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CHEMONICS
INTERNATIONAL CONSULTING DIVISION

FINAL REPORT

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SEEDS ADVISOR

SUBMITTED TO

THE MINISTRY OF RURAL AFFAIRS AND AGRICULTURE

AND TO

THE REGIONAL SEED COUNCIL IN SANTA CRUZ

BY

CHEMONICS INTERNATIONAL CONSULTING DIVISION

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MAY 1980 - MARCH 1985

I BACKGROUND

The Agricultural Sector II 511-T-059 Project, included an 18 person/month position in seed technology. The expert was to provide services throughout the country, and was to be based in La Paz. At a later date, the Ministry of Rural Affairs and Agriculture (MACA) reconsidered and recommended that the expert reside in Santa Cruz due to the importance of this agricultural region. Dr. Adriel E. Garay, the author of this report, was hired to fill this position.

The activities of the Seeds Advisor began in May, 1980. Due to political problems in Bolivia, there was an interruption of activities during July and August of that year. In September, the Advisor finally established his residence in Santa Cruz and worked without interruption until the present.

Initially, the Advisor intended to work throughout the country. However, it gradually became clear that this intention was diluting the Advisor's efforts and impeding his effectiveness. The need to concentrate efforts in regions according to their importance was identified. Factors considered included the level of regional interest, the need, the Advisor's capacity, and the human resources of counterparts available within the Project.

In view of the above, Santa Cruz was identified as the priority area. Although dependent upon the availability of Project resources and local interest, subsequent progress was to be achieved with concentrated efforts in Yacuiba, Chuquisaca, and other regions.

II SEED SITUATION IN SANTA CRUZ AT THE INITIATION OF THE PROJECT

The agricultural sector in Santa Cruz demonstrated a high level with regard to credit, mechanization, use of pesticides, marketing, etc. In contrast, seed production revealed an underdevelopment which could be diagnosed by the following characteristics:

1. Common and ordinary grain of poor quality was generally planted as seed.
2. Most varieties of soybeans, corn and rice were obsolete. In the case of wheat, planting was incipient.

3. A certain amount of soybean and corn grains was offered in the region as "seed". Even MACA was selling seed which demonstrated a very low germination rate (40-50 percent), low vigor, and other problems.

4. Imported seed was mainly used for soybeans and cotton.

5. No certification services existed, i.e., no work was done in inspection, sampling, analysis, etc. The quality of imported and local seeds was not controlled.

6. No seed program existed. There was confusion of objectives among the institutions and even within entities such as MACA. This institution carried out, or wanted to carry out, activities such as production, conditioning, certification, sale, and price control, which are conflictive activities.

7. MACA was interested in setting up a National Seed Enterprise, without having first attempted to develop the seeds supply in a more simple and practical way.

8. On the other hand, some very important resources also existed.

* The producer and farmer associations, were concerned and interested in using seed of better quality.

* There were entities such as associations, CIAT, MACA, and private enterprises which could be brought into an integral seed program.

* External financial support and technical assistance existed, which could serve as a catalyst to bring together the scattered human resources.

III PROGRESS

Based on the need, interest and available resources, the diagnosis revealed that it was necessary and possible to organize a seed program. Taking advantage of the common concern that existed among producers of soybeans, the Advisor demonstrated that the seed they were using, both local and imported, was of poor quality. Imported seed was losing its germination and vigor while being transported in metallic rail cars. It was demonstrated that local seed, technically handled, could be of superior quality.

A. Progress in Seed Production

Due to the lack of counterparts, the initial need to concentrate efforts on only one crop was identified. Soybeans was selected for two related reasons:

* The great effective demand observed among producers in the purchase of quality seed.

* The interest on the part of farmers and institutions to produce local seed.

Figure No. 1 demonstrates the progress achieved in production which was initiated during Summer 1980-81 with traditional varieties of soybeans such as Mandarin and Pelicano and some UFV-1. This growth came about as a result of a certain level of interinstitutional coordination and technical assistance from the Project. During the first year of work, the installation of the first seed conditioning plant in Warnos was initiated. The construction could not be completed by April 1981 as originally planned. Moreover, the months of March-April were very rainy, and as a result, all seed was lost before harvest.

Through repeated meetings with the Board of Directors of the Soybean Producers (ANAPO) and direct contacts with more progressive farmers, a small seed production plan for the winter season was established. To carry out this plan, ANAPO imported by air cargo 30 tons of the UFV-1 variety, since planting was already delayed. Assembly of the Warnos plant was completed in August and seed began maturing in September. At the beginning, the process of seed conditioning in Warnos was viewed with much distrust on the part of seed producers. Approximately 450 tons were conditioned and the quality was excellent. The interest shown by ANAPO and the seed growers increased and credibility in the project was achieved.

