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STATE COLLEGE, MISSISSIPPI



Report to USAID/ECUADOR

and

The Government of Ecuador

on

SEED PRODUCTION, INSPECTION AND CERTIFICATION

in

ECUADOR

April 26 - May 22, 1971

Services Rendered
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Seed Technology Laboratory
Mississippi State University
State College, Mississippi

July, 1971

REPORT SUMMARY

TITLE: Seed Production, Inspection and Certification in Ecuador
AUTHOR: C. Hunter Andrews, Associate Professor
PERIODICITY: April 26 - May 22, 1976
PROJECT NUMBER: 23-72-MSU
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CONTAINER: Mississippi State University
PRINCIPAL INVESTIGATOR: C. Hunter Andrews

Summary

At the request of USAID/Ecuador and the GOE, Mississippi State University sent a Seed Certification Consultant to Ecuador to advise the Seed Certification Department on the production, inspection and certification of seed.

Joint meetings with USAID/Ecuador, the Seed Certification Department personnel and pertinent INIAP Administrators provided a clear insight of the problems and goals of the Seed Program/Industry. Field trips with certification field inspectors permitted observation of major seed production areas, processing facilities and general overall organization of the existing seed program.

A favorable impression was gained concerning potential seed production capabilities. Definite regions or zones are utilized in the production of specific crops, and considerable emphasis is being devoted towards improving

seed production practices in these areas. A major limiting factor is the absence of adequate seed processing facilities; consequently, organization and implementation of the Mixed Government-Private Seed Enterprise is strongly recommended. Recent releases of new rice and cotton varieties will increase the need for services of this Enterprise.

The Seed Corporation Department is assuming a leading role in attempting to produce good seed and in developing a sound seed improvement program. Fortunately this Department has a core of capable and willing technicians; however, additional training, both in-country practical training and advanced training in other countries is advisable.

The request from the COE for additional assistance in the Seed Program should be fulfilled. Follow-up consultation and training programs will facilitate the development of a well organized and sound Seed Improvement Program.

FOREWORD

This report is the result of a 4-week consultation assignment, April 26-May 22, 1971, of the author with the USAID Mission to Ecuador and the Government of Ecuador (GOE) under the provisions of contract AIC/ead-2976. The report covers the initial phase of an anticipated three-phase technical assistance program as described in the unclassified airgram, TO AFD-20 dated 2/8/71.

The author gratefully acknowledges the excellent cooperation of the USAID/Ecuador Mission (specifically Mr. Neil G. Fine and Mr. Richard L. Winters), the Seed Certification Department of Ecuador National Research Institute (INIAP) and the various agencies and persons contacted during the consultation period.

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REPORT TO USAID/EQUADOR
AND
THE GOVERNMENT OF EQUADOR
ON
SEED PRODUCTION, INSPECTION AND CERTIFICATION
IN EQUADOR

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Andrews has been involved in developing a seed program/industry for the past decade. Success in certain areas and impediments in others have resulted in a rather critical and confusing situation at present. Consequently, the USAID Mission together with the Seed Certification Department of the Ministry of Agriculture and the National Research Institute deemed it desirable to identify the major problems and to coordinate efforts in resolving them in order to move rapidly in implementing all phases of a complete seed program/industry.

A request was submitted to AID/W for services of a Mississippi State University Seed Specialist-Consultant whose responsibility would be to review the existing seed program but specifically to advise and assist in seed production techniques for certified seed to include selection of qualified seed producers and to instruct in field inspection procedures and other seed certification aspects. In accordance with terms of the

existing Mississippi State University AID/ent-2976 contract, the author was nominated by USAID, accepted by AID/W and USAID/Ecuador, and arrived in Quito on April 29, 1971.

BACKGROUND

As stated in the best and most reliable information available as supplied by Ing. Hector Orellana, Director of the Seed Certification Department, the concept of a Seed Program in Ecuador was initiated in 1955 when the National Wheat Commission was established with Ing. Orellana as Director. In 1956 Ing. Orellana participated in the Special Seed Improvement Course at Mississippi State University, and afterward returned to Ecuador to set up five wheat seed processing plants, each consisting primarily of an air and screen seed cleaner (Super X 298-D) and one seed treater. Thus, with the introduction of three wheat varieties in 1957 by the Rockefeller Foundation, the wheat seed improvement program was initiated in the Sierra region.

From an initial 1000 quintales (1 qq = 100 lbs.) wheat, which was more or less field inspected in 1957, the wheat seed program has expanded greatly. Last year 40,000 quintales of wheat seed were certified under the existing program. This year will be the first in which a seed crop (wheat) will be completely certified, that is, this is the first year in which Breeder seed will be introduced into the system, and all subsequent generations will be certified. The wheat seed program has been developed on a rather sound basis. Indeed, available statistics reveal that average production

has increased from approximately 8 quintales per hectare in 1955 to 23 quintales in 1961, while good seed producers harvest as high as 40 quintales per hectare. Wheat growers have gained an awareness of the value and importance of good seed, and now seed are at command in a 15 Sucre production program.

The National Agronomical Research Institute (Instituto Nacional Investigaciones Agrícolas - INIAP) was organized. Thereafter, the wheat research program was transferred to this organization. INIAP stations are strategically located throughout the country and seed production of all crops became their responsibility. The National Wheat Commission ceased to exist in its original concept and became only an office within the Ministry (now called the Wheat Program).

In 1969 the Seed Certification Department was established. Active interest and participation of this Department has resulted in considerable progress during the past two years. The need for reorganization and program implementation has been recognized, and this Department is presently proposing some sound program changes which will be considered later in this report.

ORGANIZATION

The rather specific scope of my assignment was primarily to provide assistance in field inspection and seed certification techniques and to advise in the overall area of seed production. In accomplishing these objectives, however, it was necessary to obtain information concerning the background and development of the current programs and agencies involved in the seed program. Therefore, on the scene interviews and

discussions with strategic persons and agencies directly involved in the existing seed program provided the basic information on the current status of the program. Hence, the extent and type of training and services needed were determined.

