors - Barranca.

limited market.

The competition situation generated by this new element in the industry appears to be good for seed quality.

Consejo Nacional de Produccion

A major part of the original request for technical assistance was the design of a seed processing and drying facility for CNP. Appendix II shows the basic plan and elevation views of the facility and pictures on adjacent pages and at the front of this report show some views of the almost completed product. This facility was partially financed by USAID loan funds but because of rapid inflation between planning and construction it was necessary for CNP to supply a substantial part of the funds from other resources.

During a previous consulting visit (Jan 1977) the seed processing part of the facility was started and on the job training conducted for the work crew. From mid-January to 30 June of this year the processing plant has processed the following approximate quantities:

Rice	142,000 qq.
Corn	2,500 qq.
Beans	500 qq.

The rice harvest from the Central Pacific zone which began in mid-August was the first opportunity for operating the drying and storage part of the facility. Two consultants from MSU/STL arrived in Costa Rica on 8 Aug. 1977 and travelled to Barranca on the following day. Accounting of the activities, problems encountered, solutions and recommendations are presented in Appendix III. The staff of the seed facility was very concerned that the facility was not operating properly at first but it is doubtful that there were many more problems in start-up



Receiving Seed Rice.



Discussion On Equipment Operation And Maintenance.

than are encountered at a similar facility anywhere else in the world, including the United States.

One of the first efforts on arrival was a conference with staff of the seed facility and members of the engineering, maintenance, and legal departments of CNP to explain the function of a multiple pass drying system, drying theory supporting its operation and the specific operation of the Barranca facility. This conference was attended by a total of 12 people. Following the above mentioned conference, CNP requested that a drying seminar be held for the managers of their grain buying and storage stations. This seminar was scheduled for the final day of assistance at Barranca. On Aug 31, 1977 the seminar was presented with the assistance of Chief of Seed Plant, Ing. Raul Guillott, to 17 members of the CNP management group. This seminar covered a broad range of drying-storage problems. A list of participants and brief outline of subjects is included in Appendix V.

Recommendations of Future Relations

The seed program in Costa Rica is developed in the areas of seed testing and seed processing-drying capability to the point that they should be a leader in training and demonstrations for other parts of Latin America. To this end preliminary discussions were held with USAID/Costa Rica, UCR and CNP concerning the presentation of a short course on seed processing and quality control in Costa Rica in August 1977. This course is envisioned as approximately 3-4 days in San Jose for all participants, following which the group will be divided according to interest and job responsibilities. Processing will be taught in Barranca and Testing - Quality Control at CIGRAS in San Jose.

In view of the enthusiastic response from CNP and CIGRAS it is recommended that plans be confirmed immediately and announcement made to

interested organizations. Immediate action is necessary to insure sufficient lead time for participants to arrange travel and per diem support.

The foundation seed project is developing and a request for future assistance in this area has been requested.

After a season of operation the manager and staff at the processing-drying facility will have gained sufficient experience to have a sound base for an in-depth review of operational procedures. It is recommended that such a review be made at their convenience in 1978 or 1979.

Future assistance to the seed program should encompass the following areas:

1. Cooperation in training and demonstrations for other countries in Central America.
2. Technical assistance on specific problems as they arise.
3. Staff training assistance in country and degree training at MSU/STL.

