PRELIMINARY HISTORICAL REVIEW OF

RURAL DEVELOPMENT DIVISION

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F O R E W O R D

This is a preliminary survey of the history of the Agricultural work carried out in Bolivia by the Government of Bolivia in cooperation with the U.S. Agency for International Development and predecessor Agencies. The report should be used as an indication of some of the work carried out since 1944 and not be considered as a complete review.

INTRODUCTION

In 1941 the United States was involved in two wars on four continents. She was completely unprepared to meet the demands a war of this magnitude made on her resources, and in serious need of friends and the commodities needed to win the war. In the spring of 1942, a Presidential Order authorized the Board of Economic Warfare "...to arrange for reciprocal aid from foreign countries, to represent the United States in dealing with the economic agencies of allied countries, and to send abroad technical, engineering and economic representatives...". "The object", wrote Dean Acheson, "was to corner all useful materials for our side and preclude the enemy from getting them" 1/.

Before this, in a memorandum to the Bolivian Ambassador to the United States, Luis Fernando Guachalla, August 1, 1941, the U.S. Department of State presented the basis for a program of economic cooperation between the United States and Bolivia 2/. The memorandum mentioned:

a) technical assistance in designing a long-term economic development plan

b) technical assistance in the development of communication systems (U.S. engineers and other "experts"--Resolution No. 63 of the 76th U.S. Congress)

c) roads

1/ Dean Acheson, Present at The Creation (New York: Norton, 1969) pp. 39, 40.

2/ Misión Económica de los Estados Unidos a Bolivia, Merwin Bohen, Jefe, Vol. 1 (La Paz: 1943) pp. 1-18.

d) agricultural diversification, with special reference to export augmentation (U.S. experts would cooperate with Bolivian officials in studying agricultural potentials and designing a strategy for development)

e) stimulation of the production of tin, tungsten and other minerals by small mines

f) currency stabilization

To implement this program, the Department of State authorized the formation of the U.S. Economic Mission to Bolivia on December 4, 1941. On December 17, the Mission, headed by Merwin Bohen, arrived in Bolivia with the agriculturalists, B.H. Thibodeaux and Wilbur A. Harlen 3/. The Mission was met and assisted by Marvin A. Cheek and Harvey Frantz, rubber technicians, and William Pennock, quinine production technician, present under the auspices of the Office of the Coordinator of Inter-American Affairs 4/.

The Mission completed its work in Bolivia and departed on May 21, 1942. The report was completed on August 15, 1942.

Rather than a fully detailed plan for the agricultural sector the report contained a thorough sector analysis and some development ideas and priorities. The analysis revealed that 37 percent of the net export profits from mining was spent for the importation of agricultural products.

3/ Ibid.

4/ Ibid.

The 1936-40 average spent for agricultural imports was $10,500,000. In 1957-59 constant dollars, this amounted to $24,450,000, or $7 per capita.

The Mission proposed the following program:

1. Cochabamba-Santa Cruz road
2. Sucre-Camiri road
3. Santa Cruz-Montero road
4. Sugar production--30,000 tons per year
5. Rice production--10,000 tons per year
6. Meat processing plant--12,000 cattle a year
7. Forest products industry--8,000 metric tons a year
8. Rubber production
9. Preliminary irrigation studies, Villamontes

The Mission also proposed the formation of a Bolivian Development Corporation to implement the program. Corporación Boliviana de Fomento (CBF) would be responsible for road building, and would also work on the various facets of an agricultural program.

<u>First Step</u>

1. Stimulate the production of rubber, quinine and other products for exportation to the United States.
2. Help the Bolivian government set up an experiment stations to guide agricultural development in areas with potential.

Suggested--

a. Titicaca area--crops, pasture, irrigation, livestock

b. Central Altiplano---livestock

c. Yungas--fruit, coffee, quinine

d. Sucre-Potosí--crops, fruit, livestock

e. Villamontes--crops, fruit, livestock

f. Santa Cruz--crops, livestock, pastures

g. Upper Amazon--rubber

h. Beni--livestock, pastures, crops

3. Agricultural education in rural schools (there was none)

4. Agricultural credit for small farmers (there was very little)

5. Establish priorities for commodity crops

6. Acquire land and assist with colonization.

Second Step

Increase domestic production of wheat, cotton, vegetable oil, barley and other crops to the extent of a net savings in foreign exchange of $6 million to $8 million a year.

The estimated total cost of the total program was $62,625,000; Bolivia would contribute $29,000,000; the U.S. Export-Import Bank would loan $30,500,000 in two steps; the U.S. Rubber Reserve Company would contribute $2,125,000; and the U.S. Coordinator of Inter-American Affairs would contribute $1,000,000. The total amount of funds to be used for agriculture in the first step was estimated at $8,000,000.

On April 6, 1943, representatives of the two governments involved signed an agreement to implement the program. This agreement required, primarily, the acquisition of land and other resources necessary for the beginning of the program by the GOB, and the provision of technicians by the U.S.

A national revolution on December 20, 1943, delayed further interest in the program until late in 1945. In December, 1945, the GOB purchased a farm known as "La Tamborada", five miles east of Cochabamba, and expropriated the Belen farm located in the vicinity of Achacachi.

Another revolution in July 1946 further delayed the program. However, in November 1947, a 250 acre farm 40 miles north of Santa Cruz, was donated to the government to be used for experimental purposes.

In December, 1947, CBF withdrew from the agreement because of a lack of funds. In January, 1948, the GOB, through the Ministry of Agriculture, agreed to assume the obligations of CBF; the agreement was then between the Bolivian Ministry of Agriculture and the United States Department of Agriculture. "Servicio Agrícola Interamericano" (SAI) was given official sanction by Supreme Decree No. 1401, on November 30, 1948 after several years of preliminary operation.

THE EXPERIMENT STATIONS

"LA TAMBORADA"

Dr. Leonard of the U.S.D.A. arrived in Bolivia (in late 1947) and was subsequently appointed director of SAI. Floyd R. Oliver came to SAI as agronomist, Nicario C' de Baca as extension officer and 20 Bolivians, a number of whom still work with the Ministry, were hired for the program. Dr. N.E. Winters arrived in October 1948 to replace Dr. Leonard 1/.

"La Tamborada", which covered 5,000 acres, was the site of the first experiment station. The U.S. personnel in SAI, obviously steeped in the Land Grant College Philosophy, had great hopes for the cooperation of nearby San Simon University and favored legislation to transfer the property to the school. This legislation was not passed, but SAI did set aside 275 acres of land for University use.

The station divided the remaining acreage into three main sections; 500 acres were to be used for crop research, 1,900 acres for pasture research and 370 acres for seed production.

"La Tamborada" launched a program of adaptation trials, cultural practices and fertilizer requirements for wheat, potatoes, salad vegetables, corn, fruits, and forage plants. The station introduced most of the table vegetables found in the Bolivian markets today, including tomatoes, lettuce,

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1/ Servicio Agrícola Interamericano, N.E. Winters, Director, Report January 1, 1948 - June 30, 1949 (La Paz: Ministry of Agriculture, 1949) cc.

cucumbers, spinach, cabbage, onions, garlic, red pepper, water-melons, string beans and Bruce plums 2/.

The station also identified adapted varieties of alfalfa, perennial grasses, silage, corn, barley, and oats. The extension workers gave seed to farmers, according to the findings of the station.

The station established a dairy herd, which soon degenerated to a commercial operation with no regard to research. However, several of the Bolivians who were trained in dairy production during the program later became leaders in the dairy industry.

The station's poultry work had similar results. In the beginning, in spite of difficulties with hatching, the station distributed New Hampshire and other similar types of chicks among the country people. This increased the productivity of backyard flocks, but had little effect on the industry as a whole. One SAI employee, who had worked on this project, later began an independent poultry business, and by 1970 was a leader in this field.

Wheat investigations were emphasized from the beginning of the program. The international variety collections have been maintained and adaptation trials of promising varieties have been carried out, both on and off the station. In 1966 the Station released COPOSU, a semi-hard wheat bred by

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2/ Information on "La Tamborada" Station was drawn from SIA annual reports, 1948 through 1961, the station's annual reports, 1950 through 1968--all of which are in the Ministry of Agriculture Library, La Paz--and the personal observations of the writer, 1968-1970.

Ing. Máximo Cabrera, the station director. In 1967-68, Jaral 66, a hard wheat, bred by International Maize and Wheat Improvement Center (CIMMYT), Mexico, was selected as promising. In 1968-69, two more CIMMYT varieties were picked for multiplication. The work done by Cabrera on and away from the station has provided guidance for Bolivia's wheat production campaign.

The University's claim to the "La Tamborada" station was extended over the years, and in 1969 it was awarded control of all but 12 acres and Cabrera's office-laboratory, which continued to be controlled by the Ministry for wheat research.

In March 1970, Dr. E. J. Welhausen, director of CIMMYT, inspected "La Tamborada's" wheat plots and reported that the soil was too poor and too varied to permit a reliable genetic response.

In 1970 "La Tamborada" was abandoned to the University, and the wheat work was moved 18 miles to the San Benito Station.

BELEN 3/

In 1945, following the Bohen recommendation to establish agricultural experiment stations, the Bolivian government expropriated La Hacienda Belen, a 2,350 acre farm near Lake Titicaca, at the town of Achacachi. The owner left, but the 130 families which had worked for him remained to work at the station.

In 1946, twelve Corriedale rams were imported from Chile. The station artificially bred 700 privately owned criolla ewes to the Corriedale rams and at the same time investigations were begun on swine parasites.

Experimental crop work was started in 1949. One hundred and thirty two varieties of wheat and thirty-two species of forage plants were planted that year. By 1951-52 (no report was made for 1949-50) barley, oats, potatoes, table vegetables, sugar cane, sunflower, bamboo and forest species had been added to the crops. An attempt to begin work on quinoa was unsuccessful.

The complaints made in 1950 by the Station personnel were, a) that the station was forced to operate as a commercial farm to the detriment of research, and b) that the 130 peasant families on the station constituted a social problem.

The Bolivian Agrarian Reform Revolution took place in 1952, and the Agrarian Reform Law was enacted in 1953. In December of 1953 the peasant families

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3/ From Belen Annual Reports, 1949-1965 (La Paz: Ministry of Agriculture Library).

expelled the management and the scientists and occupied the station until August 1954, eliminating the results from studies for that year.

The Agrarian Reform Service subdivided the farm, awarding 120 families with 15 acres of land each, and reserving 330 acres for the station.

Investigations of major crops continued, but work on forestry, bamboo and sunflower was dropped. The station identified high yielding, adapted varieties of barley, both feed-type and malt-type. As soon as reasonably reliable results were obtained on the performance of a given variety, SAI imported great quantities of that seed and gave it to the Campesinos. Bolivia has subsequently reached self-sufficiency in barley as well as in oats, potatoes, cabbage, carrots, lettuce, beets, radishes, cauliflower, onions, squash, turnips, kale and broadbean. These were all new to the Altiplano or greatly superior to anything previously grown in the area.

Among the forage crops evaluated, alta fescue, Kentucky fescue 31, and crested wheat grass proved to be adaptable.

Station agronomists collected 62 types of quinoa and started the increasing and selecting process.

The sheep work continued with the importation of more Corriedale in 1957 or 1958 from the United States. They achieved up to 92% conception with artificial insemination and the service was extended to other private

flocks. In 1955, the station, with SAI assistance, gave a short course to extension personnel and Campesinos on sheep management. The course included A.I. techniques, such as heat detection and semen collection, as well as crossbreeding and parasite control.

SAI imported motorized shearing machines and obtained the services of an Australian who introduced mechanical shearing. After a year or so, however, it was concluded that only the large owners would be able to use this system. So, in the next ten years, courses in hand-shearing were held for Campesinos.

A herd of 126 criolla cows and two Holstein bulls was assembled at the station in 1951. In September 1960, the station received 5 Holstein cows, one bull, two heifer calves and three bull calves from "La Tamborada". The next June they obtained 30 more cows. The first year they produced one calf, the second year ten, and the third year nine. Out of the 20 born, 15 died. Eleven of these deaths were attributed to mal de altura (altitude sickness), which eventually caused 28 out of 38 mortalities.

In late 1969 the Swiss Government gave the Bolivian Government 40 head of Brown Swiss cattle, which were sent to Belen from the Peruvian Highlands. Only a minority were affected by the altitude.

In the beginning of 1954, the station, according to the annual reports, became deeply involved in rabbit adaptation work. Elaborate projects in crossbreeding, castration and feeding were carried out. In 1959-60, in

spite of small litters and high mortality, the station raised 550 surplus rabbits and sold 348 of these to Campesinos for breeding. The majority of the rabbits sold were of the New Zealand breed.

Instead of keeping them in hutches, as they were at the station, the Campesinos allowed them to roam free as dooryard animals, where they burrowed in the ground for shelter and lived on the forage they could find. In 1970 the effects of the project were still evident in the area and a few domestic rabbits were marketed in La Paz.

In May 1962, armed Campesinos occupied the station, and the station manager retreated to La Paz. All of the work for that year was lost.

In 1963, the Ministry of Agriculture assumed full operative responsibility for the station. The potato project was moved to Toralapa and Chinoli and most of the sheep were moved to Chinoli and Patacamaya. The International Collection was maintained to observe disease resistance in the wheats and the work being done on quinoa was moved to Patacamaya. Work with barley, oats, vegetables, forestry, bamboo and swine was at a minimum.

In 1965-66, the USAID-Utah State Contract Team reestablished forage adaptation trials at Belen. So far, the results have been very similar to those found by earlier teams who worked there. In 1966-68 the Utah group also performed irrigation cost and return studies.

The station had a small herd of alpaca, but little if any data has been collected from it.

As a sequel to the variety adaptation work, the station continued to grow a few acres of the relatively high yielding Sani Imilla potato, developed at "La Tamborada" and proven adaptable at Belen, for sale as seed. Sani Imilla potatoes have now become common in the markets. The seed merchants in La Paz continue to import adapted varieties of vegetables, perhaps in response to demands by the farmers. The brewery industry aids in the perpetuation of one or two varieties of malt barley by contracting with growers for production. By 1970, oats were no longer emphasized.

REYES 4/

In 1944, in accordance with the Bohen Plan 5/, CBF undertook a development project on the Beni River in the Department of Beni. Reyes was selected because it was located on a navigable stream, situated above the flood elevation and relatively near (140 air miles) to La Paz. It covered 5,060 acres of land.

An airstrip was cleared, and a town built--streets, houses, electrical power plant, sawmill, hotel and slaughterhouse. All the supplies except wood were flown to Reyes.

In about 1948, this project started the Beni beef airlift, which completely changed Bolivian beef marketing. Before then a few cattle were shipped by boat to Manaos, Brazil, and others were trailed to Sao Paulo, while the majority were slaughtered for hides and tallow. By 1970 the Beni was supplying half of Bolivia's beef. Before this time, 40 percent of Bolivia's beef had been imported; now it produces a slight surplus.

In 1953, a SAI team designed a plan for the development of the Reyes land into a demonstration ranch and livestock improvement center. The plan required cooperating ranchers to consign selected criolla (Spanish type) heifers to be bred to Santa Gertrudis bulls. The male offspring would be

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4/ James Blaidner, End of Assignment Report with History of Reyes Livestock Improvement Project (La Paz: USOM, 1960; on file at the USAID Rural Development Division). Unpublished.

5/ Bohen, op.cit.

returned to the cooperator and the females would be retained to build up the station herds. CBF would build the fences and sheds, and USOM would provide the bulls and a project manager.

James Bleidner, the U.S. technician, arrived at Reyes in January 1957. By this time, construction of the town and station was under way, and 800 Brazilian Zebu cattle had been brought to Reyes.

This was not the first livestock development activity at Reyes. Jesuit priests once walked 25 Spanish cows and two bulls into the area, which they had trailed all the way from Buenos Aires 6/. These were the first cattle stocked in the Beni.

This type of cattle, derived from a mixture of the decendants of Aurochs and Celtic Shorthorn were brought to the Americas by the Spanish. Over time, by natural selection, they achieved a remarkable adaptation to their environment. In the Beni they became short-haired, fawn colored cattle to withstand the tropical heat, and were highly resistant, if not immune, to the tick-born disease, piroplasmosis. On the Altiplano at 14,000 feet they became black and long-haired to withstand the cold. In both regions they have developed black pigmented skin to absorb the tropical sun's rays without blistering.

Bleidner found the ranks of the good cattle badly depleted due to the demand for beef caused by the opening of the area. With the advent of the

6/ Bleidner, op.cit.

airlift, untrained ranchers were eager to gain the greatest profit possible and simply sold their biggest, fattest cattle for slaughter. Moreover, they severely reduced their herds by extracting more than the reproduction rate of the cattle.

It has been established in other similar parts of the world, that hybrid cattle-Bos torus, the Spanish and European cattle, crossed with Bos indicus, the zebu-type cattle, are more efficient than either parent for tropical environments. This idea is recognized and utilized by the Elsner Brothers Ranches in the Beni and Santa Cruz, who are developing separate pure criollo and American Brahman type zebu herds to supply bulls for criss-cross hybrid breeding 7/.

Upon his arrival Bleidner became the operating "Mayor" of Reyes, as the company owned town was turned over to SAI. The Bleidners were the only English speaking people in the community.

Bleidner's first task was to discharge everyone employed by the project, which meant everyone in the town, including the physician, as employees of CBF. Then he had to rehire or replace these men on the SAI payroll in accordance with a reorganization plan. "Problems of adjustment to this change, as can be imagined, were enormous..." he wrote 8/.

7/ Bernardo Bauer, Mejoramiento del Ganado de Carne en el Beni y Santa Cruz (La Paz: Sociedad de Ingenieros Agrónomos de Bolivia, 1970)

8/ Bleidner, op.cit.

The design of the project was shifted or at least limited at this point to improving the cattle on hand, improving the pastures and moving the offspring to privately owned ranches.

In April, 1960, SAI transferred the slaughterhouse, hotel, carpentry shops and certain other properties back to CBF. Employees of the SAI project were reduced from a high of 143 to 33.

The breeding plan required beginning with either a Santa Gertrudis or criolla base, and stabilizing on a Santa-Gertrudis-type mix. Two Santa Gertrudis and 18 American Brahman bulls were ordered for the project.

At the same time the Gir and Nellore races of Brazilian importation were maintained as separate herds. Bleidner concluded from production records and observation that the Nellore cattle were superior to the Gir cattle in milk production, weight-for-age and temperament. Because of this determination the Gir herd was dispersed to private ranchers or bred to the Santa Gertrudis bulls, the inference being that while inferior to the Nellore they were also superior to the criollo 9/.