The current seed program in Ecuador has been developed within the organizational structure of the Ministry of Agriculture. The relationship, responsibilities, and structure of the various agencies is best illustrated by the table and diagram in Figure 1. Of specific interest and concern within this organizational structure are:

- I. INIAP (Instituto Nacional Investigaciones Agropecuaria)
- II. Seed Certification Department
- III. Agricultural Development Department
 - a. Cotton Program
 - b. Rice Program
 - c. Wheat Program

INIAP is directly responsible to the office of the Ministry of Agriculture, thus, they have considerable freedom in formulating and implementing research and development programs in the seed industry. The Seed Certification Department is responsible to the office of the Sub-Secretary through the Agricultural and Development Sector. The more organized crop commodity programs, Cotton, Wheat, and Rice, are all national programs organized within, and responsible to, the Agricultural Development Program of the Agricultural Development Sector.

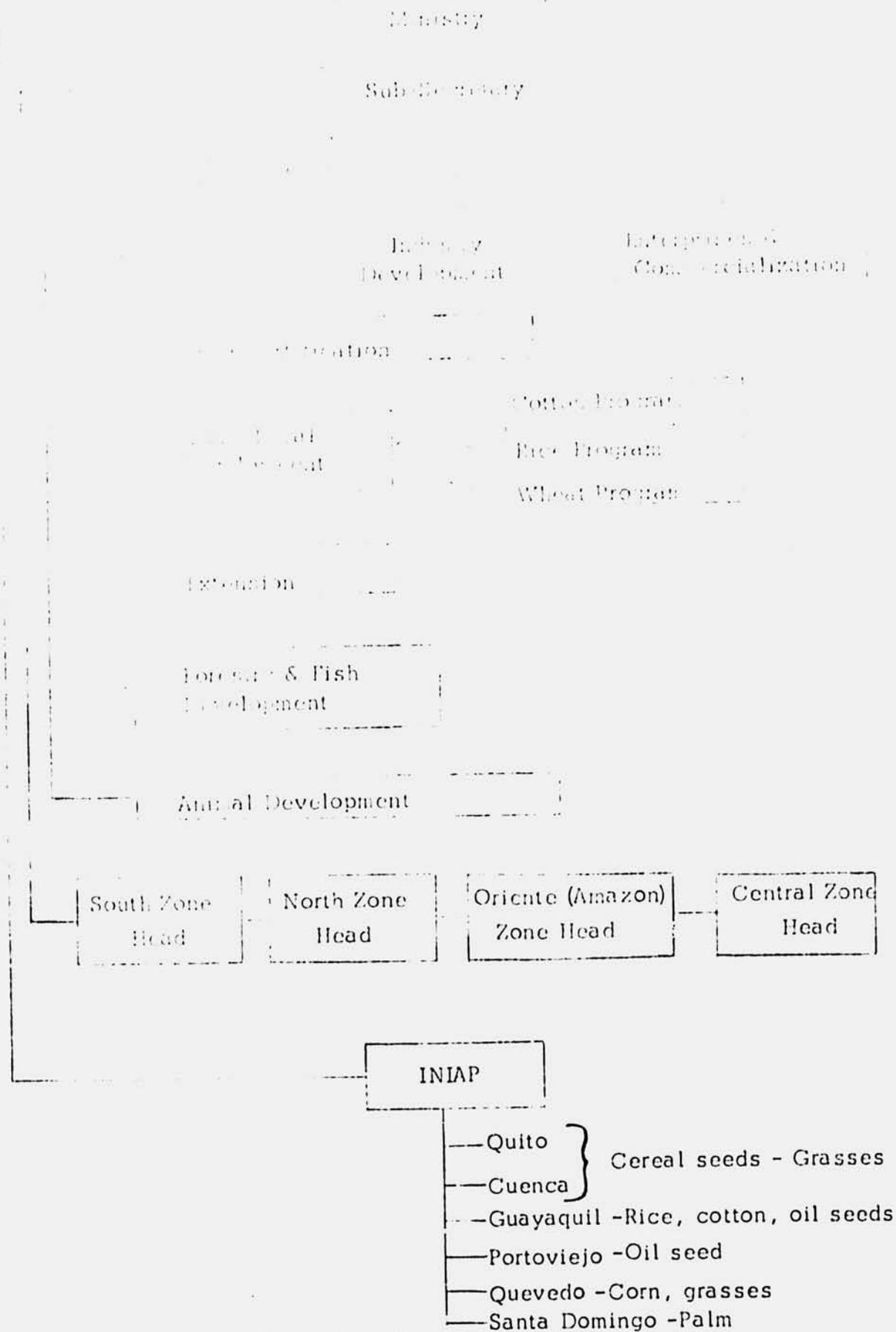


Figure 1. Ministry of Agriculture Organizational Chart.

An abbreviated organizational chart for INIAP is shown in Figure 2. INIAP was organized in 1952 as the National Research Institute for Breeder. At the time of its organization, the National Council of Agricultural Development (CONADE) was the central authority and all seed production was directed to INIAP. Subsequently, the various breeders and their respective breeding programs have been working for CONADE, and currently all plant breeders are producers of and distributors of seeds and mutants for the country. Thus, INIAP is the sole source of all seed raised (Genetic seed for all crops in Ecuador. (An exception may exist when seed stocks are depleted.)

Seed Production - INIAP Stations

Present plans and current practices are to produce the second generation Genetic Seed on the various INIAP stations. However, subsequent generations, Registered Seed (third generation) and Certified Seed (fourth generation) may or may not be produced by INIAP, depending upon the qualifications of available seed growers of the specific seed crop. Until seed growers do become qualified, however, INIAP will likely produce the Registered Seed of a particular crop.

Interviews with pertinent personnel in INIAP revealed that their seed program is organized in the following manner:

1. Each station is responsible for research on certain crops for the specific geographical area.
2. A plant breeder for each crop maintains and supplies Breeder (Genetic) Seed.

