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CHEMONICS
INTERNATIONAL CONSULTING DIVISION

END OF TOUR REPORT
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LEADER OF THE NATIONAL SEED PROGRAM

SUBMITTED TO

THE REGIONAL SEED COUNCIL - SANTA CRUZ,
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Chemonics International was contracted by the Ministry of Rural Affairs and Agriculture in Bolivia (MACA) to provide a number of technical services under the Agriculture Sector II Project, 511-T-059, financed by USAID/Bolivia. One of the technical areas specified in the Project was seed improvement. The current report is one of several end-of-tour reports prepared by advisers who have worked in this area. Because the author was leader of the seed program at the end of the Project, a general summary of accomplishments of the national program has been included as Part I of this report.

Seed improvement activities began in Bolivia in June of 1980 with the arrival of Dr. Adriel E. Garay. The post of this adviser was originally to have been La Paz to work at the national level. However due to the potential for the development of regional seed production programs in Bolivia, a change of post was made before the arrival of Dr. Garay from La Paz to Santa Cruz. Work in Santa Cruz began with an attempt to organize the provision of services needed by seed producers. These services were: seed certification to provide quality control; technical assistance to seed producers; and the installation of seed processing facilities.

In 1981 a study was performed to establish guidelines for implementing seed programs in other regions of the country. This study showed that the valley regions of Cochabamba and the Gran Chaco Province of the Department of Tarija had the necessary conditions to begin seed production programs. As a result, the hiring of two more seed specialists for these areas was recommended. Dr. Juan A. Landívar was hired to work in Gran Chaco and Dr. Edgar R. Cabrera in Cochabamba. Due to local disagreements, Dr. Cabrera was transferred to work in the Department of Chuquisaca. Although this region did not have the favorable conditions of Cochabamba, it was possible to develop a seed production program there. Dr. Landívar began working in the Gran Chaco Province in April of 1983 and Dr. Cabrera in Chuquisaca in September of the same year. Later Ing. Julio Loredo was hired to help Dr. Cabrera in Chuquisaca. Dr. Garay was named team leader and with support of Dr. Preston S. Pattie from La Paz, the team expanded to three regions of the country.

In 1985, Drs. Garay and Cabrera accepted positions outside the country and left the Project. Dr. Claudio Braçantini was hired to replace Dr. Cabrera in Chuquisaca and Dr. Landívar was transferred from the Gran Chaco to Santa Cruz to replace Dr. Garay. To cover the vacancy in Gran Chaco, Ing. Diógenes Chávez was hired. In addition to the four full-time advisers, Ing. Víctor Gonzáles, adviser in a cotton production program, helped

part-time in cotton seed production in Santa Cruz and in Gran Chaco. Therefore during the last year of the Project, the seed improvement team consisted of two expatriate seed experts, three local advisers plus the Chief of Party. We consider the inclusion of local advisers in the team to be an important achievement of the Project, since these technicians were trained in seed technology through their involvement with on-going Project activities.

End-of-tour reports were completed by Drs. Garay and Cabrera at the time they left the Project, covering Santa Cruz from 1980-1984 and Chuquisaca from 1983-1985. In order to accommodate End-of-tour reports of the remaining seed advisers according to the different regional programs, the following organization was agreed upon with the Director General of MACA:

Santa Cruz:	Garay 1980-84	Landívar 1985-86
Gran Chaco:	Chávez and Landívar 1983-86	
Chuquisaca:	Cabrera 1983-85	Braquantini and Loredo 1985-86
National Program:	Landívar 1980-86	

As a result, the current report has two separate parts: I. National Seed Improvement Program, 1980-1986, and II. Progress in the Seed Program in Santa Cruz, 1985-86. The first is a report on accomplishments of the program in general, while the second is more specific to the work of the author during his last year on the Project.

