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THE POTENTIAL AND LIMITS OF BOLIVIAN AGRICULTURE

by

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Geographical Institute of the Technological University, Aachen

1. General

In 1973 the population of Bolivia stood at 5.3 million in an area of 1.1 million km². About 66% of the gainfully employed inhabitants were engaged in farming, animal husbandry and gathering. Altogether they contributed 15.9% (US \$ 173 million) to the *gross national product* (in 1961 their contribution was 29.5% and in 1966 22.0%).

Farming accounted for 83% of this sum, while animal husbandry and gathering made up 13% and 4% respectively. In the last decade the mean annual growth rate in the value of agricultural production (based on the 1958 prices) amounted to 2.0% (the population increased at the rate of 2.31%). Government spending in the agricultural sector of the economy is pitifully low and out of all proportion to the number of persons employed on the land or to the value of the country's agricultural output. For example, in 1971 only US \$ 2.9 million, i. e. 2.7% of total government expenditure, was allocated to the agricultural sector.

The last *agricultural census* was taken in 1950. All the estimates made in subsequent years are based on the 1950 data and in certain areas some of these estimates differ from each other by as much as 10-20%.

According to the census about 1/5 of the country (i. e. 23.9 million hectares, see Table 1) consists of *agricultural land*, but in 1973 only about 950,000 hectares were actually under cultivation. An additional area about three times this size could probably be cultivated but at the present time it is lying fallow. The remaining 20 million hectares of agricultural land are made up of natural pastures. Just about 45 million hectares of the country (41% of the total area) are covered with forest and an area of

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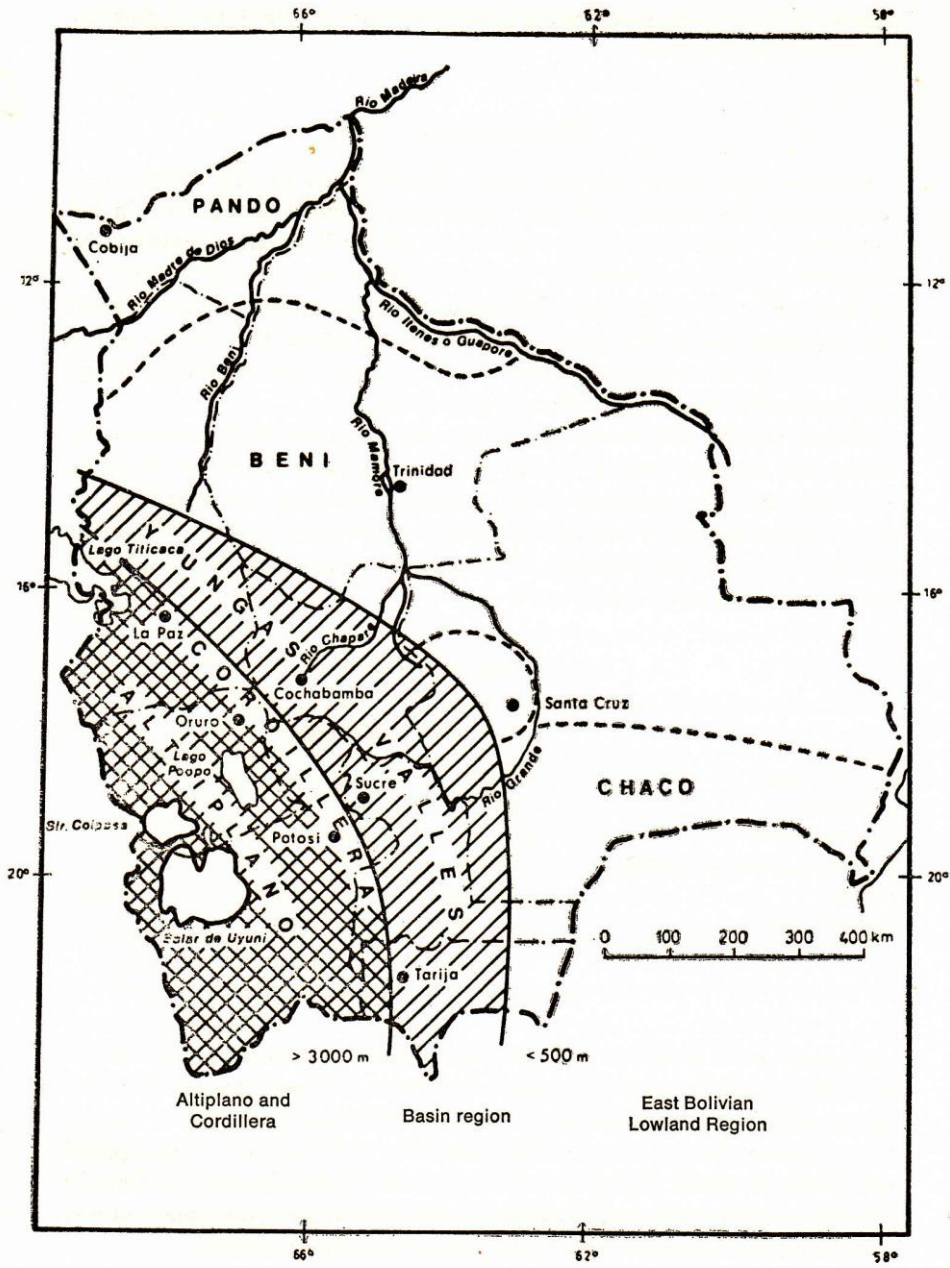
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Map 1 - The Agricultural Regions

almost the same size (rocky and swampy regions) is totally unsuitable for any form of agriculture.