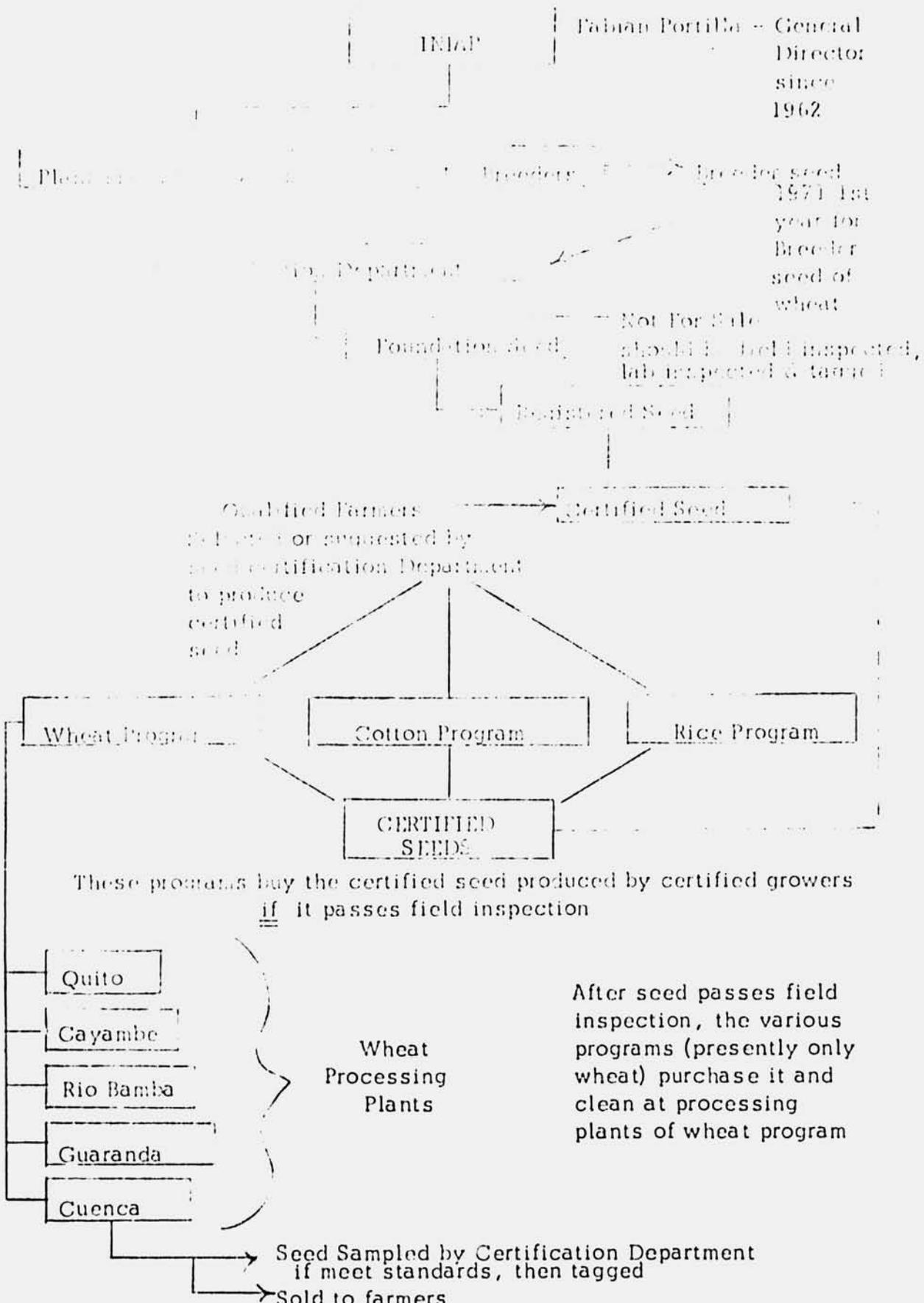


Figure 2. INIAP Organizational Chart.

3. A person who is the Head of the Seed Production Programs within the research station receives the Breeder Seed and increased it to the next generation, Foundation Seed. (The program head may have 1 to 3 assistants who may or may not be trained in seed production techniques.)
4. Presently, the same Seed Production Head is responsible for the production of registered seed, since, in many instances, there are no qualified seed producers to assume this role.
5. Finally, the Registered Seed is sold to qualified seed growers who, at the present, are selected or recommended by the Seed Certification Department. These qualified growers produce the seed which is marketed through the National Wheat Program as discussed later.

The on-going or anticipated seed certification programs at the various INIA research stations are organized as follows:

1. Quito (Santa Catalina) and Cuenca

Wheat	-	5 varieties
Barley	-	2 varieties (additional one to be released)
Oats	-	2 varieties
Potatoes	-	2 varieties
Corn	-	4 synthetics
Grasses	-	None (anticipate ryegrass & fescue)
Legumes	-	None (anticipate alfalfa)

2. Guayaquil (Boliche)

Rice	-	2 varieties (additional one next year)
Cotton	-	6 varieties (4 medium & 2 long fiber)
Sesame	-	1 variety
Peanuts	-	2 varieties

3. Portoviejo

This will become a branch station of Boliche and will not produce seed.

4. Quevedo (Pichilingue)

Corn	-	1 synthetic
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5. Santa Domingo

Oil seed - Primarily concerned with palm

Without exception all the INIAP stations visited agreed unanimously that their primary function is to produce Breeder and Foundation Seed. Registered Seed should be produced only until such time as private growers become capable of handling this phase. It was noted, however, that seed processing facilities were being constructed at various stations. Even though the basic concept is to process only the Foundation and Registered Seed, at this station, these facilities might also be used to handle "certified" types of seed, i.e., Certified class seed. It is certainly recommended that processing facilities are either minimum or completely lacking at this time for receiving and cleaning certified seed, but, it should be considered entirely unsatisfactory for the INIAP research stations to enter into the commercial seed business. They might, however, use their facilities to "custom" clean seed for private certified growers on a fee basis until such time as the private sector can establish its own facilities. Strict precautions, however, would have to be taken to prevent varietal mixtures.