APPENDIX I

**List of Reports to USAID Concerning
Seed Programs in Costa Rica**

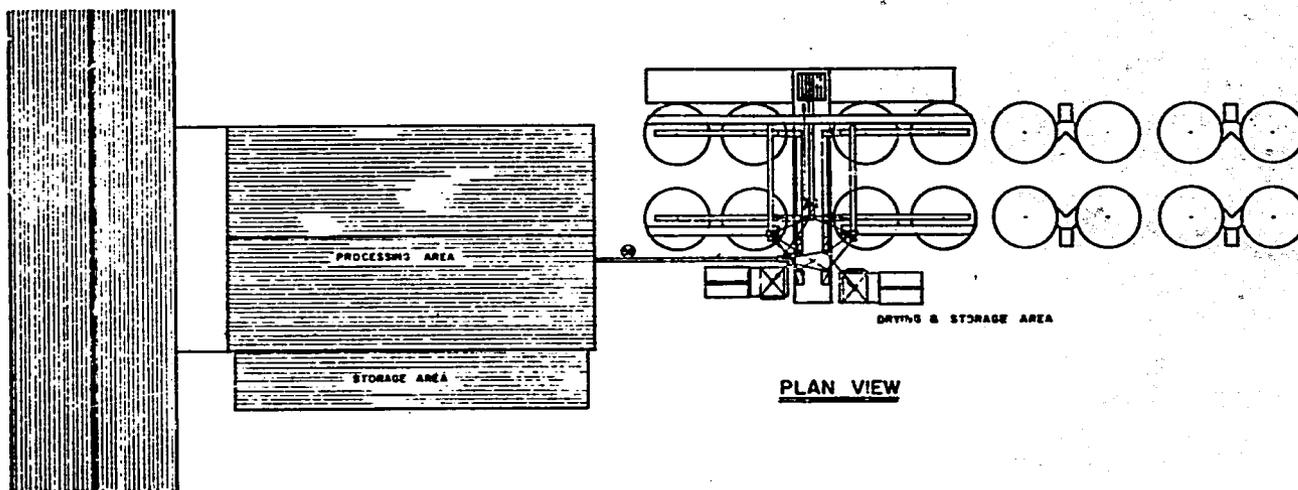
Reports to USAID/Costa Rica Project

<u>Report No.</u>	<u>Date</u>	<u>Author</u>
1. -----	Oct. 1970	J.C. Delouche
2. -----	Dec. 1970	J.C. Delouche
3. TA 71-07	Mar. 1971	A.H. Boyd
4. TA 71-08	Mar. 1971	A.H. Boyd
5. TA 71-10	Oct. 1971	A.H. Boyd
6. TA 72-1	Feb. 1971	A.H. Boyd
7. TA 71-12	Sept. 1972	A.H. Boyd
8. TA 73-3	Apr. 1973	A.H. Boyd
9. TA 73-4	Mar. 1973	J.C. Delouche
10. TA 74-07	Apr. 1974	A.H. Boyd & J.C. Delouche
11. TA 74-17	Sept. 1974	A.H. Boyd & G.B. Welch
12. TA 76-04	Mar. 1974	
13. TA 76-09	Apr. 1976	
14. TA 76-14	Aug. 1976	A.H. Boyd & W.C. Couvillion
15. TA 76-15	Aug. 1976	W.C. Couvillion & A.H. Boyd
16. TA 76-22	Nov. 1976	A.H. Boyd
17. TA 77-2	Jan. 1977	A.H. Boyd

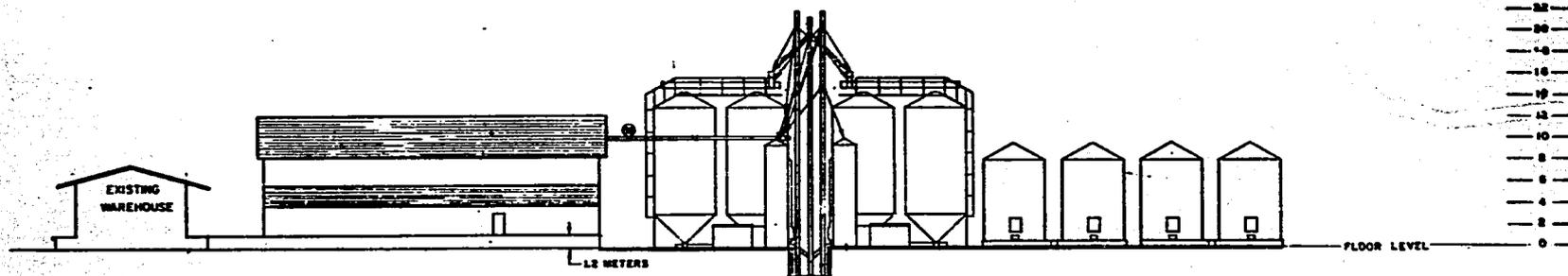
APPENDIX II

**Basic Plan View and
Elevation of Seed Facility
Barranca, Costa Rica**

NOTE: FOR LEGEND AND ITEM NUMBERS
SEE DRAWINGS 8 & 9.