PART I. NATIONAL SEED IMPROVEMENT PROGRAM, 1980-86

A. Seed Certification

The provision of essential services to seed producers was the main objective during the early stages of the program. The formation of functional Regional Seed Certification Services was limited by the lack of credibility of the existing Service and the lack of qualified personnel to carry on field inspections and laboratory work. The direct participation of advisers served to demonstrate to local institutions the importance of this activity in the program, to win confidence for the Services and to provide technical assistance to seed producers through field visits.

As seed production activities developed, increases in the number of technicians were recommended. In most regions these recommendations were not readily implemented due to lack of funds in the National Seed Department of MACA. Once the Regional Seed Councils were implemented, decisions to hire new personnel were made at the local level. This facilitated the implementation of the Certification Services. Table 1 shows the number of field technicians by region.

Table 1. NUMBER OF FIELD TECHNICIANS IN REGIONAL SEED CERTIFICATION SERVICES BY REGION, 1980-86

Region	YEAR						
	1980	1981	1982	1983	1984	1985	1986
Santa Cruz	2	2	3	4	4	6	6
Gran Chaco	1	1	1	1	1	2	3
Chuquisaca	1	1	1	1	2	2	2

In addition to field technicians, currently Santa Cruz has 4 administrative employees, Gran Chaco 1, and Chuquisaca 2. All three regions now have the necessary personnel for carrying out quality control services and technical assistance to growers. However, further training is needed. The project offered training to Certification personnel through short courses outside the country, short courses at the local level and on-the-job training. To assure future growth of the services it is necessary to provide financial aid for advanced academic training. It is recommended that each Regional Seed Certification Service have at least one technician trained at the Master of Science level in seed technology. Each region should have enough trained personnel to replace immediately anyone leaving Certification.

Other regions of the country need to implement Seed Certification Services as a first step. This is necessary in order to develop essential support services for seed producers. The departments of Cochabamba, Potosí and Tarija have the potential for developing functional seed programs, but

currently their Regional Certification Services are not capable of providing services. Their stage of development is similar to that encountered during the early stages of the program in Santa Cruz, Chuquisaca and Gran Chaco. Their limitations are lack of credibility for the services and lack of personnel with the necessary leadership to provide quality control and technical assistance to producers. These limitations can be overcome with expert technical assistance. It is highly recommended that the National Seed Council find financial aid to provide this assistance.

B. Seed Processing Facilities

Provision of seed processing is another essential service often lacking in the earlier stages of the program. The Project provided funds to install and/or improve the public processing facilities of Warnes in Santa Cruz, Zudáñez in Chuquisaca, El Palmar in Gran Chaco, Betanzos in Potosí, and Las Barrancas in Tarija. The seed processing plant of Cochabamba did not need any additional equipment or installations.

As part of the program development strategy, seed conditioning plants were designed modestly in accordance with the growth of local production. It was intended that the public seed plants provide services to all seed producers. This was achieved through different management programs. For example, in Santa Cruz the Warnes plant was rented to the regional experiment station (CIAT). In Chuquisaca the Regional Seed Council managed the plant and in Gran Chaco a farmer cooperative provided the services. All three management schemes were approved and supervised by the Regional Seed Councils. The criterion used for assigning administration of the facility to an institution was to provide processing services to all seed producers without exception.

The publicly owned facilities served as a model for the private sector to design their own plants. In Santa Cruz, government investment in a single processing facility in 1981, provided an incentive for investments by the private sector in seven additional facilities. Table 2 shows the historical development of the seed processing capacity in the country.

Seed processing facilities in regions where the program did not provide technical assistance were somewhat under-utilized. This is very evident in the Department of Cochabamba, where a previous USAID project financed a modern seed processing facility, capable of processing 1.5 metric tons per hour. Yet it is used to process only 100 to 300 metric tons per year. Similar statements can be made about the processing plants of Potosí and Tarija. The lack of an organized seed production program for those regions, is resulting in poor utilization of processing facilities. Again, technical assistance is needed to develop these programs.