Considering the number of crops and the varieties to be handled by each station, it is strongly recommended that the INIAP stations limit their activities to production and supply of Breeder and Foundation Seed and produce Registered Seed only until such time that it can be produced by private seed growers or cooperatives.

Additional discussions with certain INIAP station directors revealed their uncertainty as to the mode of marketing Foundation and Registered Seed. They feel that if all of the seed cannot be sold as either Foundation or

Registered seed, they will have to sell it as "mill seed" or mill and lose money, usually 20%, they want the Seed Certification Dept. to either buy the seed or guarantee the sale of all seed sold. The Government is not willing to do this. The Dept. of Agriculture is willing to register seed. Dept. of Agriculture can we transfer this responsibility to them.

Seed Processing - Mill

There are two commercial type seed processing plants that have already been completed in Ecuador - Santa Catalina and research station. Initially the planters for processing only the formation and registered seed produced by the station (or possibly other stations). A second plant, similar to the Santa-Santa Catalina plant, is under construction at the Guayaquil-Bahia station. This is also a commercial type plant built primarily to process the seed produced by the research station.

These facilities are probably more than adequate for the seeds produced on the station; however, the concept of utilizing them for commercial "custom" cleaning would lead to more efficient use of the plant provided production schedules of the station and private seedsmen can be so arranged as to permit custom processing.

NATIONAL WHEAT PROGRAM

The National Wheat Program (Wheat Program or Commission) was probably the first functioning seed improvement program in Ecuador. Engineer Agronomist Hernan Orellana, who was the Director of this program during its initial organization, envisioned the necessity and extension of this program throughout the Sierra region of Ecuador.

After attending the summer training course at the Food Technology Laboratory at Michigan State University, he ordered basic equipment for five wheat processing plants which were actually located throughout the wheat region in Louisiana.

A major contribution for the development of this initial seed program was the introduction of improved wheat varieties into the country in 1955. Through the National Wheat Program, a considerable amount of money has been increased for the development of a top quality national seed program and physical facilities.

Production figures furnished and available production figures reveal that the national average production has increased from 8 quintales per hectare in 1955 to 22 quintales per hectare in 1970. In fact good seed producers have obtained as much as 40 quintales per hectare by using good clean seed. In addition, from 1000 quintales of wheat which was inspected and certified in 1957, the certified seed volume in 1970 was 40,000 quintales.

In its scope of operation the National Wheat Program agrees to purchase certified seed from any certified seed grower, IF the seed meets certification standards. A premium is paid for certified wheat seed, and thus the program facilitates commercialization of wheat seed as marketing channels are limited.

The National Wheat Program has developed soundly over the past decade, and such a system for other major crops (rice, cotton, etc.) would be extremely advantageous.

FOUNDAION AND REGISTERED SEED ACT

It is the policy of the United States Government to encourage the production of cotton seed in the United States and to provide for the importation of cotton seed from other countries. The National Cotton Program and the National Cotton Foundation are authorized to produce and distribute cotton seed to growers in the United States. The National Cotton Program is authorized to produce and distribute cotton seed to growers in the United States. The National Cotton Foundation is authorized to produce and distribute cotton seed to growers in the United States. This section was amended by the Act of 1954 which is set forth in the notes.

Locally, F-1 should supply foundation seed for the United States only to the National Cotton Program. Apparently, however, INIAP has provided a portion of seed and seed of some of their experimental varieties in past years to seed growers in direct competition with the National Cotton Program. This has created confusion and distrust in the overall program execution. Therefore, only one organization should be charged with the responsibility of either importing seed or producing the Foundation and Registered Seed. Since basic seed stocks of cotton are imported, cotton seed importation could be handled by either the National Cotton Program or INIAP, but only one of them. Success will depend upon close cooperation and understanding between both agencies.

Until INIAP can release their own cotton varieties, continued importation of Registered seed will be necessary. The Director of the INIAP cotton research station indicated that 8 varieties would be released

seed for 200,000 quintales of seed would be available in December, 1971.

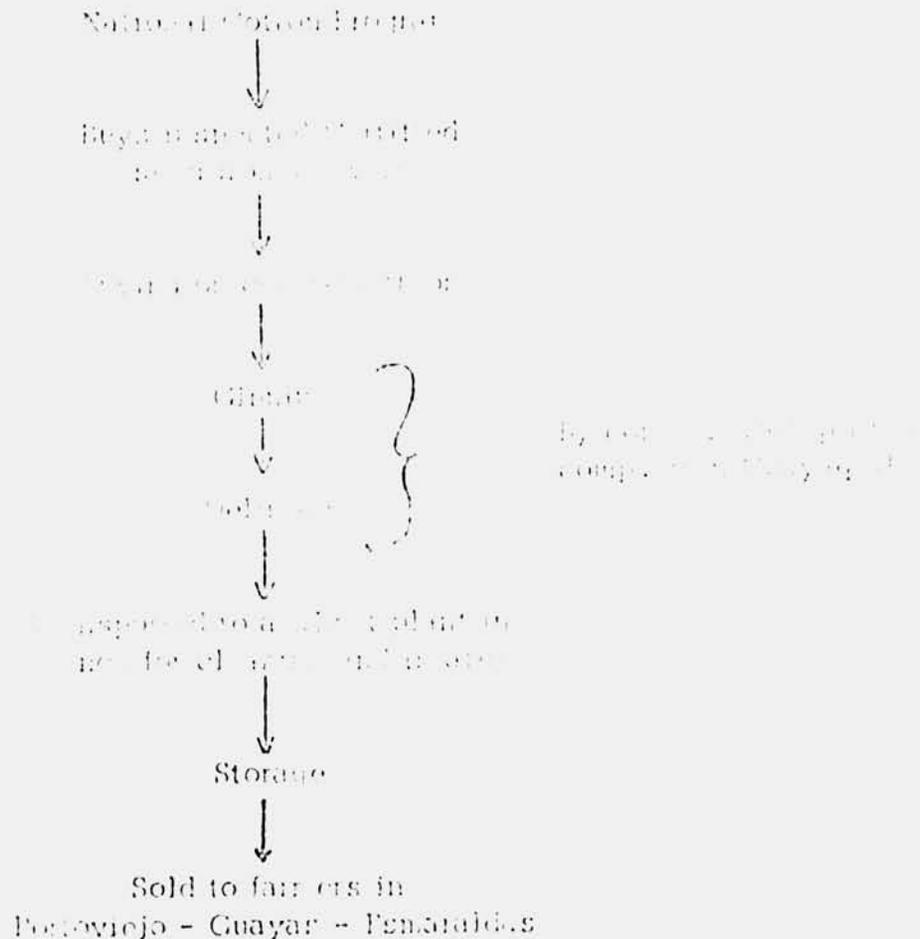
Currently, only 10% of the Peanarica cotton, and certification has not been completed.