In three years, 1957-1959, the project auctioned 331 zebu bulls and 456 zebu females to Beni ranchers and retained 559 zebu females for the project. Bleidner reported in 1960 that there were 885 zebu females of breeding age and condition in the Beni. It appears that this project introduced zebu cattle to the region.

9/ Ibid.

Bleidner also reported the presence of 10/ ..."very palatable natural grasses such as arrocillo (Leersia sp.), Cañuela (Panicum sp.) and Gramalote (Paspalum sp.) which leave nothing to be desired or introduced." These grasses grow on the flood plains in the dry season but the production of an equal amount of forage on the much smaller, less fertile high ground during the flood season was a problem. Bleidner found, that jaragua, molasses grass and elephant grass were very good forage when controlled. Ten years later, jaragua seems to have become dominant.

The project introduced a large number of animal health aids, including vaccination against anthrax and rabies, and control of the screw worm.

Business at the slaughter plant increased from 2,173 head in 1956 to 5,185 head in 1959.

Bleidner departed in September 1960, and was not replaced. On Feb. 1, 1961, SAI turned the project back to CBF, Reyes was incorporated into a municipality and took up the management of its own affairs and the airport. The producer's cooperative received the slaughter house, and was operating it in 1970. CBF was still operating the ranch and producing zebu type breeding stock, reportedly at a loss. At that time they were said to be interested in turning the ranch into a "commercial" operation.

In 1969, the Ministry of Agriculture, with the cooperating Swiss Mission, put some Brown Swiss cattle and a Swiss technician at the station.

10/ Ibid.

Subsequently, the Ministry has expressed an interest in reviving the research at Reyes.

From the time the Reyes experiment began until 1970, about 35 slaughter-house-airstrip combinations have been constructed in the Beni, which supplies 70% of the beef consumed in La Paz and half of all that consumed in Bolivia.

S A A V E D R A

In November of 1947, señor Miguel Roca of Santa Cruz gave a 250 acre farm, known as "El Naranjal", to SAI for use as an experimental station, in accordance with the Bohen plan 11/. Work at "El Naranjal" began in 1948 but was suspended the next year in anticipation of SAI taking control of "Proyecto Azucarero", a 1235 acre sugar plantation project of CBF, located 40 miles north of Santa Cruz. SAI obtained possession of "Los Llanos", at General Saavedra, on April 4, 1950. The plan for this project included work on sugar cane, rice, corn, oilseeds, forage plants, beef cattle, dairy cattle, swine and horses 12/.

The work procedure for crops was standard for each species: the local types would be collected and foreign types would be introduced; all would be grown in competition, and the best planting time, spacing and cultivation would be determined. The best varieties would be multiplied for seed distribution 13/.

A great deal of work was undertaken that had not been envisioned in the 1950 plan. For 1952-53, the station reported on rice, cotton, kenaf, peanuts, soybeans, sesame, sugarcane, corn, wheat, yuca, sweet potatoes, collard, kole, lettuce, string beans, sweet corn, cucumber, pepper, cabbage, tomatoes, onions, watermellon, grasses, legumes, tobacco, citrus, cacao, tung and forestry 14/.

11/ Bohen, op.cit.
12/ N.E.Winters and Eduardo Palomo, Informe Anual del SAI (La Paz: Minag, 1950).
13/ Ibid.
14/ Estación Experimental Ganadera de General Saavedra, Informe Anual, 1952-53 (General Saavedra, Santa Cruz, 1953) Unpublished.

Activities for the next decade were largely repetitious. Due to large variations in crop responses, the result of changing weather conditions as well as many other factors, consistency in performance was difficult to establish.

The station released three varieties of rice--Palomorado, Durado and Pratao--and introduced a "certified" (i.e. pure and cleaned) seed production and distribution program, which by 1967 had handled 90 percent of the rice grown in the region. It was demonstrated that irrigation increased the rice yield to 4,000 pounds per acre, compared to 1,335 pounds per acre on dryland. They also worked out improved systems of cultivation and insect control.

In 1953 and 1954, the station released Cuban Yellow corn in commercial seeding quantities, which averaged 40 bushels an acre without fertilizer, compared to 13 bushels an acre for criollo corn. By 1967, according to Kushner 15/, nearly all of the corn planted in the Santa Cruz Department was Cuban Yellow.

By 1965, station workers had decided on a superior variety of soybeans for seed and oil--the Acadian. They had also worked out planting and cultural methods, and were awaiting the coming of the soybean industry, which began four years later. Two thousand eight hundred and sixty acres of soybeans were planted in 1969, and twice that amount were planted in 1970. By 1970 there were plans to establish two mills in the vicinity of Saavedra.

15/ José M. Kushner, "Participación de la Estación Experimental Agrícola de General Saavedra en el Desarrollo Agropecuario de Santa Cruz", Bol. de Divulgación No. 11 (General Saavedra, Santa Cruz, 1967).

The Brangus cattle herd arrived from Charagua in 1964, with 30 cows and 3 bulls imported by USAID. At Saavedra the herd was maintained at about 35 cows. Meticulous records were kept, but with no apparent experimental design and no conclusions. The surplus bulls were sold at auction.

In 1965 the station received four American Braham bulls from the J.D. Hudgins Ranch and assigned then to four ranches where they would breed selected criollo heifers. Although the cattle were numbered by fire brand, no data on the project was reported.

Saavedra began the cattle show at the annual Santa Cruz Industrial Fair by exhibiting station cattle. By 1970, the cattle show had become a major event of the fair.

The station published its first bulletin in 1961, for distribution to guests attending its Eight Field Day 16/. The bulletin contained recommendations of varieties and cultural practices for the principal crops of Santa Cruz. Also, at the field day they handed out a mimeographed report on the control of rice insects.

In 1965 they published their fifth information bulletin, which was based on research done at the station 17/. That year they published the first of their "Boletín de Divulgación" series 18/ and two years later, Boletín # 11 was distributed 19/. Station scientists provided a steady flow of practical articles to the Santa Cruz newspaper.

16/ Estación Exp.Ag. de Los Llanos, Boletín Informativo No. 1 (Gral.Saavedra, Santa Cruz, 1961)
17/ Bol. Inf. No. 5 (1962)
18/ "Guía Práctica para el Agricultor y el Ganadero, Bol.Divulgación No. 1
19/ Kushner, op.cit.

In January 1966, responsibility for the station was transferred from SAI to the Ministry. The 1965-1966 Annual Report was the last submitted up to this writing, 1970 20/.

In 1970, F. Le Grand, sugar agronomist at the Florida Everglades Station, Belle Glade, said after a visit to Saavedra that its collection of varieties was totally obsolete, and promised to send them some modern material. There was also evidence that the station's foundation corn seed had become severely crossed. However, the station was still producing "certified" rice seed in 1970.

In September 1970, Wolfango Peña, the station director, and Segundo Alandia, national director of experiment stations, planned to reorganize and, hopefully, revive Saavedra.

20/ Estación Experimental Ganadera de General Saavedra, Informe Anual 1965-66 (Santa Cruz: 1966) Unpublished.

MUYURINA

Project Muyurina was started in 1953, to provide improved seed, breeding stock, a training center and a demonstration center for Santa Cruz Department. SAI would develop and operate the livestock and seed farm, the Education servicio would develop a four year vocational agriculture school and the Health servicio would man a health-center. The graduates of one curriculum or another would become vocational agriculture teachers, extension workers, farm foreman, farm machinery operators or mechanics. The farm would sell seed and breeding stock to farmers and ranchers 21/.

The project was located in 1260 acres of jungle, 30 miles north of Santa Cruz.

On or about 1955 the project acquired the following cattle inventory: 10 Brangus cows and 3 bulls from the U.S., 8 Santa Gertrudis cows and 4 bulls from the U.S., 8 Nellore cows and 2 bulls from Paraguay, 3 Brown Swiss cows and 3 bulls from Cochabamba. Two more Brangus bulls were imported in 1958 and 105 criollo cattle were purchased that year.

In 1956, Muyurina imported 100 hogs from Perú, disposed of 50 through the Extension Service and 25 died. They also obtained a Duroc boar and sow and a Poland China boar and sow from Argentina.

21/ Richard D. Hughes, End of Assignment Report with Brief History of Muyurina Experiment Station (La Paz: SAI, 1960); W.W. McIlroy, End of Tour Report (La Paz: SAI, 1960); F.R. Gross, Jr. Completion of Tour Report (La Paz: SAI, 1958). Copies in USAID RDD/Files.

No construction or other improvements had started when W.R. Gross, Jr., arrived as resident farm manager in 1956. Over the next four years a thousand acres of land were cleared, cross-fenced and seeded, farm buildings and corrals were built, and the school plant was completed 22/.

Cattle experimental work involved an effort to prove the superior cross, Brangus-criollo or Santa Gertrudis-criolla but this project was inconclusive. Then 90 criollo cattle were submitted to eight treatments of supplemental and trace minerals but the data collected did not yield consistant values.

An unsuccessful artificial insemination program was started in 1959, using Muyurina bulls. It was a "farm service" operation in an area where there were few dairy cattle, and at that time there were no beef cattle producers who managed their cattle in a way that they could use the service.

Gross reported the average litter size for 1957 as 5.7 pigs farrowed and 4.5 weaned and in 1958 they averaged 5.0 and 4.5, even though the sows got bonemeal, and their milkflow didn't dry up prematurely 23/.

Other activities reported were; the establishment of dual purpose chickens, the production of corn which averaged 12.15 bushes per acre, the adaptability of Copin grass for wet areas and that Jaragua grass could support two animal units per acre.

22/ Ibid.

23/ Gross, op. cit.

In 1959, dormitory space was increased to 60 beds and that number of students was recruited for the following year. The first enrollees should have been in their third year at that time. In 1960 the entire project--school and farm--was granted to the Salesian Order of the Catholic Church, who installed their own management and faculty.

SAI moved the Brangus herd, first to a private ranch, then to the Saavedra Station. The Nellore herd was driven to Trinidad, Beni, to start another demonstration project.

In 1970, the operation was still in the hands of the Salesian Order. The Cattle herd consisted of Santa Gertrudis, criollo, Brangus and Brown Swiss. There were about 300 New Hampshire hens, a few Argentine Merino and Corriedale sheep and the swine herd had been maintained at about a dozen sows. Except for those imported by the U.S. Heifer Project, Muyurina has been the sole source of swine breeding stock for Bolivia. In this role it has no doubt made a considerable contribution.

The school was expanded to include three years at the intermediate level and four years of high school. There were 250 enrolled, with a two year waiting list in 1970.

The Head Master said that many of the graduates went on to the School of Veterinary Medicine at Santa Cruz or to the School of Agronomy at Cochabamba. Terminal students, mostly from the nearby ethnic colonies, returned to their villages to become retail type entrepreneurs, such as operators of bicycle shops.

In a national survey report in 1968, the Dunwoody Industrial Institute of Minneapolis proclaimed Muyurina by far the best vocational agriculture school in the country, albeit with little competition 24/.

The school fulfilled its objective of providing extension workers and the like to some extent by serving as a preparatory school for the universities. No other high school in the country provided equal agricultural experience. It is logical to assume that Muyurina graduates of the university may become better veterinarians or engineer-agronomists than those coming from the city high schools.

24/ Dunwoody Industrial Institute, Vocational Industrial Education and Social and Economic Progress in Bolivia, AID Contract (Minneapolis: Dunwoody Institute, 1968).

TRINIDAD

On August 8, 1961, the Livestock Experiment Station at Trinidad was inaugurated. The station consisted of 920 acres of land a mile and a half from the city. The Nellore cattle from Muyurina had arrived the previous September and had been held on the ranch of Sr. G. Tineo. They were received by the station as soon as the boundary fence was built. As facilities were completed more cattle were acquired, including 27 Santa Gertrudis heifer calves and 5 Santa Gertrudis yearling bulls from Texas, five from Muyurina, two Brahman bulls, one Brown Swiss bull, 4 Brown Swiss-Criolla crossbred cows, and 49 Criolla heifers, a total of 125 head 25/.

"The artificial insemination program is not giving the results that had been desired", it was stated in the first annual report 26/. It had been planned to spread the work of the station bulls as widely as possible among the ranches in the vicinity of Trinidad and an attempt was made to breed 300 cows at Estancia "San Juan". By the end of October they had served only 180 cows, at the rate of four a day, which appeared close to normal distribution for a herd previously subjected to year-round breeding.

Dr. Carlos Morant, the station director, said that the ranches in the area simply did not have the handling facilities required 27/. The A.I. project was not mentioned in subsequent reports except for station breeding.

25/ Estación Experimental Ganadera Trinidad, Informe (Trinidad: 1962) Unpublished.

26/ Ibid., Carlos Morant G., Director

27/ Ibid.

The next year, 1962, a grass nursery was established, containing 44 species and by 1967, four native species and nine introduced types looked promising. Guinea, Malta, Elephant grass, Capin Planta, and Jaragua were the high yielders 28/.

Work with mineral supplementation for cattle was mentioned in the 1967 report, but not subsequently.

By 1968 conclusions were being reached on breed crosses. The Santa Gertrudis-Criolla cross and the Brahman-Criolla cross did about equally well to 205 days of age. These crosses out performed all others as well as the purebred parent types.

At a four-day short course held at the station in 1970, where the director had ample opportunity to discuss and show his experimental projects, none was mentioned, which left the impression that none were in progress. The grass nursery had been destroyed.

28/ Informe Anual, 1966-1967

R I B E R A L T A

In January 1952, Paul Tobber, Jr., arrived in Riberalta, near the confluence of Rio Beni and Rio Madre de Dios, to establish the Bolivian Tropical Crops Experiment Station. The objective was rubber production 29/.

Natural rubber (Hevea brasiliensis) is exclusively native to the Amazon Basin, a possession fanatically guarded by the Brazilians for half a century. However, in 1875, the British collected 70,000 hevea seeds, and from them produced 2,400 seedlings at Kew Gardens, England. These were sent to Ceylon, West Java and Malaya 30/ and without South American leaf blight (Dothidella ulei) which in all probability was unknown to the collector.

In the Far East, by expert selection, the yield of latex per tree was increased phenomenally. By 1939, 99 percent of the total world supply of rubber came from the Dutch East Indies, Malaya and Ceylon 31/, which explains interests of Marvin Cheek and Harvey Frantz in Riberalta in 1941 32/. At its peak production, Bolivia exported, 4,000 metric tons of wild rubber a year, second only to Brazil 33/.

29/ A.V/ McMullan, History and Progress of the Servicio Agrícola Interamericano Experimental Station, Riberalta, Bolivia (La Paz:MinAg, 1959).

30/ J.J.Ochse, et.al., Tropical and Subtropical Agriculture (Vol.II New York: McMullan, 1961) p. 927.

31/ Ibid.

32/ Bohen, op.cit.

33/ McMullan, op.cit.

Tobler acquired for SAI 30 acres of land a mile from Riberalta. Fifty seven acres were added in 1956 34/. By 1968 the station controlled 525 acres, a hundred of which was under cultivation 35/.

Planting materials were supplied by the Turrialba, Costa Rica, Station. While the clones were being established, multiplied and grown to the age and size of productivity, it was necessary to observe how each performed under new conditions, and in fact, find out how to grow rubber trees at Riberalta.

Twice budded (three-component) trees and the hybrids were put out in randomized design (the Latin square), using two spacings. One was two meters apart in rows 10 meters apart, the second was two meters between trees in the row, with rows paired three meters apart and the pairs 18 meters apart. The vacant space, at least for the early years, was intercropped to provide income for some of the first eight years required for the trees to come into production.

Two by ten meter rubber tree spacing proved superior by 49 percent. The average production of dry latex for the 2 x 10 planting for the eighth through the fourteenth year was 1515 pounds per acre, compared to 1015 pounds per acre for the 2 x 3 x 18 system. Three clones averaged better than 13 pounds per tree, or 2,700 pounds per acre, their fourteenth year 36/.

34/ McMullan, op.cit.

35/ Octavio Antezana P., Informe de Labores, Gestión 1967-1968 (Riberalta: 1968). Unpublished.

36/ Antezana, op.cit.

This compared favorably to the best yields in the Far East. Fortunately the result included the hybrid plants because the twice grafted tree didn't prove satisfactory at Riberalta. The graft unions proved brittle 37/. In 1966, there were about 250 acres of plantation hevea in the region.

The United Fruit clones of cacao were introduced and it was learned that rooted cuttings were not satisfactory for multiplications, because, not having a tap root, the root system would not penetrate the evaporation line by the onslaught of the first dry season.

Various selections of coffee were planted, some with shade and some in the open. Most of the citrus species were established, as was yuca, Cuban Yellow corn, edible beans and various vegetables.

The cacao, coffee and citrus projects were leveled off to supplying seed and nursery stock to farmers of the region. 38/. By 1970 the station had lost its citrus root stock material and requested new seed from USAID.

The station made an unsuccessful attempt to produce Brazil nuts domestically. They found that the seed required from three to twelve months to germinate, and that it took the trees from 12 to 18 years to come into bearing. Hence, with an abundance of producing trees in the jungle, they gave up the project.

37/ Ibid.

38/ Ibid.

The African oil palm was introduced and found adapted.

The station got a start of black pepper (Piper nigrum L) from the Japanese colony on the Amazon, who had gotten its start from Singapore. It was released and recommended as a commercial crop in 1968, with the warning that it required much attention.

They also planted half an acre of tea and found that it grew well as long as they controlled the fungus.

Poultry (New Hampshire and Barred Plymouth Rock) were tried and abandoned as uneconomical.

The last annual report was for 1968 39/. However, the station was still functioning in 1970, with renewed interest on the part of the Ministry of Agriculture in La Paz.

39/ Ibid.

PATACAMAYA

The Bohen Plan called for a livestock experiment station in the Central Altiplano 40/.

In 1956, Leo R. Smith, an ICA employee assigned to SAI, went to the Cerro de Pasco Corporation in Central Perú and bought 493 grade (PPC, puro por cruz) Corriedale ewes and 20 grade corriedale rams. The ewes trailed across the Desaguadero River into Bolivia, arriving at Hacienda Kiripuyo, in Los Andes Province, owned by the Solis Bustamante family, on April 13, 1956. The rams arrived on July 5th.

In the absence of a station, Smith worked out a boarding system with the Solis' 41/. From April 13, 1956, to January 21, 1959, one of the rams and 142 ewes died. The next year produced similar results. By 1957 management evidently improved and the surviving ewes produced 257 lambs and weaned 229 42/.

In July 1958, USOM Director Curtis J. Spalding and Minister of Agriculture Jorge Antelo signed a project agreement providing for establishing a "sheep breeding and wool improvement ranch" 43/. The Bolivian Government was to furnish the land, the USOM would provide the improvement and SAI would operate the station.

40/ Bohen, op.cit.