C. Regional Seed Councils (RSC)

Local institutions participated from the beginning of the Project in designing strategies for the regional seed programs. For example, the Association of Oilseed Producers of Santa Cruz (ANAPO) was important in the formation of Certification. The need to include interested institutions in

Table 2

SEED PROCESSING CAPACITY IN BOLIVIA, 1980-1986

Institution	P l a c e	Y e a r						
		1980	1981	1982	1983	1984	1985	1986
		(Metric Tons per Hour)						
MACA	Tarija	.25	.25	.25	.25	.25	.50	.50
CRS	Gran Chaco				.50	.50	.50	1.00
MACA	Betanzos (Potosí)	.50	.50	.50	.50	.50	.50	1.00
MACA/CRS	Zurup (Chuquisaca)	.25	.25	.25	.25	.25	.25	.50
CBN	Sucre (Chuquisaca)				1.50	1.50	1.50	1.50
SEFO	Cochabamba	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MACA	Cochabamba	1.20	1.20	1.20	1.20	1.20	1.20	1.20
MACA/CIAT	Warnes (Santa Cruz)		1.20	1.20	1.20	1.20	1.20	1.20
CAICO	Okinawa (Santa Cruz)					1.20	1.20	1.20
ANAPO	Santa Cruz					1.20	1.20	1.20
SAIO	Okinawa (Santa Cruz)						1.20	1.20
Libertad (Aceite Fino)	Warnes (Santa Cruz)						1.20	1.20
Cordillera	Santa Cruz							1.20
CIAT (in constr.)	Saavedra (Santa Cruz)							1.00
CAISY (in constr.)	Yapacaní (Santa Cruz)							1.20
TOTAL		3.20	4.40	4.40	6.40	8.80	11.65	16.40
Public Plants		2.20	3.40	3.40	3.40	3.40	3.65	5.70
Mixed Plants		1.00	1.00	1.00	1.50	1.50	1.70	2.00
Private Plants		.00	.00	.00	1.50	3.90	6.30	8.70

producers gained experience, growers participated in the program independently of other institutions. This was particularly true in Santa Cruz and Gran Chaco. In Chuquisaca this process will progress at a slower pace, because of the small amounts of the land owned by farmers, but there is a tendency to form several smaller groups of seed producers. Farmer cooperatives will play an important role in this respect. The RSC participated in this activity by helping in the formation of support components for commercial seed production, such as research on varietal improvement, foundation seed production, seed marketing and utilization.

The level of production from the beginning of the different regional programs are shown in Table 3. There is great potential for developing similar seed production programs in the departments of Cochabamba, Potosí and Tarija. Technical assistance is needed to form the basic production structure for those regions.

Table 3. HISTORICAL PRODUCTION LEVELS OF CERTIFIED OR FISCALIZED SEED IN THE THREE REGIONS FOR WHICH TECHNICAL ASSISTANCE WAS PROVIDED

	Year						
	1980	1981	1982	1983	1984	1985	1986+
	(Metric Tons)						
<u>Santa Cruz</u>	*						
Soybeans	0	450	801	1017	1545	4507	4000
Rice	0	0	0	160	185	180	400
Corn	0	0	0	200	367	297	600
Cotton	0	0	0	0	0	0	80
Common Beans	0	0	0	49	94	37	25
Sub-total	0	450	801	1896	2902	5000	5505
<u>Gran Chaco</u>	*						
Soybeans	17	79	70	70	80	350	338
Corn	0	0	0	0	10	0	2
Sub total	17	79	70	70	90	350	340
<u>Chuquisaca</u>	*						
Wheat	17	0	25	0	97	63	100
Sub-total	17	0	25	0	97	63	100
Total	34	529	896	1966	3089	5918	5940

* Year in which technical assistance began.

+ Estimated production.

the program resulted in the creation of the RSC. Its formation was authorized by a Ministerial Resolution. Seed Councils were formed in six regions of the country.