At present, the seed production plan, which is 50% of the total seed requirement, is based upon 15 ha. of certified seed from the 1970 crop. Current cotton seed production is 12 quintales/ha. for certified seed. The planting rate is 20 lbs./ha. of seed. Therefore the seed requirement is based upon the following:

1. 15 ha. of seed (300 lbs.) Foundation Seed will plant 15 ha. (20 lbs./ha.)
2. 15 ha. of seed produces 12 quintales/ha. Therefore, 15 ha. of seed produces 180 quintales (18,000 lbs.) of Registered Seed.
3. 180 quintales (18,000 lbs.) will plant 900 ha. (20 lbs./ha.)
4. 900 ha. of seed produces 9 quintales/ha. Therefore 900 ha. of Registered seed produces 8100 quintales (810,000 lbs.) of Certified Seed.

This is sufficient seed production at the present time and appears to fulfill the 1975 projected 1975 production goal of 6,000 quintales and 30,000 ha.

A major problem facing the NCP is ginning and delinting the Certified seed. Facilities are limited, and only a few private cotton gins exist. Last year ginning and delinting of certified seed was accomplished as follows:



Fortunately the ginning and delinting were accomplished through contract with a private company who no longer processed cotton seed of their own. Consequently, the gin stands could be cleaned for the certified seed, and it appears that this arrangement can be continued until other ginning and processing facilities are developed for cotton seed. Even though this system may appear rather disorganized, certified cotton seed was available for 3 Sucres less than imported seed last year.

The National Cotton Program was advised that their current storage facilities for imported cotton seed and soybean seed are inadequate. The

seed were stored in an ice house, and even though the temperature was 2°C the relative humidity was at least 75%, and probably higher. The main immediate cause, however, was the actual condensation of water on the bags of seed. The doors of the storage buildings were opened. The godowns were particularly vulnerable in unlined jute bags, and the moisture was measured to be in the order of 16-17%. The cotton seed was in hurlap bags lined with polythene and consequently were lower in moisture, approximately 14%. Nevertheless, this level is not safe for long term seed storage. The National Commission is aware of the hazards of this storage problem, and they plan to acquire more adequate facilities immediately.

NATIONAL RICE PROGRAM

The third crop commodity program, the National Rice Program, has been actively engaged in a seed program for only 3 years. Consequently, most of their effort has been expended in the commercial aspects of production and milling rice. Although an attempt at certification of rice seed was made in 1970 with the introduction of the IR-8 rice variety, lack of organization and control over who handled the seed created various problems. The rice mills sold "seed" to farmers who wanted cheap seed, which, of course, is not a way to develop a sound rice seed improvement program.

Considerable emphasis is currently being placed upon rice seed production and improvement. With the introduction of two new rice varieties, INIAP-2 and INIAP-6 (from C.I.A.T. - Columiba), a more organized rice seed program must be developed.

As a result of the General Director of INIA, the Seed Certification Department of the National Office of Agriculture, repeatedly received in a proper manner the requests for help from the rice growers of the new rice varieties. Initially, INIA's Department of Agricultural Production, one of the two varieties and also provided the quantity of hectares for each variety on the basis of the initial seed requirements of the rice growers and the requirements for increasing the area of rice by 100,000 ha, a national objective of rice cooperation with the U.S. The voluntary rice growers who were interested in this project were being expressed a very definite interest in participating in the rice seed certification program with these and other rice varieties.

Therefore, it appears very favorable that with proper guidance and assistance the National Rice Program could enter into a rice seed certification system and function in a manner similar to the operation of the National Wheat Program. It also seems advisable that other crops could be certified according to this same procedure.

SEED CERTIFICATION

The Seed Certification Department is structured according to the organizational chart in Figure 3. This Department was organized in 1969 and has been very active in promoting certification and use of improved seeds since then. In 1970 the seed laboratory section of the Certification Department tested approximately 100 samples of all seeds, and the field inspection division inspected approximately 2000 hectares. Seed crops, yields and prices currently in the certification system are as follows:

