CHEMONICS

TECHNICAL ASSISTANCE TO THE AGRICULTURE SECTOR IN BOLIVIA

- LAND CLEARING
- SOIL CONSERVATION
- COTTON PRODUCTION
- INSTITUTION BUILDING
- INFORMATION SYSTEMS
- SEED PRODUCTION

FINAL REPORT OF THE AGRICULTURE SECTOR II PROJECT (511-T-059)

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SECTION I

INTRODUCTION

The Agriculture Sector II Project in Bolivia (511-T-059) was developed by the U.S. Agency for International Development (USAID) and was signed with the Ministry of Rural Affairs and Agriculture (MACA) in 1977. On May 4, 1979, Chemonics International signed a host-country contract with MACA, numbered 511-T-059-008-HCC, to provide technical assistance in support of project activities. The original technical assistance contract was for two years with a provision to extend for a third year. However, many events changed, which caused the project and the contract to be extended several times to September 30, 1986. The present report summarizes the activities and experiences of the technical team over the seven-year period of project implementation.

A. Original Project Design and Setting

The project concept was to meet a number of different needs in the agriculture sector at the same time. As a result, several unrelated activities were included, but they had two primary points of focus:

- Expansion of agriculture in the Gran Chaco, and
- Institution building at the central level of MACA.

The Gran Chaco is a remote region in the southeastern part of the country, bordering Argentina and Paraguay. Its agricultural potential was recognized in the early 1970's when the government built a large oilseed processing plant there to extract edible oil from soybeans, peanuts, cottonseed and other crops. The Bolivian market for edible oil was not satisfied by local production, which was concentrated in the Santa Cruz Department. ("Department" refers to a geographical subdivision of the country, similar to a state.) Considerable amounts of oil and substitute products such as lard were imported. Expansion of agriculture in the Chaco hinged mainly on clearing more land for cultivation. Hence the central activity of the project in the region was the operation of a pool of Caterpillar tractors, including a central shop for maintenance and repair. The activity was to be carried out by the Departmental Development Corporation of Tarija (CODETAR). Related activities included providing credit for land clearing and credit for soybean and peanut production through the Bolivian Agricultural Bank (BAB), and research and extension through the Bolivian Institute of Agricultural Technology (IBTA). The latter two institutions, BAB and IBTA, are part of the Ministry of Rural Affairs and Agriculture.

Simultaneously, USAID was implementing another project (T-055) to assist agricultural cooperatives, one of which was being formed in the Gran Chaco. The principal interface in project design was that the Integral Service Cooperative, "Gran Chaco," Ltd. would operate a pool of agricultural machinery, including tractors and combines. Hence this activity was not included in the original design for the T-059 Project.

In the second area, related to institution building, the emphasis was on sector planning, statistics, and reorganization of MACA. At the time, projects receiving support from USAID were not focused on the private sector. Instead, most rural development projects were limited to supporting the smallest farmers and were implemented through public institutions; in the case of Bolivia, these fell under the MACA umbrella. At the same time, the agriculture sector in Bolivia has traditionally had little importance in the eyes of public officials, and policy reflected this attitude. MACA received a small share of the budget, had little authority and influence, and was gradually becoming weaker. Hence it was thought to be in general need of support in order to carry out programs and projects, as well as participate more effectively in policy and decision-making processes.

Many of the institutions under the MACA umbrella got their start through development project support. They had been "decentralized" (separated from the central part of MACA) to protect themselves from the influences of political changes, but with few exceptions continued to centralize authority within their own institutions at the national level. This approach was not questioned in the design of the T-059 Project; therefore, the emphasis was on institutional strengthening at the central level.

Besides the two areas mentioned above, seed production and irrigation were to be included in the project. These, along with credit, were referred to generally as provision of inputs to farmers. However, irrigation was excluded from the project before the arrival of the technical team.

Finally, provisions were included both in the project and the technical assistance contract for other activities in the agriculture sector. Therefore, the project was purposely designed to be highly flexible, to the point where it could easily become a "grab-bag," i.e., a source of funds to carry out unprogrammed activities or to make up for lack of funds in other projects.

B. Major Events Which Shaped the Project

The original Project Agreement was signed on November 24, 1977, and had a duration of five years. USAID support was initially scheduled at $11,300,000 from loan funds and $2,200,000 from grant funds. The Chemonics technical assistance team arrived on June 10, 1979, after a lengthy process of contract formulation

and negotiation. The initial value of the technical assistance contract was for $1,521,510, of which $1,310,540 was from grant funds.

Several abrupt political changes helped shape the course of activities. In August of 1979 power was handed over peacefully from a military to a civilian government. In November a military coup interrupted the peace, but the new government lasted only a few weeks before again handing power back to civilians. General elections were held the next year, but a violent military coup in July of 1980 stopped the process. The new military government was not well received by most of the international community, including the United States. Many programs receiving foreign support were canceled or curtailed. The status of the T-059 Project was undetermined for several months before being "frozen" in September, 1980. Under the new rules, long-term advisors already in country could remain in their work, but no new advisors could be recruited. Disbursements would be held to a minimum, only the bare essentials to keep activities alive.

Despite the strained relationship between governments, the advisors on the team had no particular problem working with local counterparts. Also during this period, policies followed by AID began to change, allowing greater flexibility to work at the local level with leaders in the private sector.

Another military coup in August 1982 opened the way for "reactivation". However, when the project was officially reactivated in May of 1983, a new system of programming funds was being utilized by USAID, and a detailed plan was required. By this time, activities had become almost completely decentralized to the regional level. Chemonics had three regional offices outside La Paz and worked with literally a countless number of clients in multiple technical fields. Presenting a global plan comprising so many varied activities was a time-consuming, but necessary step. The plan did not receive USAID approval until May of 1984, which was effectively the date the project was reactivated.

Power was again handed over to a civilian government in October, 1982. Rapid inflation and devaluation of the Bolivian peso had already begun. The next three years under the Siles government would see the highest rate of inflation in the world, rising to over 20,000 percent per year during some periods. Policies that fixed an official rate of the peso to the dollar, while street rates soared out of sight, distorted much of the economy. Principally because of these problems, new elections were called for ahead of schedule, resulting in the peaceful transfer of power to the MNR party in August of 1985.

The continual changes in the political environment within the country and between the Bolivian and U.S. governments resulted in four one-year extensions in the Project Activities Completion Date (PACD) until the final closing of the project on September 30, 1986. The technical assistance contract was also

affected by this unstable environment, being extended six times for longer and shorter periods as shown in the table below:

TABLE 1.1 SUMMARY OF CONTRACT DURATION

	Contract Termination	Months of Extension
Original Contract	June 30, 1981	25
Amendment 6	December 31, 1981	6
Amendment 7	November 24,1982	11
Amendment 10	March 31, 1983	4
Amendment 11	December 31, 1984	21
Amendment 14	September 30, 1985	9
Amendment 15	September 30, 1986	12
Total duration of contract		88

Loan funds for the project remained at 11.3 million dollars, but grant funds were increased to $3,060,000, for a total of $14,360,000. The technical assistance contract budget by the end of the project reached $5,605,667, of which $3,018,008 came from grant sources. The portion of total USAID contributions to the project for technical assistance increased from 11 percent to 39 percent. Loan funds increased from 14 percent of the original technical assistance budget to 46 percent. These figures demonstrate the increased importance placed on technical assistance as the project progressed.

C. Evolution of the Technical Components of the Project

Two members of the initial four-person team of long-term advisors were located in Yacuiba to work on the land clearing component. After an initial period of receiving new equipment and putting it into operation, both advisors became frustrated by the lack of support and mismanagement on the part of CODETAR. Later the scope of the land clearing activities in the Chaco was widened to include farm mechanization and soil conservation. In both cases, the advisors had the advantage of working directly with farmer clients, and did not depend totally on support from authorities in public organizations.

The soil conservation program had an interesting history that other persons working in development projects overseas can learn from and take heart in. The program was virtually without resources, and had several failures the first year, but the team did not lose its enthusiasm or its creativeness, and was able to find viable, cost-effective methods of soil conservation which were accepted and applied by farmers. Their work also resulted in much greater efficiency in the land clearing operation, a goal that had eluded the technical team from the start.

At the initiative of farmers in the Chaco, a cotton production program was started in that region in time for the 1982-83 crop cycle. The purpose of the program was to introduce cotton to the region and put an existing gin into operation. At the same time, technical support in maintenance of land clearing equipment and in farm mechanization were terminated, but the seed component of the project was expanded to include the Chaco. Therefore, by 1983, the effort to expand the agriculture sector in the Gran Chaco had evolved from land clearing and farm mechanization to soil conservation, cotton production and soybean seed production.

Two other members of the original team were located in La Paz to work in institution building and project management. Problems typical of development projects working with public institutions abounded. Advisors and their technical counterparts had little influence on decision-making processes, counterparts were few in number and poorly motivated, and little local support was provided in the areas where the advisors were assigned to work.

As the project was extended beyond the initial contract period, Chemonics attempted to reduce the institution building component to a minimum, and in this way avoid the frustrations arising from the politically unstable environment. (See figure 1 on the next page.) This was not entirely possible, because of well intentioned requests made by MACA officials for further assistance.

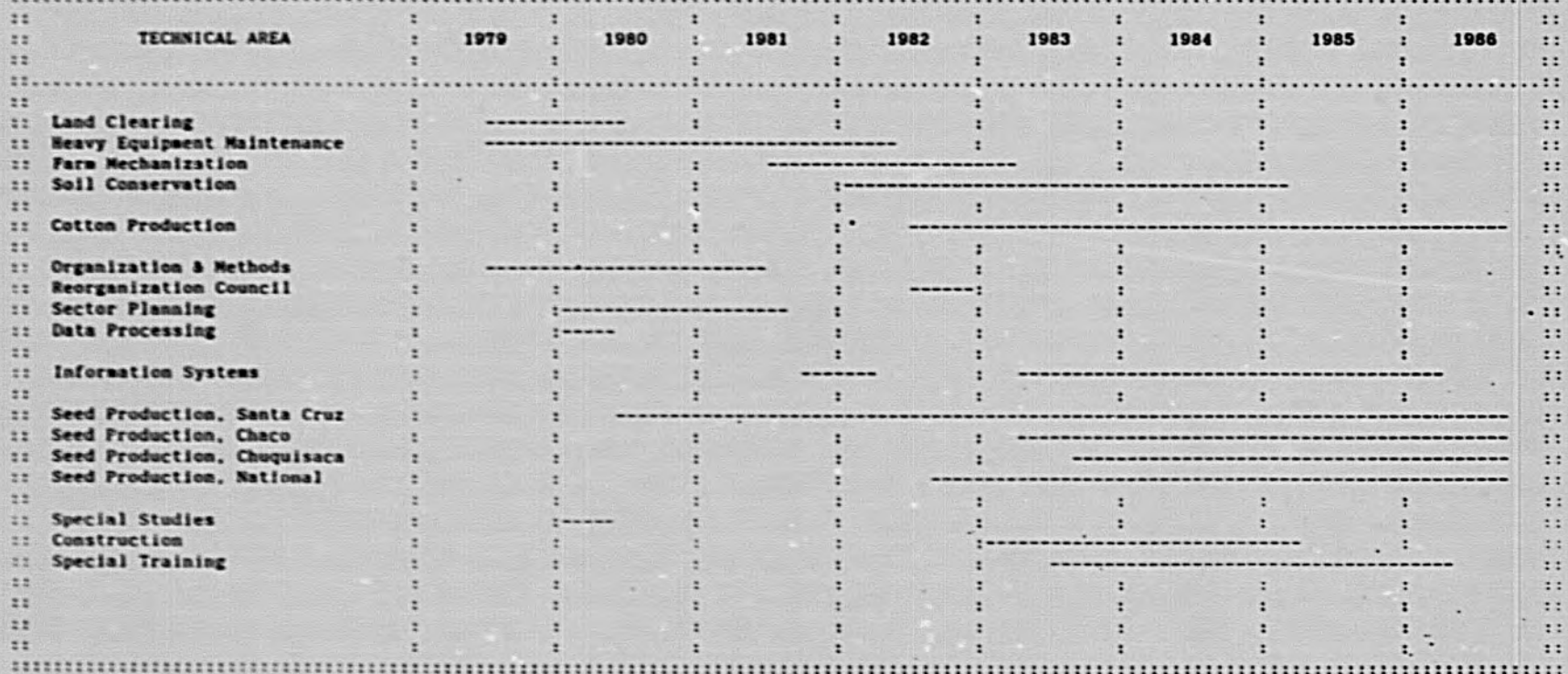
One such request resulted in the formation of a small program based in La Paz which distributed technical documents and a periodic bulletin to subscribers around the country. Despite its high visibility, it was not greatly susceptible to changes in the political orientation of the ministry.

Perhaps because of the credibility Chemonics had achieved in implementing field programs, the subsecretary of agriculture asked for cooperation in a new effort to reorganize the ministry and its decentralized institutions. A technical team made up mostly of local advisors was formed for this purpose in 1982 under separate funding from the PL-480 program. One outcome of this effort was the passing of a ministerial resolution creating regional seed councils.

Chemonics' participation in the institutional reform effort, which tended to decentralize public authority to the regional level and promote greater participation of farmer organizations, prompted an attempt by an unfriendly minister to cancel the technical assistance contract. The possibility of such a reaction occurring in a shifting political environment had been anticipated, but the opportunity to make a positive contribution was considered to be worth the risk. Only with the support of officials from USAID and from leaders in the agriculture sector

Figure 1

CHRONOLOGY OF TECHNICAL ACTIVITIES



in different regions could the contract be rescued. Fortunately, some of the most important objectives of the efforts in institutional reform were eventually achieved.

Beginning in 1980, the first advisor in seed improvement began working, and for this purpose an office was opened in Santa Cruz. At a time when other project activities were closely tied to public institutions, the seed specialist was able to work directly with a series of clients in the region, some from the private sector. By the time the original technical assistance contract ended in June, 1981, the potential of the seed production program was already being recognized.

By 1983 the seed production program in Santa Cruz had grown to a magnitude and importance that no one had previously imagined. Several thousand tons of seed were produced, including soybean, wheat, corn and rice. Local companies had gotten started and were investing in private seed cleaning plants. The Regional Seed Council was a legitimate, active body, establishing fees to finance a technically competent and credible certification service. Because of its success, this activity was expanded not only to the Chaco but also to Chuquisaca, an area where farms are smaller and not mechanized.

Thus, from 1983 to 1986, the project had four primary work sites:

- o La Paz: administrative offices and the base for the information systems program
- o Yacuiba: combined offices for soil conservation, cotton production and seed programs in the Chaco, including a seed certification laboratory
- o Santa Cruz: seed certification laboratory and offices
- o Sucre: seed certification laboratory and offices for Chuquisaca

By the end of the project, seed production activities occupied nearly all the attention of the technical team, and were progressing very rapidly. Local seed production topped 7,000 metric tons per year, replacing more than three million dollars of imported seed with local material of excellent quality. Yields of at least one important crop had jumped by more than 50 percent in just a few years. Dozens of small, local seed companies had been started to produce seed in various parts of the country. Most persons who were familiar with the project knew it as the "USAID Seeds Project."

The project gained wide recognition in Bolivia, receiving several prestigious local awards, including a gold medal for "Meritorious Service to the Agriculture Sector in Bolivia." The first seed advisor to work on the project was credited as being the "father of the seed industry in Bolivia." The National Seed

Council developed an outline for a new project in seed production which would cover all of the country, instead of only certain regions, and provide funds for long-term training at higher academic levels for local technicians. The proposal, which did not request any funds for capital investments, was presented to USAID by the minister of agriculture. The acceptance of technical assistance was in great contrast to the earlier days when a minister attempted to terminate the contract with Chemonics.

D. Level of Effort

A mix of human resources was involved in implementing project activities. Most long-term advisory positions in the initial stages of the project were held by expatriates of North American origin. Later, however, some positions were held by persons of Latin American origin, and finally one long-term position was held by a Bolivian. Short-term advisory personnel was also highly mixed, with a larger involvement of Bolivian professionals. Locals were also employed for a number of other technical jobs, such as the members of the Technical Team for Reorganization of MACA, extension agents in cotton production, and others. A great number of student workers were involved in information systems, soil conservation, and seed production.

Table 1.2 on the next page summarizes the person-months of effort of advisory and managerial personnel specified in the technical assistance contract, including the amount of home-office staff time paid directly by the project. The table does not include time invested by other professionals not holding advisory positions, time of local managerial staff, or time of home-office managers and administrators carrying out regular backstopping from the home office. The information in table 1.2 reveals the relative importance of each component of the project. Some components consist of up to four separate activities or programs.

E. Organization of the Present Report

The following section of this report explains the general project management style used by the institutions involved--MACA, USAID and Chemonics. It then presents a summary of project personnel according to the managerial or technical functions they fulfilled.

The next six sections, III-VIII, give a track record of the 16 specific areas of activity included in the project. An activity is defined as an area where a long-term advisor or short-term advisory team was responsible for work in a particular program. Related activities are grouped into "components." In some cases, activities within a component were closely connected and managed as a unit; in others, they were implemented separately and are grouped together in the report only for ease of presentation. For each activity, general project objectives

Table 1.2 SUMMARY OF LEVEL OF EFFORT IN PERSON-MONTHS

	Long-term Advisors	Short-term Advisors	Procurement Specialists	COP, DCOP, & Home-office Management	Total LOE
Land Clearing and Related Areas	108.0	3.5	2.0	12.5	126.0
Cotton Production	32.5	15.5	--	4.0	52.0
Sector Planning & Institution Building	25.0	15.5	--	12.0	52.5
Information Systems	--	36.0	--	2.0	38.0
Seed Production	158.0	59.0	--	29.5	246.5
Special Studies, Construction & Training	--	24.0	--	6.0	30.0
Management, Reporting, Administration & General Procurement	--	--	3.0	59.0	62.0
TOTALS	323.5	153.5	5.0	125.0	607.0

are stated and level-of-effort is expressed in terms of person-months of advisors. Instead of presenting a detailed chronology of events to demonstrate the progress made, the history of each activity is summarized in a brief analysis called "problems encountered and accomplishments." Conclusions are then presented for each activity.

Finally, section IX, entitled "General Conclusions," identifies some of the factors believed to have contributed to the success of the technical assistance team under the T-059 Project. It also points to the need for continued USAID support in seed production.

SECTION II

PROJECT MANAGEMENT AND PERSONNEL

A. Institutional Structure

The three primary institutions charged with project management were the Ministry of Agriculture and Rural Affairs (MACA), the Agency for International Development (USAID), and Chemonics International. The director general of MACA was the official project director and counterpart to Chemonics' chief of party. The director general holds the highest technical position in the ministry, reporting directly to the subsecretary of agriculture and then to the minister. Despite the demands on the director general's time, the persons who held this post were always involved in project implementation.

USAID named a technical project manager in the Rural Development Division to participate in project implementation and follow-up with other parts of the mission. Because of the project's complexity and the number of clients it involved all around the country, the USAID project manager became absorbed in various project activities, and even played a major leadership role in some areas as time permitted. He was called on to travel frequently to work-sites in different regions.

A Coordination Office was established to maintain constant contact with the many client institutions--several dozen in number--to help formulate their requests for project assistance, and to channel these requests to MACA and USAID for approval. This office also carried out administrative tasks, such as local procurements, inventories, and project accounting.

Chemonics' chief of party (COP), and later also the deputy chief of party, were based in La Paz in order to coordinate closely with MACA and USAID. The La Paz offices were primarily administrative, whereas technical programs were run out of regional offices in Yacuiba, Santa Cruz, and Sucre. The technical assistance contract budget provided for full services--travel, vehicles, secretarial staff, publication of reports, etc.--to be handled directly by Chemonics.

Office space in La Paz for both Chemonics and the Coordination Office was paid for by the contract budget, thus joining these two entities under the same roof and at the same time giving them a degree of independence. The Chemonics administrative and secretarial staff worked closely with the Coordination staff on a daily basis, and over time a tight-knit team was formed.

Weekly meetings were held among the USAID project manager, the coordinator, and the chief of party. The director general, and sometimes the subsecretary or minister, were consulted where major decisions needed to be taken or approvals were required.

Since the COP traveled continually to field offices to participate in technical activities, he often acted as liaison, representing the advisors and their clients and counterparts in meetings with MACA and USAID. During some periods early in the project when political conditions were unfavorable, conflicts arose over whose interests were to prevail: those at the central level or those at the regional level. Fortunately over time, an environment of trust and understanding grew, and a very dynamic and effective decision-making process evolved. For example, decisions were often taken through verbal agreement and executed without being formally put in writing. Streamlining the implementation process in this way was of great value because of the large number of activities and the resulting administrative work load.