The main responsibility of the Councils are to assure the development of the essential components of a seed program. Particular attention was placed on Seed Certification, which is the operation arm of the RSC. The RSC was responsible for financing the operational costs of Certification. To accomplish this, in Santa Cruz an agreement was reached with seed producers to contribute to the RSC 3 percent of the value of the processed seed. In turn, the RSC used the money to finance the operational costs of Certification Services in the region.

Success achieved in the seed programs of Santa Cruz, Chuquisaca and Gran Chaco can be attributed in great part to the development of the Councils. In these regions the advisers were instrumental in orienting members of the RSC on program development strategies and the analysis of available alternatives. This collaboration facilitated the work of the adviser and allowed him to make decisions that were in the best interests of the region. Unfortunately, in regions without technical assistance, the RSC did not develop as fast. Formation of the RSC was a major contribution of the advisers in regional program development. I strongly believe that the seed programs of Cochabamba, Tarija and Potosí will not grow at the level of Santa Cruz, Chuquisaca or Gran Chaco without the provision of technical assistance.

D. Seed Production

Seed Production was initiated at the same time the advisers began training Certification technicians. Strategically, the programs began by advising on the production of a single crop, or "lead crop". The lead crop was selected with the following criteria: it should be a crop for which there is already a demand; it should be easily produced and should lend itself to field inspections and laboratory work; it should be relatively easy to process; it should be a crop for which the technology exists to produce genetic and foundation seed and whose genetic purity is easily maintained. The lead crop for Santa Cruz and Gran Chaco was soybeans and for Chuquisaca, wheat.

Seed production fields of the lead crop were used by the advisers as training laboratories to train Certification personnel as well seed producers. As experience was gained by Certification personnel and by seed producers, other crops entered the program. In Santa Cruz, corn entered the program almost immediately after soybeans. Then rice, wheat, common beans, forages, potatoes, cotton and sorghum seed entered the certification program. In Gran Chaco, soybean was followed by corn, cotton and wheat. It is possible peanut will enter the Certification program in 1987. In Chuquisaca wheat was followed by barley. It is expected that in 1987 potatoes will enter. On some of the crops only laboratory analysis was performed (for example, forages in Santa Cruz).

Initially seed production was performed under the direct coordination of the interested institutions. The main ones were ANAPO in Santa Cruz, CORDECH in Chuquisaca and the Integral Cooperative in Gran Chaco. As the

E. Organization of Seed Producing Groups

The availability of basic services to seed producers, such as quality control, technical assistance and seed conditioning services, facilitated the formation of seed production groups. During the early stages of the program the advisers provided direct technical assistance to growers. As the program developed, direct assistance was not possible, but the trained technicians of Certification provided these services. Table 4 shows the number of seed producing groups involved in the program.

Table 4a. NUMBER OF GROUPS (COMPANIES) INVOLVED IN SEED PRODUCTION DURING THE 1986 SEASON (BOTH SUMMER AND WINTER)

Region	Crop						Total
	Soybean	Wheat	Corn	cotton	Rice	Beans	
Santa Cruz	26	4	11	4	15	1	61
Chuquisaca	0	3	0	0	0	0	3
Gran Chaco	6	1	1	1	0	0	9
Total	32	8	12	5	15	1	73

Table 4b. NUMBER OF COOPERATING FARMERS PRODUCING SEED FOR THE GROUPS LISTED ABOVE

Region	Crop						Total
	Soybean	Wheat	Corn	cotton	Rice	Beans	
Santa Cruz	66	125	12	9	16	19	247
Chuquisaca	0	450	0	0	0	0	450
Gran Chaco	51	1	1	1	0	0	54
Total	117	576	13	10	16	19	751

The 55 groups of seed producers that participated in 1986 seed production campaign can be divided into four groups according to their organization. These are:

1. Specialized Farmers. These are individual farmers that decided to become seed producers. Normally these are progressive farmers owning more than 50 Hectares. They produce the seed, pay the cost of certification and use the services of public processing plants. Their seed is

marketed partly as retail sales and partly (all in some cases) wholesale. Examples are Carlos Rojas and Jorge Serrate in Santa Cruz and Julio Gumiel in Yacuiba. There is none in Chuquisaca yet.