SEED CERTIFICATION DEPARTMENT

Director: Jaime Flores

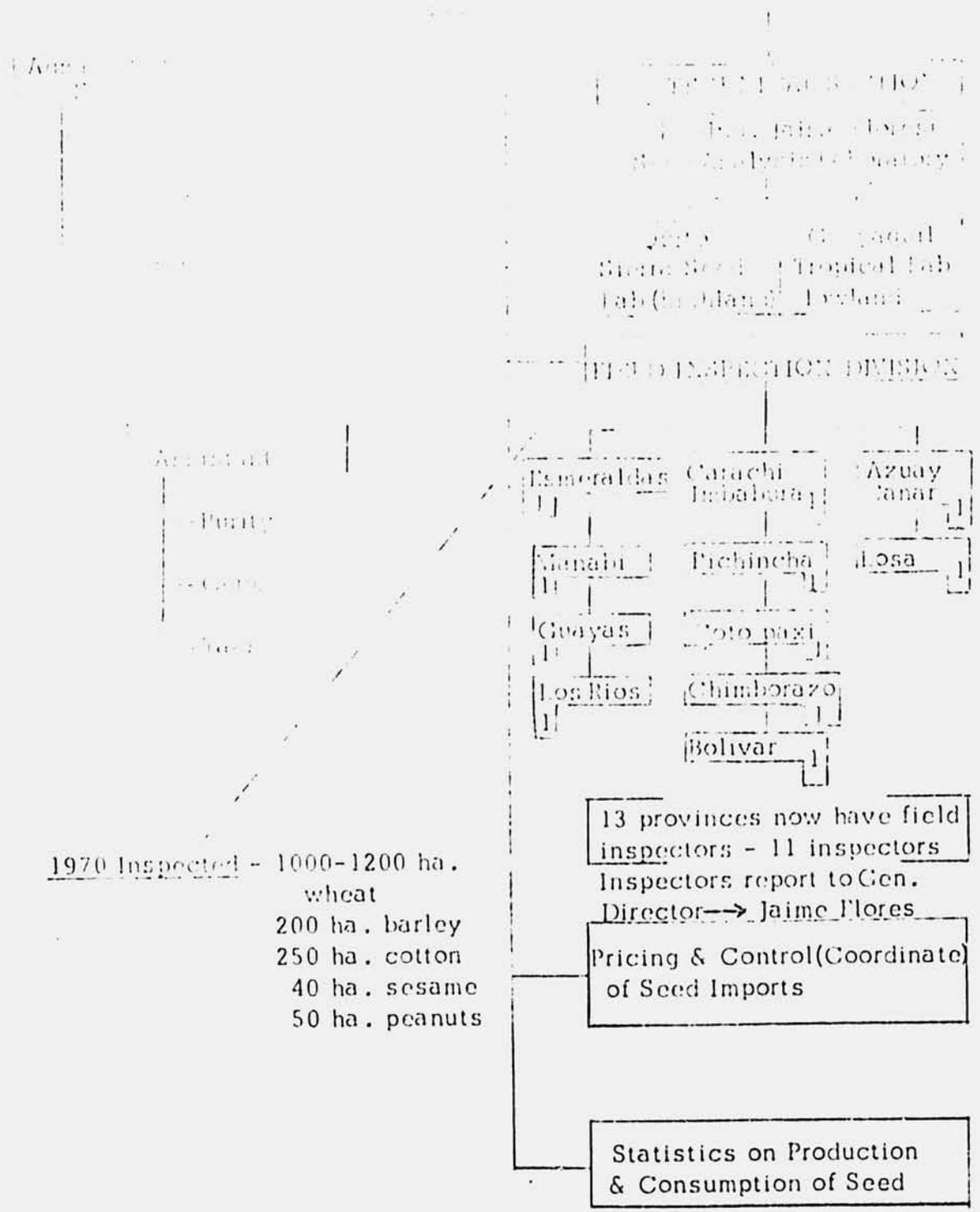


Figure 3. Seed Certification Department Organizational Chart.

Crop	Expected Yield (Cultivated Area) (Hectares/Year)	Seed Price (Sucrea/quintal)	Non-Seed Use Conventional Price (Sucrea/quintal)
Wheat	30-35	165	120
Barley	30-40	135	87
Rice	15	200	135
Cotton (Paddy)	17-11	300	55
Peanuts (Paddy)	30-40	350	280
Com	20-25	155	70
Sesame	16-18	300	250
Potatoes	200	125	30

Discussions with certification field inspectors revealed that anticipated certification acreages and number of seed producers would be approximately as follows:

GUAYAS PROVINCE

	<u>Hectares</u>	<u>No. Seed Producers</u>
1971: Cotton	190	4
Sesame	200	3
Peanuts	<u>100</u>	<u>2</u>
TOTAL	490	9
1972: Cotton	200	
Sesame	200	
Peanuts	150	
Soya	<u>50</u>	
TOTAL	600	

MANA

	<u>Hectares</u>	<u>No. Seed Inspectors</u>
1971:		
Cotton	150	4
Soybean	89	3
Peanut	20	3
Corn	10	4
	<u>269</u>	<u>14</u>
1972:		
Cotton	200	
Soybean	80	
Peanut	40	
Corn	20	
	<u>340</u>	

ITMA

1971:		
Cotton	103	4
Soybean	10	3
Peanut	30	2
Corn	3	4
	<u>TOTAL 146</u>	<u>13</u>
1972:		
Cotton	100	
Soybean	20	
Peanut	60	
Corn	50	
Soya	1	
	<u>TOTAL 231</u>	

In projecting acreage and production increases, the Seed Certification Department maintains statistics on present and anticipated crop trends. These figures assist greatly in planning for growth during the next few years. Statistics on some crops are provided in Table 1.

The Seed Certification Department has a core of capable individuals who are concerned and devoted to expanding seed certification and thus improving the quality of seed in Ecuador. Actual on site field inspection trips provided inspectors with the opportunity to become better acquainted with techniques

Table 1. Production figures for selected seed crops.