From that moment on, the Project was oriented towards realistic and clear objectives, with the following basic concepts:

1. To direct efforts at crops in order of their importance. To look for short-term impact and the possibility of gaining resources for local services. These efforts, focused primarily on soybeans, continued through the following year.

2. To develop local services which would serve to promote and support seed producers in an effective way. This objective included the following services:

- * Supply of foundation seed from CIAT.
- * Drying and conditioning services in Warnos.
- * Certification Service of MACA.

These services were designed to activate the formation of associations of farmers and seed producers which did not yet exist. As a complementary activity it was established that reference prices would be provided by the association itself.

3. To assign specific but complementary responsibilities to the various components of the seed program.

During the following years, seed growers began forming associative, individual, managerial and institutional groups. Gradually the seed growers began to work with corn and rice. CIAT enjoyed great success in its special wheat program in the high valleys of Comarapa and Vallogrande.

The amount of certified seed produced increased annually. In 1983, production was limited due to lack of greater capacity in drying-conditioning. In 1984, two private plants initiated their work and another increase

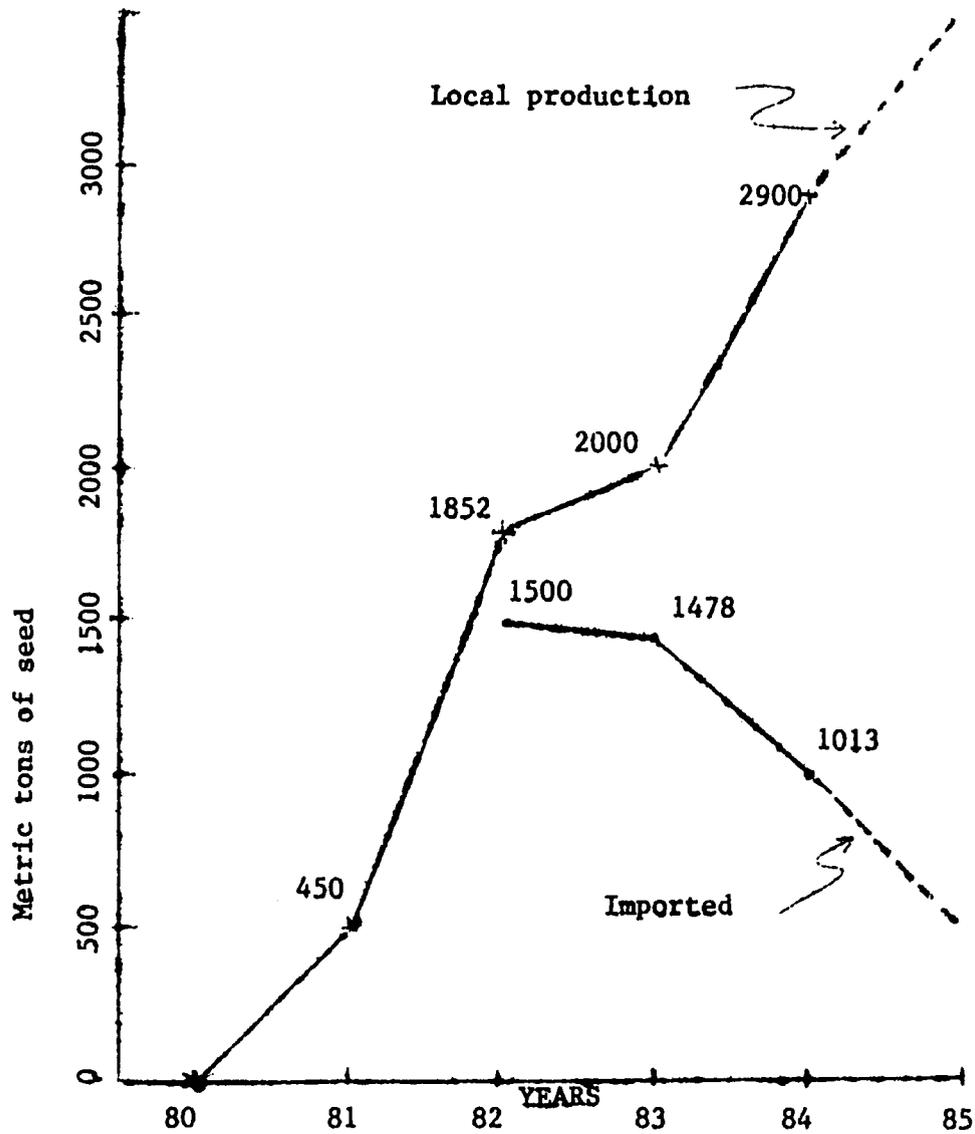


Figure No. 1 AMOUNT OF CERTIFIED SEED PRODUCED LOCALLY AND IMPORTED SEED SINCE THE BEGINNING OF THE SEED T-059 PROJECT OF USAID-MACA-CHEMONICS

————— Historical amounts
 - - - - - Projected amounts

in production was experienced. It is estimated that the level of production will increase in the coming years, yet the lack of diffusion and marketing programs could be limiting factors.