B. Programming and Management of Funds

After the project was reactivated in 1983, the Coordination Office was charged with reprogramming five million dollars in remaining project funds, and directly managing and disbursing peso funds for local expenses. Although the total amount of funds was not large, the different programs and clients around the country were numerous. Reprogramming schedules contained perhaps more than 75 line items, each one with its own background information and detailed breakdown. The project was so complex that no single person was completely up to date on all activities at one time.

Because project funds were so limited, other sources were found for some activities. PL-480 and CODETAR both financed the construction and installation of seed plants and provided credit for seed production programs. Also, a special peso fund was created within the project, amounting to nearly $185,000. It was derived from the payments for eight Caterpillar tractors made by CODETAR to the project itself. This local counterpart fund was handled entirely by the Coordination Office to supplement USAID funds in various activities. It was named for the Project Implementation Letter that approved the concept, PIL 103.

Management of funds for training activities in Bolivia was a special problem. At first budgets were prepared for each event and presented to USAID for approval and disbursement. The executing agency would then settle accounts after the fact. This system lacked the flexibility to adjust to changing conditions in the local environment, not the least of which was extreme inflation. By the time disbursements were received, they would frequently be too devalued to cover costs. The problem was solved by budgeting for these expenses in the technical assistance contract. Chemonics advanced the funds to meet local expenses through its regular accounting methods, kept track of the dollar cost at various exchange rates, and recovered the amount through its regular monthly invoice to the project. Perhaps more

important, advisors felt they were provided the means to carry out training activities with a minimum of time expended in budgeting and administration.

In addition to training, the project provided funds for meetings, conferences, and special travel. The largest of these events were the national Round Tables on Seed Program Development, which grew to more than 200 participants by 1986. The ability to facilitate travel to and from different work-sites, coupled with the flexibility to provide extra support through PIL 103 funds, created an unusual amount of leverage to the management team.

Project objectives were not defined for training and other events; instead these were carried out when needs arose within ongoing programs. Therefore, no attempt was made to record the number of seminars, short-courses, meetings, conferences, etc., that were organized and executed under the project. Suffice it to say that training and special events were so frequent and intense that they became a major task of the DCOP, the coordinator, and much of the administrative staff. Perhaps the magnitude of these efforts is not reflected in the descriptions of the various programs, again, because they were viewed simply as a method of carrying out advisory work, rather than as separate activities.

C. MACA and USAID Management Staff

The director general of MACA was the official project director. Fortunately, this position did not change with every change of cabinet. Therefore, the list of persons who held this post during the life of the project is fairly short:

Ing. Gover Barja
Ing. Osvaldo Antezana
Ing. Lucio Arce
Ing. Jaime Sejas
Ing. Raul Salas

Three persons held the post of USAID project manager, one of whom served in this role during two distinct periods. They are as follows:

Mr. Richard Peters
Ing. Jorge Calvo
Mr. John Rifenbark
Ing. Jorge Calvo

The rural development officer, Mr. Robert Thurston, took an active part as well, especially during the long period when the project was frozen.

The Coordination Office was staffed at first with a coordinator, an accountant and a secretary. Later an administrator, a procurement agent, an architect, and a messenger were added. Two persons held the coordinator's job for significant periods of time:

Lic. Orlando Cabrera
Lic. Isabel Canedo

The administrator of the Coordination Office was Lic. Dexter Vargas.

D. Chemonics Personnel who Served on the Project

The summaries of the project components found in later sections of this report provide a general outline of the make-up of the teams responsible for technical activities and show the level of effort in person-months of advisory time paid for by the contract budget. However, they do not always state the titles of each advisory position, show the duration of the assignment, or identify the person or persons who held the position. This information is summarized below for easy reference.

The order of presentation of technical advisors coincides with the order in which project activities are discussed in sections III through VIII. In addition to the technical advisors, information is also given on managerial personnel located in La Paz and in the home office in Washington, and on local support personnel in Bolivia.

1. Technical Advisors

Long-term land clearing technician. Mr. James Wilkinson was employed under a different USAID project to help CODETAR set up its operations in the Chaco before start-up of the T-059 Project. He came on the Chemonics team in June of 1979 and held the land clearing position until August, 1980.

Long-term heavy equipment maintenance technician. Mr. Aveling Vega held this position for only a few months between June and November of 1979. He was replaced by Mr. Leslie Rios in January of 1980. Mr. Rios continued in this role until October 1982.

Long-term farm mechanization technician. Mr. Terrence McCarthy was contracted by another firm to assist the cooperative under the T-055 Project. After its closing, an agreement was reached whereby he was transferred to the Chemonics contract. Mr. McCarthy held this position from October, 1981 to February of 1983.

Long-term soil conservation advisor. Mr. E. Don Hansen held this position from December 1981 to March 1985, with one interruption because of illness.

Short-term assistance to produce a video tape on soil conservation activities. Mr. Omar Serritella directed a team of three local assistants to produce the 25-minute tape. This required three months' effort in the latter part of 1984.

Short-term team to study the feasibility of introducing cotton production in the Chaco. The leader of the study group was Dr. Luis Ampuero, who had just completed other assignments with Chemonics in sector planning, The other advisors were also locally hired: Ing. Roberto Baldomar, Ing. Ricardo Lepere, Ing. Luis Taborga, Sr. Tonchi Gomizel. Each team member worked for a few weeks in August and September 1982.

Cotton production specialist, short-term then converted to long-term. Preference was given to local recruitment for this position. It was held by Ing. Victor Gonzales from October 1982 to the end of the project in September 1986.

Long-term organization and methods advisor. Mr. Robert Sparks was advisor in this area from June 1979 through July 1981.

Short-term organization and methods advisor. Mr. Jorge Montealegre served in this capacity working with a local team from June through December of 1982.

Long-term advisor in sector planning. The chief of party, Dr. Preston S. Pattie, served part-time as planning advisor in the early stages of the project. The position was redefined, substituting the general emphasis on sector planning with specific responsibilities for defining policy within ongoing project components.

Short-term assistance in sector planning. David Zimet and Luis Ampuero, both doctors in agricultural economics, worked with the chief of party in this area. Dr. Zimet worked from July through September of 1981, and Dr. Ampuero from October 1981 through August of 1982.

Short-term advisory team to develop specifications for a computer center and equipment. Two experts worked at separate times for a few weeks each in the first part of 1980. They were Mr. David Freeman and Mr. Rafael Martinez.

Local specialist in information systems. This was first defined as a half-time position, and was then changed to full-time. It was officially called short-term under the contract, although it was extended from September 1983 to April 1986. Mr. Miguel Ibanez held this position and supervised a group of student workers from the Catholic University.

Long-term seed specialist/activity leader in Santa Cruz. Dr. Adriel Garay began the seed activity under the project and remained in the position for five years, until March of 1985. His work resulted in an expansion of seed activities to other

regions and to the national level, which lead to the designation "activity leader" for the advisor's position in Santa Cruz. After Dr. Garay's departure, Dr. Juan Landivar was transferred from the seed program in the Chaco to Santa Cruz. Dr. Landivar served in this position from July 1985 through September 1986.

Short-term assistance to study problems with wheat seed in Santa Cruz. An agricultural economist, Mr. Nicholas Minot, was hired for this purpose. The material also served as a basis for Nick's master's thesis. He worked from March 1984 to August 1984, and then returned in July of 1985 to give a presentation on the findings of his thesis.

Long-term seed specialist, Gran Chaco. The assignment for this advisor was originally intended to be split between Santa Cruz and the Chaco, but the latter absorbed nearly all the advisor's time. Dr. Juan Landivar was responsible for these activities from April 1983 until transferring to Santa Cruz. At that point, a local advisor, Ing. Diogenes Chavez, replaced Dr. Landivar in Yacuiba. Ing. Chavez started his assignment as a short-term advisor in May 1985, and was later converted to long-term, remaining with the project through September 1986.

Long-term seed specialist in Chuquisaca. This position began in August of 1983. It was held for two years by Dr. Edgar Cabrera and for the last year by Dr. Claudio Bragantini. Besides supporting the local seed program in Chuquisaca, the position called for assistance in the design and installation of seed conditioning plants in various regions of the country, a responsibility that occupied about a third of the advisor's time.

Local advisor in seed production, Chuquisaca and Potosi. This position was created to provide better coverage of day-to-day activities in regional seed programs and create an opportunity to develop the capacity of a local technician. Ing. Julio Loredo carried out this role very effectively from May 1985 through the end of the project. After participating in additional short-term training in Brazil, Julio returned to Sucre as director of the Regional Seed Certification Service.

Short-term assistance to carry out studies in Chuquisaca. Lic. Gover Barja was contracted for this purpose in March of 1984. He first worked on a feasibility study for a seed plant in Santa Cruz, and then was responsible for a series of studies and projects in Chuquisaca and Potosi. The position was extended several times through February 1985.

Short-term assistance in national seed program activities. A local agronomist was employed for seven months in La Paz during 1982 to help reorganize the National Seed Department of MACA. Ing. Jorge Suarez worked in this capacity as special advisor to the subsecretary of agriculture. In May of the same year, a local attorney, Dr. Benjamin Garnica cooperated in developing a rental agreement to transfer a seed plant to a regional institution.

Short-term advisor in seed plant installation. Near the end of the project, Dr. Edgar Cabrera returned to assist with the installation of two seed cleaning plants. Dr. Cabrera had worked on the project for two years heading up the seed program in Chuquisaca.

Local advisor in civil engineering to assist with seed plant construction projects. Ing. Eddy Decormis was hired as a short-term advisor in La Paz to design the buildings for several seed conditioning facilities around the country. He worked from June 1983 through March 1985 in total, but it is estimated that about nine months of this total were used to assist MACA with construction projects unrelated to the seed program.

Short-term advisor to prepare a video tape on seed certification. Mr. Omar Serritella from Chemonics home office skillfully carried out this effort during two months in early 1985. Fortunately he had the same local assistants who helped with the earlier soil conservation video.

Short-term advisors to conduct studies on fruit and vegetable marketing. Frank Mason and Manuel Silva carried out the first of these studies in Tarija in early 1980. Lic. Gustavo Vega carried the effort a step further the following year, with a few days' help from Mr. John Lamb from Chemonics home office. Mr. Waldo Heron was responsible for work in Chuquisaca and for developing a course outline for the University of Tarija.

Short-term instructors for a training program in natural resource management. Several courses were given between 1983 and 1986, nearly always using a mix of local and foreign instructors. The persons provided for this purpose through Chemonics were: Dr. Joseph Iosi, Ing. Juan Carlos Quiroga, Ing. Juan Arandia, Mr. Frederick Tracy, Dr. Edgar Ortiz Lema, and Dr. Carlos Gandarillas.

2. Managerial Personnel

Project supervisor. Ms. Candace Conrad fulfilled this role from the initiation of the Chemonics proposal nearly to the end of the project. Candy spent two months in Bolivia during start-up, and provided continuous assistance from her base in the home office in Washington D.C. She made one-week supervisory trips to the project twice each year. Mr. Thurston Teele, director of Chemonics International Consulting Division, substituted for Candy on one of these trips.

Chief of party. This position was held for the entire length of the Chemonics contract by Dr. Preston G. Pattie, who also had responsibilities as advisor in sector planning. The position implied a wide variety of technical, managerial and administrative tasks. The primary function of the advisor was to provide leadership for studies, policy analysis and institution building activities within the various project components.

Deputy chief of party or administrative director. This position was not defined and filled until July of 1984. It was initially conceived as a short-term position and was later converted to long-term. It was held consecutively by three persons: Dr. Bernard Delaine, Ms. Kimberly DeBlauw, and Ms. Gail Owens. Mr. Delaine came to Bolivia at the end of another Chemonics project, and Ms. DeBlauw was transferred from the home office. Ms. Owens was first hired in La Paz as a local administrator, and then took the position as administrative director to handle project closing.

Project administrator. Ms. Ellen Holguin was responsible for administration for the technical team in the home office for the duration of the project. She made three visits of about one week each to La Paz, including a trip to help close the offices in September 1986.

Procurement specialists. The assistance of procurement agents was needed to support the advisory team in the technical assistance contract, and to provide additional procurement services for project equipment and materials. Aside from continuous support to ship household effects and personal vehicles of team members, Chemonics' Procurement Department dedicated nearly six months to special purchases and shipments of project commodities. The persons primarily responsible for this work were Mr. Lester Hook and Mr. Andrew Dobson.

3. Local Support Staff

Naturally there was a certain turnover in local personnel as positions were created and terminated with the changing conditions under which the project operated. In this section, only the most permanent positions and most long-term employees are mentioned.

Bilingual secretaries and translators. Two very capable and responsible secretaries in La Paz handled translations, final editing and publication of Chemonics documents. They were Ms. Magda Alborta and Ms. Malena Pacheco de Losantos. As head secretary, Ms. Alborta handled many aspects of office management and communications.

Accountants and local administrators. These functions were primarily handled in La Paz by Mr. Corsino Baptista, Ms. Monica Calderon de Higalgo, and Ms. Antonieta Montano.

Secretary-bookkeepers. These positions were held in the regional offices and involved a great deal of general office management and communications. Ms. Rosario Rueda de Mollca very capably carried out these functions in Santa Cruz from 1980 through 1986. Ms. Ilse Vasquez and Ms. Elizabeth Ayala were co-secretaries in Yacuiba. And in Sucre, the position was first held by Ms. Antonieta Montano and then by Ms. Celia Villagomez. Ms. Montano first worked as secretary in the La Paz office, then transferred

to Sucre to work as secretary-bookkeeper, then returned to La Paz to work as administrative assistant. Ms. Gomez worked as receptionist in La Paz before transferring to Sucre.

Driver-messengers. The title does not describe the position accurately because these persons were called upon to assist with a great variety of activities, including performing electrical installations in offices and seed laboratories, preparing materials for short courses, repairing seed cleaning equipment, and handling customs clearances, shipments, and local procurements. Mr. Oscar Ballivian held this position for seven years in La Paz, being the local employee to gain the most seniority on the project. Oscar was assisted in many tasks by Mr. Cecilio Chavez, who had dedicated many years of his life to development projects in MACA. Mr. Gualberto Mojica worked to support the Santa Cruz seed program from its beginning in 1980 to the end of the project. Messers. Ismael Gallegos and Daniel Rojas fulfilled these functions in Yacuiba. And Mr. Edwin Sellis was the driver in Sucre, having transferred from Yacuiba.

SECTION III

LAND CLEARING AND RELATED TECHNICAL AREAS

A. Background

1. Land Clearing

The Gran Chaco Province in the Department of Tarija lies in the southeastern part of the country, bordering Argentina to the south and Paraguay to the east. The region is quite remote, and separated from the city of Tarija by a narrow mountain road passable in dry weather. Most interaction is via railroad with the city of Santa Cruz, 589 kilometers to the north.

Ten years ago, the main activities in the region consisted of raising cattle, logging, and small-scale trading of goods over the Argentine border. Agricultural production was limited mostly to corn for feeding hogs on a small scale. Probably no more than 4,000 hectares of land had been cleared for cultivation in the Yacuiba valley up to that time. Perhaps half of this amount was used for pasture.

In 1976, an oilseed processing plant was built in Villamontes, 90 kilometers north of Yacuiba. The plant has the capacity to process 90,000 metric tons per year of soybeans and other oilseeds. Though the Chaco region has a vast amount of arable land that could potentially be opened up for agricultural use, rainfall levels decline very rapidly as one proceeds north or east from the Yacuiba valley. Therefore, without massive investments in irrigation systems, production potential is limited to about 20,000 hectares in what is called the "humid Chaco" region consisting of the Yacuiba valley and adjacent valleys.

The oilseed plant, called FACSA, was operated by the Bolivia Development Corporation of the Ministry of Industry and Commerce. Because it was oversized for the area, the plant was run at a considerable loss to the government and the Bolivian people. Still, for the first time in the region, it provided access to a major market for a commercial agricultural product. The cornerstone of the Agriculture Sector II Project was to expand agricultural production of raw materials--soybeans and peanuts--for the FACSA plant. Therefore a major activity of the project was to clear land for crops. For this purpose eight Caterpillar D7G tractors were purchased for the Departmental Development Corporation (CODETAR).

2. Maintenance of Land Clearing Equipment

CODETAR set up an office for the first time in the Chaco to implement the project, and built a facility to house the central shops for maintaining heavy equipment at Palmar Chico, 18

kilometers north of Yacuiba. The D7G tractors purchased by the project were delivered in mid-1979, about the same time the technical assistance team arrived in Bolivia. The equipment included not just the eight bulldozers, but also two tractor-trailers to transport them, and support equipment.

When the advisory team arrived, the shop was virtually empty; it still lacked water and electrical installations and fencing around the grounds. A few tools and pieces of equipment were just being delivered, including a portable welder, a lathe and a bench grinder. There was no tooling for any of these; no parts or materials were on hand.

3. Farm Mechanization

Farmers in the area traditionally used oxen and hand labor to produce one or two hectares of corn, peppers and vegetable crops. With the emphasis now placed on soybeans, agricultural machinery was needed to cultivate upwards of five hectares per family, an amount that grew over time to an average of 15 hectares per family. This problem was to be addressed by an agricultural cooperative formed with support from USAID Project T-055. The first activity of the Integral Cooperative was to purchase agricultural machinery, mostly tractors and combines, and operate an equipment pool for farmers. However, equipment for the pool did not arrive until late in 1980. In the meantime CODETAR used a few older FIAT tractors to offer services to farmers, mostly for plowing. Partially to alleviate the scarcity of harvest equipment, two combines were purchased for CODETAR by the T-059 Project in early 1980, just in time for harvest in May and June.

After a year of operation, the Integral Cooperative saw the need for additional support in maintaining and operating its equipment pool. Hence, an agreement was developed in 1981 whereby a Chemonics advisor would train personnel in operating and maintaining farm equipment for the cooperative, but would have his base of operations in the CODETAR shops, along with the advisor in heavy equipment maintenance. The advisor would also set up a system of field maintenance for both the cooperative and CODETAR.

4. Soil Conservation

During the first few months of work on the project, the land clearing technician pointed out the problems he saw developing in soil erosion. This concern was expressed in several Chemonics reports, beginning with the first Progress Report published in November 1979. As a result, USAID included a soils soils expert on the first project evaluation team in February 1981. Although the team was not alarmed by the amount of erosion they saw in the field, the evaluation report recommended that a

long-term advisor be placed in the area to explore the introduction of contour farming and other methods of protecting the soil. Ideally, introduction of these methods could be linked to the land clearing program.

Average rainfall at the Yacuiba airport over the 30 years prior to 1981 was very close to 1000 millimeters. However, during each of the crop years 82/3, 83/4, 84/5 and 85/6, rainfall was more than double the previous average. The damage caused by water erosion stimulated farmer interest in soil conservation, but complicated the planning of adequate structures and conservation practices.

B. Objectives and Level of Effort

The overall objective of these four components taken together was to expand the agricultural "frontier" in the humid Chaco for production of commercial crops, mainly soybeans. The initial target of 10,000 hectares stated in the Project Paper was somewhat theoretical, because the amount of land cleared depended on the interest of farmers and landowners in the region.

The objectives of the advisory team in each separate component were as follows:

1. Search out the most efficient methods of land clearing for the region and train CODETAR operators.

2. Install a maintenance facility for CODETAR and train local mechanics in repair of heavy equipment and operation of a maintenance system.

3. Establish a system to maintain and operate the farm machinery pool with the Integral Cooperative.

4. Find adequate methods for control of water erosion in the region and introduce farmers to these practices.

The land clearing advisor began his work at the outset of the project in June of 1979. He did not complete the full two years originally planned, but instead left the project, recommending that he be replaced not by a land clearing expert, but by a specialist in soil conservation.

The technician in heavy equipment maintenance also arrived with the original team in June of 1979. His assignment was extended beyond three years, to October 1982, principally for the purpose of continuing in-service training to local mechanics. Several additional person-months of support were provided for procurement and shipment of tools and equipment to install the large central shop in Palmar Chico.

The technician in farm mechanization began working with Chemonics in October 1981. After the sale of the machinery pool

to individual farmers was completed, MACA did not see the need for further support in this area. Therefore, the position was terminated ahead of schedule in February 1983. Additional support was provided in this area by a procurement specialist.

The soil conservation specialist started his assignment in December 1981, and continued through March 1985. Other special support was provided by a short-term specialist from the home office for preparation of a video tape for national television.

A summary of the overall level of effort in these fields is shown in the table below.

Table 3.1 LEVEL OF EFFORT IN LAND CLEARING AND RELATED AREAS

	Long-term Advisors	Short-term Advisors	Procurement Specialists	Sub-Totals
		(person-months)		
Land clearing	14.5			14.5
Heavy equipment maintenance	38.0		2.0	40.0
Farm mechanization	17.5	0.5	0.5	18.5
Soil conservation	38.0	3.0		41.0
Subtotals	108.0	3.5	2.5	114.0
COP, DCOP and Home Office supervision				12.5
Total LOE				126.5

With more than ten person-years of effort over a period of six years, land clearing and related activities form the second largest project component in terms of technical assistance.