2. Seed Companies. There are a small number of groups operating in this category. Seed production is done through contract with cooperating farmers. They have their own processing facility. Marketing of the seed is done through retail sales. Examples are Semillas La Libertad, Semillas SAIO, and Semillas Cordillera in Santa Cruz.

3. Cooperatives and Associations. These constitute a small number of groups, but they produce the largest volume. Seed production is done by their associates. They have their own processing facility or use the services of the public processing plant. Marketing of the seed is done through retail sales. Examples are Semillas CAICO in Santa Cruz, Semillas Gran Chaco in Gran Chaco and ASOPROHL in Chuquisaca.

4. Public Institutions and Projects. There are several public institutions involved in seed production. Seed is produced through contract with cooperating farmers. Normally the institution provides the seed and some chemical inputs such as fertilizer and herbicides. Marketing is done through retail sales or distribution to members. Examples are CIAT and Vallecitos in Santa Cruz and CORDECH and CARITAS in Chuquisaca.

The organization of the different production systems has been encouraged according to the needs of each region.

F. Formation of the National Seed Council

Seed program development took place at the local level, with a primary objective of improving seed for regional needs. As the regional programs developed there was a need to coordinate activities among regions. It was necessary to create a National Seed Council (NSC) to facilitate the coordination of seed activities in the country. The first evidence of this need was seen during the Third National Round Table on Seed Production, held in Chuquisaca in August of 1985.

The NSC was formed after the Round Table, and had its first meeting in October of 1985 in Santa Cruz. It is formed by two members of each RSC, one from the private sector and one from the public sector. It is presided over by the Director of the National Seed Department of MACA. To date, the NSC has had several meetings. Its most important contribution so far has been the approval of a new seed law. This law has been presented to the Bolivian Congress.

The main function of the NSC is to coordinate activities among RSC's and to obtain financial support according to regional needs.

G. Summary

The T-059 Project began providing technical assistance in seed improvement in June of 1980. The Department of Santa Cruz was the first region to receive this support. In 1983, the provision of technical

assistance was expanded to the Gran Chaco Province in Tarija and to the Department of Chuquisaca. The main job of the advisers during the early stages of the program was to coordinate with local institutions with regard to quality control services, technical guidance to producers and seed conditioning services. It was intended that Seed Certification provide the first two services and the publicly owned seed processing facilities provide the third.

Parallel to the formation of basic services, the project attempted to initiate local production of a "lead crop". Some frustration was experienced, but the attempt served to provide experience in seed production and to train Certification technicians. Results were obtained approximately two years after the initiation of the programs. Currently there is a total national production of some 6,000 metric tons of seed.

Although the seed production programs were successful in Santa Cruz, Gran Chaco and Chuquisaca, little progress was made in the regions in which no technical assistance was provided. The adviser must be stationed in the region in order to provide an efficient service. Providing temporary technical assistance to a region proved to be ineffective in developing seed programs. This was attempted with Potosí, in which the adviser for Chuquisaca was to assist Potosí through periodic visits to the region. This did not work because developing the programs in each region was a full-time job. Working in both regions diluted the adviser's time and contributed little to the development of Potosí. It is better to concentrate in a single region.

Due to the great potential for developing seed programs in the departments of Cochabamba, Potosí and Tarija, it is highly desirable that a second project be initiated in seed improvement to provide technical assistance to those regions. Technical assistance is needed to develop Seed Certification, foundation seed units, and Regional Seed Councils and to train seed producers. It is unlikely that these institutions develop without expert assistance like that provided to Santa Cruz, Gran Chaco and Chuquisaca.