41/ Estación Experimental Ganadera del Altiplano, Patacamaya, Bolivia Informe Anual, 1959-1960 (La Paz: MinAg. SAI, 1959) Unpublished.

42/ Ibid.

43/ ICA Project No. 11-13-170, "Sheep Breeding and Wool Improvement" Ranch (La Paz: MinAg, 1958).

On November 24, 1958, in the name of the Agrarian Reform Law, the Government exappropriated "Culta-Arajllanga", an ex-hacienda three miles west of Patacamaya, and awarded it to SAI, a Public Entity 44/.

On November 11 and 12, 1959, the Peruvian sheep arrived at Patacamaya--345 ewes, four yearlings and five lambs--(The fate of the rams was not reported).

In the first few years, shearing data were accumulated. The half-blood-and-better Corriedales produced about 6.9 pounds of wool a year, compared to two pounds for the Criolla. Also, birth weights and rate of growth were recorded. The station management also initiated planting of alfalfa and fescue grass for the sheep, although they never had enough.

In 1960, 114 sheep were transferred from Belen. A hundred were born and 23 died at Patacamaya, bringing the inventory to 545 in June of that year 45/.

In 1965, Utah State University became associated with the station through a technical assistance contract with AID and a small flock of Junin sheep was imported from Perú 46/. Registered Targhee and Rambouillet sheep were imported from the United States in 1966 and 1970. In 1965, the station established a llama herd.

44/ Gobierno Boliviano, Resolución Suprema No. 79793 (La Paz: Nov.24,1958).
45/ Ibid.
46/ Fine wool sheep developed by a U.S. mining interest it Junin, Perú.

In 1967 the station had 375 ewes, which produced an 85 percent lamb crop with only four percent mortality to weaning 47/. In 1969 some 485 ewes produced 500 lambs, but the mortality rate was 21 percent, due to a shortage of feed. While the ewes were maintained to build up the station flock, the rams were either rented out to private flock owners for use in artificial insemination or sold outright. Up to 1970 they have not fulfilled the demand.

Investigation of quinoa started in 1961.

That same year the station management took on an active role in extension, holding two short courses in sheep management. In 1962-63 they held six short courses which were attended by 13 extension workers and 227 rural leaders. Also that year the station was host to 10 extension meetings which were attended by 290 rural leaders. They produced a field day in 1966-67 48/, as well as other years.

Beginning in 1962, the station employed one person full time to work with agricultural groups and cooperatives and by 1967 he had organized a federation of cooperatives with an active membership of 2,000. This group owned 12 diesel tractors and a slaughterhouse.

Irrigation studies have been conducted since 1965.

47/ Patacamaya, Informe Anual, 1966-1967.
48/ Patacamaya, Informe Anual, 1966-1967.

Vegetable adaptation trials were begun in 1968 and in the next two years, the salad vegetables produced had a wide dissemination through the Patacamaya market and restaurants 49/.

In 1970, the station did not have a farm management plan which coordinated the feed supply with the animal requirements. This resulted in retarded growth and a delay in the distribution of yearling rams.

49/ Luis Chacón C., "Jardines y Huerta de Hortalizas", Informe de Actividades Correspondiente al Año 1967-1968 (Patacamaya: 1969).

CHINOLI

Ing. Raúl Pérez Alcalá, Minister of Agriculture in 1961, is credited with the "birth of the idea of an agricultural demonstration center in Potosí Department". On May 11, 1961, Ings. Eduardo Palomo and Luis Spiaggi began scouting for a location and two weeks later they settled on the Ex-hacienda "Chinoli", 36 miles from Sucre on the road to Potosí. This was the former property of Gregorio Peña Valda, who had been dispossessed by his peons in name of the Agrarian Reform 50/.

On April 24, 1962, a part of the hacienda, consisting of 720 acres was ceded by the Agrarian Reform Service to the Ministry of Agriculture. This land was to have been awarded to a cooperative of "ex-peons" of the hacienda. In a huge, yet factual understatement, Ing. Eduardo Rodríguez wrote, "The transactions (or events) that followed were prolonged and filled with incidents, the details of which are not essential to this report" 51/. The campesinos resisted but the inauguration was on May 15, and work began on June 20, 1962.

The station personnel planted collections of wheat, oats, barley, forage plants and Sani Imilla potatoes the first year as well as building fences and buildings.

50/ Centro de Demostraciones, Chinoli, Potosí, Informe Anual 1962-63 (Chinoli, 1963) Unpublished.
51/ Ibid.

In subsequent years attention was given to competitive variety testing, seeding dates and cultural methods. However, in 1970, the station had a wheat variety of its own breeding, Chinoli 70, ready for mass demonstration and multiplication 52/.

By 1964, some information had accumulated on the adaptability of a few forage varieties, both as to the soil and the climate. For example, Kentucky Fescue 31, Italian Rye grass and Weeping Love grass were "well developed" but severely affected by 28°F weather.

The station got 29 ewes and two rams from Belen in 1963, complaining that they showed "two many criolla characteristics" 53/.

The 1968 report indicated that the station was continuing to work with wheat, barley, oats, potatoes, forage plants and sheep. More emphasis was placed on fertilizer trials with not too encouraging results 54/.

Utah State University began to collaborate in forage work in 1966 and the work was expanded to include comparative trials of alfalfa and ve

The Sani Imilla potato continued to prove the best.

Although a year behind with its annual report in 1970, this station remained very much alive and active. Like Patacamaya, it had become the socio-technical center of the region.

52/ Ben L. Grover, Monthly Report, U.S. Govt. Memorandum to Jack R. Morris (La Paz: USAID/RDD, September 23, 1970) Unpublished.

53/ Chinoli, Informe Anual 1963-1964.

54/ Chinoli, Informe Anual 1967-1968.

TORALAPA

About 1961, it was decided that to continue potato investigations at "La Tamborada" was unwise. The viruses were so severe that it was impossible to get reliable responses on other factors. In 1962, the Ministry established the Toralapa potato station, situated 40 miles from Cochabamba on the Santa Cruz road. The site consisted of 53 acres under cultivation, 22 acres which could be developed and 107 acres of gorges and cliffs 55/.

One hundred thirty types of potato were established in the collection garden or "germ plasm bank". Of these, eight lines were selected for crossbreeding 56/. Variety crossing were continued, with four Bolivian varieties excelling. They were Sani Imilla, Imilla Blanca, Runa and 54-510-61 which averaged 20,000 pounds to the acre.

By 1965, Ing. Segundo Alandia had concluded that the fertilizer recommendation for the Toralapa region was 60-120-0 per hectare 57/. Investigations on fungus control were established, as well as for insect control.

Station authorities teamed up with the extension workers in the region and produced field days at the station as well as demonstrations on

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55/ Estación Experimental de Toralapa, Año 1966-67 (Toralapa:1967) Unpublished.
56/ Centro de Demostraciones de Toralapa, Informe Anual, 1964-65 (Toralapa, 1965) Unpublished.
57/ Ibid.

private farms, which proved that with the Sani Imilla, they could get twice the yield by following the station's recommendations. The station printed two small instructional bulletins.

In 1967, income from seed and commercial potato sales was sufficient to cover the cost of operation plus moderate expansion. The station continued to be active in 1970.

CHIPIRIRI

In 1962, the Ministry of Agriculture acquired land for the Chipiriri station, near Villa Tunari, in Chapare Province of Cochabamba, to provide a tropical experiment station and demonstration center for the colonists in the region. The Ministry team arrived in April 1964.

The introduction to the 1964-65 annual report was a solid complaint of the inconveniences caused by the absence of roads 58/. Even so, much was accomplished. They obtained the successful rubber clones from Riberalta, the United Fruit cacao clones and started increasing hybrid and straightline cacao clones from Trinidad, Turrialba and from the U.S. collection at Homestead, Florida. Work was started with bananas, citrus, rice, tea, blackpepper, goats and swine. In 1966, work with forage crops was started.

The 1967 report (none filed for 1965-1966) stated that the station had become the "nerve center of agricultural activities in the region" and the director, Ing. Spiaggi could forsee Route 1 progresseng toward the station 59/.

The Chipiriri Station supports subsistence farmers with a commercial orientation.

58/ Centro de Investigaciones Agrícolas, Chapare, Informe Anual, Año Agrícola 1964-1965 (Chipiriri: 1965) Unpublished.
59/ Informe Anual Gestión 1967.

The plants and seed it distributed improved the diet of the rural family. Introduced were pole beans, lettuce, tomatoes, mellons, turnips, cabbage, pumpkin, sweet corn, evergreen bunch onions, pickle pepper, spinach, mustard, long red pepper, Georgia collard, okra and broccoli. Among the tropical fruits they introduced mangos, cashew, carambola, and papaya.

The station also established a source of the New Hampshire chicken as a dual-purpose bird. In the swine project they disposed of the Poland China and maintained the Durocs.

Up to 1968 the station had distributed 10,000 budded rubber trees, enough to plant 50 acres 60/.

60/ Chipiriri, Informe Año Agrícola 1967-68.

AGRICULTURAL AND HOME ECONOMICS EXTENSION SERVICE

One member of the USDA team that arrived in Bolivia in 1947 to initiate the agricultural sector of the Bohen Plan was Nazario C° de Baca, country agricultural extension agent from New Mexico. C° de Baca was provided three assistants: Ing. Carlos Cossio, Extension Agent and Chief of Agricultural News Service Department; Ing. Luis Guardia, Extension Field Agent; and Ing. Luis Ovando, Extension Field Agent 1/.

Their job was at first to distribute information, methods and seed that had been proven at "La Zamborada" to the people in the Cochabamba Valley. This program was described by one Bolivian reporter, "as an activity totally unknown to the authorities and the people in general" 2/. They also sponsored a "One Minute a Day" radio spot, two 15 minute programs a week and two newspaper articles a week 3/.

In addition they conducted a census of milk production in the Valley provinces they expected to serve which was to establish a benchmark for measuring their success in future years. Although subject to bias it did measure dairy development, and proved to have some value. By 1950, the number of dairies that were operated "more or less rationally" had increased from 34 to 4[illegible], there were 18 percent more milk-bred cows in the valley, milk production per cow was up nine percent, and total milk production had doubled 4/.

1/ N.E. Winters, SAI, Report, January 1, 1948; June 30, 1949 (La Paz: MinAg, 1949)

2/ Jorge Zuna, Informe Sintético de la División de Extensión Agrícola (La Paz: MinAg, August 2, 1967) Draft.

3/ Winters, op.cit.

4/ Winters and Palomo, op.cit.

The Extension Department started artificial insemination, organized the Milk Producer's Association (Asociación de Productores Lecheros, APL) and convinced them to buy two locally raised Holstein bulls for breeding. Later, two Holstein bulls were imported from the United States for the Cooperative. In 1970 the program was still in progress, increasing at the rate of about 9 percent a year. APL was using frozen semen from the American Breeders Service, Wisconsin, with dollars borrowed from the Bolivian Bank of Agriculture. Their daily production had reached 34,000 liters a day, about nine times that shown in the 1947 census.

Among other activities, much was devoted to small fruit groves and gardens, seed distribution and insect control--this with their "Brigade Sanidad". C' de Baca wrote an extension methods manual, which was evidently followed. They organized citizens' advisory committees in each of the four provinces in which they worked--Cliza, Sacaba, Tarata and Punata and started farmer's meetings, method demonstrations and result demonstrations as well as rural youth clubs 5/.

The program grew, some U.S. advisors said too fast, although in general it followed the Bohen development plan--from Cochabamba as a center to Chuquisaca, Tarija, and Santa Cruz. By 1952 there were 15 provincial agricultural extension agents and two home demonstration agents 6/.

5/ Ibid.

6/ Henry K. Botch, End of Tour Report (La Paz: USOM, 1958) Unpublished.

Extension in Bolivia was a SAI project, and as such it has borne a stigma of illegitimacy from both sides. The, "Land Grant College Philosophy", group, personified by Landerman, considered it indignant that the Bolivian Legislative Group had not endorsed and adopted the Smith-Lever Act of the U.S. Congress in 1914. Anything else, like the SAI agreement of 1953, or the Extension Service transfer Agreement of January 4, 1961, were fundamentally wrong 7/. On the other hand, the program was criticized in certain circles as a foreign operation 8/.

In 1955 there were 39 agricultural agents and 13 home agents 9/. In 1959 there were 63 agricultural agents and 14 home agents. At this time there was a national staff which included the director, chief of agriculture, home economics and rural youth work, and seven subject matter specialists. Each of seven regional departments had similar staffs, except specialists 10/. There were 10 U.S. employees assigned to operative positions in the program.

In 1959 there was a 25 percent cut in the budget. Salaries were already so low, due to the inability of the government to escalate them in tune with inflation, that attrition with some dismissals soon brought the provincial agents down to 41 men and 12 women. The SAI report philosophized

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7/ H. Lee Landerman, End of Tour Report (La Paz: USOM, 1958) Unpublished.

8/ Zuna, op.cit.

9/ SAI, Status Report, 1956 (La Paz: MinAg, 1956)

10/ SAI, Informe Anual, 1959 (La Paz: MinAg, 1959)

that this was good for the program in that it provided an opportunity to eliminate poor performers and bring the program back to manageable proportions 11/. Huron Smith, Director at that time, said, "It causes the remaining employees to redefine their objectives for the purpose of making the strongest contribution to the rural welfare of Bolivia" 12/.

The Extension Service was involved in all rural activities. For example, in two years after improved sugarcane varieties were released by Saavedra Experimental Station, 90 percent of the acreage was planted to them. The same was true with Cuban Yellow corn, and vegetables of all species. The Extension workers have borne the brunt of the sheep program from the beginning as well as the wheat program from 1958. However, they have been relatively expensive. Besides their salaries and offices, the workers have required means of transportation--a brief of their reports from 1949 to 1970 is fairly conclusive: they have not been supported by the National Government. Over and over, year after year, the reports reveal no funds available and cutbacks in personnel 13/.

On January 4, 1961, the Extension Service was transferred from SAI to the Ministry of Agriculture. At that point the ten U.S. personnel were shifted from operative to advisory roles, while Bolivians filled the executive positions.

11/ Ibid.

12/ Huron Smith, End of Assignment Report (La Paz:SAI,1960) Unpublished. [illegible] reports are available in the Min. of Agriculture Library, La Paz.

The year 1961 was financially difficult. On March 1, 1962, the Government and USOM signed an agreement to release U.S. P.L. 480 generated counterpart funds to support the extension Service budget for that year. The Ministry of Finance would contribute $b.100,000 ($8,500) a month and the balance would come from counterpart. It was also agreed that SAI would resume financial management for a while longer 14/.

For 1963 the Agreement was that 65 percent of the budget would come from PL 480 counterpart, provided that the Ministry of Finance gave 35 percent. This amount, $b.3,500,000 ($290,000), would permit restaffing to 45 extension agents and 15 home agents. The Government fell delinquent on its November and December, 1962, installments and made two months' payment in February 1963, designating it January and February installments. March, April and May installments were met, but not those for June, July and August. Hence, for five months at least, the Servicio received no funds 15/.

The story has continued year after year. First, approval of the budget would be delayed until late in the year--not just for the Extension Service, but for the whole Ministry of Agriculture. Then when the budget was approved there would be little or no money for operations--just salaries. In 1970 the operational budget was financed with PL 480 funds. Of $1,465,000 equivalent programmed, $800,000 went to civil service salaries already paid by the Government and only $190,000 equivalent went to the Extension Service. This was much more than they had previously received.

[illegible] (Fact USAID, 1963) Unpublished.

Bolivian Governments, with practically no tax revenue base, are always short of funds. Traditionally, one of the tenets of power maintenance has been peace in La Paz and the mines. Peace in La Paz is not helped by falling behind with government payrolls, so if there is money available, regardless of committments, the Minister of Finance has preferred to meet the La Paz payroll. The Extension Service payroll and operational expenses are mostly in the rural areas.

Relative to this problem, the provincial extension agents are sometimes less than vigilant. In the period 1957-1959, when inflation dorve their salaries as low as $25 a month, they came to rely on travel per diem as supplemental salary--so much so that they wouldn't work without it. When they don't get per diem they don't work.

There having been 185 governments in Bolivia since its independence in 1825, it can be appreciated that the average government of Bolivia is not long-range development oriented, and this should be the basis of the Agricultural Ministry and the Extension Service.

Rural Youth Development

C' de Baca started rural youth work in Bolivia in 1949 16/. The idea, born in the United States, was to teach the youths some farm and home making skills, to provide them a modern agricultural education, to develop their leadership abilities and to get modern farm and home demonstrations before their parents.

16/ Winters and Palomo, op.cit.

From about 1953 to 1959, the program was directed by a U.S. 4-H Club specialist. Huron Smith, the ICA employee in charge in 1959, was named Chief of the SAI Extension Service and was then replaced by a Bolivian.

The program reached its apex in 1959, when there were 7283 members in 451 rural clubs, directed by 617 volunteer adult leaders 17/. The pattern which varied and was never fully executed, was: Each club was supposed to have a collective, economic supervised skill project, generally at the school, under an adult leader and the provincial extension agent. In 1959 three fourths of the clubs had such projects. Secondly, each member had to have their private economic (or optionally for the girls, home improvement) project, and 7004 out of the 7283 had those. Then each club was supposed to have a community service project--do something to improve the community--and 171 out of the 451 clubs had those 18/. The program included everything imaginable to make the youngsters achievement oriented, civic minded leaders. This included skills demonstration teams, leadership activities, and provincial fairs and expositions. It also provided through annual meetings a channel of communication from the rural communities to La Paz.

As the funds declined, the program decreased. In 1967, the scope of the program--membership and activities--was less than half that of 1959 and by 1970 it scarcely existed.

17/ Smith, op.cit.

18/ Ibid.

Home Economics Extension

Bolivian Home Economics Extension work was started by Canuto Trujillo in the Cochabamba Valley in November 1951. Trujillo, a U.S. extension worker, succeeded C° de Baca as director of the Extension Service. Maruine Hearne arrived from Texas in March 1952 19/ to set up a program aimed at teaching rural women and girls to improve the family diet and health, to make family life a little more pleasant, and to develop a personal life and a community spirit.

Bolivia had no universities or technical schools to train home demonstration agents, as was the case for agricultural extension agents, so they hired welfare workers and, to a lesser extent, rural school teachers. Before being assigned to provinces the girls received three months training in extension methods. Because they perhaps felt inadequate and because of the very rugged working conditions, the rate of turnover was high. At the same time, with no experienced personnel whatsoever, the U.S. technicians (there were three positions in the 1950°s) had the task of training supervisors for La Paz and seven regional departments.

The Home Economics group started community development in Bolivia. Among H.E. projects completed between 1955 and 1959 were roads, bridges, schools and village shade trees planted 20/. They also started the assistance to native art crafts work.