C. Problems Encountered and Accomplishments

1. Land Clearing

Land clearing services were provided at the request of farmers or land owners. Since most farmers were not mechanized, requests were usually to clear only two to four hectares of land at a time. Clearing each parcel requires a site inspection by the supervisor, a contractual agreement with the owner, transport of a Caterpillar tractor and Rome plow to the site, and an access road into each site. These conditions dictate that the operation must sustain certain inefficiencies that would not be present in

a large-scale project where parcels are hundreds or even thousands of hectares in size. They also imply that innovative methods should be explored with managers and operators according to the terrain and desires bf farmer/clients.

During the first season, from June through December 1979, new equipment was still arriving which needed assembly. Operators whose previous experience was mostly in road building required training in land clearing techniques. Development of maps for the region and schedules for personnel and equipment were among the first priorities. Information was gathered in the field under different conditions to help set prices for different services. Unfortunately during this period, prolonged interruptions in work schedules were brought on by fuel shortages, a violent military coup, and lack of credit for land clearing from the Agricultural Bank of Bolivia (BAB). Still, 470 hectares were cleared in total during the first year.

Problems were identified in the field, and alternatives were sought to better utilize equipment in order to speed up operations and reduce costs. During the first year, some of the recommendations given by the advisor were:

- To charge for land clearing and stump removal by the hour, rather than by the hectare.
- To purchase tank-trailors for holding diesel fuel at work sites.
- To reduce the distance between windrows to 50 meters or less.

Because clients were not requesting larger amounts of land to be cleared, CODETAR managers were convinced of the need to generate more interest by doing extra work for the same price per hectare. For instance, in many cases access roads into the sites would be built or widened. Fallen trees and brush would be pushed into windrows 100 meters or more apart, and sometimes piled in rows around fields to form a temporary fence to keep livestock out. Land was left so clean, that some landowners were able to plant immediately after clearing without additional land preparation. Unfortunately, as other farmers learned about the nature of the services being provided, they expected similar or even better treatment on their land, and at the same price. As a public institution that had just opened an office in the region to promote development, CODETAR naturally wanted to create a favorable image. Consequently, neither the first nor the third recommendations above were taken, and it required between 9 and 11 hours of tractor time on the average to clear a hectare. The normal amount of time per hectare would be about 6 to 7 hours under these conditions.

Many requests were received by CODETAR for construction of stock water ponds from ranchers farther out in the dry portion of the Chaco. USAID approved this use of the equipment, and the

advisor prepared design specifications for the ponds, including overflow canals. This activity occupied at least as much tractor time as land clearing during the first two or three years.

The practice established at the start of the project was to put a single tractor on a job; however, the expansion into the dry Chaco had not been foreseen. Further, half the requests for land clearing were in the Villamontes area, whereas the program was set up to operate mainly in the Yacuiba valley. Consequently, work-sites became widely disbursed around the region. By the end of 1980, field supervisors and maintenance personnel complained that they traveled long distances each day to see only one or two pieces of equipment. If they found that all was working well, they had "wasted" a day just to visit the sites. If they found a problem, the tractor might have been down for a day or two waiting for support personnel to arrive.

From maps and other scheduling information prepared by the advisor, it was clear that equipment could be operated in groups to handle all the jobs pending in a community or district at one time. Each group would have two to four tractors, one or two portable diesel tanks, and one or two Rome plows. Support personnel would have only two or three sites to visit, rather than eight sites. Each day in the field, the supervisor and mechanic would see two to four tractors, instead of one or two. Implementing this system would require some additional planning to schedule groups of tractors among communities. Unless CODETAR managers had credibility with local leaders, having two tractors in one community while another waited its turn could be considered favoritism. Also it assumed that the farmers in a community would all apply for loans and request services at the same time of the year. Thus, requests could no longer be received at any time of year.

After several attempts to convince CODETAR authorities of the benefits, this system was implemented during 1980. Reliable information on costs and use of resources was never available to analyze the impact in detail. However, operators and field support personnel were extremely pleased, indicating that their work was greatly facilitated. Despite this apparent improvement, early in 1981 authorities in CODETAR began letting the management slip, until the system reverted to its original form.

Attempts to experiment with different methods for land clearing and destumping met with total frustration during the first two years. It appears that the operators and other personnel sensed the lack of direction on the part of management, and simply refused to accept any changes. Two stump grinders were never tried out. An eight-ton chain made to be pulled between two tractors was also never tried. Because of these frustrations, the advisor left before the end of two years, and the position was terminated. Even so, the COP and other team members continued to be involved with the program.

In early 1981 an evaluation team visited the project and left a document containing more than a dozen recommendations for CODETAR. The only one of these to be implemented was to charge for land clearing services by the hour, instead of per hectare. Immediate improvements resulted in land clearing operations, principally because farmer/clients behaved differently. Instead of insisting that their land be scraped clear and that brush be removed, they instead agreed with the use of more efficient practices. Not only did the cost efficiency of operations improve, but also soil conserving practices could be introduced.

Despite the improvements, many other aspects of the program needed attention. In cooperation with the project manager, Mr. John Rifenbark, Chemonics assisted in preparing a proposal to reformulate the land clearing component of the project. The main points included in the proposal were as follows:

- Amortization of the Caterpillar tractors was changed from a per-hectare rate to a flat yearly rate. Under the old agreement, CODETAR received only 46 percent of the revenue from clearing a hectare; the other 54 percent went to the Agricultural Bank (BAB) to "pay for" the tractors. This mechanism was meant to prevent subsidies for tractor services and to bring capital into the BAB. Under the revised agreement, CODETAR still pays BAB, but at a flat rate per year of $92,500. This is done to create a better incentive system for CODETAR. They keep 100 percent of revenues for services, so if they clear more land, their income is greater, but if they do not clear land, they still must pay the yearly amortization.

- The shop was to be run as a business, performing repairs for other institutions and private parties. By this time the machinery pool belonging to the cooperative had been sold to private farmers, who needed support in both field maintenance and repairs.

- Excess equipment, including harvesters and agricultural implements, was to be sold. Funds were to be deposited in a special account to be used in experimenting and demonstrating new land clearing and soil conservation methods.

- Clients would attend special courses on soil conservation and alternative methods of land clearing and soil conservation before having their land cleared by CODETAR.

The new plan was enthusiastically agreed upon, but since there were no advisors working full-time in this area, it fell to CODETAR authorities to take initiative and implement decisions. Again, the results were disappointing.

Finally in 1984 a new agreement was reached which drastically reduced the responsibility of USAID and MACA in the

land clearing program. The terms of this agreement were as novel for this kind of project as they were effective. The yearly payments which CODETAR was supposed to make to the BAB would now be made to the T-059 Project itself. The funds generated would form a special peso fund to supplement USAID dollar funds, and would be reinvested in project activities. This fund became known as the Chaco-PIL-103, named for Project Implementation Letter number 103 which approved the concept.

Also under this agreement with CODETAR, project managers (MACA, USAID and Chemonics) would no longer interfere in the land clearing operation. When the final payment was made, the way was clear for transferring title to the tractors to CODETAR.

2. Maintenance of Land Clearing Equipment

As in the case of land clearing, the advisor in this area spent most of his efforts during the first season helping receive and assemble new equipment. Support equipment based in the shop included two tractor-trailers, four service trucks and pickups and jeeps. CODETAR purchased several basic sets of tools for use in the shop and field. With the advisor's help, they also purchased an initial supply of basic parts, mostly oil filters and air filters. The basic facilities at the shop were installed, including:

- o fencing of the two-hectare lot
- o tool room, welding area, machinists area
- o offices, baths
- o grease and wash racks
- o fuel storage tanks
- o parts warehouse
- o electrical installation, including generating plant
- o tank truck for hauling diesel
- o portable holding tanks for the field

Though limited in equipment and personnel, the shop became operational in the second half of 1980.

In order to prepare specifications for procurement of shop tools and equipment, policy decisions were needed about the role of the facility. Since no other large shop existed in the region, it was agreed that CODETAR would provide repair and maintenance services on agricultural machinery for other institutions (especially the cooperative) and private farmers. The military

coups of 1979 and 1980 seriously delayed reaching these policy decisions and obtaining approval for the procurement, which was not received until March of 1981.

The Procurement Department of Chemonics/Washington was given the responsibility of carrying out the purchase and shipment of these commodities, valued at nearly $100,000. The procurement was especially tedious because of the number of suppliers and the detailed specifications of some items. For instance, tooling for a lathe and a bench grinder previously purchased by USAID involved more than 50 specific pieces. The equipment arrived in Bolivia in September 1981, and within a short time the shop was fully installed.

At this point the tractors and other land clearing equipment had completed three years of work, and many machines were nearing 3000 hours of use. Besides the specific repairs needed for some pieces of equipment, most of the Caterpillars required reworking of the tracks. A track press had been included in the shop equipment; CODETAR obtained the tooling needed for D7G tracks.

Several strict operating systems were established at the shop. First, the work areas, storage areas, offices, and grounds were kept well-organized and clean. Tools were kept in designated places, and a person was put in charge of the tool room. Machinery was diagnosed and parts were obtained before disassembling. Therefore equipment stayed inside the shop only a few days on each repair; the shop did not become a parking garage for torn down vehicles and tractors. Certain areas were off-limits for unauthorized personnel, including the machine shop and the tool room. Manuals and parts calalogues were carefully filed and used for reference. The right tool was used for the right job, and was to be used correctly.

Only the most routine maintenance work was done in the field, and this was also carried out by mechanics from the shop. Therefore operators received the maximum amount of support possible, and at the same time, control over maintenance and also use of equipment was centralized in the shop. These methods were imposed by the advisor, who took responsibility as both head mechanic and shop foreman. As a result of this systematic approach, the shop soon became the center of the land clearing operation. Most CODETAR personnel at the operating level took pride in the efficiency of their work, and were pleased at the opportunity to gain new skills.

When the regional office of CODETAR was moved to Villamontes, the new manager asked for project support to establish a separate shop. All the institutions responsible for managing the project and especially the advisor opposed this action as unnecessary duplication of effort; however, for nearly two years a "shade tree" operation was run in the back yard of the Villamontes office. As a result, half the machinery pool was very poorly maintained during this period.

Regrettably decisions over personnel remained at the bureaucratic level of CODETAR in Tarija, making it difficult to bring along promising managerial talent while weeding out negative elements. Worst of all, it was impossible to obtain or develop an adequate counterpart who could take on greater responsibilities and who could take over for the advisor at the end of the project.

3. Farm Mechanization

The most critical need at the beginning of the project was for combines or threshers for harvesting soybeans. As the amount of land under cultivation increased over time, more tractors, plows, disks and seeders were needed. With the delayed arrival of the machinery pool for the Integral Cooperative, Chemonics offered to carry out a local emergency procurement of combines. A short-term procurement advisor was necessary for this purpose to comply with strict AID regulations and still complete the task within a very short time. The advisor purchased two combines in Santa Cruz in March of 1980, in time for harvest which began in May.

In an effort to assist the farmer to the extent possible, five older FIAT tractors were reconditioned and put into operation. Most farmers would hire custom plowing, but would complete land preparation and planting by hand and with oxen.

In 1981 the cooperative received 11 agricultural tractors, 8 combines and other implements. No provision had been made for tools, maintenance and parts. After considerable discussion, the cooperative reluctantly entered into an agreement whereby CODETAR would provide maintenance and repair services, both in the field and in the shop. To carry out this agreement, the advisor in farm machinery maintenance and operation began working in October 1981.

The truck which was to be used to set up the field maintenance operation fell under the control of the regional director of CODETAR in Villamontes for some time. This caused serious delays and justified the cooperative's lack of confidence. In time, a complete system was established, with a mobile lub unit and a field mechanic. The lub truck handled regular routine maintenance according to a schedule prepared with the advisor. The truck carried tools, lubricants, filters, nuts and bolts, and various fast-moving parts. Examples of the latter were roller bearings for harvesters and hydraulic hoses for Caterpillars. The field mechanic visited equipment in the field more frequently than the lub truck. He did minor repairs in the field and interfaced with the shop. His program did not obey a rigid schedule.

The system worked well, but only for a short time, and only for CODETAR-owned equipment. The cooperative remained

distrustful and did not utilize the system, forcing the advisor to support a separate makeshift maintenance program for the co-op's machinery pool.

In the meantime, major problems had occurred in the use of combine harvesters. Few machines existed in the region and farmers depended on them for harvesting soybeans; therefore it was extremely important that they be operated effectively. However, they were operating far below capacity as a result of a series of problems:

- Access roads into fields were often narrow; unsupervised operators allowed headers to be damaged.
- Combines were used in recently cleared fields with sticks, tree roots and other trash on the ground.
- Weeds were often not controlled, to the point that harvesters could not cut them. Soybean plants were pulled by hand and fed into the harvesters in large bundles.
- Operators had no training or prior experience with combines; they often ran the machine across the fields without checking their efficiency or attempting to make adjustments.

The advisor was able to establish a degree of authority during the 1982 harvest which allowed him to correct some of these problems. First he personally inspected each soybean field before allowing a combine to enter it. Farmers were instructed to cut trees along access roads and control weeds before harvest. Further, cooperative and CODETAR operators were trained and supervised in making adjustments and checking threshing efficiency. Field losses were reduced from around 50% to perhaps 30% in a single year, though precise estimates are not available.

In October 1982, the machinery pool was sold to individual farmers. This decision was taken by mutual agreement of all involved. The cooperative then asked the advisor to present a series of short-courses on operation and maintenance to farmers who had acquired machinery. At the same time, the advisor who worked as head of the CODETAR shop completed his assignment and left the project. It soon became impossible for the farm mechanization advisor to use the shop as a base of operations. Hence the courses were given at another facility. Several more courses were requested by farmers; however, authorities in MACA did not agree with a proposal to extend the position beyond February of 1983.

4. Soil Conservation

The soil conservation advisor arrived in Bolivia in December of 1981, but his assignment was interrupted by illness

during the first few months. He returned to work full time in March 1982. Two excellent local counterparts were assigned by the Bolivian Institute of Agricultural Technology (IBTA), one an extensionist with several years' experience in the region, and the other a recent graduate with an M.S. in soil science from New Mexico.

The team was extremely energetic, but had no defined tasks to complete in the field. Instead their job was to promote the concepts of soil conservation and experiment with different techniques that might gain acceptance among farmers. A quick survey of the problems in the region was done. Topographical instruments, tools and audio-visual equipment were obtained. Meteorological information was analyzed. Maps and other planning materials were assembled. Talks were given on radio, at local schools, and to farmer groups. A committee was formed from local leaders and representatives of institutions.

Within a short time, some of the major problems facing the region became more clear, and alternative methods for solving them were generated. The basic erosion problem in the region is caused by water. The Yacuiba valley lies at the foot of a very steep mountain range. Though land in the valley is relatively flat, rainstorms in the mountains cause small drainageways to become major rivers, but only for a few hours at a time. Already overflowing drainageways encounter two major obstacles as they cross the valley from west to east: the principal highway and the railroad which both run north and south. With the increased rainfall of the last few years, culverts are far too small and bridges are too infrequent (and sometimes too small). Having no way to cross, the water backs up into fields and residential areas along the center of the valley, causing direct damage to structures and depositing large amounts of silt.

Several studies were made in areas where farmers and other rural residents requested help. In some cases, designs of protective structures were prepared along with material lists and cost estimates; however, these always implied more resources than could be obtained either through the project or other sources. Different practices were also explored for on-farm application. Control of water flow in places where gulleys were being formed was of great concern to farmers. Converting gulleys into grass waterways was one alternative. Another was to build temporary wooden dikes in the gulley to reduce the velocity of the water flow and gradually fill the gulley with sedimentation. It was particularly frustrating to the team when little interest in trying these alternatives was generated among farmers. Evidently, they saw the cost as too high or they were not confident that the methods would control erosion and eliminate the problem. Another disadvantage of the grass waterway is that it takes more land out of cultivation in the short run.

In a visit to northern Argentina, the team discovered a new alternative, which was to build protective ditches or canals on the contour to control water flowing throughout the field. This

system is referred to as "broad-based terraces." Personnel of the National Institute of Agricultural Technology of Argentina (INTA) were very helpful in presenting two short-courses for groups from Bolivia, one made up of representatives of institutions and the other of rural leaders and farmers. Subsequently, two farmers requested the construction of terraces on parts of their land. Near the end of the 1982 season, two experimental terrace systems were constructed, one on 44 hectares and the other on 30. Construction was carried out with medium-sized agricultural tractors and disk plows; hence the ridge of the berms and the depth of the ditches were not as great as desired. Still, the systems performed reasonably well at first. Unfortunately, sufficient supervision was not given during planting, and farmers did not follow the contour. Running tractors over newly formed canals flattened down berms and partially filled canals, making the system ineffectual when heavier rains came later in the year. To add to the frustrations, one of the key counterparts left the program and was not replaced, reducing the team from three to two persons.

The first breakthrough in the program was achieved in early 1983. The program had created sufficient interest that farmers began to recognize the damage being done to their soils when the land was cleared. Therefore they asked the soil conservation team to offer alternative methods of clearing land. A course was given to CODETAR operators introducing the "dirty" land clearing system. In this system, the soil is not scraped clean, removing roots and topsoil along with trees and brush. Instead only vegetation is removed from the surface, but roots and soil remain intact. This implies working the land by hand for a year or two (planting corn instead of soybeans) while removing roots and burning out stumps. However, tractor time in clearing is reduced from about 8 hours per hectare to 5 or less. (CODETAR was charging $45 per hour at the time, although the non-subsidized cost was probably closer to $60.) During the course, careful measurements in the field showed operators and farmers that roughly 4 centimeters of topsoil are lost when the regular "clean" system is used. Virtually no topsoil is lost with the dirty system.

The system caught on quickly with farmers, to the extent that more than half the land cleared from early 1983 to the present has been done using the dirty system. Interestingly, the soil conservation team achieved increased efficiency in land clearing operations where others had failed.

The second breakthrough also occurred in early 1983, again at the initiative of a local farmer. Seeing that the failure of the terrace systems in the two experimental fields was caused by poor management, Dr. Antonio Mogro asked that a similar system be constructed on a 22-hectare parcel where seven large gulleys were rapidly forming. This time a road grader was used, which both reduced cost and formed the terraces according to specifications.

The field was in a highly visible location with easy access. Adequate follow-up on soil management, especially contour farming practices, was provided.

Soon after the system was completed a heavy rainfall hit the Chaco, causing flooding in some areas and erosion damage to many fields; however, the terraces withstood the impact and protected the field from further gulley formation. As a result, many other farmers expressed interest in building terrace systems. Soon this activity became the core of the soil conservation program.

A shared-cost plan was devised in which the farmer paid half the cost of the use of equipment and the T-059 Project paid the other half. The costs per hour by machine and the average cost per hectare are shown in the table below. Surprisingly, the farmer's cost is only nine dollars per hectare on the average, depending on the slope and the number of terraces required. In addition to initial construction of the system, some repair and maintenance of canals must be carried out each year.

Table 3.2 AVERAGE CONSTRUCTION COST OF TERRACE SYSTEMS, 1985

	Hourly cost of equipment	Average of hours per hectare	Average cost per hectare
	(Dollars per hour)	(Hours per hectare)	(Dollars per hectare)
Road Grader	25.00	0.45	11.25
Caterpillar D-7	45.00	0.15	6.75
TOTAL COST PER HECTARE			18.00
FARMER'S SHARE OF COST			9.00

Before the end of 1983, the team had more requests for terracing than it could handle. The main limitation was availability of machinery to build terraces; however, planning of the systems and topographical surveys also required large amounts of time. Before the departure of the advisor in January of 1985, 42 kilometers of terraces had been built on 15 farms, protecting 502 hectares. The counterpart continued working in this field for a short time later and constructed canals on roughly 200 more hectares.

The need for conservation programs in various parts of Bolivia is known to many leaders in the agriculture sector; however, the only means of becoming familiar with the program in the Chaco was to travel to the region and contact the technical team directly. Because only a few persons would have the opportunity to do this within the life of the project, the need for another means of dissemination was felt. As a result, MACA asked Chemonics to produce a video film which could be shown on national television.

A 25-minute video was produced under the guidance of an expert in audio-visual methods from the Chemonics home office. Final editing and narration were done in professional laboratories in Washington, D. C. The film has been shown several times on Bolivian television, and has won two international competitions for technical videos.

D. Conclusions

The humid Chaco of Bolivia has been transformed into an agricultural region. Besides the 5,000 hectares or so cleared by the project, perhaps another 2,000 or 3,000 hectares have been cleared by hand in the last seven years. A survey done in 1981 for the first project evaluation showed rapid growth of income derived from farming. The opportunities created have led to a modest amount of migration to the region, especially from the central part of Tarija and from Potosi.