Year	Area Planted Has.	Area Harvested Has.	Production Tons	Production per Acre	Seed Production Tons	Seed Production per Acre
<u>WHEAT</u>						
1969	72,250	75,000	75,750	1,009	1,009	1,009
1970	78,280	76,000	81,050	1,066	1,066	1,066
1971	79,820	77,500	91,300	1,178	1,178	1,178
1972	81,880	79,500	103,600	1,303	1,303	1,303
1973	84,460	82,000	120,200	1,466	1,466	1,466
<u>CORN</u>						
1969	258,770	251,230	199,660	795	795	795
1970	252,140	244,600	212,320	872	872	872
1971	249,680	242,400	223,760	923	923	923
1972	245,000	237,680	236,870	997	997	997
1973	240,690	233,680	263,190	1,127	1,127	1,127
<u>SOYBEANS</u>						
1969	940	900	1,560	1,656	1,656	1,656
1970	1,460	1,400	2,590	1,850	1,850	1,850
1971	2,800	2,000	3,680	1,840	1,840	1,840
1972	2,920	2,800	5,150	1,839	1,839	1,839
1973	4,170	4,000	7,350	1,838	1,838	1,838

Table 1. (Cont'd)

Year	Area Planted Has.	Area Harvested Has.	Production Tons	Production % of 1969	Area Planted % of 1969
<u>POTATOES</u>					
1969	44,100	40,090	353,410	100.0	100.0
1970	44,080	40,070	359,373	101.7	99.9
1971	44,040	44,040	384,070	108.7	100.0
1972	42,660	38,780	401,850	113.7	97.0
1973	40,660	36,950	420,450	118.9	92.7
<u>BEANS</u>					
1969	60,080	57,220	28,130	100.0	100.0
1970	60,970	58,070	29,340	104.3	100.0
1971	61,880	58,930	31,950	113.6	101.5
1972	63,330	60,310	34,770	123.6	102.0
1973	64,050	61,000	36,650	130.3	101.7
<u>RICE</u>					
1969	116,350	110,000	217,500	100.0	100.0
1970	118,350	112,000	252,550	116.1	96.3
1971	121,250	115,000	187,400	86.2	98.8
1972	126,150	120,000	333,300	153.2	103.1
1973	132,380	126,300	398,970	183.4	108.6

Table 1. (Cont'd.)

Year	Area Planted Has.	Area Harvested Has.	Production Tons	Production sq. meters	Yield kg/ha	Production sq. meters	Yield kg/ha
<u>FIELD COTTON</u>							
1969	24,850	21,750	25,290	384,000	15.35	384,000	15.35
1970	26,290	23,000	17,550	301,000	12.85	301,000	12.85
1971	28,710	25,100	21,000	456,540	18.18	456,540	18.18
1972	32,960	28,800	26,980	599,545	22.17	599,545	22.17
1973	39,170	34,200	36,740	799,737	21.80	799,737	21.80
<u>LONG BEANS</u>							
1969	34,330	33,010	20,010	435,011	21.75	435,011	21.75
1970	35,620	34,250	21,430	465,693	22.06	465,693	22.06
1971	36,790	35,270	23,300	509,547	23.21	509,547	23.21
1972	37,990	36,530	25,600	560,803	22.19	560,803	22.19
1973	40,080	38,530	29,120	633,059	24.48	633,059	24.48
<u>PEANUTS</u>							
1969	13,710	13,300	9,400	193,459	20.59	193,459	20.59
1970	14,130	13,700	9,350	209,270	22.65	209,270	22.65
1971	14,640	14,200	10,650	221,700	23.43	221,700	23.43
1972	15,460	15,000	12,670	277,011	23.19	277,011	23.19
1973	14,430	14,000	13,410	281,000	20.07	281,000	20.07

Table 1. (Cont'd.)

Year	Area Planted Has.	Area Harvested Has.	Production Tons	Production % Area	Yield Tons/Has.	% Increase 1973/1969
<u>SUGARBEET</u>						
1969	2,600	2,500	2,880	66.7	11.1	---
1970	3,120	3,000	3,480	78.0	11.3	---
1971	3,850	3,700	4,250	92.3	17.9	67.7
1972	4,690	4,500	5,160	112.5	20.2	82.3
1973	5,730	5,500	6,330	137.6	25.0	141.0
<u>BARLEY</u>						
1969	138,320	134,300	96,320	2,093,995	65,004	4.7
1970	135,960	132,000	100,230	2,179,000	121,000	1.8
1971	131,840	128,000	105,800	2,300,000	161,371	7.6
1972	127,720	124,000	113,370	2,464,660	177,934	6.5
1973	122,880	119,300	121,550	2,542,497	---	---
<u>CASTOR BEAN</u>						
1969	22,350	20,500	19,150	416,321	87,612	21.0
1970	22,350	20,500	23,180	503,933	79,785	19.2
1971	22,350	20,500	26,850	583,719	128,914	47.3
1972	22,350	20,500	28,640	622,633	138,915	56.2
1973	22,350	20,500	30,200	656,545	---	---

Table 1. (Cont'd.)

Year	Area Planted Has.	Area Harvested Has.	Production Tons	Production C.M.T.S.	Production C.M.T.S.
1969	310	300	400	10,300	32,900
1970	801	780	1,240	1,100	3,500
1971	1,412	1,370	2,730	59,300	32,300
1972	2,290	2,220	5,170	112,800	53,000
1973	6,220	6,040	8,870	102,000	21,100

of improved rice and other crops. Experiments with plant breeders provided valuable information regarding the natural characteristics of certain crops. Continued research is necessary to determine the best plant material for the needs of the country and to develop a system with a program for further development of the country.

When a seed laboratory which is an integral part of the Germination Department is established, severe difficulties due to lack of adequate space, lighting, and other facilities. Although the laboratory will be located in one of the best facilities in the near future, special consideration must be given to provide the necessary space and conveniences for seed testing.

This seed testing problem might be easily resolved in view of anticipated plans for developing special grass seed facilities. Immediate plans are to construct two specialized grass seed processing plants, one in the Quito area and one in Quevedo. In addition two seed laboratories will be constructed, probably at the same locations. Although some justification may be made for constructing separate grass seed processing plants, the seed testing laboratories should be the same for all crops in order to standardize test results and eliminate the need for staffing unnecessary laboratories.