As local production increased, importation diminished, especially of soybeans. On the other hand, the importation of sorghum, hybrid corn and cotton (crops not addressed by the project), revealed a tendency to increase.

B. Progress in Quality Control

The production of certified seed has increased. At the beginning, certification personnel, due to their reduced number and multiplicity of required activities, worked on a superficial level. With the formation of the Regional Seed Council, which immediately created the Regional Seed Certification Service in cooperation with MACA, a systematic and more technical effort was initiated and was developed in the following stages: registration of seed growers, field inspections, sampling of bagged seed, analysis, labeling, and record keeping.

Progress obtained in the quality and number of analyzed samples is presented in Figure No. 2. The progress in germination is shown for soybeans since this is the most delicate seed. It is observed that during the first year, germination was excessively low. This germination has increased annually, despite the fact that larger volumes were handled on an annual basis. The improvement in quality is a good indicator of the technological improvement during the stages of production (field, seed plant, quality control). It is expected that in the future, quality will continue to improve, but less rapidly. The areas which need improvement are: purity and disease control in wheat, purity in rice, and germination and vigor in soybeans and corn.

C. Progress in Conditioning Infrastructure and Creation of Seed Producing Companies

Initially, the companies used the services of the Warnes plant. Some seed growers, after watching this plant's operations, started to make plans for setting up their own plants. The Advisor, in cooperation with the advisor in Sucre, provided support in different aspects of design and construction for plants of the private sector. Deficiencies in the design and quality of some machinery were noted and support was given, when possible, to solve the problems encountered. Mainly, this was attributed to the fact that specifications were not provided with sufficient advance time.

For three years only the Warnes plant existed (see Figure No. 3). In 1982, the private plant of Semillas Horizonte started its work, which to date has completed the installation of a drying warehouse, but does not have conditioning machinery. In 1983, the construction of CAICO and Cordillera plants was initiated, which entered into operation in 1984. That same year, construction of the I.A.S.A. plant began. Initiation of construction for the Foundation Seed plant in Saavedra is foreseen for 1985.

The seed plant in Warnes plays a role in promotion and education because it constitutes a small but complete model, equipped with driers, conditioning machinery and climatized storage room. Its impartial and