On the other hand the internal management and efficiency of the land clearing and mechanization programs were very poor from the beginning. The central shop was operated effectively only for the time the advisor was present. At the end of the project it was in extremely poor condition--disorderly and underutilized. During the second evaluation of the project in 1985 it was not even clear who was head of the shop and the land clearing program.

What appeared to be an almost impossible situation was greatly improved by the efforts of the soil conservation team. The history of that program contains many useful lessons for persons involved in international development. The advisor and his counterparts did not initially have a clear plan to guide their work; nor did they have a serious commitment from local institutions. During the first year and a half of the program several efforts failed to produce results. Still the team maintained a high degree of enthusiasm and energy. In the end, they succeeded in changing the methods of land clearing in the Chaco, simultaneously improving the methods and reducing costs.

The team did not stop at demonstrations and training. Although resources were extremely limited, they proceeded to implement a full-scale conservation program at the farm level. This approach resulted in a program which could be implemented

within the resource constraints of the region--in terms of capital, machinery, infrastructure, and technology. This is an achievement of which the persons involved can be proud.

Farmers in the Chaco and authorities of MACA in La Paz requested that Chemonics keep the advisor in place for another season; however, it was clear that local institutions had the capability to carry out the program without external support. CODETAR took the initiative to continue the program, and hired the technician who had worked as counterpart to the advisor. However, this initiative met with little support on the part of authorities higher up in CODETAR. Within a year, the technician had taken another job and the program was at a standstill.

SECTION IV

COTTON PRODUCTION

A. Background

With the widespead production of soybeans in the Gran Chaco, people became more aware of the agricultural potential of the region. Many rural families began dedicating more time and effort to farming, and were searching for alternative activities to diversify and intensify their production. Although an earlier attempt to produce cotton had failed, many local leaders felt that the crop was appropriate for the area. The earlier failure was due mostly to the institutional arrangement that attempted to centralize production under a capital-intensive program managed by the University of Tarija. A result of this earlier program was that a cotton gin had been installed in Campo Pajoso, 15 kilometers north of Yacuiba. Although these facilities had not been used for several years, they were kept in good condition by the university.

The only region where cotton was produced in Bolivia was Santa Cruz. Recent experience with the crop was boom-to-bust, growing from about five thousand hectares to over fifty thousand in a few years, and dropping just as quickly back to previous levels. Consequently, Bolivia again imported more than 75 percent of its cotton fiber needs.

In mid-1982, farmer leaders approached the project manager from USAID, Ing. Jorge Calvo, to request that a study be done on the economic feasibility of producing and ginning cotton in the region. USAID and MACA then requested that Chemonics carry out the study, which was to encompass all aspects from production to marketing. The plan outlined in the study called for a special extension program for cotton producers. The costs of two or three technicians would be financed by the producers themselves, once production levels reached about 600 hectares. This was seen as being of special importance during the first few years while the crop was being introduced to the region.

The results of the study were promptly reviewed with MACA and USAID in September 1982, and Chemonics was requested to begin implementation immediately. Its role was to hire an advisor who would train local technicians in cotton production and extension methods. In two or three years, the advisor would no longer be needed, and the extensionists would be on their own to manage and carry out the program. It was assumed that implementation would be done through the Integral Cooperative.

8. Objectives and Level of Effort

The overall objective of this project component was to introduce cotton production in the Gran Chaco. Chemonics' role was first to carry out an initial study and develop an implementation plan. Then the advisor was to set up a technical assistance program for small farmers and train the extensionists. Finally, the program was to put the cotton gin into operation and establish marketing channels for cotton seed and fiber.

Field work for the study was carried out in August by a five-member team as follows:

- o Agricultural economist and team leader
- o Agronomist
- o Civil engineer
- o Electrician
- o Specialist in cotton gin operation

The USAID project manager and the chief of party also participated in the study.

In October 1982 a local agronomist experienced in cotton production was employed as the advisor to implement the program. Because the Chemonics contract was limited in duration, the advisor was first hired short-term, then later became long-term. The same individual held this position until the close of the project in September 1986. The table below presents the level of effort for this technical field.

Table 4.1 LEVEL OF EFFORT IN COTTON PRODUCTION

	Long-term Advisors	Short-term Advisors	Sub-Totals
		(person-months)	
Feasibility study		4.5	4.5
Extension program	36.5	10.5	43.0
Subtotals	36.5	15.0	47.5
COP, DCOP and Home Office supervision			4.0
Total LOE			51.5

In addition to the advisors, Chemonics employed two local extensionists for most of three years. Since these persons were to be trained by the advisor, they were regarded as local counterparts, and are not included in the level-of-effort of the advisory team.

C. Problems Encountered and Accomplishments

The feasibility study was divided in two parts, one dealing with production at the farm level and the other dealing with the rehabilitation and operation of the gin. These were to be used to analyze the economic feasibility of the crop in the region. If favorable, an overall plan for introducing the crop to the region would be formulated.

The production side of the study took a farming systems focus, exploring the place that cotton would have in rotation patterns on different size farms, its input requirements, and potential profitability relative to alternative crops. Farmers were stratified according to number of hectares cultivated, and a sample was drawn from each strata for purposes of applying a questionnaire. Particular emphasis was placed on availability of capital and labor during harvest season. Results were analyzed using a linear programming model. The crop was found to be relatively profitable among small farmers, and gradually less profitable as farm size increased across the strata. This is attributable in part to use of family labor for harvesting. Most production would occur on medium-sized farms having between 7 and 35 hectares of cultivated land.

The infrastructural side of the study found equipment in the gin to be in good condition; however, electrical and supporting installations were deficient. For example, storage sheds for incoming raw cotton and outgoing baled fiber needed roofing and siding. Also the water system was not designed to control fires. Perhaps most urgent was the need for protection from flooding due to poor location. Still, the gin was found to be useable in its present state until it should become necessary to process larger volumes of cotton in the future. The break-even point to cover operating expenses was estimated at only about 600 hectares with a yield of 12 hundredweight of fiber per hectare. Imputed fixed costs such as depreciation and interest were, on the other hand, very high. Maximum capacity would be reached at just over 2000 hectares planted to cotton.

Because the gin had not operated for four years, investments already made by the government in equipment and installations were not being recovered. Consequently, introduction of the crop to the region up to the current installed capacity of the gin was highly justified.

Recommendations included the formation of a local committee made up of public and private institutions and farmers to guide activities under the program. Special care was taken in program design to avoid "cotton fever" and resulting risks of boom-to-bust. Amounts of land planted by farmers to cotton would be controlled at modest levels to coincide with the farmers' capability and with the capacity of the program. Technical assistance to farmers would be provided through a special extension unit which would be paid for by farmers. Deductions

would be made at the cotton gin for this purpose. The local committee would be responsible for supervision of the technical team and for the use of program funds.

During an initial three-year period, outside grant financing would be needed to finance the expenses of the technical assistance team. Further, extension personnel would have to be trained. Also during the first year, only demonstration plots would be planted on a small scale.

Because of the urgency expressed by local leaders to begin implementation as soon as possible, decisions were taken based on a summary report presented in September. A Chemonics advisor was hired locally and planting of demonstration plots started in November. The Integral Cooperative hired a local agronomist to begin forming the technical assistance team.

The nine demonstration plots were carefully supervised throughout the growing season; however, practices used were those available to the farmer on a commercial scale. Comparisons were made between planting dates in November and December and among three varieties of cotton. Detailed data were gathered in the field regarding progress of each plot and costs of production. Average yield from the four hectares included in the plots was 14 hundredweight (cwt.) of fiber per hectare. This was above the average yield of 10 cwt. per hectare in Santa Cruz, but was not as high as hoped for. Heavy rains during harvest caused losses of 37 percent in the field. Still, quality of fiber obtained was excellent and prices were high. Problems with pests were present, but minimal, resulting in production costs that could be covered with only about 6 cwt. of fiber per hectare.

Numerous field days were held, radio programs broadcast, and written materials distributed. However, local leaders, including members of the Guidance Committee, did not become committed right away. In fact, a political campaign was launched to stop the program on the basis that cotton is inherently bad for the soil and will destroy the farmer. A visit to Paraguay organized by the advisor with the cooperation of the Paraguayan Ministry of Agriculture and the USAID missions in the two countries was key in allaying these fears. Paraguay produces over 300,000 hectares of cotton, nearly all with small farmers. Eleven Bolivian farmers and leaders participated in the visit. Besides the agronomic practices, they were able to see systems of small-scale cultivation using animal-drawn equipment and systems for marketing cotton.

During the second season, 45 farmers entered the program with 125 hectares under production. To provide assistance to this number of farmers, two extension agents were needed, besides the advisor; however, USAID was unable to provide financial support to the cooperative for this purpose. At this point it became clear that the program lacked a clear institutional setting. The Guidance Committee set general policy, but was not

formed to be capable of implementing a program. The cooperative had been chosen earlier out of convenience to obtain USAID support. IBTA indicated a willingness to provide personnel for the extension team, but could not obtain autonomy to manage funds at the local level. Consequently, Chemonics was asked to hire the extension agents during an interim period while the program grew and institutional arrangements were developed. During this period, the extension agents were to be trained by the advisor in extension methods and cotton cultivation.

The Integral Cooperative continued to play a major role in the program by obtaining production credit and inputs, such as seed and pesticides. The cooperative also reached an agreement with the University of Tarija to operate the gin. After processing, the co-op markets the fiber in Santa Cruz and the cotton seed in the Villamontes oilseed plant.

The extension team found it impossible to visit each farmer as frequently as required to combat pests and train farmers in cultivation practices. To overcome this limitation, they identified demonstration fields in each community with the agreement of nearby farmers. A weekly visit was made to each demo field on a specified day and time so that all farmers in the area could attend. As pest problems began to grow, more emphasis was placed on detecting levels of insect populations, determining the right time to apply pesticides, and using spraying techniques with ultra-low-volume hand sprayers.

Average yields the second year were about 10.5 cwt. per hectare, but with better market conditions, profit margins were slightly greater. Consequently, the third year, many more farmers entered the program. The table below gives a summary of the four years' experience.

Table 4.2 NUMBER OF PARTICIPATING FARMERS AND HECTARES CULTIVATED DURING THE FIRST FOUR YEARS OF THE COTTON PROGRAM, 1983-86

	1982/83	1983/84	1984/85	1985/86
Farmers	7	45	158	160
Hectares	4	125	550	450
Yield (cwt./hectares	14.0	10.5	6.0	11.0
Production (cwt./fiber)	56	1313	3300	4950

The average yield in the 84/85 season was low, and production credit going into the following year was extremely scarce. Both these factors contributed to the reduced number of hectares planted in 1985/86. However, yields came back up in 1986, and about 800 hectares are projected for the 1986/87 season.

Average yield is only part of the story. The variation in yields each year among plots was extreme, usually from a low of zero to a high over twenty cwt. per hectare. Planting dates, varieties and climatic differences among zones explained only a minimal part of the variation. Instead it was due to the attention given to the crop, especially during harvest. Farmers who took advantage of sunny days to get their crop in had lower losses from rotting in the field and much higher yields. Farmers who let a good day or two go by often did not get a second chance to harvest.

Many new farmers enter the program each year who have little experience in agriculture, and no experience in growing cotton. The investment required to cultivate cotton and the risks of losing the crop are greater than with traditional crops such as corn. Extreme care is required in pest control. There is also a need to coordinate among institutions and provide guidance in decision making. The crop must be programmed ahead of time so that inputs can be ordered well in advance. Seed of the desired quality and variety must be obtained, along with other imported inputs such as pesticides. Hand sprayers and other pest control materials must be available to farmers at the proper time. Large bags must be on hand for harvest. Parts and personnel must be available to operate the cotton gin. Materials must be on hand for baling. Fiber has to be graded and offered to prospective buyers. Finally, prices in different markets and transportation costs must be obtained. There are risks of error in each of these steps.

As the program entered its third year, it was evident that the extension team was essential to its success. The need for a local institution to take responsibility for the program also became more evident. After considering several options with farmers and local leaders, efforts were directed toward the formation of the Association of Cotton Producers of the Gran Chaco (ADEPACH). A detailed plan of activities and budgets was prepared and discussed with leaders and representatives of USAID and MACA. Under this plan ADEPACH would employ a manager to coordinate among institutions and two extension agents to provide technical assistance to its members. The equivalent of two dollars per hundredweight of fiber would be deducted by the cooperative when the cotton was sold. These funds would revert to ADEPACH to pay for the program.

Ideally ADEPACH would have begun operating during the fourth year of the project, while the Chemonics advisors were still on hand to support the new institution. However, only when the termination of the project drew near were decisions made. In

mid-1986, a board of directors was elected, a competent manager was hired, legal status was obtained, and finally, the two extension agents were employed by ADEPACH.

D. Conclusions

Cotton has been successfully introduced to the Chaco and has become a regular part of the cropping pattern. It has assumed an important place in the economy of small farmers in the region. Most persons involved in the program, including farmers, feel that steady growth for the crop over the next few years depends on the assistance of an effective extension program. Two dedicated local technicians have been trained to fulfill this role; however, the institutional and financial base of the program is not as sound as desired.

The cotton program was the only project component to be handled in the traditional fashion according to an initial study and plan, with relatively formalized work-plans, and with formal yearly evaluations. Still, at the time project support was terminating, transfer of critical services to local institutions was anything but smooth. Future financial support for the extension service is in doubt. The reasons for this are important to recognize.

First, at the time the study was done, the institutional base in the agriculture sector of the Chaco was limited. As with many development projects, a major objective was to create or strengthen institutions that can provide needed services. But local leaders must define what kinds of institutions are the most appropriate in each case--public or private--and what form they should take.

The set of rules that creates the environment and defines the possible options is the Bolivian law, both written law and the form in which it is applied. A fundamental aspect of Bolivian law in the past has been that public entities by definition must be centralized at the national level. The law makes little or no allowance for local autonomy over budgets and key decisions, such as selection of personnel. This makes the option of funding an extension program through local public sources nearly non-existent. For instance, a tax on cultivated land cannot be charged and managed locally, even if the majority of farmers consent to it, because it requires the political authority of the government to be exercised at the local level. Without this authority, anyone not wishing to pay the tax would not be required by the government to pay it.

On the other hand, the possibilities of obtaining public financing at the central level of government for a specialized extension activity, such as cotton production in a specific region of Bolivia, are also extremely remote. Since the alternatives for organizing the service through public

institutions locally or centrally are eliminated, the only possibilities are through private means. This leaves only two options:

- Finance the program out of user fees.
- Seek continued support from foreign assistance projects.

Although the majority of cotton growers have agreed among themselves that the technical assistance program is necessary, financing extension services with user fees is not always feasible. Many of the benefits generated by the program are available to farmers in general, whether or not they pay a part of the costs. For example, the technical team has brought in new varieties of cotton from the United States, Paraguay and Argentina to test in the region. Once the results of the tests become public, anyone can purchase the seed without necessarily paying user fees established by ADEPACH.

For funds actually to be collected, ADEPACH depends upon a system whereby all cotton is marketed through the cooperative, and the cooperative makes the deductions and reverts the funds to ADEPACH. This is a process over which ADEPACH has little direct control. When the benefits of a program are not exclusive for those who pay the fees, collecting user fees is similar to taxing without having the political authority to do so: anyone who can find a way gets by without paying for the service. ADEPACH has little legal recourse.

Because the benefits of research and extension are often not exclusive to those who contribute to paying the costs of the programs, these services are usually provided by the public sector rather than the private. But in Bolivia, the options for public organization are not available. Because of the limited institutional alternatives, it is not surprising that interest groups in some developing countries have to turn back to foreign assistance donors for continued support of their programs.

SECTION V

SECTOR PLANNING AND INSTITUTION BUILDING AT THE CENTRAL GOVERNMENT LEVEL

A. Background

1. Organization and Methods and Institutional Reform

The Ministry of Rural Affairs and Agriculture (MACA) is made up of the central ministry plus 13 "decentralized" institutions. Examples of the latter are the Bolivian Agricultural Bank (BAB) and the Bolivian Institute for Agricultural Technology (IBTA). The decentralized institutions were created to operate autonomously from the ministry, thereby protecting them from the constant changes in policy and authority at the central government level. However, despite being partially separated from MACA, most of these organizations continued to be internally centralized, maintaining control at the central level through a top-down vertical structure based in La Paz. One result of this phenomenon was that the central ministry gradually had functions and resources drained away by the decentralized organizations. As MACA became gradually weaker, other ministries played a more aggressive role in agricultural policy--notably the Ministry of Industry and Commerce and the Ministry of Finance.

Many officials in MACA had seen the need to undertake a major reorganization of the institution. Several studies to this effect had been carried out under different initiatives. USAID was pushing in the same direction and was offering financial support. Therefore, an expert in organization and methods, or public administration, was included in the Chemonics contract. Wisely, the terms of reference for this position did not lock the advisor into working exclusively on institutional reform. Technicians in MACA could see that the political feasibility of such an undertaking ran hot and cold, and depended upon factors outside their control and that of the advisor. Hence the advisor's assignment was defined in terms of administrative analysis and support, perhaps leading to institutional reorganization.

The original O & M position was for 24 contract months; hence the advisor departed after two years in July of 1981. Within this period, the advisor participated in an attempt to reorganize MACA under the sponsorship of IICA (Interamerican Institute of Agricultural Sciences of the OAS). This effort terminated with an abrupt change in government. However, in April 1982, the subsecretary of agriculture invited the chief of party to participate in a new commission for restructuring MACA. This commission decided to create a Technical Team for Reorganization of MACA (TTR), and requested that Chemonics provide the vehicle for employing its members. Mr. Robert Thurston, rural development officer of USAID, was instrumental in

helping MACA reach an agreement with PL-480 to provide funding. These funds were to pay honorariums and expenses for the Bolivian team members. Chemonics was also to hire a short-term O & M advisor to serve on the TTR under its technical assistance contract with MACA. The team worked from June 21 to November 16, 1982. Its work was again cut off abruptly with a change in government.

In 1986 leaders and officials in MACA initiated new efforts at political reform. This time the movement had the benefit of political support and stability, plus a reasonably widespread consensus among leaders throughout the country on what actions needed to be taken.

2. Sector Planning

This activity was to have occupied half the time of the chief of party. One central focus was to develop a linear programming model of the agriculture sector. Another was to assist with the reorganization of the Office of Sector Planning (OPS) in order to strengthen MACA's ability to carry out this function. Though the need for planning must have been seen by many leaders at the central level, MACA at the time did not lend itself to meaningful involvement. Most policy decisions were taken in other ministries or institutions. The project designers had also underestimated the amount of time required for the COP to manage the project and supervise many different activities. Much less than half time was actually available to work in a separate technical area.

In early 1980, two young technicians from MACA took a personal interest in reworking the linear programming model of the agricultural sector originally developed under the earlier Ag Sector I Project. Although their request for assistance did not officially reflect the concerns of MACA authorities, support was provided. Later, MACA requested that a short-term advisor be hired to help with the effort. This was the only extended effort made in the field of planning.

3. Data Processing

The original concept behind this technical activity was that MACA would form a central data processing facility for the entire agricultural public sector. The T-059 Project included funds for the purchase of computer equipment for MACA, and a long-term position in data processing was included in the original Chemonics contract. However, terms of reference for this position were not defined, and doubts continued to arise about MACA's capability to undertake such a sophisticated activity. Since the ERTS program also had requested USAID financing for computer hardware, and some of their needs and uses were similar to MACA's, Chemonics was asked to provide short-term assistance to help determine the needs of both institutions and develop

specifications for equipment. Recruitment for the long-term position was to have been carried out simultaneously with procurement of the hardware.

USAID exercised more direct control over this technical area than any other because of the strong leadership of its staff members and heavy involvement of advisors in earlier projects. Several institutions received support to handle different kinds of information, but potential for overlap and duplication justified USAID's careful control.

B. Objectives and Level of Effort

The general goal that gave rise to the sector planning and institution building components stemmed from the need to increase the capacity of the Ministry of Agriculture to deal with policy issues and to implement agricultural programs. Therefore the goals of the O & M, planning, and data processing fields can be summarized as follows:

- Increase the capacity of the administrative departments of MACA and related institutions, especially in terms of personnel management.

- Increase the capacity of the planning and statistics divisions of MACA to carry out data collection and analysis.

With the formation of the TTR, the main objective of institutional reform was more clearly defined. It could be reduced to the following:

- Create fundamental institutional change in the public agricultural sector so as to: 1) decentralize decision-making in MACA to the regional level, and 2) incorporate farmers and rural leaders in decision-making processes.