19/ Lena MacAnlauf, End of Assignment Report, 1958.

20/ Ibid.

The program grew rapidly, it seemed to those involved, but not in proportion to agricultural extension work. In 1970 there were 20 provincial agents, compared to 70 agricultural extension agents. By 1970 the women in the national office, having begged for funds to the point of exhaustion, appeared to have become resigned to continued non-support.

Agricultural Information

Immediately after becoming Director of Extension in 1947, Nic C' de Baca hired Ing. Carlos Cossio as Extension Agent, Chief of the Agricultural News Service Department and Chief of Publication 21/. With C' de Baca's guidance, Cossio launched into a daily radio program on one station and a semi-weekly show on another, commanding prime time, between 7:30 and 8:00 p.m. All the while he supplied the same materials to the newspapers in the form of feature articles. Besides his radio and news work the first year, Ing. Cossio edited and published C' de Baca's Manual for Extension Agents as well as five how-to-do-it farm bulletins 22/.

The complaint over the next four years was that they didn't have a printing press and therefore could not get their message to as many farmers as they desired nor as often as they felt was necessary. This was alleviated by the SAI agreement of May 29, 1953 which provided the needed equipment. The Cochabamba group received a small offset press and a mimeograph machine, and continued their work 23/. The new technical Information Service,

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21/ Winters, op.cit.

22/ Ibid.

23/ This point is not clearly documented.

attached to SAI headquarters in La Paz, received a small but complete offset plant, costing $20,000--about a 15 man shop--and five "mobile units" of audio-visual equipment. They also had an ICA agricultural information specialist to run the service. The result was the production of a quarter million impressions a year 24/.

SAI reported showing movies to 118,558 people in 1955 25/. There was a total of 528 programs using audio-visual aids, including all forms, with a gross attendance of 38,614 people, in 1959 26/. Subsequent mention of audio-visual "mobile units" was not found in the Ministry's archives, and ten years after the last report, no sign could be found of a "mobile unit".

The SAI print shop was so successful that the Education and Health Servicios requested the same. Therefore, all machines and people were grouped, under a USOM audio-visual officer, to make a national government printing office. This was consumated in 1958 in a USOM project agreement with the Bolivian Government to establish the single "audio-visual center". SAI's equipment formed the base for the shop, although some, imported for other Servicios and never installed was taken directly from the USOM warehouse. SAI personnel became the artists and craftsmen for the new project.

A USOM audit two years later recommended that because of certain irregularities in the management of its revolving fund the project be terminated. USOM took possession, picking up the direction and payroll.

24/ SAI, Status Report, February 1956 (La Paz: MinAg, 1956) and elsewhere in USAID/RDD files, La Paz.

25/ Ibid.

26/ Smith, op.cit.

ENGINEERING, LAND DEVELOPMENT, RESOURCE SUPPORT, MACHINERY MAINTENANCE AND TRANSPORTATION

SAI's organization in 1953 grouped all engineering and mechanical operations in its Development Operations Division. This included land clearing and farm machinery pools, transportation control, automotive, farm machinery and heavy equipment repair centers, soil surveys, irrigation, well drilling, mechanized farming demonstrations and the importation and sale of farm machinery and supplies. In the seven years of its existence the program imported about $9.6 million worth of equipment for its own operation and control and about $11.2 million in machinery and supplies for sale to farmers 1/. All of the equipment was sold or donated and most of the activities were discontinued by 1960, with the idea that the Bolivians were capable of carrying on these activities on their own.

Land Development

The Bohen Plan on opening up Santa Cruz included land clearing 2/, in that the good land was covered by big trees. An attempt, said to have been made by CBF, in the Mid-1940's was not a success. According to the story, CBF ordered machinery from the United States and contracted with an American to direct the operation. He arrived, but the machinery was delayed by war priorities.

1/ SAI, Status Report, 1956; Annual Report CY 1960 (La Paz: USAID/RDD files) The records are incomplete.

2/ Bohen, op.cit.

The work proceeded using axes and hired laborers but by the time the farm machinery arrived the land had grown over and had to be cleared the second time.

In 1953, SAI ordered $7.1 million worth of land clearing and farming machinery, including 86 crawler-type tractors and attachments 3/. They began to arrive in 1955, but due to the rainy season, it was 1956 before clearing of any significance got under way. In the next four years they cleared 11,154 acres of jungle at a subsidized charge to farmers. They also did custom land leveling and plowing to complete the clearing of 40,000 acres 4/ and constructed a four-mile road for the Chipiriri Colony. A comparative cost study made by the Saavedra station about that time concluded that it was cheaper to clear land with axes 5/.

Farm Custom Service

A major purpose of the project was to demonstrate farm mechanization and custom work was performed for a fee. The first order included 206 wheel-type tractors with attachments 6/.

In Fiscal Year 1954-1955 they ordered $157,000 worth of well drilling equipment 7/. In 1956, they ordered $2,525,885 worth of SAI pool equipment.

3/ SAI, op.cit. This citation may represent a typographical error. It gave sixty-six, where eight-six crawl-type tractors are mentioned repeatedly elsewhere.

4/ Ibid.

5/ USOM, Annual Report, SAI, CY-1958, Airgram TOICA A 1809 (La Paz: USOM, 1959)

6/ SAI, Status Report, 1956.

7/ Ibid.

including 36 threshers, 25 combines, 2 peanut shellers, 21 rice driers, 52 rice hullers and 32 windmills 8/. Fifty-three wells were drilled in the three-year life of that project 9/.

In Addition to land clearing, plowing and leveling, during its life the pool sprayed (insect control) 432 acres, dusted 812 acres, combined 5727 acres of rice, planted 2185 acres of corn, harvested 369 acres of corn and cultivated 7220 acres of sugarcane.

The SAI pool was disposed of in 1960--donated to public entities, such as schools and the ethnic colonies and sold to others 10/. The project did successfully demonstrate the use of machinery practices, which in 1970, in updated forms are includ d as standard operations in Santa Cruz and the Cochabamba Valley.

The non-successful exceptions were the mechanical sheep shearing and the sheep dipping demonstrations. Relative to the shearing activity, after two years and 24,491 sheep sheared they concluded that it was only applicable for large scale operators who could well afford their own rigs so they gave up the demonstration 11/. In 1969, the Chuquiña Sheep Cooperative imported a single-drop rig to shear its 22,000 sheep. One possible reason for apparent failure of the shearing project was a limited market for the criolla wool, so the flock owners had no reason to shear.

8/ Ibid. This list is not necessarily complete.

9/ Ibid.

10/ L. George Coonrad, End of Tour Report (La Paz:USAID,1963) Unpublished.

11/ SAI, Development Operations Division, Summary of Activities for Period August 1, 1956 through February 29, 1960 (La Paz: SAI, 1960) Unpublished.

Transportation

In 1960, SAI had 282 vehicles, including 90 assigned to the Extension Service and those assigned to the experiment stations and other projects. They also included all the vehicles considered necessary to supervise the projects, as well as, from 1956 to 1958, a fleet of 28 trucks. At one time transportation was available at one or more of the three motor pools--La Paz, Cochabamba and Santa Cruz--around the clock. To cope with the management and maintenance of this fleet, ICA provided one or two U.S. technicians for the better part of the 1950's. In Santa Cruz, the job was combined with managing and maintaining the farm machinery pool.

The truck fleet was disposed of in 1958, when it was determined that the private commercial fleet was adequate to accomodate SAI. Ministry vehicles were turned over to the Extension Service and the pattern was established that the vehicles went with the successors to the projects as they were terminated.

Maintenance

The maintenance of vehicles at Cochabamba and vehicles, heavy equipment and farm machinery at Santa Cruz was a major concern. The hardships suffered by the shop superintendents (ICA technicians), according to their End of Tour reports, were great. For example, once, the Campesinos raided the Santa Cruz motor pool and made off with 32 vehicles. It took weeks to get them back and in operation again. The operators would stick whole trains of tractors in the mud trying to pull out the first. In 1958, Cannon

Jurgensen had to rebuild 15 combines before the rice harvest season, but he did it and held school in the process 12/. Actually, the record shows that for the life of the equipment pool, the equipment was down for maintenance only 2.15 percent of the time.

Resource Support

In the infancy of the program, when an experiment station proved something to be beneficial--a new variety of a crop or an insecticide--SAI simply imported the item and the extension agents gave it to the farmers. In 1953 or 1954, this was changed to a selling program. From then to 1959, SAI brought in at least $11,118,000 worth of farm tractors, implements, tools and supplies, which the extension agents sold through their offices 13/, a practice bitterly protested by the ICA extension officers 14/.

The commodities were imported with funds from two separate allotments. One was referred to as "Emergency Food Production Funds" and the other "Economic Aid Funds". It appeared that the same classes of commodities were purchased with both sources.

This is one accounting of imports 15/:

fertilizer	2,000 metric tons
barbed wire	24,500 rolls (80 rod)

12/ Cannon Jergensen, End of Tour Report (La Paz: USOM, 1960) Unpublished.
13/ SAI, Annual Report, CY 1960
14/ Landerman, op.cit.
15/ SAI, Development Operations Division, op.cit.

fence post staples	13 metric tons
hand tools	58,147 pieces
animal traction implements	15,892 units
wheel type tractors	209 units
implements for wheel tractors	1,350 units
grain threshers	120 units
pesticides and insecticides	323 metric tons
seed	58.5 metric tons
crawl type tractors	86 units
implements for crawl tractors	169 units
spare parts	$1 million
veterinary supplies	62 types

This list was obviously a scramble of the 1953 order and the 1956 order and was both incomplete and inaccurate. However, it is cited for the information it provides.

At the beginning of the sales program the commodities were sold at near the equivalent of cost in local currency but as inflation soared the subsidy increased. The idea was to get the things in the hands of the farmers.

By 1961, the inventory had been reportedly reduced to between $330,000 and $500,000 in value. It was auctioned off-some by the piece, some by the lot and some by the kilo.

In 1970, farmers were importing all the farm machinery they could finance. This included tractors, soybean oil mills, cotton gins and agricultural airplanes. Fertilizer use was up to about 12,000 metric tons a year and about eight tons of vegetable seed a year was imported via commercial firms.

Soils Investigations

The apparent role of the U.S. soils specialists in Bolivia up to about 1965, was to follow the colonizers and the irrigation developers and inform them as to the quality of the land. To survey a million acres in a reasonable period required a team of about 24 with the capability of managing programmed and random samples, as well as recording ecological descriptions. This required training and supervision. In addition to the functional role, the soils men had a concern for institutional development, to provide a national capability, which they all did.

Lacking a program and support, the SAI soils men accounted for themselves very well. They located and described all the good land in Santa Cruz Department. Subsequently, all colonial groups moving to the region settled on such land, except the 1967 Mennonite immigration which settled on porus, sandy land south of the city. In this case, there is no evidence that the settlers consulted the Ministry of Agriculture on the selection of their site.

The work in Santa Cruz was done in the 1950's. In 1960-1961, 185,000 acres of the Alto Beni were mapped for colonization. And in the next two years a million acres was mapped for colonization in the Chapare area and another 100,000 acres in the Inicua-Rurrenabaque-San Borja area of the Alto Beni 16/. In the following year, 1,900 miles of the Mamoré River Coarse was mapped 17/.

The soils mappers themselves contributed to colonization. In most areas they had to bulldozer a path six feet wide every 500 meters or every kilometer through the jungle to be able to work. These paths served as colonization routes and access roads.

The job of soils mapping was assumed by the British Tropical Agricultural Mission in the late 60's and operating a lab in Santa Cruz where soil samples from the whole country are analyzed.

In 1967, after the absence of a resident soils specialist for some time, the AID-North Carolina State University International Soil Fertility Project took an interest in Bolivia. Their interest was in determining optimum fertilizer requirements for major crops in all regions. Since the USAID Mission was particularly interested in wheat production the North Carolina project placed emphasis on it.

16/ E. Don Hanse, End of Tour Report (La Paz: USAID, 1963) Unpublished.

17/ Lucio Arce P., Estudio Exploratorio del Rio Mamoré y sus Afluentes (La Paz:BAI, 1963).

Irrigation

U.S. assistance to Bolivia in irrigation has been sporatic. The three or four technicians supplied by the U.S. talked about projects--almost all of the 200 to 500 acre type--and went away leaving about a quarter of a million dollars worth of hardware. SAI worked on small-scale but widespread extension irrigation projects emphasizing the efficient use of small streams and seep water in 1960--digging out seeps, back-filling with rock and building collecting basins but it did not receive great emphasis.

FORESTRY

One of the features of the Bohen Plan was that the time frames in goal achievement were left for th eproject planners. Twenty-eight years later, like the rest of the agricultural sector, there was no forestry project plan. Bohen set an annual goal of 8,000 metric tons, roughly equivalent to 4,500,000 board feet of forest products. Although it is not clear what year this was achieved, there were 22,800,000 board feet of lumber sawed in 1966 1/. This did not include charcoal, firewood, tanning back, quinine nor wild rubber. In 1969, the logs harvested for lumber and veneer amounted to 28,303,187 board feet 2/.

What the annual harvest should or could have been in 1969 is not known. This report is restricted to the fact that the production was attained with very little assistance from the U.S. aid program.

Sometime in the 1950's, USOM gave the Bolivian Army a sawmill to operate as a money-making venture. The mill was located with the Fifth Division at Roboré, about two thirds the way down the Corumbá railroad from Santa Cruz. In March 1957, Richard Klugh, ICA forestry advisor assigned to SAI, was called in to help find logs for the mill. It was sawing about 80 logs a month when it should have been sawing 80 a day 3/.

1/ MINAG. Boletín Estadístico Anual No. 4(La Paz:MINAG. 1968).
2/ MINAG Departmento de Estadísticas Agropecuarias (La Paz: 1970) Unpublished.
3/ Richard H. Klugh, Report of Mission to Region of Roboré for Purpose of Appraising Forestry Conditions with a View of Finding Suitable Conditions for Installation of its Sawmill (La Paz: SAI, April 1, 1957) Unpublished.

It was determined that with the remoteness of the mill with with respect to Corumbá, the export market, a steady supply of spanish cedar or bolivian oak would be required. After about 10 days of aerial reconnaissance, a two mile linear sample of the most promising jungle was taken. Along this machete-opened patch, only 40 trees of saw timber size were found -- 18 inches average diameter at breast height--one oak and no cedar at all. Klugh recommended that the engine of the mill be repaired and that it be relocated near Santa Cruz 4/

Mr. Klugh arrived in Bolivia in December 1956, finding no forestry program of consequence. Sometime during the next six months he drafted a seemingly most reasonable little project agreement for SAI and the Ministry. First, it provided for a national forestry inventory. Second, it provided for some assistance in establishing eucalyptus nurseries at Cochabamba, Tarija and La Paz. Third, it would provide a professor for the San Simon School of Agronomy to teach forestry.

Klugh filed his End-of-Tour Report in May, 1957 and was never replaced. The project agreement was never signed.

In 1963, FAO made a preliminary survey of Bolivian forest resources. A conclusion from this study was that Bolivia had a lot of valuable forest resources, a large proportion of which was inaccessible. However, 7.5 million acreas was identified in the area delimited by Santa Cruz, Trinidad and the Sucuré River, that was estimated to have the capacity to

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4/ Ibid.

supply 450 million board feet a year for 50 years 5/. Five million acres of this was said to be dominated by mahogany.

In 1970, the West GErman Mission was providing two professors of forestry to the Tarija School of Agronomy. Besides teaching, they had a 250 acre reforestation project which was aimed principally at erosion control.

5/ Jan D. Hutchison, Informe Sobre el Estudio Preliminar de los Bosques de Bolivia (Rome: FAO, 1967).

FISHERIES DEVELOPMENT

Bolivian waters are divided roughly into three regions. First, there is the interior drainage of the Western Altiplano, which is dominated by Lake Titicaca which drains into Lake Poopo by means of the Desaguadero River. They were found in their natural state to contain a very few species of fish (two genera), which were reported to be small and of poor quality. Titicaca was found to be poor in plankton, the smallest, basic link in the fish food chain.[1/] Second, there are the upper tributaries of the Plata River, which drain the Southwestern Altiplano. Except for the Villamontes area, streams were shallow and fishing is poor. The third region is the Northeastern Cordillera and the Upper Amazon Basin. The Amazon Basin portion is rich in fish but isolated in the tropical heat; hence it was difficult to exploit.

The first and apparently most of the effort to influence the fish population was placed on sports fish. The first introduction was made in 1936 by Antonio Zimmerman, brewmaster of the Taquiña Brewery of Cochabamba, who planted rainbow and brown trout in the Cordillera del Tunari.

That same year M.C. James of the U. S. Fish and Wildlife Service studied Lake Titicaca and recommended the introduction of lake trout and white fish. In 1940, the USFWS sent two million white fish eggs and a quarter million lake trout egss but the white fish eggs didn't hatch. Although the lake trout hatched and were planted in the lake, they disappeared. That same year a

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1/ Alan C. Taft, Informe Sobre el Estado de la Pesca en Bolivia (La Paz:SAI 1954) Unpublished. Taft also cites a study by Agasse and German,1876.

government fish hatchery was built at Pongo, 40 miles east of La Paz. About this time rainbow trout were planted in Lake Titicaca and some of its tributaries 2/. By 1948 they were sufficiently plentiful to be of commercial interest but by 1954 they were declining, prematurely Taft thought, and so were the small native fish on which the rainbow fed. Taft's remedy was to catch more trout, particularly the big ones 3/, and this they did with dynamite, a practice bitterly opposed by U.S. advisors, but which continued for some time.

Rainbow trout were planted in nearly every lake and stream in the Altiplano and the Cordillera, and except for Titicaca they did well. This became the leading market fish in the country.

In 1944, construction of the Angostura (Cochabamba) hatchery was started and in 1947, they got pejerrey eggs from Argentina for the hatchery 4/ This is a small white fish which has proven extremely prolific, flourishing in Lake Angostura as well as in the shallow lakes around Oruro, where it was reported to have been transferred from Angostura or Los Lagos Vacas by waterfowl. It was probably the second most popular commercial fish in 1970.

Carp from Brazil were introduced in the Cochabamba Valley, Sucre, Tarija and the Orient in 1952. They survived in Tarija, and in 1970 they were

2/ This importation was made unilaterally by the Bolivian Government from Chile, where they had been introduced from the United States.
3/ Taft, op.cit.
4/ Ibid. This was a technical assistance project from Argentina to Bolivia, including a preplant survey.

available in the La Paz market. Tilapia, which with carp were described by Fuqua as "the world's best fresh water fish from the standpoint of food for the masses and for adaptability", were introduced, but with some problems with the winter temperature 5/. By 1970 they had become competitive to more desirable native fish in the Alto Beni but were not available in the markets.