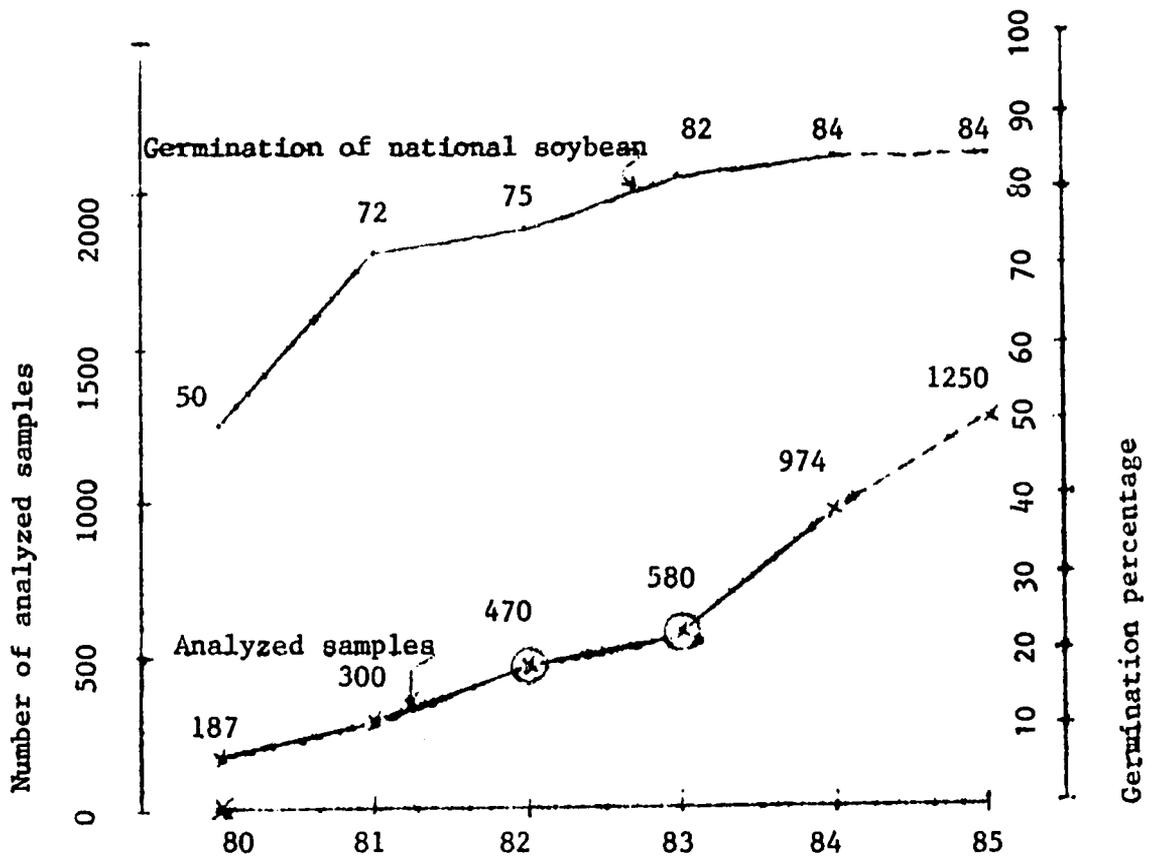


Figure No. 2

GERMINATION AVERAGES OF SOYBEANS AND TOTAL NUMBER OF ANALYZED SAMPLES SINCE THE BEGINNING OF THE SEED T-059 PROJECT OF USAID-MACA-CHEMONICS

————— Historical amounts
 - - - - - Projected amounts

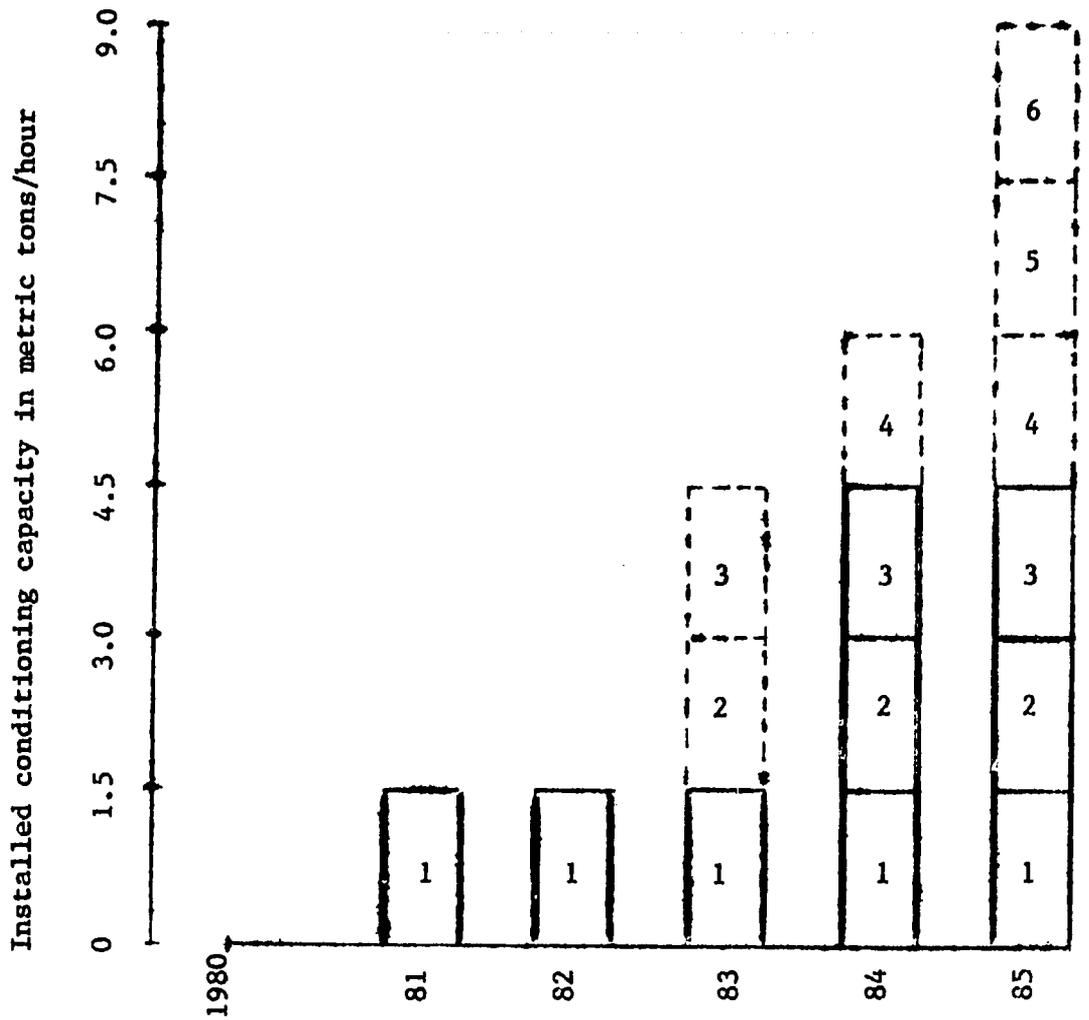


Figure No. 3

NUMBER OF SEED PLANTS AND THEIR INSTALLED CONDITIONING CAPACITY IN SANTA CRUZ

- Plants with driers, machinery and air-conditioned or natural warehouse, complete
- - - - - Plants at the beginning of construction, in the middle of it, or incomplete.