IMMEDIATE CONSIDERATIONS

A major limiting factor immediately facing the development of seed programs for rice, cotton, peanut or other kinds of seed is the lack of adequate processing facilities, particular in the coastal region. Since very few private

The enterprise could be organized with a Director and representatives of each of the regions. It would be set up as a commercial company to buy and sell seed. The buyers would be growers who would be facilitated to do it their own way. The seed would come from the seed bank established from INIAP, and the processing would be done by the company. The buy, process and sell the seed. The company would be set up to be a sound product to solving the immediate needs of the growers involved in seed. Good quality seed has been a problem for the project and, in fact, some private subscriptions have already been received.

If the new enterprise is initiated, a logical approach would be as follows:

1. Remove and relocate at least four of the wheat seed processing plants to handle seed processing in the Sierra region. Since the National Wheat Program has become an office within the Ministry, the five existing plants and equipment actually belong to the Ministry. Therefore, as a member of the Enterprise, the Ministry could supply this existing equipment and whatever financial support is available from USAID or other source as their contribution.
2. The remaining equipment could be transported to the coastal region (near Guayaquil) and a new processing plant could readily be constructed for this region. Actually there is one Super X 298-D seed cleaner which has never been uncrated, and it could well serve as the basic machine for developing the much needed processing plant in the coastal region.

The proposed program of plant and the proposed reorganization for the modernized seed production program is as follows:

Equipment	Location	Remarks
1 Super Y 298-D	(1) Guayaquil	(1) Remodel and modernize
1 Seed treater		
1 Chip mill	(2) Ibarra	}
1 Seed treater		
1 Press	(3) Guayaquil	
1 Dryer		
1 Super Y 298-D		(2) Constructed of new and Guayaquil - remodel and modernize
1 Seed treater		
1 Super Y 298-D	(4) Quito	(3) Relocate on outskirts of Quito and modernize
1 Seed treater		
1 Super Y 298-D	(5) Cayambe	(4) Remodel and modernize
1 Seed treater		
		(5) Take the new Super Y 298-D in Quito and build new plant at Guayaquil coastal region

3. The financial support from the Comision de Valores, Banco de Fomento and the private sector will provide the necessary funds for building construction and procurement of additional necessary equipment.

RECOMMENDATIONS

1. The role of each participating agency in the total seed improvement program must be clearly defined, and an atmosphere must be created for their close cooperation and coordination.

2. The Seed Company or institution should have the sole responsibility of controlling the biological purity (mechanical purity) of seed crops. The government should control seed production facilities, but this does not preclude the use of private seed and the use of qualified seed producers.
3. Increase the degree of responsibility to that of producer breeder and the government should limit registered seed production until private seed production is qualified.
4. Training for all inspectors must include instruction in crop varietal characteristics and methods and techniques for field inspection. The INIA plant breeders should provide assistance in this area.
5. Demonstration field plots should be located in selected zones in order to show the superiority of Certified Seed.
6. Comprehensive in-country training should be provided to all persons involved in seed. Excellent facilities and equipment are available for this. In addition qualified persons should receive advanced training in Seed Technology in the United States or in other areas where facilities are available.
7. Provide adequate seed testing laboratories through implementation of the grass seed program.
8. Encourage the immediate acceptance of the EMPRESA de ECONOMIA MIXTA (Mixed Seed Enterprise). Proceed to implement the plan to reorganize and re-locate the wheat processing plants in the Sierra and build a completely new processing facility in the Guayaquil (Coastal) region. The author considers this recommendation to be of utmost importance since adequate seed processing facilities are severely inadequate at the present time.

APPENDIX

Itinerary

Monday, April 29:	Arrive Quito, Ecuador. Briefed at Seed Certification Department with Mr. George Kimbrell, Mr. Jaime Flores and other staff. Arrived in Quito with Mr. Neal G. Fine.
Tuesday, April 30:	Santa Cecilia Experimental Station Cotton Gen. Program.
Wednesday, April 30:	Santa Cecilia Experimental Station Cotton Gen. Program. Visit with Dr. Julio Romero, section director and seed production personnel.
Thursday, April 29:	Meeting in Seed Certification Department to plan and confirm details of schedule.
Friday, April 30:	Travel to Guayaquil. Visit with Dr. Enrique Anpuero, Sub-Director of INIAP. Visit with Mr. Richard Winters, USAID Guayaquil.
Saturday, May 1	In Guayaquil - visited with Mr. Lee Townsend, CLUSA representative, and Mr. Rex Kimbrell, rice consultant for CLUSA.
Sunday, May 2	In Guayaquil
Monday, May 3	In Guayaquil - visit with National Cotton Program
Tuesday, May 4	In Guayaquil - visit INIAP Boliche station with Jack Traywick, Rockefeller Foundation
Wednesday, May 5	In Guayaquil - visit with National Cotton Program
Thursday, May 6	In Guayaquil - visit local Cotton farms for field inspection

Friday, May 11	In Quito and visit National Rice Program with Dr. A. W. Hutton, G.I.A.C., Director, Ecuador.
Saturday, May 12	Field stop at various local rice and cotton farms for field inspection.
Sunday, May 13	Rest day in Quito.
Monday, May 14	Pre-arranged field inspection facilities.
Tuesday, May 15	Travel to Loja to visit INIA station.
Wednesday, May 16	Travel to Guano.
Thursday, May 17	In Quito - discussions with Certification personnel.
Friday, May 18	In Quito - discussions with Certification personnel - met with Dr. Fito Jimenez, Director of INIA, Colombia, Dr. Robert Cleary, CIAT, Colombia and Dr. Fabian Fortilla, General Director of INIA.
Saturday, May 19	Travel to Guayaquil.
Sunday, May 20	Attended INIA rice field day at Daule.
Monday, May 21	Visited with National Cotton Program and discussed seed storage problems - travel to Quito.
Tuesday, May 22	Travel to Cayambe to inspect barley and wheat fields.
Wednesday, May 23	Travel to Quito.
Thursday, May 24	In Quito - final discussions with Seed Certification Department - discussion with Dr. Ayora, Director of Comision de Valores.
Friday, May 25	In Quito - discussions with USAID, Mr. Neil Fine and Mr. Richard Winters.
Saturday, May 26	Depart Quito for United States.