The advisor in organization and methods arrived with the original team and completed a two-year assignment in July of 1981. A year after his departure, political events took another turn, which led to the formation of the TTR. A short-term advisor was hired to participate in this effort during the second half of 1982. Work in sector planning was carried out intermittently by the chief of party beginning in 1979, and two short-term advisors, between the years 1980 and 1982. In addition, two short-term advisors in data processing carried out assignments in early 1980. The total level of effort is summarized below:

Table 5.1 LEVEL OF EFFORT IN SECTOR PLANNING AND INSTITUTION BUILDING

	Long-term Advisors	Short-term Advisors	Sub-Totals
		(person-months)	
Organization & methods	25.0	1.0	26.0
Institutional reform (TTR)		5.5	5.5
Sector planning		7.5	7.5
Data processing		1.5	1.5
Subtotals	25.0	15.5	40.5
COP, DCOP and Home Office supervision			12.0
Total LOE			52.5

There were three other members of the TTR who were paid locally by Chemonics. Since the source of funds for these persons was PL-480 under a separate agreement, their time is not counted in the level of effort for the technical assistance contract with MACA.

C. Problems Encountered and Accomplishments

1. Organization and Methods and Institutional Reform

The work of the long-term advisor in organization and methods can be thought of as having two phases. The first phase occurred when the advisor was assigned to work on a commission to reorganize MACA and related institutions in the agricultural public sector. During the second phase, the advisor and his counterparts carried out a personnel study.

The Reorganization Commission was well staffed by MACA and the Interamerican Institute for Agricultural Sciences (IICA). The advisor participated in conjunction with his counterparts from the Office of Administrative Analysis of MACA. Many studies and reports had been prepared previously by other groups, and in each case these contained recommendations for institutional reform. Still, no meaningful focus or theme was generally agreed upon by leaders in the sector or authorities in MACA. Instead, controversy centered around the possibility of splitting the ministry into two parts, one to deal with technical agriculture and production and the other to deal with rural affairs and political issues.

Support for the commission's work was weak at first, and then grew much stronger with a change in minister and the naming of a new subsecretary, Ing. Raul Zegarra, in August of 1979. However, the effort was cut off on November 1 with a violent military coup. After power was handed back to another civilian government within a few weeks, it became apparent that the new minister would not support institutional reform.

In the meantime, the advisor helped prepare the First National Agricultural Symposium, which was held in Santa Cruz in March of 1980. This was an historic event in the agriculture sector of the country, with more than 300 persons attending. In the conclusions, a great deal of emphasis was placed on the need for continued efforts in institution building and reform. Perhaps as a result of this, MACA asked the advisor and the Office of Administrative Analysis to undertake a new institutional analysis focusing on personnel management.

The personnel study covered all 4,287 employees of MACA and the 13 institutions that fell under it. By examining the job descriptions of each employee, many functional duplications were noted among institutions under MACA's own umbrella. For instance, at least 10 of the 13 institutions provided extension services to farmers in one form or another. Also, many entities dealt with rural infrastructure, including roads and irrigation systems. This duplication was thought of as unmanageable and was blamed by some for MACA's institutional weakness.

The study also compared job descriptions with levels of education and salary in an effort to develop better systems of personnel administration. Projects receiving support from foreign donors and having more autonomy from MACA paid higher salaries and attracted more qualified personnel. The closer jobs were to the central government, the lower the salaries.

Fortunately, the advisor's activities were neutral enough in focus so as not to be greatly affected by the coup of 1980. However, the prospects for decision making on institutional reform were also remote. Therefore, when the personnel studies were completed, the advisor departed and was not replaced. Under the one-year extension in the technical assistance contract in 1981, it was assumed that Chemonics' role in this technical area was completed.

After a cabinet change in 1982, however, the new minister of agriculture asked the chief of party to participate in another technical commission formed to reorganize MACA. The commission was headed by a young, dynamic subsectretary of agriculture, Ing. Freddy Teodovich. It soon decided that a technical group was needed whose members could devote full time to the effort, and funds were made available through the PL-480 program for this purpose. Chemonics was asked to employ the members of the group and provide full support, including technical orientation,

development of work plans, secretarial and administrative support, office arrangements, and report publication and distribution.

Although previous efforts had met with frustration, Chemonics remained committed to these efforts. In three years' experience in Bolivia at that point, the team had witnessed several persistent serious problems:

- Research results did not reach the farmer.
- Credit programs were not supervised.
- Some semi-public agroindustrial enterprises also had authority to decide on sector policy.
- The farmer and rural resident had no input into policy regarding provision of public services.
- Most services of MACA were directed from the central level, resulting in little effort spent on policy analysis.

The subsecretary originally intended to avoid another study and instead proceed directly to implementation. However, again a lack of direction was sensed; hence it was agreed that a brief study was needed to determine the overall direction or thrust that reorganization would take.

The group, called the Technical Team for Reorganization of MACA (TTR), was made up of three Bolivian members and a foreign advisor. The chief of party also played a major role at critical moments. Within a short time, the TTR developed the concept of institutional reform by creating fundamental changes in the manner in which MACA and other public institutions relate and deliver services to the rural population. Emphasis was placed on starting at the local level and working toward the central level as required. Maximum participation from leaders and organized groups in the various regions was encouraged. Members of the TTR spent much of their time giving presentations in meetings throughout the country where they would receive feedback and new ideas from participants. The principal thrust of the reorganization that resulted from this process was, not surprisingly, that MACA should be decentralized. Regional committees with farmer participation were to be formed and would have authority over funds, personnel and local policy.

A great many copies of the TTR report were distributed around the country, and it was apparent that a national consensus was being reached, when again abrupt political change stopped the process in October of 1982. Hence the TTR operated for only about four months in total.

During 1983 and 1984, the reorganization issue lay dormant. However, discussions with leaders from around the country showed that conviction concerning the concept of decentralization was becoming even more solid. Also, a working example of a reorganized public service, operating at the regional level with private participation, was being developed in this period, i.e., seed certification, which is covered in a later section of this report. The Paz Estensoro Government that took power in August 1985, appointed a minister of agriculture dedicated to these concepts, and an extremely capable subsecretary, Ing. Alejandro A. Pacheco, was appointed with the mission of reorganizing the ministry.

Ing. Pacheco quickly formed a new technical team within MACA and agreed on a strategy for reorganization, which was based on many of the concepts in the earlier TTR reports and on the practical experience of the seed program. MACA was successful in obtaining direct support from the PL-480 program and at the time the T-059 Project was ending, the reorganization was being carried out.

2. Sector Planning

The idea of developing a five-year agricultural plan had existed for some time and was of interest to many technicians in the Sector Planning Department (DPS) of the ministry. No activities in this regard were initiated until one of the commissions formed in the First National Agricultural Symposium was charged with developing the plan. Two young technicians in MACA, Lic. Fernando Mojica and Ing. Johnny Pereira, suggested that the linear programming model developed earlier for the sector could be used to analyze alternative policies as an input to the five-year plan.

The linear programming model (LP model) had originally been developed by foreign advisors in a previous USAID project. However MACA technicians were only vaguely aware of its existence; none had actually worked on it. Copies of the model could not be found in MACA. Thanks to Ing. Pereira, the original model was recovered from persons outside the ministry. However, only the basic model was found, no supporting materials were available, and the source of the information could not be identified. Upon contacting the creators of the model, it was discovered that no single source had been used and that much of the data was based only on gross estimates, and included only to test the structure. Results of the model could not be relied upon. Therefore the model would have to be reworked with accurate production and cost data.

A new work-plan was drawn up contemplating more time and effort than originally anticipated. A short-term advisor was hired in June of 1980 and the work was divided into three areas: demand, transportation, and production or supply. The short-term advisor took responsibility for the first part of the model on demand, and the COP developed the second part on transportation.

The structure for these two sections was changed greatly from the original model. The two local technicians handled the section on inputs, production costs and productivity. The 1978 Agricultural Sector Survey was used as the primary source of information for the production or supply section of the new model.

By the time the model was ready to run on computer, both local counterparts had resigned from the ministry; nor were any authorities carried over who were interested in utilizing the results. The commission to develop a five-year plan had never become operational. Still, the computer run and subsequent analysis were completed. A local short-term technician was employed half-time for this purpose over several months. Reports containing the details of the model--structure and source data--and reports containing results and analysis were published and distributed.

3. Data Processing

At the outset of the project, the COP was involved in helping MACA and USAID reach decisions on the purchase of a central computer and on the best timing and job description for a long-term advisor in computer science. However, it was difficult to justify a large investment in sophisticated equipment for MACA. Budget levels were so low that it would have been impossible to obtain qualified personnel and operating capital. Also at that time, new hardware was being developed. It was not clear that a center with a mainframe computer was the right approach to apply to the agriculture sector in Bolivia. For these reasons, agreements would be reached one moment, then questioned the next.

In January 1980, the minister signed an agreement with the director of the ERTS program in Bolivia to provide funds from the T-059 Project for the purchase of computer hardware. Soon afterwards Chemonics was asked to employ a short-term advisor to develop specifications for the part of the equipment that would be used in interpreting digitalized satellite images and, hopefully, would also satisfy some of MACA's needs in statistics.

The advisor recommended that a central minicomputer be shared between MACA and ERTS. After agreement was reached on this concept, another short-term advisor was assigned to help determine the specific needs of MACA, focussing mainly on statistics and administration. He also developed a plan for the data processing unit, defined its personnel requirements, and outlined the costs of operation. MACA and ERTS soon reached agreement on this plan and requested that the equipment be purchased by USAID. Chemonics proceeded with the recruitment of a long-term advisor and presented candidates to authorities in MACA. However, when the project was frozen after the July 1980 coup, funding for the procurement and hiring of new technical

personnel was indefinitely postponed. When the project was reactivated in 1983, its focus had moved away from strengthening central government institutions.

D. Conclusions

The initial concept of the project was to strengthen existing institutions at the central governmental level, rather than to develop more effective institutional forms throughout the sector. Perhaps the goal of creating fundamental institutional change in public institutions leading to decentralization and participation of private organizations in decision making would have been considered a goal too ambitious or inappropriate for a project funded by an international organization. In reality, it was defined not by the project team, but by local leaders working through the process of institutional reform. Only by their determination could the advisors change the emphasis from administrative methods to policy-making processes.

Institutional reform implies changing the systems within which decisions are made, and therefore changing the rights of different groups and individuals to make or influence those decisions. Throughout the process, the proposed changes were threatening to most persons in the MACA bureaucracy at the central government level in La Paz. The work of the TTR was so controversial in political circles at the time that it became a national issue and nearly resulted in the termination of the Chemonics contract. The importance of this activity justified the risk.

The team was fortunate in being able to carry the issues to a wide number of institutions and leaders who became committed to one central theme. This was made possible in large part because other Chemonics advisors were located in field offices and had credibility with the agricultural community. They were also involved in institution-forming within their technical activities. Constant contact made it possible to examine the options openly with hundreds of leaders around the country and reach conclusions that eventually would be accepted.

If the process of determining the direction for institutional reorganization and reaching a national consensus is the first half of the job, then the job was slightly more than half done at the end of the project. To carry out a complete institutional reorganization will take several more years of effort, and a great deal of support from international entities such as AID.

SECTION VI

INFORMATION SYSTEMS

A. Background

This area of work is closely related to sector planning, but it stands alone in that its primary goal is not institution building. It arose as a result of a request by the head of the Planning Office in MACA to conduct a study of information systems in the agriculture sector. Even before the terms of the study were specifically defined, the head of the Planning Office had already changed. Still, expectations had been raised among persons in several institutions, so Chemonics felt obliged to proceed. A short-term technician was hired to work half-time in information systems, while dedicating the other half to analyzing the results of the linear programming model. The advisor himself, a young Bolivian just returned to the country after earning a Ph.D. at Iowa State, felt strongly about the need for improvement in this area.

Upon completion of the study, enthusiasm and expectations grew even more, especially in the area of scientific and technical information for professionals working in the sector. The advisor initiated an implementation plan, which was to have been acted upon by different institutions. A very dedicated student at the Catholic University took the lead, working in Chemonics' offices in La Paz for about six months without pay. When the activity had gained some momentum, an advisory position, short-term, was defined.

D. Objectives and Level of Effort

The first objective was to carry out a study to identify informational needs in the agriculture sector, both statistical information and scientific/technical information. Later the following objective was defined:

- Create a service for distribution of technical publications for professionals working in the agriculture sector of Bolivia. This was to be done in coordination with the Bolivian Institute for Agricultural Technology (IBTA) and the Catholic University of Bolivia (UCB).

The study was carried out by a short-term advisor during 1981 and 82. Before completing his assignment, he was able to initiate implementation of the service with participating institutions. Nearly a year later, in November 1983, a new position was created for an advisor to continue assisting with implementation. Though officially short-term, this position was periodically extended to a total of 29 person-months. Therefore, only short-term support has been provided in this area, as shown below:

Table 6.1 LEVEL OF EFFORT IN INFORMATION SYSTEMS

	Short-term Advisors	Sub-Totals
Study of information needs	3.0	3.0
Implementation of information service	32.0	32.0
Subtotals	35.0	35.0
COP, DCOP and Home Office supervision		2.0
Total LOE		37.0

In addition to the level of effort shown, the contribution of several students of the Catholic University was important. First, as mentioned above, at the outset of the program, a student took the initiative and worked for nearly six months with little or no financial support. Later, a team of four to six students worked half-time in the Information Center (CICTAR). They received scholarships to pay tuition and fees, plus small stipends to reimburse minor expenses.

C. Problems Encountered and Accomplishments

The overall purpose of the study was to do a general diagnosis, identifying information needs and the methodology to obtain it. The advisor was also charged with defining the responsibilities of institutions which should be involved in a national agricultural information system. Unfortunately, no distinction was made as to which types of information should receive greater emphasis. In examining the literature on the subject of information systems, the advisor found that many authors fail to make this distinction. In practice, the treatment of different kinds of information varies according to its purpose, the sources, its useful lifespan, the needs of the user, and other factors. The advisor identified three principal kinds of information as follows:

- Historical data in statistical form used for economic analysis and planning
- Market data used for making immediate decisions in commercial activities
- Technical and scientific information, usually in published form, used by professionals to keep up with technological advances in their field.

At that time, prices in Bolivia were controlled by the government, causing market information to be politically sensitive. Hence it was extluded from the study.

Over 100 individuals were interviewed from different parts of the country in regard to the information needs of their institutions and the methods used to gather and analyze information. More than half responded that they were aware of the existence of a great many documents published in Bolivia, including project documents and plans, that contained valuable information, but that the few copies produced were seldom made available to technicians and professionals working in the sector. Documents were jealously guarded by individuals and institutions. In few cases were they distributed to libraries or other centers where technicians could gain access to them.

Two meetings were held in early 1982 to analyze the results and recommendations of the study. A great deal of interest was expressed in the area of technical/scientific information. On the other hand, the area of statistical information caused conflict. The representative of the National Statistics Institute (INE) was especially insistent that his organization be the national leader in this area and that there was no need for additional coordination within the agriculture sector. Consequently, it was decided that the project should provide modest support in the area of technical/scientific information, and none in statistical information.

The strategy chosen for technical/scientific information was to develop an information service that would have the individual technician and professional as its clientele. This was a radical change from the orientation of activities in the previous section where institution building predominated. In that case the role of the project would have been to strengthen IBTA's and MACA's capacity to manage information. The most appropriate institution to carry out this activity would have been an association of professionals in the agriculture sector. However, existing groups were splintered by specific profession and level of training. Worse than that, of the 3500 to 4000 professionals working in the sector, less than half belonged to an association. Hence, a work-plan was developed between IBTA and the UCB, with modest support from Chemonics and the T-059 Project.

The first task chosen for the information service was to publish a directory of professionals working in the sector. This would be a useful document for many purposes, and would help define the magnitude and nature of the client group. It would also give the information service some visibility. Before finishing his assignment, the advisor helped prepare and distribute 6,000 copies of a questionnaire to collect data for the directory. A Guidance Committee was formed to promote and coordinate work in this area. Upon the departure of the advisor, it became clear that personnel assigned by IBTA and the UCB did not have the capacity to carry out the tasks without assistance

and direction. However, a student in the Catholic University, Mr. Miguel Ibanez, learned of the activites and took interest. He willingly volunteered his services during more than six months to tabulate information for the Directory of Professionals.

In mid-1983 the Guidance Committee requested that Chemonics employ a local advisor to head a technical group to continue work in this area. The committee and the technical group adopted the name CICTAR (Technical/Scientific Center for Rural/Agricultural Information). At this point, IBTA, MACA and the UCB assigned a total of five student-workers to the group. The UCB student who had previously been working on the program was hired half-time as an advisor.

The initial work-plan of the group focused on distributing the Directory of Professionals, preparing annotated bibliographies and linking together documentation centers and libraries. These tasks were intended to increase the access professionals and technicians would have to documentary information. The group suffered several setbacks at its inception: printing the directory was delayed more than seven months by a private publisher; several members of the technical group were assigned to other tasks in their institutions, causing constant turnover in personnel; practically no support from MACA or IBTA was forthcoming. However, the UCB continued to provide support with personnel, office space and funding, and Chemonics was committed at this point to implementing the program. In early 1984, 1000 copies of the Directory of Professionals were distributed and were well received around the country. This was the first document of its kind in the agriculture sector in Bolivia.

Through continued feedback from interested persons around the sector, it was determined that a periodic bulletin would be of interest, especially to inform the user about recent publications and how to obtain them. This activity was adopted in lieu of annotated bibliographies in part because the product had more chance of being distributed with user fees attached, i.e., subscriptions could be sold. The income generated would help ensure continuation of the activity, and also the activity could be more easily managed. The group could measure its success on the basis of the number of subscriptions obtained. The bulletin would carry more than announcements of new publications; it would also contain articles and announcements of events, training opportunities and employment opportunities. The first edition was launched in March of 1984 with disappointing results at first. Though the price was nominal, less than 100 subscriptions had been sold after four editions. The problem was identified as lack of regularity in publication and distribution.

A systematic work schedule was established for the group, and regional representatives were recruited on a volunteer basis to distribute materials directly to users in their area. With the technical group in La Paz, they created a system for distribution and collection of materials that reached every

corner of the country. Within a few months, subscriptions rose to more than 1200; the initial target had been set at only 600. The bulletin soon grew into the main activity of the technical group in La Paz, occupying more than half the time of the advisor and the student-workers. The expert from the home office in audio-visual methods helped improve the format and style of presentation, which was later printed with offset, rather than mimeograph.

The local advisor's position was later changed to full-time. He presented several seminars to librarians and other persons in charge of documentation centers around the country. Three regional committees were formed (in one case reactivated) to promote information networks among institutions within their regions. Ideally, these were to be linked together nationally through lead institutions in each region using a common system for indexing and retrieving documents, a long-term goal not reached within the time frame of the project.

Assistance in doing bibliographic searches for all available publications in a subject area was repeatedly requested of CICTAR. For the first year, the group did not have the capacity to respond. Later, when several regional networks were beginning to operate, this service was initiated. Requests and responses were published in the bulletin at first so that other users could see how the system operated. Also, other persons with relevant information could contribute beyond the information located by CICTAR.

A plan was developed with the Catholic University to assume the functions of CICTAR as one of a number of activities being initiated by the UCB in the agriculture sector. The UCB obtained a commitment from PL-480 for funding for three years into the future, and hired a qualified professional to take over activities. Project support was terminated in April of 1986, and for a period, activities fell dormant. However, under the guidance of the new head of CICTAR, Mr. Pascual Sanchis, the program is being reinitiated. Overall objectives have been defined along similar lines as before.

D. Conclusions

The degree of success or failure in this activity is not clear. On the one hand, the most straightforward yardstick is the number of subscriptions sold for the bulletin, and it showed that objectives were met and surpassed. On the other hahd, the quality of work produced by CICTAR was seen by many persons as poor. None of the members of the technical group had worked in the agriculture sector before. Being located in La Paz, they were not able to make many direct contacts or gain much first-hand knowledge about commercial agriculture. Despite the remarkable personal efforts put in by student-workers, they could not overcome this limitation.

Because project support was limited, investments in this technical area were kept to a minimum. In retrospect, it appears that a more successful approach would have been to obtain financing for an experienced agricultural expert to strengthen the group's capabilities in technical agriculture and rural development. This person could have created greater credibility for CICTAR by maintaining direct contact with other professionals in the sector, and by selecting and editing technical materials for the bulletin--activities which student-workers could perform effectively. Fortunately, the Catholic University has overcome this deficiency by naming Lic. Sanchis as Director of CICTAR.

The principal reason for the apparent success is that needs were correctly identified. Most technicians in the agriculture sector in Bolivia receive virtually no published technical information from outside the institution in which they work. They do not belong to any professional association. The few associations that do exist have adopted policies that tend to limit their membership, rather than expand it; they are not service oriented, and carry out a minimum of professional activities. Therefore, the CICTAR approach was readily accepted. High caliber professionals volunteered important amounts of time as regional representatives because they saw an opportunity to promote professional activities. Consequently, the CICTAR Bulletin had no real competition.