~~effective service encourages and maintains~~ the interest of seed growers who do not have their own plants. This effort constitutes a strategy essential to providing impulse to the seed activity in the region.

In 1985, the construction of the foundation seed plant will begin. Its importance lies in its capacity to handle seed of this category, which will be distributed among seed growers of the region. From this point of view, both the Warnes and the foundation seed plants comply with the strategy of serving as encouragement and support for seed activity, without competing with the private sector plants.

Despite the already existing and projected plants, special attention will still be required for rice, forage, and cotton seeds; moreover, air-conditioned storage facilities are required in the region.

D. Progress in Diffusion of Varieties and Yields

It is difficult to estimate the progress achieved in yields for all crops in the region. Taking soybeans as a measure, it is observed that from 1980 to 1984 factors such as mechanization, cultivation systems, climate, etc. remained relatively comparable. However, average yields have increased from 1 ton/hectare to 1.7 to 2.1 tons/hectare. A great deal of this increase can be attributed to the quality of the planted seed, due to the following reasons:

- * Planting of superior genotype. Seeds of varieties with more yield potential are being planted.

- * Seed of good quality, due to better rates of germination, vigor, purity and freedom from disease, is a consequence of the good handling and quality control being carried out.

During the first year, soybean producers were planting the Polícano and Mandarin varieties, which have a reduced capacity to set fruit, produce a great deal of vegetative growth and have a tendency to lodge. At present, the UFV-1 variety is planted in 40-50 percent of the area. This variety has high yields. Another 40-50 percent of the area is planted with the IAC-8, Cristalina and Bossier varieties. Because of its excellent adaptability to winter climate, the IAC-8 variety offers great possibilities for extending the commercial production of soybeans for oil during that season so as not to depend only on the summer production.

Through the program, the Swan variety yellow grain corn has been promoted and has been well accepted. In rice, the use of variety CICA-8 is encouraged without neglecting the traditional varieties. In wheat, the use of the Jaral variety, which originated from the valleys was discouraged; the Quimori variety was eliminated because of its susceptibility to disease; and planting of the Saguayo variety was promoted. Planting of this variety also has been encouraged in Chuquisaca and Cochabamba with excellent results.

In the future, the need to replace the Cristalina variety of soybeans is foreseen, as well as the introduction of new varieties of wheat within the seed program, and initiation of hybrid corn production.

E. Progress in Development of the Program

The regional program was organized on the basis of resources available in the region. The objective of the program is to establish an active and effective system to supply seeds. The program itself is made up of a series of essential activities which, operating in a synchronized and complementary way, facilitate production and utilization of better seeds by farmers.

The structure of the seed program in Santa Cruz is presented in Figure No. 4. Its operation consists of the following:

1. Research: Identifies the varieties best suited to the region, and recommends and prepares genetic seed. This seed is prepared by the researchers themselves and it does not represent more than a few kilos or hundredweights.

2. Foundation Seed Production: Receives the genetic seed, reproduces it maintaining quality and distributes the seed among registered seed producers approved by Certification. This activity was organized by CIAT. It is necessary to continue strengthening this unit with infrastructure, training and vehicles.

3. Commercial Seed Production: This activity has been implemented by seed farmers and seed companies. Its objective is to receive foundation seed and improve it for the registered and certified categories. At present, there are several seed companies with their own brand such as: Semillas CAICO, "Vigorosa", "Cordillera", "Horizonte", "Somillas del Sur", and others. This produces a certain amount of competition and allows the farmer to choose the seed at his convenience. In the region, wheat seed in its totality, is being produced by CIAT in a very effective manner.

4. Marketing and Distribution: Several channels of distribution currently exist. Most of the seed companies still do not have their own infrastructure. However, they are able to market seed that is finished and ready for planting. This has been possible due to existing services. The need to support this activity through a more aggressive program of diffusion is foreseen.