In 1957, SAI and the Ministry initiated a technical assistance project for fisheries development. Basically, it provided three successive fresh water fishery scientists over five years. The job was to, a) catalogue the fish species of Bolivia, b) develop and teach methods of operating hatcheries and ponds, including rearing native and introduced species, c) make an ecological study of Lake Titicaca, with emphasis on the rainbow trout-- a joint project with Peru, d) produce and plant trout fingerlings, and e) catalogue the sport fish in the Bolivian waters, including trout and native species 6/.

The lead-off man for the project was a Mr. Sythe, who envisioned developing Bolivian waters for sport fishing as the drawing force for a thriving tourist industry.

In 1962, the project was terminated with a formal Completion of Project Agreement. In this document, success was claimed for completing the Chissi

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5/ Charles Fuqua, "Fisheries Situation in Bolivia", U.S. Government Memorandum to C.J. Spalding (La Paz: USOM, May 5, 1959) Unpublished.

6/ Bolivian Ministry of Agriculture, Institute of Interamerican Affairs and SAI, Project Agreement for the Development of the Fisheries Resource of Bolivia (La Paz: MINAG May 23, 1957).

hatchery and rehabilitating the Pongo hatchery. Thirteen thousand more rainbow trout were planted in 33 streams and six-hundred pejerreyes were planted in one stream in Abaroa Province, Department of Oruro. A number of ecological studies were mentioned and the spawning season for Titicaca trout was found to be Mid-July to Mid-September. Other studies were mentioned 7/, but none were submitted as complete or iterim reports and the national inventory was not made 8/.

In 1946, Ing. Wagner Terrazas enrolled at the University of Michigan for a Master's Degree in fisheries biology and in 1952 he was given charge of the fisheries program. Although he had little support, he was a prolific contributor to the La Paz papers. For a long time his principle burden was to condemn dynamiting and poisoning Lake Titicaca and the streams. By 1970 the problem had been largely self-corrected because trout had become so scarce in Lake Titicaca that the kill would not pay for the dynamite or the poison. On the other hand in the Alto Beni, fish were so plentiful that alternative methods of harvesting were more economical.

In 1969, Ing. Terrazas condemned the rainbow trout as inefficient, requiring 10 pounds of food to produce one pound of live fish, while carp and Tilapia produce a pound of fish for two and a half pounds of food 9/. (Commercial trout farming in the U.S. achieve 2 1/2-1 feed conversion).

7/ Government of Bolivia, SAI and USAID, Termination Agreement for the Development of Fishery Resources in Bolivia (La Paz: MINAG 1962).

8/According to Wagner Terrazas, 1970. No such reports were to be found in the MINAG Fisheries Division Office, nor the Library,nor in USAID files.

9/Wagner Terrazas U. "Una Política para Desarrollo Nacional de bs Recursos Nacionales de Piscicultura (La Paz: El Diario, 1969)

But neither were carp nor Tilapia the answer, according to Terrazas.

The carp, which adapted to the good fishing waters at Villamontes, proved to be commercially inferior to the native catfish types which were plentiful, and at the same time they competed with the native species by disturbing their nesting grounds. The Tilapia, a carnivorous fish, competed with larger, more desirable native species in the Alto Beni and in the eastern streams. Since it was so prolific there was the danger of it taking over, Ing.Terrazas wanted to eliminate the carp and Tilapia, which by 1970 was an impossible task. The usefulness of carp and Tilapia is limited primarily to controlled pond and tank culture, where feed is provided artificially.

Ing. Terrazas' view the introduction of the pejerrey was most fortunate but it was limited to the lakes in the vicinities of Cochabamba and Oruro. The rainbow trout was the fish for the high Cordillera streams and lakes. Terrazas knew of no other species rugged enough to survive that altitude (above 13,000 feet) and temperature. The answer to Lake Titicaca was still unknown. He believed that the trout should be eliminated and two of the small, native species should somehow be encouraged.

AGRICULTURAL CREDIT

SAI started its agricultural credit operations in January 1955, establishing a supervised farm credit program, which was called Crédito Agrícola Supervisado (CAS) 1/. SAI launched field teams led by ICA personnel and the Bank of Agriculture of Bolivia (BAB) provided the banking services--deposits, disbursements, accounting and collecting, for a fee 2/.

By August 1955, there were six U.S. technicians in the program--director, assistant director and four departmental chiefs who employed and supervised 39 Bolivian field agents. The loan capital and most of the local salaries came from counterpart funds. Vehicles and office furniture were provided by U.S. grant funds.

It was similar to the U.S. FHA program. The farmer would make application for a loan--all short-term, one to two years. The departmental office would tentatively approve or disapprove it. If the action was favorable, the field agent went to the farm and, with the applicant, made a complete farm plan, returning for periodic supervisory visits for the life of the debt. Interest was 10 percent. There were difficulties; after the first year, there never was enough loan capital to accomodate the qualified applicants and the reports frequently mention delinquence in supervision due to excessive "case loads" and to personnel changes.

1/ USOM, Bolivian Agricultural Bank Program Report, Airgram TOAID A 492 (La Paz: USOM, 1965).

2/ Government of Bolivia Supreme Decree No. 03839 (La Paz; Sept. 24,1954) SAI, CAS, Activities Report, August 1956-February 29,1960 (La Paz,SAI,1960

To start with, CAS provided $426,000 equivalent in loan funds. This was built up over subsequent years to $1.7 million equivalent, after adjusting for a devaluation loss of $797,320 3/, 4/.

From January 1955, to August 31, 1963, CAS made 10851 loans and received 8257 repayments, for a capital turnover of 249 percent. At the end of that period 45.1 percent of its portfolio and 60.7 percent of its loans were delinquent. Forty percent of the business was in Santa Cruz 5/.

On September 1, 1963, CAS turned over its portfolio, other assets and personnel to BAB. The face value of the portfolio, including the delinquent debts, was received on BAB books as $1.7 million equivalent.

BAB was created as a government owned bank in 1942, with capitalization of $1,190,000 in the form of the outstanding loan portfolio of the Rural Credit Department of the Central Bank. Assets were added over the years in the form of Central Bank profits on foreign exchange and CBF accounts receivable. However, by 1954, due largely to inflation, the Agricultural Bank's total capital amounted to $170,000.

The reorganization in 1954 provided $415,000 more from the Government, along with a supervised credit department to service CAS.

3/ USOM, op.cit.

4/ SAI, CAS, op.cit.

5/ USOM, op.cit.

With its own funds BAB began commercial banking operations, including accepting deposits, making remittances, discounting commercial paper and foreign exchange operations. It also started a chain of retail farm stores.

In June 1961, BAB received $1.7 million of a $19 million Inter-American Development BAnk loan, which was directed to beef, dairy and machinery loans. The 1962 mid-year accounting the bank showed an operating deficit of $124,000.

In 1962, USAID become interested in the fate of the Bank as well a place to go with its supervised credit program, as SAI was to be phased out. A USAID study team recommended reorganization, recapitalization and the absorption of CAS. This was provided for in Supreme Decree No. 06456, dated May 13, 1963.

In August 1963, BAB received an AID loan of $3.7 million 6/, and on Sept.1, the CAS program and portfolio. It also got a team of banking advisers from AID as well as assistance from Arthur Young and Associates (AID contract) for the reorganization.

The $3.7 million was disbursed by 1965. BAB took over a $2.6 million IDB project from the Ministry of Agriculutre. The Bank applied to AID for $4.1 million more, and got it two years later in two loans 7/.

6/ 511-1-019

7/ AID - 511-L-028. $2.1 million, and AID 22-140-452, $2 million.

In 1967, the Bank received a $2 million loan from the International Development Association (IDA) for the first phase of a cattle project in the Beni and second loan for $2 million was made in 1969. An application for the third loan, $6. 8 million ($2.5 million for Altiplano sheep) was pending the solution of the marketing problem that emerged with the achievement of self-sufficiency in beef production in 1968. No export marketing system existed, although there was evidence of ample demand in Peru and Chile.

At the end of the first quarter, 1967, the Bank had 3955 loans outstanding with the face value of $6, 623,000. Under BAB's definition, 34 percent of the loans or 9.6 percent of the value of the portfolio were in default. Of the former CAS portfolio, 60 percent was in litigation 8/.
The Decree of May 13, 1963, emphasized the role of the BAB in organizing and financing cooperatives. This they tried to do as a means of financing small-scale operators. In 1968, clients served through cooperatives accounted for 86.5 percent of total clients and were responsible for 67 percent of the loan portfolio 9/.

The Bank used the agrupación system to organize neighborhood groups of small-scale farmers for production loans. The Decree of 1963 states that land can be used as collateral to secure loans, and this the Bank stressed.

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8 / Charles A. Bacon, BAB Brief Report No.2, U.S. Govt. Memorandum to Milton J. Lobell, Sept. 29, 1967 (La Paz: USAID, 1967) Unpublished. Bacon gave the percentage delinquency as 12 percent at this date.

9 / Peter E.W. Benedict, The Agricultural Bank (La Paz: USAID/RDD) Feb. 24, 1968.

They did not mention that a Decree exempted homestead property from confiscation by foreclosure. They got all the farmers in a given community together who were interested in credit to produce a particular crop, then the Bank agent determined the credit needs of each one and included them all in a single note, which each applicant signed. All except one or two who had titles to their land gave power-of-attorney to those one or two, enabling them to seize and sell their crops to satisfy the debt. This fixed it so the small-scale farmers could service their own debts.

By 1970, the Bank's loan portfolio had reached $19 million, and it was again short of loan funds. The Decree of 1963 provided for three loan terms: short-term, two years; medium-term, seven years; and long-term, 12 years. The IDA cattle loans required Bolivian counterpart participation, and these were long-term. There was a very high turn-over for the short-and medium term notes and a sharp increase in demand for credit among both individual and cooperative clients in Santa Cruz and Cochabamba. The Bank was due to have received $1.5 million in PL 480 counterpart in 1969, which had not been released in 1970. 10/ Then, too,

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10/ Agreement Between the Government of the United States of America and the Government of Bolivia for Sales of Agricultural Commodities, 1968. (La Paz: USAID, 1969).

the Bank was holding about $1 million in an "obligated" status against undisbursed loans.

The BAB has been criticized for putting so much of its portfolio into the Beni cattle project, since the country was self-sufficient in beef production. Their reply was that to export beef was a national policy but there was another reason. The Bank had also been criticized for showing a loss of $18,000 in 1968 and by building the portfolio up to $25 million they could not only break even but expand their services to include economics and planning departments. The cattle loans would provide at least $11.8 million of new capital, which, going out in relatively large sub-loans, promised to be profitable. The IDA and IDB loans would push the loan capital and portfolio above $25 million. In August 1970, BAB borrowed $1.8 million from the Bank of America to supply eight cotton producer clients, one of which was a cooperative.

The demands placed on the Bank by the Decree of May 13, 1963, presented a dilemma : The Bank was given the clear responsibility to organize cooperatives, obviously to service small-scale operators. Second, it was instructed to engage in only economically profitable business. The Bank had other problems. FHA methods inherited with the CAS field personnel had become a tradition which to some extent blocked the development of the high-volume, low-cost cooperative credit association model which the 1963 Decree envisioned. In the seven year period that followed, no serious effort was made to reindoctrinate or retrain the

field personnel. In fact the field agents were still using the old CAS Supervised Credit Handbook.

In the meantime, the Bank had developed an ugly image for having foreclosed on dilinquent loans, many of which were made by CAS. This, coupled with beginning loans among small-scale farmers having no previous experience in production credit, made the going difficult, particularly in Sucre, Potosi and Tarija departments.

In 1970, BAB was growing at the rate of about 30 percent a year until it exhausted its loan funds. A new internal audit system had been installed and was working and they had just borrowed $5 million from IDB for cattle ranch development in Santa Cruz-Chaco. They were also negotiating the third phase of the World Bank livestock project, $6.8 million.

AGRICULTURAL COOPERATIVES

In 1957, Donald Lee, ICA agricultural cooperatives specialist, was named Director of SAI's new Department of Cooperatives. He and Associate Director Ing. Wilde Urquidi, drafted the National Law for Cooperatives, and the Minister of Rural Affairs got it enacted. After two years Lee departed and following a lapse of eleven months, he was replaced by Phillip D. Smith, who after a year in the job become Director of the Economic Division 1/. He was not replaced.

Smith stated in 1962 that there were about 2,000 cooperatives chartered although 1,800 existed in name only and not more than ten were active and providing useful services 2/.

Much U.S. assistance was channeled to Bolivian cooperatives through other projects. Nearly all engaged in cooperative borrowing, receiving capital assistance through the BAB and technical assistance from SAI, or USAID, in the form of agricultural credit courseling or marketing assistance. The sheep cooperatives received counseling on sheep improvement along with bank credit to buy better stock, which had been established at U.S. assisted experiment stations with U.S. grant funds. Years after Nic C' de Baca sold the Cochabamba dairymen on better bulls, they borrowed dollars from BAB (AID...028) to import fozen semen out of the best bulls in the world as well as for tractors, milling machinery, etc.

1/ Phillip D. Smith, End of Tour Report (La Paz: USOM, 1962). Unpublished. Bryce M. Jordan was in Bolivia in a cooperative assignment for six months.

2/ Ibid.

In 1970 there were about nine types of rural cooperatives as distinguished by motive for organization, functions or state of development.

Chuquiña

Chuquiña is a community of Quechua people 20 miles west of Oruro who hold their land by grant from the King of Spain. One of their number was drafted for army duty in the Chaco War, and rose to the rank of Corporal. Upon his return to Chuquiña he built a schoolhouse, hired a teacher and organized a collective sheep raising venture to graze Royal (common or unassigned) land. After Belen was established, he and the teacher went there and bought improved rams and later obtained rams from Patacamaya. The sheep collective took on additional functions and the teacher became the manager. Known as a cooperative in 1970, it owned 22,000 sheep, four tractors, borrowed $13,500 from BAB and bought 450 imported Argentine Corriedale ewes.

Ex-Hacienda Cooperatives

On many ex-haciendas the former tenants held the headquarters and grazing lands for common use, and joint titles have been issued for such property. In a sense this is a cooperative. Some have gone further to establish collective flocks, and even further to borrow money from the BAB to buy improved sheep.

Asociación de los Productores Lecheros del Valle de Cochabamba (APL)

APL is unique in Bolivia as a production and marketing cooperative. It was organized by C' de Baca in 1948 as a bull ring, or breeders cooperative. When the PIL milk plant opened in 1960 APL became its sole supplier. Ten years later it was still the only supplier, at 85 percent of plant capacity, with sales of $1,250,000 a year.

The cooperative built up to about 250 members, fifty of whom were of Caucasian stock and the remainder indigenous, primarily Quechua women. They held semi-annual membership meetings to elect directors. The directors--all male, all except two of European extraction-met weekly. Besides the artificial insemination program APL had a Dairy Herd Improvement testing program and a feed and dairy supply store. In 1969 they bought, cooperatively, 36 U.S. manufactured pickup trucks with AID source funds and considered buying 65 tractors, with attachments, the same way. They considered the John Deere, but they received a better agreement from Massey-Ferguson of England-- manufactuer's credit, nothing down, 9 1/2 percent interest and three years to pay as compared to twelve percent from the Agricultural Bank. They were seeking 65 more tractors in 1970, more trucks and silage cutters, but there were no dollars available.

Multipurpose Cooperatives

There were one or two multipurpose agricultural cooperatives in Bolivia. The Monteagudo Cooperative provided goods and services to its members, that otherwise would have been scarce or unavailable. These included small farm implements, hardware, staple groceries, coca, and dry-goods. The cooperative operated a grist mill, a complete truck repair garage and they also bought and marketed corn. This cooperative received technical assistance from SAI and was a BAB client. In 1970 it was receiving assistance from West Germany.

Patacamaya-Sponsored Cooperatives

Soon after opening, the Patacamaya Experiment Station employed one person, Luis Chacon, full time to organize and work with cooperatives. He organized about a dozen cooperatives with 2,000 members. The cooperatives were further organized into a federation. These were all Aymara people who, from the influence of the station, endeavored to better their lot. They owned 12 tractors for custom plowing, (members first) and they had a good credit rating with the BAB. They own a slaughter house, which had been idle from its completion.

The Potatoe Production Group

From 1965 to 1968, about 80 cooperatives were organized north of Lake Titicaca to use the IDB Community Development Ban. Pre-Cooperatives were first organized and money was loaned for potato production.

Rice Harvesting Cooperatives

There were 52 rice producer's cooperatives in Santa Cruz, reported to have 1,500 members. Their only function as cooperatives was to borrow money from the BAB to harvest their crops and this amounted to $180,000 a year. However, as an association or federation, they were an effective pressure group, the only one representing the rice sector. In December 1969, the federation, called on the President of the Republic in quest of price support for the on-coming crop. They received it. The Central Bank provided the funds to BAB with instructions to buy rice. The risk assumed by the BAB from buying above the market price and having adequate storage was never an issue.

Coffee Marketing Cooperatives

In the 1960's the British Tropical Agriculture Mission, the Peace Corps, USAID and the BAB teamed up to establish a national marketing program for Yungas coffee. SAI made the feasibility study in 1962. The British and USAID furnished the technical assistance, the Peace Corps the management and BAB the USAID related finance. Cooperatives were formed and one-hundred percent equipment loans were made to build processing plants. The loans were made to buy the crops. The Peace Corps Volunteers, acting as managers, loaned money against the crop before harvest, bought the crop, hired labor and processed it. The BTAM sold it in England.

In spite of tremendous political pressure generated by individual competition, the effort was successful (A big increase in coffee prices due to a frost in Brazil helped). They managed to pay a better price to the growers than ever received before.

However, they were not true cooperatives. They had no limitation of membership, they required no initiation fee, nor did they require the ownership of shares. The effort was more like a benevolent public service.

Yungas Fruit Marketing

In the Yungas, fruit and vegetable growers were trying to organize so that they could economically assemble their produce and sell it in La Paz. They had problems on both ends, but particularly in La Paz due to no marketing experience.

The West Beni Cattlemen Cooperative

The West Beni Cattlemen's Cooperative, which was mentioned by Bleidner in 1960, inherited the CBF slaughterhouse at Reyes 3 Operating the slaughterhouse was their only cooperative function.

3/ Bleidner, op.cit.

AGRARIAN REFORM

Up to 1952, 92 percent of Bolivian land holdings were 25,000 acres or larger 1/. Each farm or *hacienda* was worked by 22 to 55 families who were bound in serfdom. They were permitted to cultivate small plots on their own in exchange for labor on the hacienda. This was changed in 1952. In 1951 the MNR Party (Movimiento Nacional Revolutionary) went about the Altiplano and the Upper Valleys organizing the peons into syndicates or peasant unions. When the Revolution of 1952 came, they were called upon to eject the *hacendados* and seize the land which they did. The Agrarian Reform *Act* of August 2, 1953 legalized their actions. This *Act* voided all rural land titles, stating that new titles would be issued on the merits of claims, keeping with the aims of the Revolution 2/. This the Government was not capable of doing.