The formation of the RSC's and NSC facilitated coordination at the regional and at the national levels. It is expected that the current structure of the programs will ensure continuity.

H. Recommendations

1. USAID should implement a new project of technical assistance for five years' duration. This project should include:

* For Cochabamba, Potosí, Tarija, Chuquisaca, and the Gran Chaco, technical assistance in the production of genetic and foundation seed.

* Training at the post-graduate level for certification technicians and personnel of the foundation seed and research units.

2. The Regional Councils should take action in order to ensure proper functioning of Certification Regional Services. The National Seed

Council and the Seed Department of MACA should support these initiatives.

3. The experiment stations should establish programs for the production of foundation seed which would permit the efficient administration of these units. They also should include coordination and quality control mechanisms. The directors and executives must support these projects in all their phases.

4. Plants for seed processing in the public sector should provide services to all seed growers registered by Certification. Administration must be diligent and efficient and should include a program for quality control.

PART II. PROGRESS OF THE SEED PROGRAM IN SANTA CRUZ, 1985-86

A. Background

At the beginning of 1985, the seed program adviser in Santa Cruz, Dr. Adriel E. Garay, accepted a position with CIAT, Colombia, and in mid-April he left the country. His position was filled by Dr. Juan A. Landívar. Prior to his departure from Bolivia, Dr. Garay presented in his final report a complete analysis of the development of the seed improvement program in Santa Cruz. In order to avoid duplication, this report will cover from April 1985 through the end of the project.

B. Evaluation of the Program in 1985

As described by Dr. Garay in his final report, at the beginning of 1985, the regional program was in an advanced stage of development. At that date the program reported improved varieties of soybean, rice, wheat, cotton and beans. Foundation seed production of these crops was developed, but with serious organizational problems, mainly where quality control was concerned. The need to carry out a production scheme to facilitate quality control was observed. There also existed the need for training in varietal purification and production of foundation seed.

During the summer 84/85 campaign approximately 30 groups were involved in seed production. Seed quality was acceptable, but most seed production was of the fiscalized category (emergency category). Existing technology permitted production of the certified categories, but the lack of planning in carrying out the multiplication chain (production of registered seed as a step between foundation and certified) on the part of seed producer groups didn't allow it.

In January 1985 only three seed processing plants existed, one public and two private. The public plant was providing processing services to seed producers that needed them. The private plants were providing services to some seed growers, but they naturally gave preference to their own production.

Seed production didn't meet local demand. The deficit was covered by a decreasing quantity of imported seed. Although the potential demand of wheat seed was considerably above local supply, production was not completely marketed. There was a need to develop marketing channels.

The use of improved seed increased year after year but at the beginning of 1985, the use of rice and corn seed was low. Approximately 70 percent of commercial producers of soybean and wheat used improved seed as a result of the support of the Association of Oilseed and Wheat Producers (ANAPO). In order to improve the use of wheat and rice seed, similar kinds of support were necessary on the part of the corn and rice associations (PROMASOR and ASPAR, respectively).

The Regional Certification Service had a team of field and laboratory inspectors able to provide quality control services and technical assistance to all seed producer groups registered in Certification. These technicians had received in-country training and training in CIAT, Colombia. It had been necessary to intensify the training of Certification personnel to ensure the quality of services as the program continued growing.

The region could claim a Seed Council conscious of the need to support the seed program. The Regional Seed Council of Santa Cruz is highly responsible for the development of the regional program and to a great extent, the national program. The Regional Director of the Certification Service received from the Regional Council all the support required in order to execute organizational and administrative decisions. But these decisions did not give much support to actions directed toward improving the quality of the seed, principally genetic and foundation seed.

In summary, the regional program of seed production was in a stage of accelerated development in 1985. Participation of the private sector was increasing year to year and there was more and more commitment to development by means of investments in seed drying and processing plants and air-conditioned warehouses. The need existed to improve the foundation and genetic seed production schemes and to develop marketing channels in order to encourage the utilization of improved seed. There was also the need to continue training of research technicians in the foundation seed and Certification units.