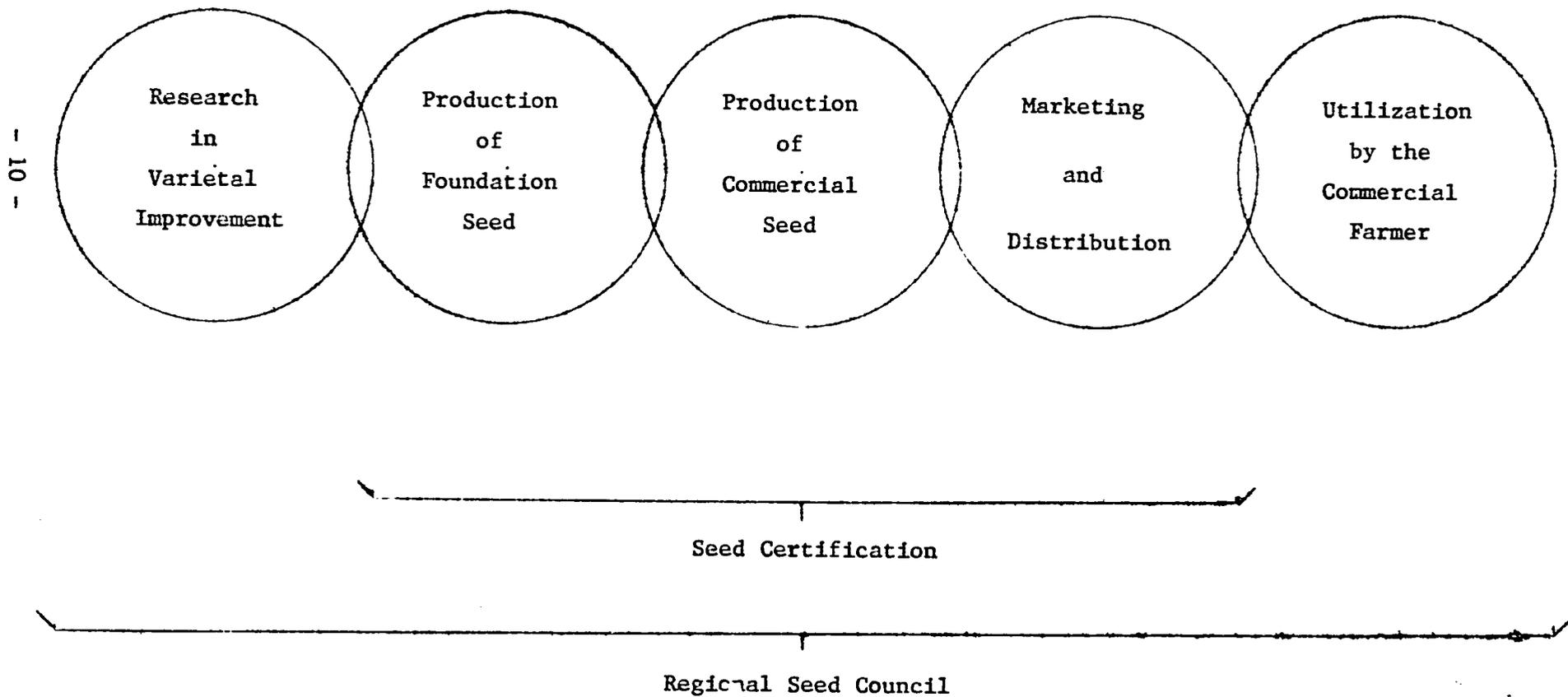
5. Utilization: Approximately 70 percent of soybean and wheat seed producers use certified seeds. Utilization in corn is considered to be 20 percent; while in rice it does not reach 5 percent. This is one of the activities that will need support, especially in a new project.

The chain of mentioned activities facilitates the flow of seeds of superior varieties from the experimental station to the farmer's field, allowing for the increase from the few kilos delivered by the researcher to the several thousands of tons that farmers require.

6. Seed Certification: This activity is carried out by the Regional Seed Certification Service. Its function is to control quality in all production stages. By its nature, this activity also coordinates varieties' eligibility, seed flow, the level of infrastructure utilization, and other aspects.

Figure No. 4

SEEDS PROGRAM IN SANTA CRUZ



7. Regional Seed Council: The Council is formed by public and private institutions related with the seed program. It dictates regional policies of the seed sector and orients the program's functions. The Council has played an effective role in the organization of the Certification Service.

Although the Advisor has worked in all activities of the program, his role incorporated four principal aspects:

- * to orient the strategies which provide impulse to the system;
- * to provide technical assistance in the different activities, with concentration in services of Warnes, Certification and general infrastructure;
- * to form human resources, and
- * to coordinate and synchronize functioning of the integral program.

IV CONCLUSIONS AND RECOMMENDATIONS

The results achieved indicate that the seed activity has progressed in its institutional organization, infrastructure, formation of counterpart personnel, magnitude and quality of the seed. The level of interest and complementary participation of institutions and seed companies anticipate the possibility of major progress in short and medium terms. However, it is necessary to secure some essential support:

1. The project has awakened the interest of the public and private institutions in the region. This sign of interest is noted in the level of investment of local funds which strengthens Project funds. In order to make investment recovery viable and to take advantage of the existing interest, the present Project should be extended, concentrating its resources in training and specialized technical assistance.