There were a multitude of conflicts. First there was the *campesinos* occupation of land, with disputes over claims and boundaries. Then, there were disputes over subdividing of land or property previously not worked by any claimant. There were conflicting claims to the claims of the deceased as well as intimidation by their own leaders and by government officials. There were cases of the landlords attempting to hold the people in serfdom and thus hold the land, or to sell it to them

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1/ Ministerio de Agricultura, Censo Agropecuario, 1950 (La Paz:MinAg,1950).
2/ D.S. 03464, August 2, 1953.

or to sell it to them and issue unregistered titles. On the other hand the syndicate often deprived the landlord of land that he could legally claim 3/.

In 1965-1967, Ronald J. Clark, through an AID Regional contract with the University of Wisconsin Land Tenure Center, studied the economic effects of the Revolution. It was recommended that the Bolivian Agrarian Reform Service mobilize teams of technicians to obtain the facts on these claims and issue titles 4/. This in brief was the proposal:

1. Assemble "Mobile Brigades", each consisting of a land title judge, a secretary, eight topographers and a driver. Equip each group with a carry-all and the instruments they needed.
2. Select communities by priority needs and advertise in advance that the brigade would be at a place at a given time to hear claims and collect information.
3. In the community the topographer surveyed all possible boundaries, and the judge prepared dossiers on all claims resolving the easy cases on the spot.
4. The dossiers, including topographic sketches and notes, were reviewed and approved in La Paz.
5. Then the titles were written and signed by the President of the Republic.

3/ Ronald J. Clark, Problems and Conflicts over Land Ownership in Bolivia LTC No. 49 (Madison: LTC, 1968).

4/ Servicio Nacional de Reforma Agraria, et.al. Proyecto Brigadas Móviles Manual de Procedimiento (La Paz: SNRA, 1967).

Three mobile units were fielded in April 1968, and before the rains started in November collected 59,000 dossiers. Three more teams were fielded in 1969 and seven more in 1970/71.

To handle the extra business, an IBM computer was programmed to process and print the titles. A small unit was installed first, then in late 1970, an IBM Model 360 was installed. Key punch operators worked two shifts a day.

The extra output was more than the President could sign, but rather than change the procedure, a computerized signature kit was acquired. The remaining problem was that he and the Minister of Rural Affairs insisted on withholding the titles until one of the two could personally hand them out.

In 1968 it was estimated that the backlog amounted to 700,000 titles. The program called for processing 680,000 by June 1975 5/.

5/ USAID, PROP, Agrarian Reform Project 511-11-190-364.4 TOAID A-177 (La Paz: USAID, May 29, 1969).

CROPS DEVELOPMENT

A great part, but not all, of the history of commodities development was explained in the chapters on institutional development. Duplications not withstanding, summaries of the development of the principle crops follows.

Sugar

No refined sugar was produced in Bolivia in 1941. In 1950, the available sugar cane varieties, Java Gold (PJ-2870) and criolla, or mongrel, were said to have genetically degenerated to very low production 1/. By 1953, there were two mills, "La Belgica" and "La Esperanza", and they produced 5,454 metric tons of sugar. Another estimated 410,000 metric tons of cane were used to make alcohol since the price of sugar was controlled, while the price of alcohol was not. In 1953, Bolivia imported 52,000 metric tons of sugar 2/. In 1956, Saavedra Station released its first variety, Co. 421 which was readily accepted 3/.

On February 5, 1959 "La Belgica" received a loan for $2,498,149.17, and in 1960-63 "La Esperanza" one for $5 million in local currency. In 1964, Bolivia reached self-sufficiency in sugar production.

1/ Kushner, op.cit.
2/ Harry Wise, 1954 Annual Report-Economic Section, SAI (La Paz: SAI)
3/ Kushner, op.cit.

Annual production continued to increase through 1969. Since neither fertilizer was used nor weed control practiced, this was achieved by taking in new land, each time further from the mills until finally the marginal distance was reached, where the cost of hauling precluded profit. In the meantime the mosaic virus had invaded the Saavedra variety releases. The crop forecast for 1970 was down 20 percent from the year before and there was fear by the Sugar Grower's Association that they would not be able to meet domestic demand.

Rice

The Ministry of Agriculture reported rough rice production for 1949-1950 at 16,400 metric tons. Imports for 1953 amounted to 8,506 metric tons and 4/, increased to 11,216 metric tons in 1958 5/. In that period, Bolivia subsidized food grain imports by selling dollars to importers for Bs.190.oo, when the free exchange rate was Bs.500.oo to $1. Nevertheless, production was reported to be up to 24,000 metric tons in 1960, while imports had declined to 4,000 metric tons 6/. The Victor Paz Estensoro Government (1960-1964) changed the policy to increased domestic production and self-sufficiency.

4/ Wise, op.cit.
5/ Deer, op.cit.
6/ SAI, SAI Activities in Santa Cruz/Cochabamba Area, Nov.13,1963 (SAI), other sources report 10,000 metric tons imported in 1960.

Advancing on the assumption that production was a function of price and that the producers were being robbed by rescatadores (country buyers), SAI proposed a remedial marketing program. Although they would work to establish marketing cooperatives, there was little hope, at least in the short-range. They proposed the formation of a National Rice Marketing Committee (Comité Nacional de Comercialización del Arroz, CONCA), which was enacted by Supreme Decree, December 27, 1960. The Committee was composed of senior officers of the Ministry of Agriculture, Ministry of Finance, BAB and CBF 7/.

In March, 1961 they received $1,665,000 equivalent from the National Stabilization Council, and with SAI trucks started buying rice. The idea was to establish a price somewhere between that paid by the rescatadores and the break-even point, this establishing a fair price to the growers while preserving the rescatadores as a necessary marketing institution. The profit would be used to build up CONCA's capital. The farmer suppliers were issued stock certificates based on participation equal to $15,000 profit realized by CONCA in 1962 8/. In July, 1961, $500,000 in counterpart was added to the fund to create a warrant storage program.

The price formula was believed to have been fixed to equal world market price, CIF Antofagasta, plus inland shipping charges. This

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7/ SAI, Santa Cruz-Cochabamba, op.cit.
8/ SAI, Marketing Department, Annual Report, CY-1962 (La Paz:SAI, 1962). Condensed, unpublished.

along with the Saavedra variety releases got increased production and Bolivia reached self-sufficiency in 1968. There was a surplus predicted for 1969, and Bolivia petitioned the United States for a waiver on the P.L. 480 Agreement to permit the export of 10,000 metric tons and got it 9/.

There was an import requirement of 30,000 metric tons of rice in North Chile, and Grace & Co. was interested in it. However, when they went into the Santa Cruz market to buy they found that they had to pay the government fixed price, which was too high for the Chilean contract. The surplus that existed was smuggled out to Argentina and Perú. There was no mention of a surplus from the 1970 crop.

CONCA bought rice until 1965, when its affairs were transferred to BAB for settlement. In a trip report, Richard Hall, USAID economic advisor, said that BAB's losses from the rice warrant program probably would not exceed $20,000 10/.

In 1970, BAB was back in the rice business on government instructions. Using six percent Central Bank money, BAB bought FNCA (FNCA, Federación Nacional de Cooperativas Arroceras) warehouse receipts at a government fixed price, which was above the free market.

9/ P.L. 480 prohibits a country receiving cereals under Title II from exporting comparable commodities. The USDA determined that rice was "comparable" to wheat.

10/ Richard Hall, Trip Report, U.S. Government Memorandum (La Paz: USAID 1965) Unpublished.

Bolivia raises upland rice with a reported yield of about 1,100 pounds per acre although Saavedra had shown that the yield could be pushed up to 3,500 pounds per acre by flood cultivation. The practice was discussed but not used.

Tropical Fruit

Besides assistance to the experiment stations in obtaining experimental materials, U.S. assistance to the Bolivian tropical fruit industry was limited to CONCOFRUT, a marketing project which lasted about three years.

In 1961, Carlos Hoffman Espinoza, Agricultural Extension Agent at Chulumani, made a survey of South Yungas Province citrus production and concluded that something should be done to develop a market. He proposed a cooperative and proceeded to organize it 11/.

In 1962 the cooperative shipped 43,000 boxes of oranges, at a profit 12/. SAI could not honor their request for financial assistance however because they were unable to get a charter; hence they didn't legally exist 13/. This was circumvented the next year by a Supreme Decree 14/creating CONCOFRUT (Comité Nacional de Comercialización de Fruta). CONCA, the rice cooperative, which was then described as "the most modern marketing system in Bolivia" was the model 15/.

11/ Carlos Hoffman E. Breve Informe Sobre Probabilidades para Organizar Una Cooperativa de Citricultores en la Provincia Sud-Yungas-Dept. La Paz (Chulumani: Min-Ag.Sept.15,1961) Unpublished.
12/ About 4.3 metric tons.
13/ SAI, Marketing and Cooperatives Division, Marketing Department, Annual Report CY-1962 (La Paz: SAI, 1962) Condensed, unpublished.
14/ Republic of Bolivia, Supreme Decree No. 6506, June 28, 1963.
15/ SAI, op.cit.

In 1964 CONCOFRUT shipped 16 carloads of bananas and two carloads of pineapples from the Chapare Colony to North Argentina, but the import license expired and shipments were stopped.

In 1965 USAID and the Ministry of Agriculture signed a Pro-Ag. (Project Agreement) to provide a loan $150,000 in counterpart funds. The Pro-Ag. stated, "If long term customs agreements permit, a competent general manager will be hired...Unit /then/the Board of Directors /SIC/ and the Marketing Division of the Ministry of Agriculture will jointly assume this responsibility 16/. This was never achieved 17/.

In May 1966 CONCOFRUT's Chulumani packing plant was completed. They exported 53 cars of citrus to Chile that year and 79 cars the next.

A USAID audit in 1965 questioned the ability of CONCOFRUT to survive. Although it could show a small profit on bananas, increased volume would not improve its financial position, because 90 percent of the cost at the Argentine border was freight, which would increase directly with volume 18/19/.

16/ USAID, Cooperative Products Marketing (Fruit) (La Paz:USAID, June 28, 1965) Draft.

17/ Lloyd Jacobs, Monthly Progress Report(s), Marketing Division (La Paz: USAID, 1965, 1966) Unpublished.

18/ Frederick Dahl, Trial Period for CONCOFRUT, Memo to William D. Broderick (La Paz: USAID, Dec. 14, 1965) Draft.

19/ Jacob P. Meerman, Trip to Chapare with Lloyd Jacobs, Memo to the Economic Branch Files (La Paz: USAID).

One of the alternatives listed in an issues paper was to enlarge the management to include, a) "Business experience in exporting perishables," b)"experience in packing and shipping tropical fruit", and c) experience in managing a business enterprise". Another alternative was, "Liquidate (the) project and reinstate /it/ when 1) the roads and bridges to Chapare and Yapacani are completed and functioning, 2) the Yacuiba-Santa Cruz railroad has been improved, 3) and when international agreements between Bolivia and neighboring countries favor exports of fruit from Bolivia" 20/.

Potatoes

The potato is native to the Andes and is the staple of the Andean diet. It was they (Andean) who invented freeze-drying (chuño), which they do to preserve their potatoes for seasons of scarcity.

Although a number of horticulturists were provided by the U.S. aid program, none was identified as a potato breeder and there is no evidence that any of them assisted directly with potatoes. However, without the experiment stations established by SAI, potato research would not have been possible.

20/ No author given. (La Paz: USAID, RDD files, undated) Unpublished.

Ing. Humberto Gandarillas, who was named in an annual report of one of the experiment stations as Bolivia's first agricultural scientist, started the potato research program. Ing. Gandarillas developed the Sani Imilla at "La Tamborada". This was a roundish potato with deep purple skin and was accepted in the Altiplano and La Paz, but Cochabamba refused to touch it. So, Gandarillas produced Imilla Blanca, the same potato with white skin. Since then two more Bolivian types have excelled. They are the Runa and the 54-510-61.

With the spread of these improved types, along with the increased use of fertilizer and insecticides, potato yields increased considerably in the 1960's. The estimates that existed suggested that the national average yield per acre increased by about 42 percent in that decade 21/. It appeared that national production increased by 16 percent while the area planted decreased by 19 percent. The blight and fungus problems are tremendous and two crops out of three in the Altiplano are reduced by frost. A commercial frost resistant potato is needed.

Corn

Corn is the success story of the Saavedra and "La Tamborada" stations and the Extension Services of Santa Cruz and Cochabamba departments.

21/ Carmen Deere, Estimates of Agricultural Production, 1958-1970 (La Paz: USAID, 1970).

Cuban Yellow, an open pollinated flint corn, was Rockefeller's first release. It worked at Saavedra, and the Extension Service pushed it. It produced about 40 bushels an acre under ordinary farm conditions, without fertilizer, compared to 13 bushels an acre for the "criolla types" the farmers had before.

Rapidly, corn changed from a scarce crop to a seasonally surplus crop, going at depressed prices in harvest season. The two limiting factors in production were the presence of the European corn borer and the absence of cheap fertilizer. The corn borer was easy to control, and fertilizer would hopefully become cheaper with increased national use.

"La Tamborada" proved another Rockefeller variety, Roca-Mix, a silage corn which in 1970 provided most of the dairy feed for the Cochabamba Valley.

Both areas are in serious need of corn breeders and seed producers.

Wheat

In 1950, there was 25,000 metric tons of Bolivian produced wheat milled in Bolivia. Production declined from then to 1956, when Bolivian mills bought no domestic wheat 22/. The Agrarian Revolution accounted for part of the decline, the Government subsidized wheat imports at the rate of 62 percent or more of foreign currency cost; stopped domestic purchases 23/.

22/ Raúl Bedoya B., "Aspectos de la Industrialización y Comercialización del Trigo en Bolivia" Ciclo de Conferencias-Simposium sobre Producción de Trigo en Bolivia, (Bol. Tecnico No. 9) (La Paz: Sociedad de Ingenieros Agronomos de Bolivia, June 1970).

23/ Wise, op.cit.

In later years the availability of wheat on very favorable terms through PL 480, Title II agreements did not encourage the Government to push wheat production. The counterpart that accumulated from the sale of PL 480 wheat was available for use by the Bolivian Government, subject to U.S. consent, whereas the proceeds from domestic wheat went to Bolivian farmers.

SAI technicians initiated wheat variety work at "La Tamborada" in 1948. By 1954, the had identified a promising variety and in 1958, Ing. Alfredo Ballerstaedt, SAI extension expert, launched a wheat production campaign. This was discontinued after two years, due to the lack of funds.

Domestic Wheat Purchases by Bolivian Mills, 1950-1970 24/

Y E A R	METRIC TONS
1950	25,000
1951	10,209
1952	4,676
1953	3,643
1954	7,545
1955	14,186
1956	-.-
1957	-.-
1958	-.-
1959	-.-
1960	-.-
1961	1,337
1962	3,223
1963	4,486
1964	9,245
1965	7,100
1966	6,706
1967	7,072
1968	7,507
1969	10,215
1970	17,600 25/

24/ Ibid.
25/ Alfredo Ballerstaedt, Estimativos de Producción Triguera de Bolivia, 1970 (La Paz: Instituto del Trigo, 1970).

Bolivian mills resumed buying domestic wheat in 1961 which coincided with President Paz Estensoro's policy of no more subsidy. Ho wever, Ballerstaedt deserves credit for getting new varieties accepted in the Cochabamba and Sucre Valleys.

In 1966, Delworth Gardner made a study of the wheat zone and concluded that it was not economically feasible for Bolivia to produce itw own wheat 26/. In 1965, Devere McAllister made an agronomic study of the same area and reached the some conclusion 27/.

In 1958, Ing. Max Cabrera, SAI wheat breeder, released COPOSU, so named because he had tested it at Cochabamba, Potosí and Sucre. This was a semihard wheat, high-yielding, but susceptable to rust. In 1966, USAID's Rural Development Division, as a result of program analysis, urged Ministry personnel to multiply the available COPOSU seed and start a wheat campaign. A $200,000 counterpart loan was made to the Ministry of Agriculture for a revolving fund to buy the seed.

Utah State University, associated with USAID on a technical assistance contract since 1965, provided Gordon Van Epps, an experiment station agronomist, to assist Cabrera with his experiments and also to assist in the production of COPOSU seed.

26/ B. Delworth Gardner, The Economics of an Increase in Wheat Production in Bolivia, USU Series 13-66 (La Paz: USU, May 1966).

27/ Devere McAllister, "Additional Pertinent Information on Wheat", An Agronomic Survey of the Possibilities for Increasing Wheat Production, by Wade G. Dewey and Devere McAllister, USU Series 6-66 (La Paz:USU,1966).

Gardner made another study in 1968, and based on the results from COPOSU with and without fertilizer, concluded that wheat could be economically produced 28/.

In 1967 and 1968 one of the releases from the Rockefeller-Ford-AID Wheat and Corn Improvement Center in Mexico, proved outstanding. It was called Jaral 66, a short stemmed, early maturing, hard wheat. USAID obtained 50 tons of seed and the Ministry of Agriculture contracted with growers to plant 595 acres of it.

At the same time, Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) with the assistance of FAO Marketing Specialist Russel Ferguson, launched a campaign to develop a fertilizer market. Ferguson joined the Ministry's wheat campaign with fertilizer demonstrations.

In 1969, fourteen Peace Corps Volunteers joined in the campaign. The final report revealed that 5,220 acres of Jaral were planted, along with 8,400 acres of COPOSU. This was harvested in April and May, 1970. The mills had their biggest run in 20 years and it was estimated that they would buy 17,600 metric tons of domestic wheat in 1970.

In 1970, new flour mills were erected at Sucre, Potosí and Tarija, and it had been conclusively proven that wheat--both the Jaral and Frontana varieties--could be grown in Santa Cruz department. Raúl Bedoya,

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28/ Delworth Gardner, Prospects for a Successful Wheat Program in Bolivia USU Series 2-69 (La Paz: USU, 1969).

president of the Wheat Miller's Association, grew 650 acres. On the strength of results plans to build a mill in Santa Cruz were made.

LIVESTOCK DEVELOPMENT

Dairy

The story that SAI organized APL, the Cochabamba Milk Producer's Association, has been told. They advanced with the times from cooperative bull ring to frozen semen from some of the World's greatest sires. In their DHIA (Dairy Herd Improvement Association) program they had a number of cows that produced over 45 pounds of butterfat a month.