CICTAR did not generate an important stream of income. Since its main focus is technical information, and promoting professional activities, it is not the kind of activity that can easily be self-financed. Still, it outlived other activities, such as sector planning and data processing, because it became user-oriented, and did not rely on the continued enthusiasm of public authorities.

SECTION VII

PROGRESS IN SEED PRODUCTION

A. Background

The vast majority of materials used for planting crops in Bolivia are grains and tubers that the farmer saves from one harvest for use as seed in the next crop season. The origin of these materials is often from native varieties brought into cultivation centuries before in the same region. In other cases the origin is material brought into Bolivia from neighboring countries, and less frequently it is material from international research centers that do plant breeding to develop new varieties.

Whatever the source, after the materials have been cultivated in a region for some time, they become mixed with other varieties and degenerate to the point where desirable characteristics are no longer maintained uniformly and reliably. For example, if seed is not genetically pure, a farmer producing wheat for sale to flour mills cannot assure the buyer a uniform quality of grain. When heads of barley mature at different times, there will be lower yields in threshing and unripened grains mixed with good ones. Or, when off-type plants in a field are susceptible to a disease, and it takes a firm hold on them, it will also infest the rest of the plants that otherwise would have been able to resist.

These are some of the problems for which farmers in general need a source of seed to renew their materials and replace older, degenerated varieties with new ones. When one gets closer to an individual crop in a particular region, several additional reasons for obtaining high quality seed often appear. For instance, in lower areas of Bolivia, temperature and humidity are high, causing wheat and potato seeds to become infested with disease. Although the crops are commercially produced with good results, farmers have traditionally found that seed must be obtained in higher locations--cold, dry environments where diseases develop less rapidly. Another example is oilseed crops grown in the tropics, such as cotton and soybeans. In both cases, the seeds or grains produced by these plants contain high amounts of edible oil, which is extracted for human consumption. But the existence of the oil in the seed saved for planting causes rapid deterioration, killing the small plant embryo before the seed can germinate.

In cases where Bolivian farmers resolved to renew their plant materials, they either purchased locally available grains or tubers that had a good physical appearance for use as seed, or they imported seed from other countries. The latter alternative was limited, not only because of the considerable cost, but also because the varieties available in other countries did not necessarily adapt in Bolivia, or did not possess other desired characteristics.

New varieties are developed each year by international plant breeding research centers for distribution to underdeveloped countries. Bolivia receives samples of seed from international centers and tests the varieties in experiment stations in various regions throughout the country. This is the main activity of the agricultural research program in Bolivia. Out of the 100 or 200 varieties of a particular crop received each year, one or two might be found to adapt to the region. The testing process takes two or three years to complete. At this point, the variety is recommended to the farmer, but the experiment station has just a few kilograms of genetic seed, the seed that the researcher harvested from the experimental plot. In order for farmers to use the variety on a large scale, this tiny quantity must be expanded to hundreds of tons of seed, retaining along the way the same favorable genetic characteristics. The large volumes produced also have to be free of noxious weeds and have to be strong and healthy. This is the function of a seed multiplication program.

A Seed Department had been created in MACA in the late 1960's, and, with the financial support of international donors, had built several seed cleaning plants around the country. From one to three technicians were located at each plant. Seed production was very low or non-existent, so MACA began to invest in land and equipment to produce within its own Seed Department. The small amounts produced were mostly of poor quality and were difficult to sell, even at subsidized prices. The low prices and government policy to produce and distribute only through the public sector prevented most private interests from pursuing the activity. Practically the only exceptions were potato and forage seeds produced with the support of development projects, in both cases in Cochabamba. MACA primarily focused on production of seed for cereal grains.

The original focus of the T-059 Project assumed that support would be provided to the MACA Seed Department to develop its capabilities along similar lines as in the past. Funds were allocated for building and equipping additional seed cleaning or conditioning plants, even though current capacity was not being utilized.

A long-term position in seed improvement was included in the Chemonics contract to strengthen the National Seed Department of MACA. The position was to be based in La Paz for a period of 18 months. However, with the unstable political environment that was developing during 1979, it was suggested to the head of the National Seed Department that the position be changed to any agricultural region, rather than the center of government. The response was positive, indicating that the advisor should have his work site in the department of Santa Cruz. It was also indicated that the position should not be filled until the end of the 1979/80 crop year. This way the advisor could begin a new crop cycle in 1980.

1. Santa Cruz

The Department of Santa Cruz encompasses a vast area of eastern lowlands stretching out to the Brazilian border on the north and east. It also includes lower mountain valleys of Valle Grande and Comarapa to the west, on the route to Cochabamba. Over the last 30 years, expansion of commercial agriculture in the lowland areas to the north and south of the City of Santa Cruz has resulted in the development of the most important agricultural region in the country. Major crops are sugar cane, corn, rice, soybeans, cotton and forages for dairy and beef production. Much of the agriculture is mechanized in medium-sized and large farms; however, small farmers, mostly highland people from Cochabamba who have migrated to Santa Cruz, account for a large percentage of the production of some of the crops, such as rice and corn.

2. Gran Chaco

Excellent results were obtained in seed production in Santa Cruz during the first two years; consequently, other regions requested assistance to implement similar programs. Especially in the Gran Chaco, the Integral Cooperative experienced serious problems each year in obtaining soybean seed, and was aware that good quality seed was being produced in Santa Cruz. A joint meeting was held among leaders from the Chaco and from Santa Cruz to define a position having responsibilities in both regions. Having the advisor based in Santa Cruz would facilitate recruiting, especially since Santa Cruz has an American School. Even before the project was reactivated in 1983, this position was included in the contract.

3. Chuquisaca

Later in 1983, after reactivation, another position was included in the contract. This time the idea was to place an advisor in a high valley area where farms are smaller and not mechanized. Cochabamba was chosen first and the advisor was recruited. Upon his arrival, the First National Round Table on Seeds was held in Cochabamba. During this event, local leaders expressed the view that seed production would be a marginal activity in the region. Instead, the southern valley areas, especially Chuquisaca, held more promise. After a period of information gathering in both regions, the decision was made to change the site of the advisor to Sucre, the capital city of Chuquisaca.

4. National Seed Program

The approach taken in seed production programs in many developing countries is to establish a centralized public entity to handle all aspects of the multiplication chain. This was the approach advocated at the central government level in Bolivia. However, at the regional level, leaders in the agriculture sector who would be involved in production had a different orientation,

more in line with that of the team of advisors. Because of this continuing conflict, a special degree of effort was required to coordinate activities of the advisors with local and national institutions. Besides the support provided by the chief of party, the advisor in Santa Cruz was named "leader" of the seed improvement component of the project. Further, short-term ass.stance was used for the National Seed Department of MACA.

Over time, as the influence of the project extended to more regions of the country, additional needs arose at the national level for carrying out special events and training programs, developing promotional materials, and finally, for creating the National Seed Council. For coordination and administration of funds to carry out special events and courses, the deputy chief of party (or administrative director) took major responsibility.

B. Objectives and Level of Effort

In all three regions the objectives were defined in the same manner:

- o Create a seed multiplication chain for a lead crop, to include foundation seed production, multiplication of commercial seed, conditioning, storage and marketing.

- o Form a certifitation service to provide technical support to each step in the multiplication chain and ensure of the finished product. The certification service under a regional seed council which formulates policy and policy and coordinates among institutions.

- o Once the system is working for the lead crop, include other crops.

The first long-term advisor arrived in June of 1980 to work in Santa Cruz. He remained for nearly five years until March of 1985. The second long-term advisor arrived in April 1983 to work in the Gran Chaco. In June of 1985 his work site was changed to Santa Cruz, and another seed specialist was employed for the Chaco. Both of these persons remained until the end of the project.

The advisor for Chuquisaca arrived in August 1983, and after completing a two-year assignment, returned to the United States. Another person was employed from September 1985 through September 1986. Additionally, a short-term local advisor was hired in Sucre (Chuquisaca) to allow for support in the neighboring regions of Tarija and Potosi. With several extensions of his contract, this advisor worked a total of 17 months. Also during the 1985/86 crop-year, the cotton production advisor assisted in production of cotton seed in Santa Cruz. It is estimated that four months of his time were used in that effort.

Besides the seed specialists described above, two agricultural economists were employed to develop several studies and projects. They spent 15.5 months of time mostly in Santa Cruz and Chuquisaca during 1984 and 1985. During the same period a locally hired civil engineer worked for a total of 13.5 months to support construction of seed conditioning facilities in all three regions.

At the national level, some of the Santa Cruz advisor's time is included as leader of the seed activity. In 1982 a short-term technician was hired to work in the National Seed Department for over six months. Also an expert in audio-visual methods provided 2.5 months of time developing a video tape for local promotion purposes. This was done near the end of the project in 1985.

The summary of the level of effort in seed production in table 7.1 below shows it to be by far the largest project component, absorbing twice the amount of technical assistance as the land clearing component.

Table 7.1 LEVEL OF EFFORT IN SEED PRODUCTION

	Long-term Advisors	Short-term Advisors	Sub-Totals
	(person-months)		
Santa Cruz	66.5	16.5	83.0
Gran Chaco	40.5	5.0	45.5
Chuquisaca	37.5	25.0	62.5
National	13.5	9.5	23.0
Subtotals	158.0	56.0	214.0
COP, DCOP and Home Office supervision			29.0
Total LOE			243.0

C. Problems Encountered and Accomplishments

1. Santa Cruz

The National Oilseed Producers Association (ANAPO), based in Santa Cruz, had experienced serious difficulties obtaining high quality soybean seed at reasonable prices for its producers. It was a high priority to do so because soybean seed in a tropical area is subject to rapid deterioration and consequent loss in germination and vigor. Many farmers could not save part of their grain crop for use as seed during the next

season as they customarily do with other crops. ANAPO imported seed from Brazil to distribute to its growers, but the cost of this material placed in Santa Cruz was very high, about $.90 per kilogram, or $900 per ton, while soybean grain was priced at only about $180.

Still, local leaders were not convinced that quality seed could be produced in Santa Cruz, and they requested that the advisor begin his work by doing quality control tests on imported seed. A rustic laboratory was set up at the Warnes conditioning plant where two MACA technicians were housed. Results of the analyses were alarming to growers--imported seed germinated at an average rate of only 68 percent, well below certification standards. The reason was found to be poor conditions in transit from Brazil to Bolivia. Temperatures in metal railroad cars stopped at the border were found to rise as high as 60 degrees centigrade (140 degrees Farenheit).

Plans were immediately made with ANAPO and MACA to produce seed during the summer season, from November 1980 to April 1981. However, seed would need to be cleaned, and equipment for the Warnes conditioning plant purchased under the Agriculture Sector I Project was not yet installed. The mechanical installation involved building hoppers, assembling elevators, building support bases for machinery, assembling drying bins, and hooking up air ducts from heater/fans to drying bins. Electrical installation included high-voltage installation, transformer, circuit box and connections out to each machine.

The production program was started at the same time that plant designs, budget estimates and construction contracts were being prepared for the installation. Because of the technical requirements of seed production and the risks involved, the program was started only with a few, mostly large, farmers. The better fields of grain were selected to be harvested as "seed." These were fields with varietal mixtures below 5 percent and low incidence of noxious weeds. The advisor personally carried out field inspections and laboratory analyses throughout the production season. Germination and vigor tests showed that high quality material was being produced in the field, but the process broke down at harvest time. The Warnes plant had not been completed in time so there was no place to take seed for artificial drying. Consequently, farmers let the crop dry in the field, as they do with grain crops. Exposure to field conditions in a hot, humid environment after the seed reached physical maturity caused rapid deterioration and loss of germination. As a result, the entire seed crop was lost, although farmers could still harvest it for grain and take it to the oilseed mills.

The experience of the first year was disappointing, but it pointed to the need for development of serious seed producers, and for an emphasis on timely harvest and facilities for prompt artificial drying and storage. Fortunately, in Santa Cruz, the opportunity exists for two crops per year. Although not practiced with soybeans at the time, several farmers offered to

produce a winter crop for use as seed. The season would run from May through September; hence the seed harvest would be in time for planting the summer crop. This would minimize the storage time and associated deterioration.

Because of the increased area under production, and the need to closely supervise and train farmers to become seed producers, more technicians were required in the MACA seed office. The advisor was not only responsible for training these persons, he also needed to train personnel in seed conditioning and begin production of foundation seed with the Tropical Agriculture Research Center (CIAT), which is the regional counterpart of IBTA. (This local institution should not be confused with CIAT/Colombia, which is an international agricultural research center.)

MACA was able to hire a laboratory technician, bringing the total technicians to three. Even in this small group, considerable turnover occurred during the first year. To compensate partially for lack of personnel during the winter campaign, project funds were used to bring in four technicians from other regions as trainees for a period of two months. This group supervised the production of 600 hectares of soybeans, and 50 hectares of corn seed. Climatic conditions during the winter were better for producing quality seed, although soybean yields were low due to photosensitivity of the plant. In total, 500 metric tons of soybean and 100 of corn seed were harvested.

The Warnes plant was put into operation on August 17, 1981. Driers had been constructed using local materials, rather than imported metal silos. This was done with the hope that seed growers would copy the design on their farms. Instruments to measure variables such as relative humidity of the atmosphere and moisture level in seed were procured by Chemonics for use in training technicians to graduate heaters and fans correctly. Because of its importance in the region, a great deal of emphasis was placed on drying and storing seed.

These production levels, though modest, set a record in Bolivia, satisfying 25 percent of the local demand for soybean seed and saving nearly half a million dollars in foreign exchange within only one year's time. Local leaders were amazed and pleased to see that Bolivia could produce seed of equal or superior quality to imported seed, and more efficiently. Through the experience gained in the first year, several basic policies were adopted to guide the program. Among these were the following:

- Private producers or other autonomous entities should grow and market seed.
- The conditioning plant should provide custom cleaning services to all seed producers for a fee.

- Open market channels with no price controls should be used to the extent possible for seed distribution.

Soybeans had been selected as the lead crop because there was an effective demand for seed. Therefore, there was no need for governmental intervention, such as subsidies or special credit programs, to promote the production and utilization of the seed. Instead price incentives attracted the attention of entrepreneurs. Because custom cleaning services were available, no major investments were needed for entry into the production system and market. Small companies and individual farmers could produce as easily as larger public or private organizations.

More than 1000 hectares were registered for production of seed during the summer season of 1981/82. Growers relied on support from ANAPO, MACA and Chemonics to provide certification services. These were not only essential to provide technical orientation to program and train farmers, but also to develop and protect the image of the program so that the buyer would have confidence in the quality of certified seed. One bad seed lot sold with the program's stamp of approval would damage the market for all growers, and especially harm those who had invested more time and money to produce good seed. Creation of the certification service was given high priority. However, at the critical moment when harvest began, MACA personnel could not be in the field because they had to operate the conditioning plant--buying supplies and materials, hiring day laborers, receiving seed lots, etc. Again the advisor was obliged to carry out many aspects of the program alone.

In early 1982, it became clear that a number of institutional factors had to be resolved before further progress could be made in technical work. An analysis and evaluation of the program was carried out by the advisor and the COP to search out alternatives for implementing certification and conditioning services. A reorientation of the T-059 Project was proposed so that USAID funds could support certification services, foundation seed programs, and other activities, rather than just the construction and equipping of conditioning plants as previously envisioned. In addition, the changes implied a new emphasis on regional institutions and participation of producers in decision making. This involved generating funds at the local level in order to partially finance needed services.

MACA did not support any of these policies; instead, they were defined and supported by the agriculture sector of Santa Cruz. Leaders in ANAPO resolved to support the certification service under MACA. To make the system operational, the Warnes conditioning plant needed to be operated by some entity other than the seed department of MACA, preferably a local autonomous organization. Out of convenience, rather than design, it was decided to rent the plant to CIAT, one of the decentralized organizations under the MACA umbrella. Although the rental agreement was between two closely related public instititions, it still implied the transfer of control from the central to

the regional level, and some authorities in MACA were reluctant to give approval. It took several months' intense effort by the by advisor and the COP and the help of a local attorney employed Chemonics as a short-term advisor before the agreement was signed.

After the responsibility for operating the Warnes plant was defined, the other elements of the seed multiplication chain began to fall into place. In the second semester of 1982, the Regional Seed Certification Service was established; the Regional Seed Council was formed to coordinate and set local policy. And a Foundation Seed Unit was set up at the CIAT experiment station. The system of seed multiplication in Bolivia was conceptualized as a chain made up of several steps, as shown on the diagram on the following page.

According to this model, the multiplication chain moves from the research phase where new varieties are introduced to Bolivia from other countries or international research centers all the way to utilization by Bolivian farmers. The process is supported technically by the Certification Service (SCS), from the production of foundation seed through marketing of seed in commercial volumes. The SCS carries out the policies set by the Regional Seed Council.

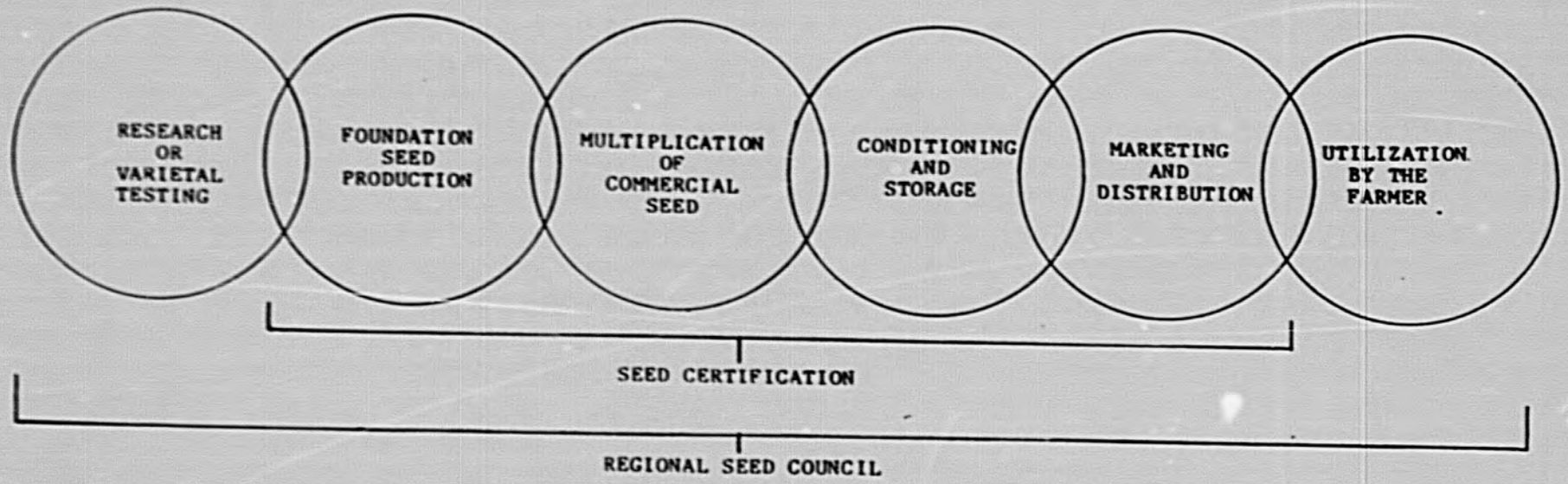
The multiplication chain soon became a reality in Santa Cruz, and the model was later carried to other parts of the country. By establishing fees for certification services, which were approved by the Regional Seed Council and the producer associations, the SCS was able to obtain more personnel and reduce turnover. This enabled it to carry out its functions in a more systematic manner. The system of quality control included the following tasks:

- Evaluation of seed growers according to their capability to produce seed of high quality.
- Coordination to distribute foundation seed only to registered seed growers for multiplication.
- Field inspections from planting to harvest.
- Sampling of local and imported seed lots.
- Laboratory analyses and labelling.
- Record keeping.

The number of producers growing soybean, corn and rice seeds increased from 16 in 1981 to 55 in 1982. Furthermore, CIAT began a wheat seed program in the Comarapa and Valle Grande region that involved over 400 small farmers as contract growers or cooperators. Production levels went from about 500 tons of finished seed in 1981 to over 1800 tons between the summer and winter seasons of 1982.

Figure 2

SEED PROGRAM IN SANTA CRUZ



In 1983, a second conditioning plant was installed, this time by the private sector, a cooperative called CAICO. The increased capacity was welcomed to take some of the pressure off the Warnes plant, which was operating round-the-clock during many months of the year.

Instead of having 3 technicians and 16 growers to orient and train, the advisor now had more than 10 technical counterparts and dozens of growers to assist. Also because Santa Cruz is the only region in the country with significant levels of production in winter months, MACA and IBTA personnel were again brought in from other regions to participate in extended training programs under the guidance of the advisor. In order to cover as many needs as possible, the advisor began to organize formal short-courses on various topics as needed. The demand for training grew constantly over the life of the project, and Santa Cruz became the center for these activities.