2. The activities of foundation seed production and seed certification require, as soon as possible, the equipment to develop said tasks. The Project must be certain that personnel trained are available to handle this equipment. Moreover, at the end of this Project, these activities must have some degree of financial and operative sufficiency.

3. To maintain the level of interest of the seed producers' sector in the region, the government must continue fulfilling its normative and promotion role as it has been doing through: the Certification Service and conditioning service in Warnes, the latter on behalf of a decentralized institution, such as CIAT.

From the point of view of seed program development, it must be pointed out that, despite the achievements, progress made up to this point only constitutes the first phase in the development of a seed supply system. Unfortunately, this Project, by its own limitations, has not produced local personnel with a deeper knowledge of seed technology. For this and other reasons, the development of a new project is recommended which would allow for continued efforts. The future program must take into account extension

into other zones and crops without forgetting the region of Santa Cruz, which must continue to be developed as a functional model within the country. Likewise, it should include components such as training in advanced university degrees and greater encouragement in the use of certified seed. It must be a project of integral nature, with intense participation of public and private institutions in its implementation.

In the following chapter, recommendations of a technical nature are presented. There is no doubt that as the seed program develops, new needs will arise. There will be more experience and some of the given recommendations will have to be reformed. In the same way, other recommendations will be needed to address new problems and new needs. The recommendations only attempt to address the most obvious aspects and not those of a technical nature, nor those that could arise in the day-to-day operation of a seed program. It is anticipated that the latter will be more frequent since the work for the seed technologists, has just begun.

V TECHNICAL RECOMMENDATIONS

A. The General Seed Program

1. Support must be continued with emphasis on foundation seed. Among the most important objectives should be mentioned wheat purification and delivery of larger quantities of rice foundation seed, free of red rice, without overlooking production of corn and soybean foundation seed. To fulfill these objectives, vehicles, a plant for the exclusive use of foundation seed, sufficient personnel, and operating funds are required.

2. Each and every one of the seed plants need to implement internal quality control. A course has been taught for this purpose. It should be the responsibility and interest of plant managers to carry out such control in order to avoid the kind of seed conditioning which has already been faced with irreversible quality problems. In this control, varietal purity, absence of red rice and rogelia, insect damage, thrips damage, fractures, etc. must be emphasized.

3. Aggressive dissemination is needed to awaken farmers' interest in high quality certified seeds. All available means must be utilized in this effort. For example, the video film on seeds, which is soon to be finished, should be presented with a certain frequency and the advertisement spot, of one minute duration, should be presented daily during the months of April-May-June and during September-October-November-December. Likewise, "Campo" magazine should be used as a way to reach institutions, enterprises and Certification.

4. Certification needs its own physical space to install offices and a laboratory. Improvement of services also requires vehicles and laboratory equipment as well as a study to provide orientation for its operational self-financing.

5. The Warnes seed plant must continue supporting the development of the seed regional program through capable and effective service. Due to the perishable nature of seeds, administration of the plant must not be centralized. On the contrary, it should be left completely decentralized

through satisfactory agreements between MACA and local entities. With these kind of agreements, certain amounts of funds could be directed to the support of certification services in regions where these activities are just beginning.

6. A ministerial resolution is needed to give authority to the Regional Seed Councils for importation of seeds. This would have several advantages directed towards improved coordination between the central government and the region in order to strengthen national seed production.

7. Special credit is required for seed producers, both for the production and storage stages.

8. Certification standards should be updated every year, in accordance with technological progress and new needs. In the case of wheat, the standards should be compatible with those of other regions of the country in order to facilitate interchange of seed. In the case of soybeans, the standards should be gradually made compatible with the ones in Brazil.

9. The Certification Service should take special care in the expansion of its services. It should not enter into other areas at the expense of weakening the current program. It is foreseen that the following areas would need support in 1985: the wheat seed program in Abapó-Izozog and the wheat seed program of CIAT in the high valleys.

10. The regional and national programs should continue emphasizing the creation of a good group of technical personnel within all elements of the program. Therefore, it is very important to continue providing training at all levels inside and outside the country.

11. In any crop, all importation of seed must be in accordance with local production. ANAPO has had good experience with soybeans, which should be valuable for other cultivars.

B. Recommendations Regarding Soybeans

1. It has been observed that the southern region, where the Mennonites work, could be an important area for soybean seed production. Nevertheless, it has been noted that they plant at very low densities and without inoculant. Seed companies could get better results if the Mennonite farmer could plant inoculated seeds at a rate of 50-60 kilograms instead of 30 kilograms. In this way, seed fields would also constitute demonstration fields for other soybeans producers in the region.