About 1955, UNICEF undertook a project to build a milk plant at Cochabamba with the idea of producing milk powder for children. CBF obtained control of the plant but had engineering problems with construction and installation, so from 1956 to 1960, ICA contributed a plant engineer and a bacteriologist.

When the plant, known as PIL, opened in 1960, they gave APL an exclusive supply contract. APL delivered 2,000 liters a day the first year and in 1970 they produced 34,000 liters a day, 85 percent of the plant's capacity.

In 1968 there was the fear that the wheat program would be strangled by the lack of a market for by-products. In 1970 there was no surplus of wheat by-products, due primarily to the dairy industry.

Beef Cattle

Neither SAI nor USAID ever really had a beef cattle development program. SAI tried several things, most of which did not work. With Bleidner's work at Reyes, SAI may claim credit for helping introduce zebú cattle to the Beni 1/. SAI personnel introduced and to a considerable extent popularized Jaragua grass, Elephant grass and a few other good forage species. Bolivia reached self-sufficiency in beef production in 1969.

1/ Bleidner, op.cit.

Sheep were introduced to Bolivia and the Western Hemisphere by the Spanish Conquistadores. Although Spain was the exclusive possesor of the Merino, so highly coveted for its fine fleece, none was released to its colonies for a century, and probably not until 1920 did any reach Bolivia. Rather, the conquerers brought the common types which Cardozo identified as the Churra and Manchega, or of the "sirio-pirenaico-africano" group. They were the same type that the Navajo Indians obtained from the same source 2/.

Over the centuries these sheep, in the process of adjusting to their environment which included the high altitude, the decline in range feed supply due to overgrazing and cultivation and the penalties of domestication, degenerated. Cardozo found that over four centuries the animals decreased 38 percent in height, from 29 inches to 18 inches, and 73 percent in weight, from 145 pounds to 39.5 pounds, average. He also noted morphological characteristics in the present day animal indicating that it had reverted to the wild state 3/. This was the dictionary example of criollo via naturalization.

Sheep were kept for four purposes, in this order: 1) for manure to fertilize potatoes and other food crops, 2) for milk to make cheese, 3) for a source of cash in case of an emergency, and 4) for wool for

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2/ Armando Cardozo, El Altiplano de Bolivia y la Cria de Ovejas (Cochabamba: Universidad Mayor de San Simon, 1970).

3/ Ibid.

home-spun clothing 4/. To collect the manure the year round and the few drops of milk when the lambs were small, the sheep were confined in pens every night. But it got cold on the Altiplano when the sun was low and remained very cold until on up in the morning. To avoid the chill of the cold dew, frost, and cold wind, the sheepherds--many if not most, little girls--took their flocks out around 10:30 a.m. and brought them balck to their pens about 5 p.m., allowing about six or seven hours to graze.

The first attempt to improve Bolivian sheep was in 1919, when Juan Perou, Ingavi Province, imported 100 Romney Marsh. In 1920 Simon I. Patiño of Cochabamba imported 21 Spanish Merino and Oxford Down, whose offspring found their way to the Altiplano. Also in 1920, Juan Perou imported an unknown number of Rambouillet. Later, Dr. Nestor Perez Velasco and Ing. Eduardo Romecin imported 20 Rambouillet and in 1932, Carlos V. Aramayo imported an unknown number of Hampshire sheep for his Tupiza properties. In 1938 the Ministry of Agriculture imported unspecified numbers of Argentina Merino, Romney Marsh and Lincoln. Between 1932 and 1943 the Rural Society of Bolivia imported unspecified numbers of Argentine Merino, Australian Merino, Corriedale, Romney Marsh, Hamphire and Karakul. Between 1947 and 1952, Carlos Eulert imported 1240 Corriedale, which were distributed among 19 properties 5/.

4/ Roberto J. Gonzales, Bench Marks from Which Economic Change Can be Measured for an Altiplano Community (Logan, USU, 1969) Master's Thesis.
5/ Cardozo, op.cit.

In 1946, the Belen station obtained 12 Corriedale rams from Chile, and with them began on artificial insemination program, both on the station farm and on neighboring haciendas 6/. This stud was supplemented by a shipment of Corriedale rams and ewes provided by ICA through SAI in 1952 7/.

Except for the Belen stud (and this is not certain) the farmers in acts of emancipation, killed and consumed the upgraded flocks resulting from the importations 8/. Then as the new propietarios, they started out a new with criollos.

In 1956, 493 Corriedale ewes and 20 rams for the Patacamaya station were purchased by SAI in Perú 9/.

SAI import registered Corriedale for the Belen and Patacamaya stations in 1958 and 1960, the Society of Friends brought Corriedale sheep to Ingavi Province. In 1962 Patacamaya received eight more Corriedale rams from the United States and Polworth and Ideal rams from Uruguay. In 1965, the station received more Corriedales and its first Rambouillet. In 1967 and 1968 they obtained 100 Targhee ewes and 21 rams, 30 Corriedale rams and 10 Rambouillet rams. These were imported from the United States by USAID.

6/ Rea, op.cit.

7/ Cardozo, op.cit.

8/ Ibid.

9/ Patacamaya, Informe Anual, 1959-1960, op.cit.

In 1968, Utah State University (AID Contract) imported 95 Junin ewes and five rams from Cerro de Pasco Corporation, Perú, and placed them with the "Exaltación" Cooperative, El Alto. The same year, the Oruro sheep cooperatives imported 117 Corriedale rams 10/.

In 1970, USU assisted the Ministry of Agriculture in importing 1080 grade Corriedale yearling ewes from Argentina. There were some 1300 purchased, but the 21 day trip, with a seige of shipping fewer took its toll. The net number of 1080 delivered to Lucio Arce's ranch, the Chuquiña Cooperative and the "Exaltación" Cooperative. Arce and Chuquiña borrowed from BAB for theirs, "Exaltación" paid cash. The money returned was put in to a revolving fund to import more sheep. Also in 1970, USAID imported 130 Targhee ewes, five Targhee rams and five Rambouillet rams. Mr. Eulert bought 15 ewes and a ram and the rest went to the Patacamaya station.

No long range program for developing the national sheep flock was adopted by the Ministry or proposed by its advisors. Rather, over the twenty five years the Belen pattern of flock upgrading became the guiding tradition. There, standing the imported rams for artificial breeding, they serviced the station sheep as well as the large neighboring flocks.

10/ Cardozo, op.cit.

Station personnel trained provincial extension agents in artificial breeding techniques, and loaned them imported rams to breed the larger flocks in their provinces. Over the years they claimed conception rates above 80 percent. The practice was adopted at Patacamaya when it opened.

The surplus rams from the stations were bartered to Campesinos with small criolla flocks, in the beginning at the rate of one improved ram worth $25 for three criollo rams worth about $4.50 each.

In 1965, USU contracted with AID to provide a sheep specialist to work with the improvement of Altiplano sheep 11/, and with this, activities accelerated. USU made all the importations (AID funds) after 1965. Eventually a ram of improved breeding commanded four criollo rams in exchange. Then the station rams came to command cash--first, out of pocket, then through the BAB.

By 1968, the idea had developed that the experiment stations, principally Patacamaya, would maintain top stud flocks which would provide rams for 12 to 20 cabañas, or stud flocks of lesser quality, which would supply range rams to the Campesinos. About a dozen flocks were identified as "pre-cabañas". A classification program was set up by Darrell Mathews of USU by which he identified and marked (ear tag) those measuring up to acceptable standards of breed type. The practice was continued by his successor and brother Nyle Mathews, and by Nyle's successor, Keith Hoopes.

11/ AID-USU, LA-319. The contract also provided a forage specialist and an economist for the sheep project.

By 1970, there were serious doubts in USAID as to whether the experiment stations could maintain the pure blood stud flocks which were envisiones. The main problem was that the station management was reluctant to feed the animals for minimally satisfactory growth.

In October 1970, the Bolivian Government was to begin negotiations with the IDA for a livestock development loan which would include $2.5 million for Altiplano sheep. This would buy, among other things, 30,000 ewes and 1,000 rams, which in ten years, according to the IDA model, would result in 400,000 improved sheep capable of providing Bolivia's wool requirements.

The big unanswered question was a market for the boned-out mutton and low quality pelts from the millions (anywhere from six to 10) of criollas, including barren ewes and surplus rams already competing for the sparse range.

Forage Improvement

Most of the experiment stations started domestic forage adaptation trials the first thing. This included Belen, Patacamaya and Chinoli. Although standard deviations in their statistics were large, there was a thread of consistency. Ranger alfalfa worked at all three places; Alta fescue was a relatively high producing grass; Reed canary grass worked where the water table reached the surface; and weeping love grass was a good range plant.

The Utah State Team reestablished the forage plots at these three stations, as well as the agricultural school at Oruro and one or two other places. After five year's investigation from much superior data, their conclusions were almost identical to the earlier conclusions reached at the SAI stations.

It was the compelling consensus that the Altiplano had been so severely overgrazed over the centuries that it was hopeless to attempt to rehabilitate the range by deferred grazing and rest. In fact the native plants on the Altiplano were judged by the late Ing. Otto Braun, Bolivian botanist, to be quick-maturing to accomodate the short growing season, thus low yielding.

Through the Extension Service and the Peace Corps, USU distributed up to 30,000 pounds of seed a year in "kits". No evaluation of this activity had been reported as of 1970.

Alpaca Hair Processing and Marketing

In 1962, SAI contracted with Stokes Brothers of Perú to study the wool and hair situation and to direct the establishment of a marketing system. The work was done by Charles E. Stokes. His solution for the hair problem was to manufacture yarn and tops, principally for export 12/.

12/ Stoker's Brothers, Alpaca, Llama and Wool Processing and Marketing in Bolivia (La Paz: USAID, 1963).

The Government, with SAI backing, responded by creating Comité Boliviano de Fomento Lanero, COMBOFLA 13/, which Stokes bitterly opposed, affirming that as a government enterprise, it was foredoomed. Nevertheless he stayed on for another year or so 14/.

COMBOFLA received a loan of $305,250 in counterpart funds and started operating in September, 1962. Stokes selected Pulacayo, 325 miles from La Paz, in Potosí Department, a shut-down mining town, as the site for the yarn mill. The reason for the choice, he said, was that there were mechanics available as this had been a repair center for mining machinery. There were also buildings, water and electricity.

With additional counterpart loans, Stokes ordered the machinery. He reported that he selected it especially to process llama hair, identical to Kashmir goat hair which was indeed valuable. The plant would handle alpaca hair 15/.

One major piece of the machinery was later criticized for its apparent antiquity. Its boilerplate read "1911". Later, in 1970, it was revealed that another component was designed to process sunthetic fibers; hence it was not equipped with bur pickers to remove foreign matter from natural animal hair 16/.

13/ Supreme Decree No. 06110, May 23, 1962.
14/ Stokes, op.cit.
15/ Ibid.
16/ Rondo Christensen, consultation with U.S. manufacturers, 1970.

While the Pulacayo plant was being readied, COMBOFLA bought alpaca hair, which it consigned to Liverpool, England, for auction. In order to assure a supply of raw hair for the mill in later years, Stokes insisted on free entry and got it. Then he located COMBOFLA's first buying station at Puerto Acosta to receive Peruvian hair. The Liverpool auction didn't work out. The plant began operating toward the end of 1965 17/.

While the mill lost money every year from the time it opened, the reports were optimistic; "a sales contract was just about to be signed". By 1970, it was obvious that COMBOFLA could not service its debts, and it was out of operating capital. A USAID review recommended that COMBOFLA cut back its operations, lay off the surplus personnel and liquidate its sizeable inventory 18/.

In the meantime, another contract came on the horizon which would put the operation in the black, except for debt service. All that would be needed would be $75,000 for operating capital 19/.

17/ Lloyd Jacobs, Monthly Report, Memorandum to Joseph Huber, October, 25, 1965 (La Paz: USAID, 1965) Unpublished: "The Pulacayo Plant is being run in".

18/ USAID, Controller, COMBOFLA Analysis Financiero (La Paz: USAID, May 31, 1970).

19/ Rondo Christensen, Weekly Report, Memorandum to Lloyd Clyburn, 8/26/1970 (La Paz: USU 1970) Unpublished.

In 1966, Roberts asked, "Is there any hope that COMBOFLA will be able to achieve adequate internal capitalization or is USAID the only source of food for survival? If the latter is the case, let us drop this project now" 20/. He thought that they could attain sufficient volume to self-capitalize but four years later they had not.

A review of the archives did not turn up an economic or a social justification for this project although the first eight years of its life proved uneconomic. Future returns on resources already invested along with additional investments needed had not been projected. It was fairly certain that most of the hair used by the mill came from Perú which represented a subsidy to Perú equal to the loss at Pulacayo.

If indeed the hair was supplied by Perú, then the fate of Bolivian alpaca owners was not an issue. To the extent that Bolivian growers did supply Pulacayo the question could have been asked, what were their economic alternatives to selling alpaca hair. This inquiry had not been made.

20/ N. Keith Roberts, COMBOFLA Financial Status, U.S. Govt. Memo to Irving G. Tragen (La Paz: USAID, July 13, 1966) Unpublished.

U.S. interest in wool marketing was first shown at Belén in 1952, in teaching hand-shearing 21/, and from 1956 to 1958, the SAI fielded a custom shearing team to demonstrate mechanical shearing 22/. Evidently, the rationale was that in Bolivia, at least, wool marketing was a function of the shearing skill, and not the other way round, since the skill was obviously a missing link in the system. There was no record of an inquiry of mill requirements. Keith Roberts, USU economist, concluded optimistically that the annual wool clip would be worth $3 1/4 million if it could be achieved 23/.

Hopefully, to obtain the wool clip 24/. Darrell Mathews held hundreds of shearing schools in Campesino communities. The format was to, 1) demonstrate technique, 2) supervise the practice, 3) conduct a contest, the winner being named Master Shearer and awarded a whet stone to sharpen the hand shears, also imported and sold by USU.

There were five woolen mills in Bolivia--Forno, Soligno and Ibusa in La Paz, Hilbo in Oruro, and Sentex in Cochabamba. Forno and Soligno were of particular interest to the U.S. assistance group. These mills had a combined volume of about 2 million pounds a year representing a substantial market for Bolivia's sheep project. The products, which gained about 700 percent in value added by manufacturing, promised competition to imported (legal and black market) worsteds. The U.S. agency made capital and operating loans to Soligno, but these were stopped, as some said, due to excessive expatriation of its funds.

21/ Winters and Palomo, op.cit.
22/ SAI, DOD, op.cit.
23/ N. Keith Roberts, End of Tour Report, USU Series 10-67 (La Paz:USAID, 1967).
24/ J.Clark Ballard, Monthly Activities Report(s)1965-1968 (La Paz: USAID 1965-1968) Unpublished.

There were ample entries in USAID files on the financial state of Soligno, how it should be reorganized, how to handle the debt, and how much it would help COMBOFLA's wool business if Soligno could become credit worthy. In 1970 COMBOFLA's wool marketing operation was profitable 25/.

COMBOFLA established seven wool grades, ranging from white fine to colored, dead, pulled wool, with buying prices for the seven grades and selling prices for six. The mills took all of the top two or three grades they could get, and an equal amount of the bottom four but not all that was available. As their warehouses filled COMBOFLA cut back on buying criollo wool.

In August, 1966 COMBOFLA, which was organized to market llama and alpaca hair, started buying wool. Charles Stokes, an earlier contract advisor, had located COMBOFLA's principal buying station at Puerto Acosta on the Peruvian Border and at the same time obtained a decree permitting duty free entry of wool and hair. As a result COMBOFLA received some business immediately and the La Paz mills benefitted from it 26/.

25/ USAID, COMBOFLA Financial Review, May 31, 1970.
26/ Stokes, op. cit.

Poultry Development

SAI established New Hampshire, Barred Plymouth Rock and White Legorn flocks at "La Tamborada". With its small incubators, in spite of poor hatching rates, "La Tamborada" supplied cockerels to extension agents to give to their farmer clients. Apparently, this effort just about doubled national egg production in 12 years. The 1950 Agricultural Census reported 32,612,020 eggs, and Padget's estimate for 1962 was a little over 65 million 27/, mostly from yard flocks.

Nothing much was done to promote the commercial end of the industry. With the change of government in 1960, Alfredo Canedo, in charge of poultry work at "La Tamborada" became urgently interested in studying in the United States. This was arranged and upon his return two years later he started a small commercial flock of broilers.

In 1962 there were between 50,000 and 70,000 hens in commercial flocks, as contrasted to previous flocks. There were 100,000 dozen eggs imported from Perú and Brazil and prices fluctuated from 45 ¢ to 75 ¢ a dozen 28/. There were approximately 244,000 broilers produced in 1962, which sold wholesale in La Paz at 57 ¢ a pound. This compared to 27 ¢ a pound for beef 29/.

27/ Charles Padgett, A Study of the Poultry Industry in Bolivia (La Paz: USAID, May 1963)

28/ Ibid.

29/ Ibid.

The country produced about 80,000 chicks commercially in 1962, and imported 285,000. They had quadrupled by 1967. Imported chicks numbered 576,000, while 972,000 were produced domestically. The standard U.S. straight-bred layers, including New Hampshire, Babcock Leghorns, as well as Heisdorf & Nelson's H & N Nicks, were included. Hybrid broiler chicks were hatched from Arbor Acres and Nichols franchised breeder stock 30/. Broiler prices dropped about four U.S. cents a pound over the five years.

The industry continued to expand about 50 percent a year. By 1970, Canedo had housing capacity for 70,000 broilers and was producing three groups a year. The price to producers for dressed broilers (Bolivian style) had dropped to between 30 ¢ and 38 ¢ a pound in Cochabamba and 45 ¢ a pound in La Paz. The retail price in La Paz was 53 ¢ a pound. In the meantime the retail price of beef had increased to 30 ¢ a pound. From the customers view, this represented a change in the price ratio of broiler meat to beef from 2.1:1 in 1962 to 1.75:1 in 1970.

The price of eggs stabilized at approximately 55 ¢ a dozen. The Cochabamba Poultry Association was packaging and shipping eggs to La Paz and about to begin shipments to North Chile. Egg imports had stopped sometime earlier.

In 1967, Sr. Leopoldo Comboni, of La Paz, who had a hatchery at Chulumani, anticipated pressure on the market from the combination of increased domestic production and imports. So he, self-appointed spokesman for the

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30/ Gordon Hatcher and Monroe Rosner, Poultry and Feed Industry Study (La Paz: USAID, January, 1968).

poultry industry, petitioned the Ministry of Finance to levy an additional 24 percent import duty on chicks. There was already a two percent duty 31/. Comboni's petition was honored, irrevocably. This helped the Bolivian hatchery industry as a whole but not necessarily Sr. Comboni. Grace-Hyline, which had been supplied from Lima, recruited an ex-Peace Corps Volunteer and started hatching in Santa Cruz. H & N, Arbor Acres and Nelson extended franchises to Santa Cruz hatcheries. In 1970 Bolivia was producing its total requirement of chicks--mostly through franchise arrangements with U.S. breeders--and increasing at the rate of about 50 percent annually.