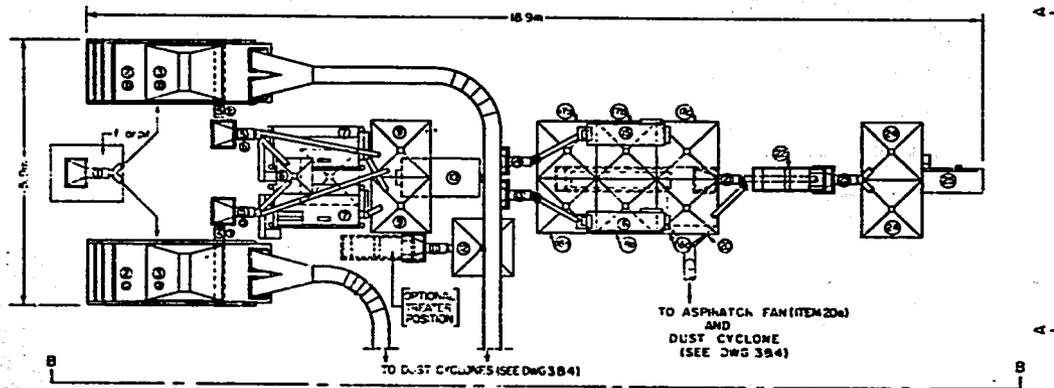


PLAN VIEW

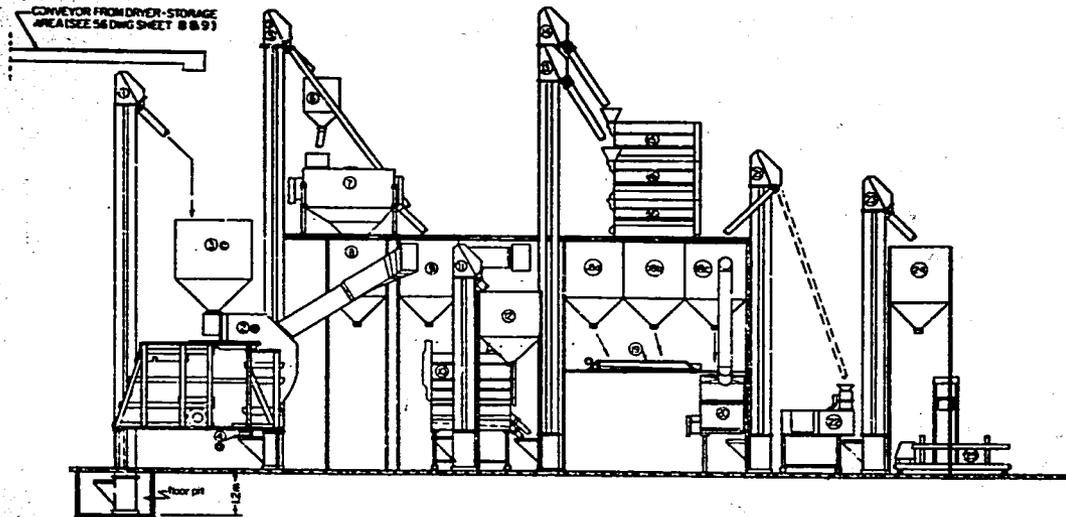


ELEVATION
SCALE: 1:200 (METRIC)

MISSISSIPPI STATE UNIVERSITY MISSISSIPPI AGRICULTURAL EXPERIMENT STATION SEED TECHNOLOGY LABORATORY MISSISSIPPI COLLEGE, MISSISSIPPI		
PROPOSED SEED PROCESSING & DRYING PLANT FOR CONSEJO NACIONAL de PRODUCCION BARRANCA, COSTA RICA		
DESIGNED BY: J. H. GIBSON	DATE: APRIL, 1971	SHEET 10 of 10
DRAWN BY: C. H. H.	FILE NO.	
APPROVED BY: J. C. O.		



PLAN-VIEW
SCALE 1:50 (mm=1m)

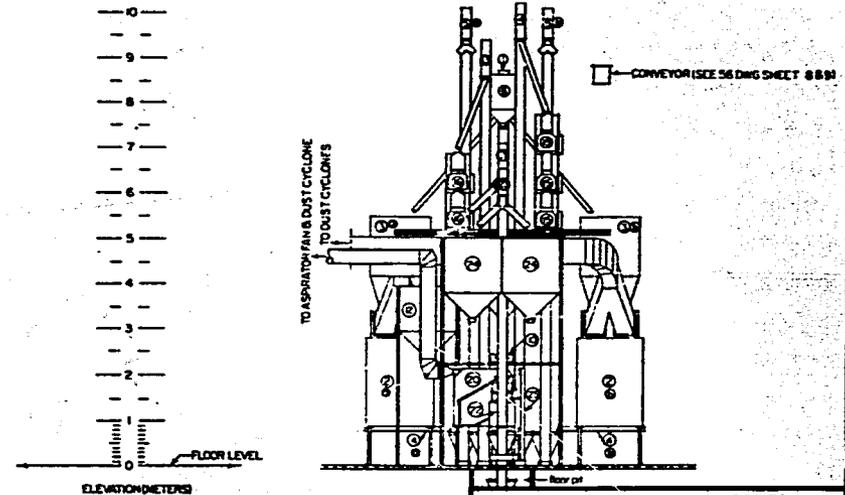


SECTION B-B
SCALE 1:50 (mm=1m)