Fortunately, the technical and managerial capacity of the Seed Certification Service grew rapidly under the leadership of its director, Ing. Jorge Rosales K. This enabled the advisor to shift some emphasis to other elements, including the wheat seed program in the valley areas and the foundation seed program, both with different units of CIAT. The wheat seed program grew in 1984 to over 1000 hectares with over 500 farmer-cooperators. It was reduced in later years to about 500 hectares due to the high cost of producing in marginal areas.

The Foundation Seed Unit, based in the experiment station in Saavedra, showed all the symptoms of a public program. Foundation seed was priced at the same level as certified seed and was sold to the first farmer to request it. Hence, much of it was used to produce grain, instead of being used to multiply seed. Funds received were often absorbed into the overall budget of the research and extension programs, creating a budget deficit in the foundation seed unit. When dedicated personnel were on hand and received support, the unit operated well, but personnel often rotated and priorities would shift, causing months of effort to be lost. At the end of the project, this element was decidedly the weakest in the multiplication chain (a phenomenon repeated in other countries with successful seed programs). However, producer associations were participating in a dialogue with CIAT to devise a system for providing financial support for research programs and foundation seed production.

Production of certified seed continued to expand by about 1,000 metric tons per year. By 1985, production of soybean seed had reached a level sufficient to satisfy local demand, which had grown to more than 4000 metric tons. During the same period, average yields of soybeans produced for grain increased from about 1100 or 1200 kilograms per hectare to over 1850 kilograms. This increase, of over 50 percent, was a direct result of the seed program. In 1986, Bolivia no longer imported crude cooking oil for refining, and was exporting soybeans.

In 1986, production of corn seed exceeded 500 tons, being limited by demand rather than supply. Importation of hybrid corn seed continued but in reduced quantities. Rice seed production satisfied the demand of about 300 tons. 1986 was the first year that large-scale production of cotton seed was attempted. This seed is especially difficult to produce, but it is also expensive to purchase and import. About 80 tons of good quality seed were obtained with four growers participating.

Total seed production in Santa Cruz among all crops and all categories was over 5500 in 1986. Nearly 250 individual producers were involved in the program, participating through 61 different entities (seed companies or other organizations).

2. Gran Chaco

In the Gran Chaco, the lead crop was also soybeans because of the existing demand for seed. As in Santa Cruz, at the start of the project, no conditioning plant was operating in the Chaco region. Personnel of the MACA Seed Department were concentrating on producing seed on MACA land, rather than working with local farmers. The small amount of seed produced was of poor quality; most seed purchased by farmers was imported. No certification services were functioning. There was, however, one important difference from the experience in Santa Cruz: leaders in the Chaco were aware of the success of the Santa Cruz program and of the manner in which it was organized. A Regional Seed Council was already organized and functioning in the Chaco; the advisor from Santa Cruz had visited the area on occasion; and local technicians had participated in training programs in Santa Cruz.

The advisor arrived in time for the 1983 harvest. Grain fields with fewer weeds and with a lower percentage of varietal mixtures were selected to be harvested for "seed." A makeshift conditioning facility was assembled at the IBTA experiment station using an assortment of small machines existing in the region which were in disuse. Production was only 70 metric tons, but it was produced for the first time by the private sector.

In preceding years, MACA had shipped soybean seed to Tarija for cleaning and storage in the dry, colder climate; however, the transport costs had been very high, and mechanical damage to seed lowered germination. Analysis of regional weather patterns carried out by the advisor indicated that soybean seed storage without air conditioning or dehumidification would be possible through the winter months. Risks of rapid deterioration were not as high as in Santa Cruz because of lower temperature and humidity. The experience of the first year verified that seed quality was maintained, especially in seed lots which were of higher quality at the time they entered storage.

The first year's experience was of great importance in formulating a strategy to overcome a dilemma faced by the

program. Whereas the regional program would have to increase to over 600 mt in order to finance services such as conditioning and certification, local demand for seed was limited to less than 300 mt. However, the favorable climate of the region made it possible to produce seed at lower cost for sale in Santa Cruz. Therefore the approach adopted by the Regional Council was to produce high quality seed for "export" from the region and retain just enough material to satisfy the local demand.

A feasibility study for a seed conditioning plant was done based on projections of volumes assuming the Chaco would supply seed to Santa Cruz. Before the study was done, CODETAR offered to finance the construction of the plant with local funds. A mixed private-public organization would be created to operate the plant, owned by CODETAR, and farmer organizations. The T-059 Project would supply dollar funds to purchase equipment for the plant. Investment in equipment was close to $75,000, while construction and installation costs would amount to nearly $150,000 paid in local currency.

At the time the study was presented, a political struggle was taking place in the region among farmer organizations. The form of organization recommended for the plant was not accepted by leftist political organizations or by authorities of MACA. After a long series of meetings that went to the City of Tarija, and then La Paz, it was agreed that the plant would be operated only by CODETAR. Designs for the plant were prepared in 1984, and construction was initiated later the same year. Equipment for the plant was included in a larger project-wide procurement carried out by USAID.

In the 1983-84 season, 12 producers registered a total of 238 hectares for seed production, between soybeans and corn. Several unfortunate problems occurred during this season:

- The only technician being trained to do field inspections was fired by MACA in mid-season.
- Heavy rains, especially around harvest time, ruined many fields.
- At the critical moment when harvest was under way, the local director of IBTA objected to several aspects of the program and closed down the drying and cleaning operation located at the experiment station.

The history of the Santa Cruz program had thus been repeated. The advisor used most of his time during the season carrying out field inspections without local counterparts. Lack of conditioning capacity--in this case caused by political and institutional interference--resulted in heavy losses of seed.

By the end of the season, another makeshift conditioning operation was set up, this time in a shed provided by the Integral Cooperative. Since no drying bins were available, bags

were stacked to form tunnels. Fans and heaters were obtained to force air into the tunnels. An elevator was borrowed from a plant in another region to feed the seed cleaner, slightly speeding up the operation. In the end, only 80 mt of soybean and 10 tons of corn seed were successfully produced. Again the region had to import seed, rather than exporting.

Despite the disappointment, the Regional Council remained determined, and seed producers registered more than 400 hectares for the 84/85 season. Funds were made available through the special fund, Chaco PIL 103 (see the section on land clearing), for certification personnel. The regional head of the Seed Department, who was not accepted by Chaco farmers, was changed for a young, capable agronomist eager to learn about seed production.

The conditioning plant was not completed in time for harvest, but weather was more favorable, removing a degree of pressure from the system. Using the same rustic procedures as the year before, 350 tons of very high quality soybean seed were dried and cleaned. More than half of this was sold in Santa Cruz, competing very well with seed produced in that region and contributing to the total substitution of imported seed with Bolivian seed in 1985. The experience the following year was similar.

The new conditioning plant entered into operation in time for the 1986 harvest, in accordance with the modified organizational plan previously agreed upon. It is located in Palmar Chico on a site adjacent to the CODETAR shops. Political winds had shifted by the time the project was ending, hence plans were underway to turn the plant over to the Regional Seed Council. It was to be operated by a special administration set up by the council for this purpose or sold to another organization that would provide custom cleaning services. Selling directly to a private company was difficult because it is the only plant in the region; the low volumes of seed produced imply that a second plant is not yet justified.

3. Chuquisaca

The three principal crops in this highland and valley region are potatoes, wheat and barley. The market for barley is dominated by the La Paz brewery (Cerveceria Boliviana National or CBN), which had built a 12,000-ton battery of silos in Sucre and had begun a grain production program with cooperating farmers. CBN needed about 800 tons of material to distribute to farmers for planting, which should have resulted in an excellent market for barley seed. However, the decision-making structure of the organization did not recognize the importance to the farmer and to the brewery of using improved varieties and pure seed; the CBN selected the better looking grain lots destined for use as malt and instead redistributed them as seed. This eliminated barley as the lead crop, though it was hoped that it would come into the program later. Potato was not chosen either; it would have

required several production cycles and a great deal of technical resources to make a major impact on this crop. Instead, wheat was chosen because of the large known market for seed in Santa Cruz for winter grain production.

For several years Santa Cruz had tried to rely on the highland areas of Chuquisaca, Cochabamba, Potosi and Tarija to supply sufficient quantities of wheat seed. A Chemonics study showed that the demand for seed is upwards of 1200 metric tons, enough to plant 12,000 hectares of wheat. Quantities and quality supplied by highland regions were never sufficient, which is what prompted CIAT and ANAPO to produce seed in the valley areas of Santa Cruz. In 1983, production in Santa Cruz had grown to around 500 tons, but much of it was harvested too late to be planted in the winter season the same year. As a result, seed was still in great demand and it was felt that the Chuquisaca region could be competitive.

The varieties existing in the region had been introduced to Bolivia some time ago and gradually been adopted by farmers. The varieties as such were well adapted to the climate. The grain produced by some varieties was of good quality for production of flour and was also acceptable to farmers for household uses. The problem faced by the seed program was to take the mixture of local materials and isolate sufficient quantities of seed of a single variety. Since this process had already been started in the valley areas of Santa Cruz, "foundation seed" to start the program was brought in from that region. Still, this material contained mixtures of over five percent, which implies 100,000 rogue plants (plants of other varieties) per hectare. For purposes of seed production, rogues are worse than weeds, because chemical control is not possible and the seeds cannot be separated in the conditioning plant. Hence the off-type plants, or rogues, must be removed by hand in the field.

As in the case of the Gran Chaco, a Regional Seed Council had been formed in Chuquisaca before the arrival of the advisor. Councils had also been formed in Potosi, Tarija and Cochabamba, all with the same needs for technical support and guidance. It was hoped that some support could be given to Potosi by the advisor based in Sucre. A severe drought had affected the region in 1983 creating widespread famine. Some farm families were forced to consume their stock of seed in the winter months before planting. Fortunately, institutions such as Caritas and CARE had development programs in the region, and they now turned their attention to the issue of providing seed. The regional development corporation (CORDECH) also took an interest in participating in the program. The improved materials brought from Santa Cruz plus additional amounts supplied by the MACA Seed Departments in Chuquisaca and Potosi were distributed to these organizations, who then contracted with small farmer-cooperators to multiply the seed. A total of 945 hectares were planted, including fields directly contracted by MACA.

Again, as in the other regions, MACA personnel were few in number and were occupied with their own separate production program. No certification services existed in the field or in the laboratory. However, ih this case, the advisor did not have the option of personally carrying out field inspections because fields were dispersed and difficult to reach. Under the Caritas program alone, nearly 500 farmers had seed fields registered, located in 32 different communities, not all accessible by vehicle. The Caritas fields accounted for only 356 hectares of the 945 hectare total. Others were similarly dispersed.

Ideally the entity that contracts the farmer-cooperator would behave like a seed company and would train and supervise cooperators in order to carry out practices such as roguing. Certification would provide technical guidance and support to the seed company with sampling and laboratory analysis. However, the organizations involved at the outset were public and did not have the personnel needed to supervise and train each of their cooperators. Further, they did not provide enough economic incentive for the producer, making it difficult to justify the practices being recommended. As a result, little or no roguing was carried out the first year. Further, at harvest time in April of 1984, institutions did not have the capital on hand to purchase the seed crop from farmers. CORDECH, for example, had no additional funds on hand, so only the amounts owed by farmers for inputs supplied by CORDECH were collected. The remainder was sold by the farmer as grain or used in the household. Consequently only 141 metric tons were recovered.

Conditioning was done in a facility occupied by MACA in the town of Zudanez with a small air-screen cleaner. This plant was similar to those in Tarija and Potosi, in that several pieces of equipment were on hand, such as elevators, which had never been installed. The air-screen cleaner was hand-fed from bags. Seed treaters were also still in crates. One of the advisor's principal tasks was to prepare designs and install all three plants. He was also responsible for the design and installation of new plants around the country, including the plant in the Gran Chaco and the CIAT/Saavedra plant for foundation seed, and for assisting with installation of other plants such as the one in Warnes.

Unfortunately, the Bolivian government at that time adopted a series of measures applied to imported wheat and intended to subsidize the price of bread. Flour mills procured only imported wheat, which was distributed to them at very low prices, causing a drop in the price of local wheat. This situation continued through the 1984 and 1985 harvests, badly damaging the program. Little interest could be stimulated among private entrepreneurs to start production programs. Also the CBN was able to obtain foreign exchange at reduced official rates in relation to the peso; therefore, importing barley was more practical than promoting a local production program.

Two studies were carried out to adjust to, or change, these policies. One was a feasibility study for a second flour mill in Sucre, prepared for a group of farmer cooperatives located in the wheat-producing part of the region. The study showed a highly volatile situation for the mill, depending on widely fluctuating market conditions which were affected by government policies and exchange rates. The other was a study of the mechanisms used in providing subsidies for imported wheat. This was done for producer groups interested in having similar mechanisms adopted for locally produced wheat. No immediate results were obtained from either effort.

Leaders in the Regional Seed Council seemed to become even more committed to the program, and continued to participate actively. A firm marketing strategy was adopted whereby only the highest quality seed would be supplied to the Santa Cruz market, and it would go out under the responsibility of the Regional Seed Council as "Chuquisaca Seed." This would facilitate marketing for the assortment of organizations that might produce seed in the region.

To obtain higher quality, a great deal of emphasis was placed on foundation seed production. However, since there is no experiment station in the department of Chuquisaca, various alternatives were tried out working through the Chinoli station in Potosi, the IBTA offices in Chuquisaca, and finally the MACA Seed Department in Chuquisaca. Technicians personally did the roguing on small areas of foundation seed, instead of attempting to get farmers to undertake the practice on a larger scale.

The volume produced in 1985 was low, but the strategy worked to improve quality and to establish a reputation for Chuquisaca seed. The council continued with the same approach in 1986, and also took charge of the finances of the Certification Service and the conditioning plant. Financial assistance was provided from the PIL 103 fund to help obtain personnel and cover some operating expenses.

In 1985 and 1986, the same problems continued with availability of funds to collect the seed from farmer-cooperators. This greatly affected the economic viability of the program, and the capability of financing services such as certification. However, government policies on wheat prices changed later in 1985 and the crop started to become more attractive. A growers association (ASOPROHL) was formed in the region and became active in wheat seed production. At the time the project was closing, several other private groups were making plans to enter the seed program for the first time. Fortunately, the local Chemonics advisor who was based in the certification office in Sucre was employed by the Seed Council as regional director, providing an element of stability to the program. The council had also employed a capable secretary and administrator.

4. National Seed Program Activities

As the seed programs in various regions expanded, they became more interdependent. Decisions were first required on the programming of T-059 Project resources, use of advisory time in activities across regions and the selection of persons to receive training in Bolivia and outside the country. Then seed was produced in some regions for sale in others, requiring agreements on interregional quality standards. Finally, a series of determinations were needed in national policy, centering around the issue of private sector participation at the regional level versus public control at the central level.

In 1982 a local technician was employed in the National Seed Department in La Paz to work as special advisor to the subsecretary of agriculture. He developed a Ministerial Resolution number 189/82 which gave official recognition to regional seed councils in any region where local leaders wished to form them. Within a year, the first three councils had been formed.

The need for more communication among regional leaders was first suggested by Mr. Robert Thurston, rural development officer of USAID, at the time the program was expanding in 1983. As a result the first National Round Table on Seed Program Development was held in Cochabamba in August of 1983. About 30 persons attended full-time, more than anticipated. By the following year, three more councils had been formed, and the second National Round Table held in Santa Cruz had 60 persons registered as participants. The third in Sucre drew 120 persons, and the fourth held near the close of the project in 1986 in Yacuiba had nearly 130 persons registered as full-time participants, and drew over 200 for some events. The round tables were week-long conferences; business meetings were mixed with local tours of seed facilities and certification laboratories. Some technical presentations were introduced in the last two years. Funding for travel of six participants from each region was provided by the project. Each local seed council extended invitations to selected leaders in its region and chose the persons to receive financial support. Therefore the round tables can be thought of as annual meetings of regional seed council members.

As in the case of the soil conservation program, the need for national coverage was felt. Many leaders in the agriculture sector were aware that the program was achieving positive results, but had little firsthand understanding of its organization or magnitude. The vast majority of leaders outside the sector were not aware of the program's existence. One effort made to overcome this limitation was a video tape produced in 1985 for national television. It depicted the stages in the seed multiplication process and demonstrated the importance of the activity in Bolivia. The video was widely shown by various channels in Bolivia, and has been distributed to other countries in Latin America as well. With this impetus, other events began receiving more coverage by the local press--radio, TV and

newspaper. Press coverage included short courses, results of seminars and council meetings, interviews of international seed experts who visited the project, and others.

At the third round table, a resolution was passed forming the National Seed Council (NSC). It is made up of two representatives from each regional council, one from the private and one from the public sector, plus the head of the National Seed Department of MACA. The first meetings held by the group pointed to the lingering conflict between two opposing viewpoints: one favoring private participation and regional autonomy and the other inclined toward centralized control in a public institution. Reaching a consensus on this issue was key to the operability of the NSC. To stimulate a dialogue in this regard, the COP and the leader of the seed program presented a series of seminars to members of seed councils and other leaders in each region. The seminars focused on the impact of certification in expanding seed markets by inspiring confidence on the part of buyers. The structure of the industry was analyzed and compared with other industries; then the options for organizing and financing certification services and seed programs were examined. Examples were used from other countries. At the end of the seminars, participants discussed the organization they saw as most desirable in the Bolivian case. Not surprisingly, the vast majority of participants coincided with the participatory approach, decentralized at the regional level.

The results of the seminars were taken back to the NSC, and shortly thereafter a new seed law for the country was drafted. It would recognize the regional seed councils as the bodies having the authority to certify seed; it would transfer to them the right to collect funds, select personnel, and provide services, and would transfer the property of the Seed Department in each region to the councils. This would include the seed processing plants still in MACA's possession. The National Seed Department would become a normative office, providing support and orientation. The law had been presented to the National Congress and was pending at the time the project closed. Its passage will be the culmination of a long process, but as was seen before, the process of reaching decisions, understanding and agreement on major issues is more important than the legal form into which they are put.

D. Summary

With the expansion of technical assistance into three major regions of the country, the seed improvement program became the heart of Chemonics' activities, and of the project itself. During the last three years, from 1983-86, seed production accounted for more than half the level of effort, and because of its success, probably received more than half the attention. By the end of the project, it was known to most people in Bolivia as the "seeds project."

Because this component of the project is so complex, covering a wide number of steps in the multiplication chain, plus supporting services, all repeated for various crops in different regions, a brief summary is provided below taking the three regions as a whole. It is followed by conclusions.

1. Seed Certification

The formation of functional Regional Seed Certification Services was limited by the lack of qualified personnel to carry out field inspections and laboratory work. The direct participation of advisers served to demonstrate to local institutions the importance of this activity in the program and to win confidence for the services. As seed production activities developed, increases in the number of technicians were needed but could not be provided by the National Seed Department of MACA. Once the Regional Seed Councils were implemented and additional funding was obtained at the local level through fees paid by seed producers, decisions to hire new personnel were made at the local level. This facilitated the implementation of the Certification Services. Table 7.2 shows the number of field technicians in each of the three regions where Chemonics advisors were most involved.

Table 7.2 NUMBER OF FIELD TECHNICIANS IN REGIONAL SEED CERTIFICATION SERVICES BY REGION, 1980-86

Region	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. The Certification Service in Santa Cruz receives about 90 percent of its funding through local sources, while those in the Chaco and Chuquisaca are able to finance only perhaps 25 to 40 percent of their expenses with local funds.

The departments of Cochabamba, Potosi and Tarija have the potential for developing functional seed programs, but currently the Seed Departments in these regions are not capable of providing certification services. Their stage of development is similar to 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.

2. Conditioning Facilities

The project provided funds to install and/or improve the public processing facilities of Warnes in Santa Cruz, Zudanez in Chuquisaca, El Palmar in Gran Chaco, Betanzos in Potosi, and Las Barrancas in Tarija. The conditioning plant in Cochabamba did not need any additional equipment or installations.

It was intended that the public seed plants provide services to all seed producers. This was achieved through different management schemes that were approved and supervised by the Regional Seed Councils. The publicly owned facilities served as a model for the private sector to design its own plants. In Santa Cruz, government investment in a single processing facility provided an incentive for investments by the private sector in seven additional facilities. Table 7.3 shows the historical development of seed processing capacity in the country. Note that plants listed as belonging to MACA were in the process of being transferred to regional seed councils at the time the project closed.

Seed processing facilities in regions where the program did not provide technical assistance were somewhat under-utilized. This is 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 Potosi and Tarija.