The big problems the industry faced was developing a reliable source of good feed and the health standards which could be expected to eventually make Bolivian poultry and eggs, competitive in the world markets.

In 1967 and before, Grace & Co. imported the Gibbons 45 percent protein concentrate from New Orleans which was blended with Bolivian corn. This accounted for about 90 percent of the feed going to commercial flocks. The concentrate sold for $13.80 a hundred pounds in 30 ton lots and even when blended with $2.50 corn, it was about twice the cost of comparable feed in the United States 32/.

There were several efforts by individuals to enter into poultry feed manufacturing, but only one seemed really serious. Sr. Hernán Rivera

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31/ Gordon Hatcher, Increased Duty on Imported Chicks, U.S. Govt. Memo to Milton J. Lobell, (Cochabamba: USAID, September 25, 1967) Unpublished.

32/ Gordon Hatcher, Monthly Report, November, 1967 (Cochabamba: USAID November 27, 1967) Unpublished.

organized Industria Molinera y Balanceado de Alimentos--IMBA. The plant consisted of a small hammer mill, a grain grinder, an improvised soybean cooker, a bone cooker and a batch mixer. The instrument of quality control was a Spanish wall chart of average analyses as IMBA had no laboratory.

IMBA produced sun dried bloodmeal; cooked and ground bone meal and cooked whole soybeans, purchased from the Okinawan colonies at $4.20/cwt when available. Other products included soybean meal imported from Brazil at $7.50/cwt and fish meal from Perú at $14 to $17 cwt 33/.

IMBA received irregular visits by USAID technicians who provided standard rations and a limited amount of literature. Toward the end of 1969, IMBA acquired a chemist, an ex-Canadian Peace Corps volunteer. Although he was a physical chemist, he readily got on to the feed quality control problem and installed a laboratory.

In 1967, IMBA manufactured 1570 metric tons of feed. In 1968 the volume was 1810 metric tons, and in 1969, in spite of a fire in the plant, produced 3600 metric tons. The Cochabamba plant made three or more concentrate mixes sold under the IMBA brand and sixty percent of its volume was custom blends, mostly for layers. IMBA also had a bulk blending plant at Santa Cruz.

The limiting factor for the feed industry was the availability of soybean meal. Only about 300 tons of soybeans reached Cochabamba in 1969. The 1970 crop was estimated at 1300 tons, while there were plans to double that in 1971.

33//Gordon Hatcher, Progress Report, July, 1967, U.S. Govt. Memo to Jack R. Morris (Cochabamba: USAID, July 19, 1967).

Heifer Project

Heifer Project, Inc., is non-profit, non-sectarian, yet religiously motivated organization of U.S. citizens who have attempted to help with rural economic development and disaster relief through upgrading livestock. It was organized in 1942 and was active in restocking Europe following World War II. Then as the U.S. became involved in foreign economic development, H. P. moved in a similar direction.

The principle of operation is that of a livestock chain: give a heifer to a poor but deserving farmer or farm boy; have her bred to a good bull; collect her first female offspring as full payment and give it to another deserving farmer.

Heifer Project began operating in Bolivia in 1957. From that time through 1969 the organization sent the following livestock, bees and other materials to Bolivia 34/.

34/ Gordon Hatcher, et.al. Heifer Project-10 years in Bolivia (Cochabamba: USAID, 1968); Jerry Perkins, et.al. Annual Report Heifer Project Bolivia (La Paz: Peace Corps, February, 1970).

Item	Male	Female	Unspecified	Total
Cattle				
Brown Swiss	55	26	17	88
Holstein	9	20		29
Jersey	4	6		10
American Brahman	13			13
Santa Gertrudis	3			3
Herford	1			1
Angus	1			1
Total				146
Sheep				
Corriedale	8	89		97
Unspecified, including Suffult, Cheviout and Shropshire	8	16		24
Total				121
Goats, including Toggenburg, Sanen and French Alpine				164
Swine				
Duroc				65
Poland Chine				5
Berkshire				3
Unspecified among the above plus Chester White				126
Total				199
Rabbits				
New Zealand			20	20
Unspecified			32	32
Chicks				13,935
Ducklings				780
Turkey poults				500
Bees (packages)				8
Horses	1			1
Mules			2	2
Miscellaneous				
Horse and mule harness (lb)				600
Debeakers				1
Egg graders				1
Veterinary supplies (cartons)				12
Medical supplies (cartons)				10
Garden seed (lb)				303
Laboratory animals (unspecified)				210

Heifer Project also furnished a management and advisory service which could be contracted for by other development agencies. H.P. fielded livestock production men to manage the importation, distribution and supervision of H.P. stock as well as to provide extension type advice. The subscribing agency paid the cost of the fieldman plus an overhead change.

Claude Wolfe came on a Peace Corps contract in 1962, with 18 "Heifer Project Peace Corps Volunteers". He, with the animals, was to support them in livestock improvement. After two years he was replaced by Donald Schultz, who was sponsored by USAID. Leon Abbros, an agriculturist, was in Bolivia on a Peace Corps contract at the same time. Mr. Schultz was succeeded by Dr. Gordon Hatcher, veterinarian, also USAID financed who left in 1968. In the meantime, Jerry Perkins came on a Peace Corps Contract, and he was still aboard in 1970.

The advisors with their consultation were unquestionably a positive value to the poultry industry. Although their reports revealed considerable concern over swine, their impact was limited, due among other things to the absence of a market which would permit expansion.

Heifer Project livestock, poultry, bee, etc., importation continued the livestock program which was initiated by the Extension Service a decade before. If, as it was claimed above, that the Extension program subsistence flocks and herds was good, it is conceded that H.P. was good. However, neither Heifer Project nor the U.S. agency sponsores had a plan for

influencing livestock production in Bolivia or any part of it. As a result the relatively few species introduced were of breeds too varied and scattered too widely to make a lasting, institutional contribution.

The mule demonstration was not successful nor was the harness project, horses, rabbits, goats or sheep. Heifer project was credited for introducing meat type ducks at Cochabamba and Santa Cruz and the results from bees was not known. The results from cattle were doubtful.

Animal Health Improvement

Bolivian cattle were plagued with six subtypes of aftosa, as well as paralitic rabies, anthrax, blackleg, and brucellosis, each of which required vigilant field surveillance, laboratory diagnosis and vaccination for control. The Government built a small diagnostics laboratory in Santa Cruz in 1939, and one in Trinidad in 1946. However, they never functioned properly because of the lack of operating funds.

In 1954, SAI commended the construction of a diagnostics and vaccine manufacturing facility at Ovejuyo, just beyond Calacoto, near La Paz. By 1963, the U.S. agency had put $193,000 in the project 35/.

In 1964, the Oxford Committee for Famine Relief (OXFAM) of the United Kingdom, initiated a project for livestock health improvement. This was a

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35/ UNDP/TA Proyecto Investigaciones y Control de Sanidad Animal-Bolivia DG/1966 (La Paz: UNDP/TA, October 26, 1966).

$92,000 grant to FAO to provide personnel and equipment. This encouraged USAID to contribute $148,000 more to complete Ovejuyo, and $100,000 for a new building and equipment for the Santa Cruz lab 36/.

The OXFAM-FAO project, which provided two veterinarians, lasted two years. Following this the FAO and the Government started a five year project which would result in a U.N. contribution of $1,564,000. Besides more equipment, vehicles and motorcycles, this provided for a team of five veterinary specialists.

The project required the Bolivian Government to provide $488,000 equivalent for operations but none was provided until July 1970, when the proceeds of $1,400,000 worth of wheat donated by the U.K., became available (This gift was to provide a means whereby the Bolivian Government could make its contribution to the British Tropical Agricultural Mission project). Neither Ovejuyo nor the Santa Cruz lab was functioning properly in 1970.

36/ Ibid.

BOLIVIAN HANDICRAFT

The women of the Andes inherited a tradition of facinating designs, featuring the llama, the puma, the hawk, a devil or so and many geometric patterns. These figures were woven into woolen or hair fabrics on ground-peg looms. There were also products of animal pelts and other things that made up their native artcraft. The SAI home economics women took an interest in indigenous artcraft in 1956, helping the women with quality improvement, and to a limited extent with cooperative marketing 1/. However, it was judged in USOM that this was not an agricultural activity but rather an industrial (home industry) activity; therefore it required industrial education assistance. The home economists were advised to refrain and a project between the Educación Servicio and the Ministry of Education was signed in 1958. In anticipation of the project Mrs. Elena Eleska Sigismund Czervenak, a handicrafts businesswoman of Cochabamba, was employed to head it (She was hired by SAI with the understanding that she would be transferred to the Handicraft Project payroll once it was approved 2/. The project was first called Andean Handicraft.

Mrs. Eleska assisted a group of indigenous artcrafters, principally, in marketing, including a selling trip to the United States. The project which was for five years, lapsed in 1963. At that point, Mrs. Eleska

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1/ MacAnlauf, op.cit.

2/ Eugene C. Reichard, Elena Eleska Sigismund Czevernak-Handicraft Specialist Employment, Memorandum for the Files (La Paz: April 28, 1958) Unpublished.

assumed ownership of the activity and changed the name to Andea. In 1967 the Methodists took it on as a socio-economic assistance project 3/.

In 1961, another group of indigenous artisans was organized by a Maryknoll priest, with the support of commercial interests in Cochabamba. Known as FOTRAMA, this cooperative grew to 500 members. Another group, Asociación de Servicios Artesanales y Rurales (ASAR) began providing technical, financial and marketing assistance to rural groups in 1965. Wennergren tried to get these three groups together in a cooperative procurement, improvement and marketing program with USAID assistance 4/, but his draft project, opposed by Edmund Faison, USAID Industrial Officer, died 5/.

In the meantime, Artesanias Bolivianas was organized as the quasi-public marketing agency for Bolivian handicraft, receiving project assistance from USAID. This included the full-time assistance in marketing by Paul Stanley for two years, short-term assistance by Luciano Dorrien, expert in chrome process tanning, and consulting and contact assistance in marketing by Mrs. Evelyn Anselevicius of the Washington University Department of Architecture. Most of this assistance was provided through the USU contract.

Mrs. Anselevicius gained Design Research of Cambridge, Mass., as a customer for Andea. She recommended shifting the point of emphasis on rug making

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3/ Boyd Wennergren, The Bolivian Artisan Project (La Paz: USAID, 1967) Draft

4/ Ibid.

5/ Edmund J. Faison, Cochabamba Artisan Production Organization, Memorandum to Boyd Wennergren (La Paz: USAID, August 28, 1967) Unpublished.

from Cochabamba to Palacayo and went down and directed the installation of the rug department 6/. This would provide a market for some otherwise waste material of COMBOFLA's.

Dorrien's contribution is said to have been to assist one shop in improving the quality of its furs.

Besides helping Artesanias Bolivianas with routine management, Mr. Stanley produced exhibits in the Frankfort International Fair in 1968 and 1969. These trips and exhibits were subsidized by the West German Government and although interest was shown, no sales resulted. There were two problems: 1) the price asked by Bolivian dealers was too high to compete, and/or, 2) in the case of a contract, Bolivia could not provide the required volume.

In 1964, the AID Latin American Regional Office contracted with the Cooperative League of the United States of America (CLUSA) to provide technical and marketing assistance to the handicraft industry of the Andean region. This plan didn't succeed, so in 1966, they contracted with Scherr and McDermott, International Inc., to do it. This organization exhibited in four "gift-ware artisan expositions each year", provided a New York sales office and warehouse, and fielded a dozen commission salesmen.

For its first year SMI produced sales of $600,000 at a cost to AID of $375,000 7/. When financing of the contract was shifted to the participating

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6/ J. Clark Ballard, Monthly Report March, 1968 (U.S. Govt. Memorandum to Milton J. Lobell, (La Pa: USAID, April 19, 1968) Unpublished.

7/ AID, Artisan Handicraft Marketing Program-Proposed FY-69 AIDTO Circular XA-1568 (Washington, AID, Nov. 21, 1967)

USAID's in the region, Bolivia declined to go along. Its share of sales had been $100,000 while the cost of continued participation would have been $75,000 8/.

On October 31, 1967, a slow day for business in Cochabamba, Orlyn Riley, who was assisting Andea at that time, looked back at an order for 24 hand woven alpaca bedspreads just shipped to Design Research. The price was $45 each. Riley figured that the cost of the spreads, including materials, labor and overhead, was $48.59 each. Then he checked six wall hangings which were priced from $15 to $60, for a total of $235.88. The total cost of the six items was $245.72. Andea was pricing at a four percent loss 9/.

Design Research was very pleased with Andea's rug samples supplied by Mrs. Anselevicius and wanted an order to test the market, at $8 to $9 a square meter 10/. The problem was that the cost to Andea was around $30 a square meter 11/.

8/ USAID, Artisan Handicraft Marketing Program-Proposed FY-69 Activity TOAID A 482 (La Paz: USAID, Dec. 12, 1968)

9/ Orlyn R. Riley, Activity Report No. 43-67 (Cochabamba: Andea, October 31, 1967) Unpublished.

10/ Joan Forester Sprague, Letter to Mrs. Evelyn Anselevicius (Cambridge: Design Research, Feb. 9, 1968) Unpublished.

11/ Riley, op.cit.

EPILOGUE

Results

Looking back at the Bohen proposal, the Cochabamba-Santa Cruz road was finished about 1950 and resurfaced (AID Loan) in 1970. The Santa Cruz-Montero road was built, as were secondary roads to the ethnic colonies. The Sucre-Camiri road was built and finally brought up to all weather standards.

Irrigation studies were made at Villamontes. The U.S. and German Governments together put about $300,000 into its development but the project died, due for one thing to the failure to get a treaty with Argentina on the use of the water.

The little 40 steer-a-day meat processing plant never materialized. Dillman of Cochabamba developed a sausage plant that used 22 hogs and three cattle a day. Haas of Cochabamba and Stege of La Paz each had about half that capacity. CBF built a large pork and lard processing plant at their Todo Santos ranch near Montero, but it never operated. The Beni airlift which originated with the Reyes project prevailed and Bolivia reached self-sufficiency in beef production in 1969, with a small surplus.

Forestry output passed the 8,000 ton mark by about six times. Rubber production reached 4,000 metric tons a year and dropped back to around 3,000.

Sugar production surpassed 30,000 tons in the late 1950's. A surplus was produced in 1964, and from 1965 through 1969, Bolivia exported about 6,500 metric tons a year.

Rice production passed the 10,000 ton mark in 1965, reaching 58,000 metric tons of rough rice and a small surplus in 1969.

Beyond the Bohen Plan goals, self sufficiency in cotton production was achieved in 1967, and two years later $347,000 worth was exported.

Self-sufficiency along with greatly improved quality was achieved in a great variety of commodities that in 1970 were taken for granted. These included eggs, salad vegetables of all kinds, cabbage, potatoes, hot pepper, onions, garlic, corn, barley and beer. These things, along with beef, cotton and lumber were imported un 1940.

In 1968, Bolivia was still importing $26.9 million in food, beverages and tobacco. The largest item was wheat, which accounted for $10.4 million. The second largest item was pork lard and edible oils, $4.6 million, with milk and milk products next at $2.3 million. Milk production was increasing at the rate of nine percent a year 1/.

When reduced to constant 1958 dollars, food, beverage and tobacco imports for 1968 amounted to $24 million. On this basis the same classes of imports for the 1936-1940 average was $24,450,000 or $7 per capita. For 1968, it was $5.20 per capita, and the people obviously ate better.

Taking the last part of the period investigated, because earlier data were completely unreliable, total agricultural production for 1968 was 124 percent

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1/ USAID, Estadísticas Económicas (La Pa: USAID, 1970).

of that of 1961, and food production for 1968 was 123 percent of 1961. On a per capita basis, food and agricultural production for 1968 was 109 percent of that for 1961 2/.

Ronald J. Clark compared the value of purchases by ex-peon households in 1966 with those of 1950. The average family purchased $140 worth of goods in 1966, but only $35 worth in 1950 3/.

ADDITIONAL COMMENTS

From the U.S. point of view the Bohen report was essentially a long range war mobilization program. The United States would help develop the war materials and pay for them, and as a bonus help finance an economic development program. There was some discussion in Washington about combating Facist influences 4/. Also Under Secretary of State Summer Wells expressed interest in the socio-economic development of Bolivia but neither of these motives came out as program objectives.

Not until 1965 was there serious attention given to devising an agricultural sector development plan. This resulted in using $400,000 of an AID feasibility study loan to the Bolivian Government to contract for a sector analysis and a plan. In July 1969, International Development Services, Inc.,

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2/ USAID, Indices of Agricultural Production in Bolivia, Airgram TOAID 312 (La Paz: USAID, July 27, 1970)

3/ Ronald J. Clark, "Land Reform and Peasant Market Participation on the North Highlands of Bolivia" Land Economics, Vol. KLIV (Madison: Land Economics Society, May, 1968) pp. 153-172.

4/ A. Berle Jr., Memorandum to Mr. Wells (Washington: Dept. of State, July 28, 1941) Unpublished.

arrived to start the project but in November, the contract was broken at the convenience of the Government.

As long as the main concern was institutional development, there was little trouble, because the U.S. patterns were there to be followed. But when they got into production there were neither goals, priorities nor plans.

The lack of a livestock development plan seriously hampered the development of that industry. The great shortfall was the failure to develop a meat processing and marketing industry. Beef production increased on its own to the point of domestic saturation, and there was no processing and marketing system to put the surplus into the export market. While there was a serious effort on the part of USAID to improve sheep on the Altiplano, there was no market for the millions of boning quality, barren ewes and surplus rams that had to first go to make room for the better sheep.

The story was the same for milk. Although plans for the La Paz extension of the Cochabamba plant dated from 1961, it had not been started in 1970.

The oilseed crop and industry was neglected. Besides the value of the oil as import substitution, soybean meal is the key to poultry and swine production. With a volume oriented pork processing and marketing industry, which could have been developed with soybean meal, a market for corn would have evolved. With soybeans and a market for corn the development ceiling that hovered over the Santa Cruz colonists would have been removed.

The need for representation and dialogue on the part of the rural man was recognized in Title IX of the U.S. Foreign Assistance Act. Predating Title IX by 15 years, the U.S., aid program in Bolivia got off to a good start when the extension people organised rural women's work, rural youth work and cooperatives were encouraged and assisted. The institutions were founded, but they were permitted to die.

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