C. Progress of the Program during 1985 and 1986

1. Research in Varietal Improvement

Considerable progress was achieved in releasing wheat varieties. During the summer of 85/86, CIAT released two varieties of wheat (Milla-Leu and Paimistol). Foundation seed of these varieties was put on sale for winter multiplication (1986). In addition to these two varieties, the multiplication of genetic seed of two more varieties was started. It is expected that enough foundation seed of these two varieties will be available for distribution among seed growers in winter of 1987. Release of these four varieties ensures the future of the wheat seed program.

With regard to soybean, a new variety (Doko) was released. This variety has acceptable yields during winter and summer.

I wish to leave the following recommendations for the researchers and directors of CIAT:

a. It is noted that the genetic quality of soybean and corn varieties is degenerating. Researchers must maintain a program of purification and maintenance of varieties in order to obtain seed of high genetic purity. Researchers in the wheat program should also maintain similar programs to ensure the quality of the new varieties.

b. Efforts to produce genetic rice seed free of red rice should continue. I also foresee the need to hire and train one more technician to support the production of genetic seed for rice.

c. In coordination with ADEPA, research should continue in varietal improvement of cotton. Hiring of a technician in order to initiate the production of genetic seed of recommended varieties is necessary. Also it is necessary to equip CIAT with a small gin and mechanical delinter.

d. It is highly recommended to initiate research and production of genetic seed of sorghum varieties. The interest of PROMASOR in coordinating this new program should be exploited.

e. Researchers in the common bean program of "El Vallecito" station should coordinate activities with the Regional Council and with Certification to strengthen the chain of bean seed production.

f. Researchers for the different crops, both in CIAT and in "El Vallecito", should support the foundation seed units in quality control of foundation seed (mainly in verifying genetic purity), since their efforts will reach the farmer through the seed.

2. Production of Foundation Seed

CIAT has progressed sufficiently in supplying adequate quantities of foundation seed of the varieties recommended for soybean, corn, rice and wheat (with the exception of the Cristalina variety of soybean). However, due to lack of coordination among researchers and the foundation seed unit, the genetic purity of most crop varieties is poor. An effort was made to improve genetic quality through purification. This work, however, combined with the work of producing 14 varieties of 4 crops, was too much to be carried out by two technicians.

The following recommendations apply for this area:

a. Since production of foundation seed is one of the more important components of the seed production program, CIAT must reorganize the foundation seed unit. Reorganization should include the following mechanisms:

- * Internal quality control
- * Coordination between the Regional Council (sub-sectors) and the foundation seed unit
- * Agile and independent administration
- * Incentives for technicians
- * Fund raising
- * Self-financing

b. USAID and other financial institutions should provide technical assistance support to CIAT. The Regional Council should give high priority to assisting CIAT in obtaining this support.

c. CIAT should coordinate with ASPAR to determine requirements and projections of foundation seed of the different rice varieties.

d. In conjunction with ADEPA and PROMASOR, production of foundation seed for cotton and sorghum, respectively, should be initiated.

e. In order to secure a continuous supply, at least a similar amount to that required for one year of foundation seed must be stored for varieties of all crops. This will protect the program against bad production years and unexpected increases in demand.

3. Commercial Multiplication

Availability of quality control, technical assistance, processing and marketing services, resulted in the rapid development of this component. The more outstanding achievements are the production of 100 percent of the demand for soybean seed and the production of approximately 75 percent of the regional demand for cotton seed. In relation to commercial production, the increase in the number of seed plants is also outstanding. At the end of 1984 there were only three plants. At the end of 1985 there were five functioning. It is expected that at the end of 1986 the region will have a total of nine seed processing plants.