2. It has been noted that the Cristalina variety is too degenerated (it has several variations and is susceptible to diseases). Either a pure Cristalina should be obtained from Brazil or it should be replaced with some other variety of similar qualities, according to CIAT's recommendations.

3. There are promisory varieties such as DOKO and IAC-6, which should be imported in small quantities of 5-10 tons for the period 85/86 in order to observe its behavior at a commercial level.

4. Lack of climatized storage facilities is the most limiting factor for the soybean seed program. These facilities require all necessary support for a rapid implementation.

5. Every certification label should display the number of seeds per kilogram to facilitate the seed buyer's calculations. By knowing the germination percentage and the number of seeds per kilo, it is easier to calculate the quantity to be purchased in order to obtain the desired planting density.

6. Adequate depth for planting of recommended varieties must be investigated. The incidence level of the insect problem should also be considered, by investigating the problem from the field to the bagging stage as finished seed. These two aspects could be executed as a thesis topic without too much cost, simply by working through the Certification Service.

7. Certification needs to develop a methodology for the identification of varietal mixtures in seedlings (taking advantage of differences in planting depth, hypocotyl color, shade of cotyledons, etc.). This need becomes more urgent as similar varieties increase in the program.

C. Recommendation Regarding Corn

1. Greater institutional coordination is required to propagate the Swan variety. This variety has good characteristics and is well accepted, although it is recognized by only a few growers. Likewise, promisory varieties already exist whose propagation requires the participation of CIAT, PROMASOR, Certification, seed companies and the Seed Council.

2. The most effective way to demonstrate the good qualities and characteristics of corn varieties is through field days during the stage of selection of cobs. Certification and the seed companies could promote such activities.

3. It is necessary to study the possibility of producing hybrid corn seed locally, either on the basis of introduced parental or local lines, if available. In coordination with PROMASOR, seed companies should take interest in this aspect.

4. All certified corn seed locally produced should have information regarding shape, size, and number of seeds per kilo, which is very useful for the buyer.

D. Recommendation Regarding Wheat

1. A commercial production program is weak if it is based only on one variety. The release of a promisory variety must be accelerated. In the meantime, purification of Saguayo must be continued.

2. Exchange of wheat seed between Santa Cruz and Chuquisaca must be encouraged.

3. The CIAT-ANAPO seed program should regard with greater interest the early collection of wheat seed and its maintenance under climatized

storage facilities for timely sowing (April-May) in the lowlands of Santa Cruz. The lack of such a strategy forces farmers to carry out late plantings with the resulting dangers.

4. The new seeds (just harvested) of the valleys have a high level of dormancy (inability to germinate). This phenomenon can persist for 2-6 weeks after harvesting. This also indicates that for timely sowings, stored seed is essential.

5. The wheat seed program in the High Valleys should concentrate its efforts in more appropriate regions, with regard to the possibility of: 1) mechanization of planting and harvesting, 2) future expansion of area under production, 3) farmer specialization, 4) disease control of seed, and 5) nature of weeds. This information will be also necessary to provide guidance for the location of a seed plant in the future.

6. The price of wheat seed paid to the farmer-producer should be differentiated according to the category (foundation, registered, certified, fiscalized) and should also be discounted for percentage of humidity and foreign matter. Otherwise, there is a risk of favoring the mediocrity and irresponsibility of some farmers at the expense of more progressive ones.

7. With the understanding that the last wheat harvests in the valleys should remain for storage, it will be easier to extend the sowing and harvesting seasons. This would facilitate the increase of hectares in the most adequate regions. The less adequate zones could remain in a separate program for mill grains under other development programs, either within or outside CIAT.

8. The Certification Service should extend its services to the Abapó-Izozog program, by initiating the work of quality control for seeds to be distributed in 1985. The technicians of this project could also participate in short courses in and outside the country.

9. In years when it is possible to harvest wheat free of fungal diseases, part of the harvest could be stored in Santa Cruz during the winter. This could be profitable particularly when there is not enough stored seed from the valley program, and when a high demand is foreseen for early plantings in April-May. However, all the stored seed for the winter planting should only be used to complement the program of the valleys and should follow strict certification control, with emphasis on health and varietal purity. With this strategy of complementing the carry over of seed from the valleys and the seed stored in Santa Cruz, the present difficulty in availability of sufficient quantities for the appropriate time could be diminished.

E. Recommendations Regarding Rice

1. The increase in availability of completely pure foundation seed of Bluebelle and CICA-8 varieties is of urgent and fundamental importance.

2. It is necessary to stop the progress of red rice. This objective can be accomplished more rapidly through the increased availability of

foundation seed, greater supervision of the seed producers, and stricter control on the part of Certification.

3. The purified seed of Bluebelle variety released by CIAT should be more widely distributed.

4. For the production of rice seed, the search for regions free of red rice and rogelia must continue.