Table 7.3 SEED PROCESSING CAPACITY IN BOLIVIA, 1980-1986

Institution	Place	Year 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	Bentazos (Potosi)	.50	.50	.50	.50	.50	.50	1.00
MACA-CRS	Zudanez (Chuquisaca)	.25	.25	.25	.25	.25	.25	.50
CEN	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	1.50
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	Warnes (Santa Cruz)						1.20	1.20
Cordillera	Santa Cruz							1.20
CIAT	Saavedra (Santa Cruz)							1.00
CAISY	Yapacani (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

3. Regional Seed Councils

Success in the seed programs can be attributed in great part to the development of regional seed councils. The councils provided a vehicle for the advisor to interact with local leaders on program development strategies and analysis of available alternatives. The Ministerial Resolution creating the councils assumed that they could all be organized in a similar manner in terms of the number of members and institutions represented. However, the regional differences are so stark in Bolivia that the structure and performance of the councils varied widely. The council with the best organization and commitment had the most members--16 in Chuquisaca. Routine activities were handled by an executive committee, an approach being considered by other councils.

4. Seed Production

Strategically, the programs began by advising on the production of a single crop, or "lead crop." 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 as 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 and then rice, wheat, common beans, forages, potatoes, cotton and sorghum seed. In Gran Chaco, soybean was followed by corn, cotton and wheat. It is possible that peanut seed will be produced in 1987. In Chuquisaca, wheat was followed by barley. It is expected that in 1987 potatoes will enter.

Initially, seed production was performed under the direct coordination of interested institutions. The main ones were ANAPO in Santa Cruz, CORDECH in Chuquisaca and the Integral Cooperative in Gran Chaco. As the producers gained experience, they participated in the program independently of institutions. This was particularly true in Santa Cruz and Gran Chaco. In Chuquisaca this process will take place at a slower pace, because of the small amounts of the land owned by farmers; there is, however, a tendency to form several smaller groups of seed producers.

The levels of production from the beginning of the different regional programs are shown in Table 7.4. There is great potential for developing similar seed production programs in the departments of Cochabamba, Potosi and Tarija.

Table 7.4 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)						
SANTA CRUZ							
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
GRAN CHACO							
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
CHUQUISACA							
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

5. Organization of Seed-Producing Groups

The availability of basic services to seed producers, such as quality control, technical assistance and seed conditioning, 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; instead trained certification technicians provided these services. Tables 7.5a and 7.5b show the number of seed producing groups involved in the program.

Table 7.5a.

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

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

Table 7.5b.

NUMBER OF COOPERATING FARMERS PRODUCING SEED FOR THE GROUPS LISTED ABOVE

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

The 73 groups of seed producers that participated in the 1986 seed production campaign can be divided into four groups according to their organization:

- Specialized Farmers. These are individual farmers who have become seed producers. Normally they are progressive farmers owning more than 50 hectares. They produce

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 the Chaco. There are none in Chuquisaca yet.

- o Seed Companies. There are a small number of groups operating in this category. Seed production is done through contracts with cooperating farmers. 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 La Libertad, Semillas SAIO, and Semillas Cordillera in Santa Cruz.

- o 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 a 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.

- o Public Institutions and Projects. There are several public institutions involved in seed production. Seed is produced through contracts 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 amd CARITAS in Chuquisaca.

6. 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. The main function of the NSC is to coordinate activities among regional seed councils and to obtain financial support according to regional needs. 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. Its most important contribution so far has been the approval of a new seed law, which is pending in the Bolivian Congress.

E. Conclusions

Accumulated net benefits through 1984 of the soybean seed program alone, due to increased yields and increased efficiency in production, were estimated at nearly 10 million dollars. This represents the decrease in the amount of resources necessary to produce the same amount of soybeans as before the project. No precise estimates were made for 1985 and 1986, but since Bolivia is now satisfying its entire national demand for crude cooking oil and is exporting both soybean oil meal and raw soybeans, the annual impacts are probably higher than before, raising the accumulated net benefit to over 15 million dollars by 1986. Therefore, the soybean seed program alone has generated enough economic benefits to justify the investments made in all the other programs put together. This does not even count the impact of the other seed programs, let alone the land clearing, cotton production, soil conservation and other project components.

SECTION VIII

PROGRESS IN SPECIAL STUDIES, CONSTRUCTION, AND TRAINING

A. Background

1. Fruit and Vegetable Studies

Thirty person-months of short-term technical assistance were included in the TA contract. These were entirely without definition as to the technical area or terms of reference, and were purposely left open to allow maximum flexibility. Early in the project, several requests were received to study and design projects for handling and processing fruits and vegetables in Tarija and Chuquisaca. These were explored carefully, and MACA indicated that they should be supported by the T-059 Project. Several other requests were made for studies and project designs, including a large irrigation/colonization project in the Chaco region of Tarija. However, MACA wisely decided that any further efforts of this sort should be limited to technical areas directly related to the project.

Studies that were closely related to project activities were needed to plan activities, design facilities and obtain funding. Examples were the feasibility study for cotton production and ginning mentioned above and several feasibility studies for seed conditioning plants. In these cases, Chemonics both carried out the studies and was highly involved in implementation. Therefore, discussions of these activities are included in the technical areas of which they are a part.

2. Construction

The Coordination Office of the T-059 Project had previously handled the Agriculture Sector I Project as well. That project terminated at a difficult political moment, and left several loose ends, including a construction project in Cochabamba consisting of a training center and related buildings at an experiment station. It was unrelated to ongoing activities in the T-059 Project, but took on special importance in MACA and the Coordination Office simply because they were over half-way completed but as yet unusable. If they were not finished the original investment would be lost.

The advisor's job was to try to clear up amounts pending on previous construction contracts and either reactivate or close those contracts so a new one could be initiated. These tasks were in addition to the advisor's principal responsibilities in designing and following up on construction jobs as part of the seed component of the project.

3. Special Training

On the initiative of local leaders, USAID supported the idea of establishing a training center to address problems related to natural resource management and conservation. The center would be located in the central valley of Tarija and would serve the entire country. Because financing of a specific project was not possible, and because Chemonics was already involved in soil conservation in the Gran Chaco of Tarija, support was offered from the T-059 Project, along with other sources. A total of six courses were given, two in Tarija and four in other parts of the country. Chemonics' role varied with each course, from providing instructors to managing funds and logistics.

As in the case of special studies, the project's ongoing activities also brought up the need for training. Hence, an important part of the seed improvement programs and cotton production program was conducting formal courses, short-courses and seminars. These are reported in each individual subject area above.

B. Objectives and Level of Effort

In the area of fruit and vegetable marketing, the objectives were to conduct studies for the Departmental Development Corporation of Tarija (CODETAR) and Chuquisaca (CORDECH), and prepare specifications for a processing laboratory and study program for the University of Tarija (UBJMS).

In construction, the project was again providing marginal support to an activity outside the mainstream of its activities. The purpose was to clean up a past contract so that the ministry could reinitiate a half completed construction project.

In the case of the training in natural resources, the project goal was to carry out an initial series of courses until another project or funding source could be found.

A summary of the level of effort in these areas is shown below:

Table 8.1 LEVEL OF EFFORT IN SPECIAL STUDIES, CONSTRUCTION AND TRAINING

	Short-term Advisors	Sub-Totals
	(person-months)	
Fruit and vegetable studies	8.0	8.0
Constructions	9.0	9.0
Natural resource training	6.5	6.5
Subtotals	26.5	26.5
COP, DCOP and Home Office supervision		6.5
Total LOE		30.0

C. Problems Encountered and Accomplishments

1. Fruit and Vegetable Processing Studies

CODETAR had initiated a fruit production program in the central Tarija valley, which was picking up momentum as perennial fruit trees came into production. However, being on the southern border of the country, the region is at a comparative disadvantage in reaching markets with produce. With a small, isolated local market, prices were subject to violent drops at harvest time. Therefore, the idea of the study was to test the economic feasibility of a cold storage packing house for fruits and vegetables to hold them for sale locally over a longer period or for sale to other regions. Also, the possibility of drying fruit was suggested as an alternative.

Studying the cold storage concept was difficult because of the need to identify the best materials and methods of construction, and the best fuel source and system of refrigeration, in an area where no similar facility existed. Besides the economist in charge of the study, an expert in refrigeration equipment helped in estimating installation costs. These, however, turned out to be too high for the expected or even potential returns. Instead, the drying operation, which required a much lower initial investment, was recommended. Drying small peaches appeared to be especially attractive, while selling larger ones to fresh markets. Farmers currently dry peaches up to their capacity to handle them on rustic trays using natural sunlight, but most go to waste. The market is strong; they are used in a drink sold on street corners throughout the country. When peaches are not available, other fruits can be

dried, including figs and grapes. CODETAR was appreciative of the study, but took no action to our knowledge. Private parties have begun to process fruits and vegetables on a small scale in Tarija, including canning and drying, and the industry will undoubtedly grow in the future.

The work done for CORDECH was simply to develop specifications for a processing plant for fruits. However, the same error was made as with CODETAR, and only large-scale investment options were considered. This project was not implemented. The same advisor presented a curriculum and specifications for equipment for a processing laboratory to the University of Tarija. Funding was not made available for this purpose.

2. Construction

Initial reviews of documentation and visits to the site revealed the complexity of attempting to clear up contractual matters which were left hanging from years past. The advisor faced the problem of determining how much of the work had originally been accomplished, compensating for deterioration that had occurred since work was suspended, and balancing this with the amounts paid. He determined that the job was just over 50 percent completed. He then entered into negotiations with the construction firm, MACA, and USAID to determine the most reasonable settlement. It was first established with lawyers and representatives of IBTA, MACA and USAID that the most expeditious option was to reactivate the existing construction contract. However, this decision was later reversed, causing the loss of several months' effort by the advisor and his MACA counterpart.

Project funds were first programmed to complete the construction job; however, when it was determined that the contract with the original construction firm should be terminated, negotiations became conflictful and drawn out. It was later agreed that MACA would request assistance of PL-480.

3. Training in Natural Resource Management

The original concept of this series of courses was that they were to be given at the graduate level for high-level technicians who might be close to the planning and decision-making levels of their organizations. The first course was held in Tarija on land classification. Chemonics' role was to provide one local and one foreign advisor to teach the course. Logistics were handled by a local coordinator employed by USAID.

The second was a soil conservation course given in Yacuiba based on the work being performed by the project team. One of the purposes of the course was to familiarize technicians and authorities from other institutions and regions with the conservation program in the Chaco. Again the audience was high-level technicians from all over Bolivia. For this course, Chemonics handled all the logistics, including publicity and

selection of participants. A foreign expert was brought from another Chemonics project in Honduras to teach the course in coordination with a local instructor and a soil scientist loaned from the extension service in Argentina.

The third was an irrigation engineering course held again in Tarija. Chemonics' only role was to provide a local instructor.

Although the content of the courses was well received and absorbed by participants, their effectiveness is questionable. No funds to continue the efforts were forthcoming from other sources, and it was agreed to suspend the activity.

However, rural teachers learned about the soil conservation efforts in the Chaco, and expressed the need for support. This represented a different audience from the earlier concept, i.e., a group of grass-roots practitioners. First the project financed a trip for Ing. Jorge Balderrama to come from Yacuiba and give a presentation at a cooperative meeting near La Paz. Then Chemonics agreed to present two practical courses to small groups of rural teachers. One of these was held in a tropical valley, and the other in a dry, cold highland, both within four hours of La Paz by road. Two foreign experts taught the courses along with two locals. Chemonics handled the logistics with the help of the IBTA experiment station that hosted the events. These courses were again very well received, but since the project does not work in the regions surrounding La Paz, no follow-up was possible.

Resources did not allow the project to expand these activities, despite the great need and tremendous interest on the part of agricultural teachers. Fortunately, Ing. Balderrama was able to take the initiative in organizing and carrying out one more course in the Yacuiba area, also given to teachers. The project paid the costs for this course, which were minimal.

D. Conclusions

Chemonics did not initiate any of the above activities, except for the soil conservation courses, which were closely associated with an ongoing project activity. Although the intention that gave rise to these activities was good, the fact that they led to no tangible results is significant. In a country with very low capacity to implement programs and projects, such as Bolivia, it is fruitless to carry out isolated training and study activities. Instead, training and studies should be done only as needed within ongoing activities and with the support of a technical team.

SECTION IX

GENERAL CONCLUSIONS

The T-059 Project and the work of the technical assistance team were considered to be a great success in Bolivia. The persons contributing to this success in the Ministry of Rural Affairs and Agriculture (MACA), the Agency for International Development (USAID), Chemonics International, and a great number of local private and public organizations in Bolivia can always look back with pride on their achievements. The appreciation of the Bolivian people was shown in the fourth National Round Table on Seeds where the USAID rural development officer was presented with a special plaque, and the "Medal for Meritorious Service to the Agriculture Sector" was presented to Chemonics and the chief of party.

Conclusions specific to each technical area were given in sections III through VIII. Two further areas of concern are analyzed in this final section of the report. The first attempts to identify some of the critical factors that contributed most to the success of the technical team and the project as a whole. The second gives the reasons for which continued support to the seed program from USAID is thought to be highly justified.

A. Factors Critical to the Success of the Advisory Team

Technical assistance is thought of as being poorly utilized in many development projects in Bolivia and other countries. Foreign advisors often are not assigned local counterparts, or there is a great turnover in those that are assigned. Therefore, the advisors are not able to transfer their knowledge and experience to local technicians. Often funding and logistical support is not forthcoming from local institutions in areas where advisors are assigned to work. These problems existed in the T-059 Project, but fortunately the evolution of activities allowed them to be overcome. The institutions and authorities that directed the project were able to create conditions favorable to the work of the technical team. For this, the members of the team, and Chemonics as a firm, are very grateful to USAID, MACA and to the Bolivian people.

It is important to look back on the experience and identify the conditions that allowed the team to carry out its work and achieve concrete results. It would be easy to point to all the positive factors, but is difficult to analyze their relative importance. In a presentation to the fourth National Round Table, the COP identified four factors he believes were necessary to the success of the technical assistance team. That is, they are aspects of the style or approach to providing technical support, without which the effectiveness of the advisors would have been

undermined. On the other hand, complying with these factors does not guarantee success either, i.e., they are necessary conditions, but not sufficient.

The four factors that were identified are:

- o Work as a team
- o Duration of the project or assignment
- o Flexibility
- o Residence in the place of work

An explanation of each of these, and their importance in the T-059 Project follows.

1. Work as a team

When the T-059 Project was originally designed, there was no provision in the advisory group for a chief of party, or any other means of coordinating among activities. Each advisor was thought of as an island, solving problems in his technical field independently of the other team members.

The importance of working as a team can be seen in a number of ways, among these the support provided by project managers--chief of party, deputy chief of party, and project supervisor--to individual advisors. One role of the COP was to promote relationships with client institutions and help define the best means of responding to requests for assistance. Another was to represent the advisor and his counterparts in the decision-making processes with MACA, USAID, and the Coordination Office. Yet another was to help channel funds from different sources toward project activities.

Because the T-059 Project was open-ended in terms of clients, goals, and technical areas of work, special effort was often required to define the role of the advisor and develop a workable job description. For instance, regional seed production activities were the most notable area of success of the technical assistance effort, but these activities were not contemplated in the original project design. Instead, an advisor was to have been assigned to MACA to work at the central governmental level in developing a national public seed company. However, as a result of the contact between the COP and representatives of MACA and the agriculture sector, the contract was modified to change the work site of the seed advisor to Santa Cruz. This resulted not only in a change in the place of work, but also in the client group and eventually in the entire focus and objectives of the program.

The role of the deputy chief of party in facilitating events, such as short-courses, round tables, and meetings of the National Seed Council, was also extremely important to the work of advisors. Before the creation of this position, impractical procedures for disbursements of funds made it difficult for

advisors to plan their work and required large amounts of their time, making it impossible to carry on a fast-paced training program.

Another way in which team-work functions is when advisors complement each other by specializing in areas where they are strong. For example, the seed advisor in Santa Cruz was more heavily involved in program organization and activities with the regional and national seed councils. He developed quality standards which were later adopted in other regions. He also advised on the national seed law. Meanwhile, the seed advisor in Chuquisaca took responsibility for design and installation of conditioning plants around the country. The seed advisor in the Chaco backstopped the cotton production program.

2. Duration of the project or assignment

The majority of development experts concur with the development experts concur with the observation that at least five years continuity is needed to produce concrete results in an activity. The original technical assistance contract between MACA and Chemonics was for two years, extendable to three. Fortunately, various events shaped the project and caused it to be extended to a total of more than seven years.

The importance of the time factor is most clearly demonstrated with a hypothetical example. Suppose the same budget will provide five advisors for one year, or one advisor for five years. A greater impact will be obtained in the latter case because in one year, farmers can only obtain a single year's experience, no matter how many advisors attempt to help him. But after five years of effort, farmers will have several years' experience in trying new methods. Generally, development projects require the formation and/or reorientation of some private and public institutions. These entities also require the experience of several agricultural seasons until they begin to consolidate.

Also we should point out honestly that the foreign advisor does not develop a viable--and above all, credible--work-plan during the first month of his assignment. At least a year is needed to produce and demonstrate some results, evaluate the applicability of the concepts being used in the context of the local environment, and, together with local leaders, redefine the strategies to be applied in the subject area. With luck, beginning in the second year, the advisor will begin to receive some of the support needed to carry through with the program.

3. Flexibility

This refers to the opportunities given to the advisory group to continually reexamine the approaches and strategies taken in subject areas, including selection of client groups, and allocation of project resources. The process of redefining problems and strategies is evident in the history of many of the programs. The soil conservation program was

ultimately successful because the technical team constantly tried out new approaches and evaluated their experiences. The organizational model of the seed program was developed locally over time, rather than being implanted from another country.

In terms of clients, the advisory group took the liberty of working with public and private institutions, with small farmers and also with large ones, with associations and cooperatives, with agroindustry, regional development corporations, and others. Efforts were not restricted to certain crops in certain regions. On the contrary, every effort was made to reach out to provide the greatest amount of assistance possible in all regions of the country where local leaders took the necessary initiative.

Finally, the advisory team was given the flexibility to reconsider investment plans, especially those aimed at building and equipping seed conditioning plants within a public sector framework. Funds initially dedicated to these investments were later reprogrammed to other activities, and thus permitted the project a longer life. Had the team not been permitted to carefully restudy each investment, the project would have not only left behind a series of "white elephants," but also a large investment in an unworkable institutional structure. A centralized public institution would have had a national monopoly on seed conditioning and certification; therefore, it would have controlled the market, making other development models unviable.

4. Residence in the place of work

Providing technical assistance through the "visiting professor" approach does not create the level of effectiveness the advisory team achieved in the T-059 Project. There were instances in the project where a single advisor was asked to provide support to neighboring regions where no permanent advisor was present, but the attempts always failed. The clients and leaders in the region with greater access to the advisor absorbed all of his time.

The explanation seems to lie in the credibility of the advisor in that region. People develop the confidence to try out new approaches because they perceive that the advisor has the necessary capability, dedication and availability to provide guidance when needed. Therefore, no amount of short-term technical assistance can replace the need for at least one long-term advisor in a development program.

Again, the above factors are felt to be necessary conditions for success in providing technical assistance. They by no means are sufficient. In fact, there are no guarantees of success in a area of endeavour so challenging and so subject to a changing environment outside the control of project managers and advisors.

B. Continued USAID Support to Seed Program

Results obtained in the seed production program have been excellent. Given the level of activity and interest, it would be logical to assume that the job is complete, and that continued support from a development project is not needed. However, persons who are closer to the program feel that, indeed, the job is only half-way complete. Three out of six regions with seed councils have not yet organized certification services, nor have they implemented a chain of seed multiplication. Further, existing seed production programs have worked in only five major crops: soybean, wheat, corn, rice and cotton. The T-059 Project left virtually untouched the most important crop in the country--potato. No significant impact has been made in barley, forages or vegetables. Perhaps more important, some of the existing seed companies were formed only within the last crop-year, and have received only a minor amount of assistance. Even though the project was implemented over a seven-year period, the seed programs of the Chaco and Chuquisaca had only three years to develop.

Most people working in the seed industry seem to agree that seed production in the country should expand to a level between 15 and 20 thousand metric tons per year. This projected growth implies an annual rate of increase in production similar to that achieved during the last three to five years--an 800 to 1000 ton increase per year. More than half of this expansion should take place in valley and highland regions where the T-059 Project has scarcely provided assistance.

In conclusion, the potential for continued growth of the seed industry in Bolivia over the next five to ten years is promising. The effectiveness of technical assistance and training is visible and inspiring; the benefits achieved have created an economic impact that more than pays for the costs within the life of the project. Social benefits are also attractive: formation of local companies using local capital; increased productivity of a majority of farmers; hundreds of cooperating farmers producing seed; organization of local institutions; public institutions reoriented to providing services in support of the private sector. Few development projects promise, with relative certainty, to produce results of this magnitude within a reasonable time-frame.