LEGEND

- 1 ELEVATOR, UNIVERSAL C-2, 9 METERS DISCHARGE HEIGHT.
- 2a,b CLEANER, A.T. FERRELL MODEL SUPER X 290-D.
- 3a,b HOLDING BINS, 1.8 X 1.25 METERS.
- 4a,b A.T. FERRELL NO. 9 STANDARD VIBRATING CONVEYOR.
- 5a,b ELEVATOR, UNIVERSAL C-2, 8.4 METERS DISCHARGE HEIGHT.
- 6 HOLDING BINS, .8 X .8 METERS.
- 7 DISC SEPARATOR, CARTER DAY MODEL NO. 2527
- 8 HOLDING BIN, 1.25 X 1.25 METERS.
- 9 HOLDING BIN, 1.25 X 1.25 METERS.
- 10 PRECISION GRADER, CARTER DAY MODEL NO. 4.
- 11 ELEVATOR, UNIVERSAL C-2, 4.2 METERS DISCHARGE.
- 12 HOLDING BIN, 1.3 X 1.3 METERS.
- 13 ELEVATOR, UNIVERSAL C-2, 8.6 METERS.
- 14 ELEVATOR, UNIVERSAL C-2, 9.4 METERS DISCHARGE HEIGHT
- 15 PRECISION GRADERS, CARTER DAY MODEL NO. IVT
- 16 PRECISION GRADERS, CARTER DAY MODEL NO. IVT
- 17a,b,c HOLDING BIN UNIT, 1.25 X 1.25 METER BINS.
- 18a,b,c HOLDING BIN UNIT, 1.25 X 1.25 METER BINS.
- 19 VIBRATION CONVEYOR
- 20a,b,c ASPIRATOR, CARTER DAY 136-0C18 ASPIRATOR FAN
- 21 ELEVATOR, UNIVERSAL C-2, 6.3 METER DISCHARGE HEIGHT
- 22 TREATER, MIST-O-MATIC MODEL M-100
- 23 ELEVATOR, UNIVERSAL C-2, 5.8 METERS DISCHARGE HEIGHT
- 24 HOLDING BIN, 1.25 X 1.25 METERS
- 25 H&P-L, HOWE-RICHARDSON
- 26 FORKLIFT (NOT SHOWN)

SECTION A-A
SCALE 1:50 (mm=1m)



MISSISSIPPI STATE UNIVERSITY MISSISSIPPI AGRICULTURAL EXPERIMENT STATION SEED TECHNOLOGY LABORATORY <small>STATE COLLEGE, MISSISSIPPI</small>		
PROPOSED SEED PROCESSING PLANT FOR CONSEJO NACIONAL de PRODUCCION BARRANCA, COSTA RICA		
DESIGNED BY: AHS, JHS, GMD	DATE: MARCH, 1971	SHEET
DRAWN BY: CEH, GMD	FILE NO.	2 of 10
APPROVED BY: JCD		

APPENDIX III

**Activities Associated with
Barranca Seed Facility**

Activities Associated with Barranca Facility.