This development has been very accelerated, while internal quality control has been neglected. This has occurred both in the field and in the processing plants. The Regional Certification Service rejected a great number of seed lots that were proposed for certification.

a. Seed producer groups should seriously consider hiring technicians to carry out internal quality control. This recommendation also applies to seed processing plants.

b. Emphasis must be put on internal quality control during harvest since late harvest, mechanical damage and delays in seed drying are the main causes for losses in the physiological quality of the seed.

c. Groups of seed producers should plan production of registered seed in order to alleviate the demand for foundation seed and to reduce production costs. Registered seed must be utilized only for the production of certified seed, not for commercial planting.

d. Producers of cotton seed need to acquire infrastructure for aerating cotton fiber and mechanical delinting.

4. Seed Marketing and Utilization

Participation of producer associations in seed marketing brought significant increases in seed utilization. ANAPO, in conjunction with soybean seed producers, coordinated market channels for 4,000 metric tons of soybean seed in 1985. It is expected that during the 86/87 summer campaign, PROMASOR will market approximately 550 metric tons of corn seed of the Swan variety (double that of previous year) and approximately 150 metric tons of imported hybrid corn. This represents an increase in utilization of improved corn seed of 35 percent. Similar results in the utilization of rice seed are expected with the participation of ASPAR.

The above examples demonstrate the importance of the role that producers associations play in seed marketing and the resulting impact in utilization of improved seeds.

Recommendations are as follows:

a. USAID, PL-480 and other financial institutions should consider granting credit to producer associations for seed marketing.

b. In wheat seed marketing, ANAPO, CIAT, and other seed suppliers should differentiate prices between the different categories. This differentiation will encourage production of registered and certified categories, as opposed to fiscalized.

5. Seed Certification

During the past two years, the Regional Certification Service continued improving the quality of its services. The most important achievement for this component was the self-financing of its operating costs. In the future it is expected that growth in the program will bring an increase in funds to cover the costs of vehicle replacement and other operating equipment. With regard to quality control services, in 1985, Certification managed to carry out three inspections of more than 5,000 hectares of seed fields and to make approximately 2,000 purity analysis and germination tests.

It is hoped that Certification will consider the following recommendations:

a. To ensure the quality of its services, the Regional Council must concern itself with the training of Certification technicians. A sufficient number of trained personnel must be available to make sure that any technician who leaves can be immediately replaced by another technician of similar level.

b. The creation of an information, promotion and transmission department within the Regional Certification Service should be considered. This decision must be made on the basis of available funds in the operating budget. The purpose of this department would be to promote the utilization of improved seeds.

c. Certification should continue organizing evaluation meetings for the rice, soybean, wheat, corn and cotton seed production programs, and should encourage the development of programs for bean and sorghum production. These meetings will be more effective if they are attended by researchers, technicians and managers of producer associations for the crop in question, and also by Seed Certification staff.

D. General Recommendations

1. Since at the national level, research in varietal improvement, genetic seed production, and foundation seed production are presently the weakest components of the production chain, it is recommended that USAID continue providing technical assistance to experiment stations.

2. Producer associations should provide financial support to experiment stations for the production of genetic and foundation seed. Also, producer associations and experiment stations should coordinate and

plan foundation seed production for the different varieties.

3. ADEPA should coordinate with CIAT to initiate a program to produce genetic and foundation seed for cotton.

4. PROMASOR should coordinate with CIAT to initiate a program for varietal improvement and for the production of genetic and foundation seed for sorghum.

5. Seed companies should implement internal quality control programs in order to meet the increasing demand for seeds of high quality. These efforts must be intensified during the harvest and drying stages. Also, quality control programs should be implemented in the seed processing plants. Particular attention should be given to quality control during reception of seed by plants.

6. USAID-PL-480 and other financial institutions should consider granting credit to producer associations for seed marketing.

7. To encourage the production and utilization of improved rice seed, ASPAR should actively participate in planning the production of foundation and certified seed and seed marketing.