1. Arrive at Barranca and review facility with Ing. Guillott Aug. 9.
2. Aug. 10 - discuss drying principles and operation of the facility with CNP, contractor, and architect staff. Present lecture on drying.
3. Begin operation of facility with grain to adjust equipment.
4. Some problems encountered and actions taken:
 - a. An elevator not operating properly -
*Repaired by DAF corporation workers.
 - b. Drive belts for conveying equipment burned out. Only 5 on hand, 19 needed for operation.
*Substitute belts located in San Jose and purchased.
*Order had been sent to U.S. for more belts. They will be used for spares when they arrive.
 - c. Transitions between hopper bottom bins and conveyors caused malfunction of rack and pinion cut off gates.
*Transitions re-built by workers from CNP shop.
 - d. Aeroglide dryers not discharging seed at sufficient rate and not cleaning out properly. Difficult to inspect clean-out gates. Discharge gates were turned 180° from proper discharge.
 - *1. Hopper was lowered 16" with vertical side walls. This solved discharge problem and allowed openings for inspection of discharge clean-out.
 2. Spouting from dryer to elevator was modified to accommodate lower discharge point.
 3. One consultant, J.M. Beck, on his return to the U.S. on 19 August, called the manufacturer and determined that the discharge drive was set up for corn - not rice and called the plant at Barranca with this information. Arrangements were then made to air-freight new sprockets to CNP to properly adjust the discharge rate.
 - e. Elevators feeding dryers while adequate to maintain flow, would fill the dryers more rapidly if they were of higher capacity. They are Universal D2-1000 as specified.
*A check of specifications and motor power indicated that all that is necessary to convert to a D2-1500 is a change of pulleys on the motor. This was not completed by our departure but was scheduled.
 - f. Some problems were encountered with water entering the conveying system above the bins.
*All elevators and conveyors were checked and caulked.
 - g. Some difficulty was encountered in collecting samples of seed as

they were handled.

*Inspection gates were cut in spouts leading to elevator boots to allow better observation and sample collection.

5. Enough problems were solved by the second week to allow seed drying when the first loads arrived. The operational procedure was established and drying supervised. It was not possible for the staff to become confident in their operation in the time available. This is to be expected. With more experience and data collected under their own conditions skill and confidence will increase. They do have sufficient basic knowledge and skills to proceed with the harvest.

APPENDIX IV

List of Participants and Subject Outline
of Drying Seminar Aug. 31, 1977

CNP and UCR Staff Attending
Drying Seminar Aug. 31, 1977

1. Jose M. Biamonte Castro
Planta Arroceras Pavas
2. Jose Fabio Bolanos S.
Departamento Agrotecnico
3. Ezequias Cambronero Morera
Auditoria General del C.N.P.
4. Oscar R. Fernandez Pacheco
Facultad de Agronomia
Universidad de Costa Rica
5. Carlos M. Gonzalez Rojas
Planta Silos Bea.
6. Rodolfo Grant Tregueros
Departamento Agrotecnico
7. Guillermo Herrera Castro
Almacenamiento y Conservacion
8. Ronald Jimenez Ch.
Centro para Investigaciones En Granos y Semillas
Universidad de Costa Rica
9. Franklin Juarez Morales
Jefe seccion Compra y Produccion
10. Bernal Mendez Arias
Departamento Agrotecnico
11. Victor I. Mesen Brenes
Auditoria General C.N.P.
12. Cristobal Montoya M.
San Jose, Costa Rica
13. Wilfredy padilla Gutierrez
Planta Secadora de Guacimo
Guacimo Limon, Costa Rica
14. Guillermo Rivas Grillo
Arroceras Los Sauces
Heredia, Costa Rica
15. Agr. Manuel Rodriguez Espinoza
San Jose, Costa Rica
16. L. Eladio Salas Paniagua
Facultad de Agronomia
Universidad de Costa Rica

17. Agr. Oscar Ulate Fernandez
Planta Silos Barranca
Barranca, Punta Arenas,
Costa Rica

Subject outline of drying seminar for CNP personnel.

- I. Introduction of participants
- II. Relationships of Grain and Water.
 - A. Calculation of moisture content
 - B. Equilibrium moisture content
 1. Definition
 2. Relationship to:
 - a. Relative Humidity
 - b. Temperature
 - c. Chemical content of grain
 3. Relationship to predisposition of grain and seed to attack by:
 - (a) fungi
 - (b) insects
- III. Basic Drying
 - A. Functions of Air
 1. Supply heat for evaporation
 2. Furnish transport medium for evaporated moisture.
 - B. Drying stages
 1. Evaporation from wet surface
 2. Evaporation from non saturated surface
 3. Relation of stages
 - (a) Heat penetratin
 - (b) Mass transfer
 - (c) Case hardening
 - (d) Stress cracks
- IV. Air Movement
 - A. Static pressure and air flow
 - B. Measurement of static pressure
 - C. Fan performance
- V. Types of dryiers and their characteristics:
 - A. Bin dryers
 - B. Batch Dryers
 1. With re-circulation
 2. Static in dryer
 - C. Bag dryers (Tunnel dryers)

D. Multiple Pass continuous flow system

VI. Demonstration of Multiple Pass Drying System and Tour of Facilities