1.1 *The agricultural regions*

Bolivian agriculture is particularly characterized by the *variety* that results from the widely differing physico-geographical conditions in the country's various regions. The central part of the Bolivian mountains, the *Altiplano region*, is situated at an altitude between 3,500 and 4,000 m. Because of the very high daily fluctuations in temperature and the dryness (the southern part is dry all the year round) only about 12% of the area is cultivated. Small subsistence-level farms predominate on which barley, maize, potatoes, quinoa and oca are cultivated.

Wheat, alfalfa and beans are also grown, but only in the climatically favourable regions, mainly in the vicinity of *Lake Titicaca*. Sheep in particular, and also auchenids (lamas, alpacas, vicuñas) are raised on the parts of the Altiplano which are covered by sparse shrub and tufted grass as well as in the eastern *Cordillera*. These animals supply meat, milk and wool and are also used as beasts of burden.

Table 1 – *Land Use in Bolivia*

	Millions of ha	Percentage
Cultivated areas	0,94	0,9
Fallow areas	2,76	2,5
Natural pastures	20,2	18,4
Total area suitable for agriculture	23,9	21,8
Forests	44,6	40,6
Unusable areas	41,3	37,6
	109,8	100,0

A much wider spectrum of agricultural products is cultivated at a lower altitude (2,000 to 3,000 m) in the valley region (*Valles*) between the Cordillera and the tropical lowlands where the precipitation is higher than on the Altiplano plateau. The Cochabamba basin with its good topographical conditions is ideally suited for Mediterranean-type irrigation farming. In this region grain crops and, in particular in irrigated areas, potatoes, legumes and alfalfa (for intensive dairy cattle production) are cultivated.

The drier valleys to the south suffer chiefly from the disadvantage that they are far removed from the consumer centres of the Altiplano. Around

the cities of Sucre and Tarija the main emphasis is on fruit-growing (citrus fruit and stone fruit) and cereal production. Beef cattle and goats supply the meat and milk needed by the local population.

In the northeast, where the mountains fall away to the lowland (*Las Yungas*), the climate is humid and tropical and the terrain is covered with thick mountain forests. Bananas, rice, manioca and citrus fruit grow on small subsistence-level farms, most of which were established by settlers from the highlands. The main products grown for market are coffee, coca and, in Alto-Beni, cocoa.

The tropical and sub-tropical lowland regions (*Oriente*) which extend from the foot of the Andes to the borders of the country, represent a large and thinly populated area with great agricultural potential. Only about 220,000 of the 75 million hectares are under cultivation, mainly in the area around Santa Cruz. The characteristic field crops of this region, of which a part are exported, are for the most part cultivated on a large scale and include cotton, sugar cane, rice, bananas and pineapples.

The region of *Oriente*, *Pando* and the northern part of *Beni*, which is closest to the equator, is almost completely covered by thick rain forest where mainly wild rubber and Brazil nuts are gathered and exported. Extensive cattle-farming is pursued on a large scale on the natural pasture-land of central and southern Beni. To the south of Santa Cruz, where the dry *Chaco* forest starts, the climate becomes much more arid and farming is no longer possible without artificial irrigation.

1.2 *Self-sufficient agriculture in the highlands, market-oriented production in the lowlands*

The Altiplano and Cordillera departments of La Paz, Oruro and Potosí contain about 35% of the country's cultivated land while the Valles departments of Cochabamba, Sucre and Tarija contain about 40%. A few years ago the tropical lowland regions accounted for a modest 15% of the country's agricultural production. But tropical agriculture in the region of Santa Cruz has been vigorously and steadily expanded so that Santa Cruz, now (1973) with 210,000 hectares under cultivation (22%) occupies first place among Bolivia's 9 departments. Table 2 shows the rapid increase in production of lowland field crops.

The four main crops, maize, potatoes, barley and wheat, which are the mainstay of *self-sufficient farming* operations in the mountain regions and in the valleys, cover about 75% of the country's cultivated land. The *market-oriented products* of the recently established and modern farms in the tropical lowlands, of which cotton, coffee and sugar and small quantities

Table 2 - Development of the Production of the Most Important Subsistence Crops and Export Products (in 1,000's of tons)¹

	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971 ²	1972
Subsistence crops												
Maize	259	265	270	280	277	269	278	288	289	283	293	265
Potatoes	516	531	546	561	575	549	519	597	627	655	698	703
Barley	60	61	55	55	59	56	50	54	61	61	66	70
Wheat	35	40	55	58	55	41	27	45	53	62	69	50
Rice (hulled)	24	27	30	33	36	36	40	46	58	45	54	52
Products some of which are exported												
Coffee	4	4	4,4	7,4	4,7	7,7	8,2	9,5	10,1	11,2	12,4	13,0
Sugar (amount of ground cane)	550	652	878	1.163	954	907	1.065	1.272	1.412	1.467	1.102	1.468
Cotton	1	1,4	2	2,2	2,4	2,8	3,1	3,1	3,7	5,2	9,8	15,5
Bananas	105	122	140	157	165	173	182	192	201	211	228	230
Citrus fruits	70	72	75	77	80	80	85	88	73	83	90	94

¹ Based on production statistics of the Ministry of Agriculture, La Paz (October, 1973).

² The production figures for 1971 published in the "BOLETIN DE LA CAMARA DE COMERCIO E INDUSTRIA BOLIVIANO-ALEMANA / LA PAZ" (1972, No. III, p. 5) were corrected as shown by the Ministry of Agriculture.

of cocoa are exported, are much more profitable, but cover only a small area.

Data on the amount of land under cultivation are of limited value in assessing the economic importance of a particular region. Nevertheless, under certain circumstances, they can indicate the value of particular crops in the *diet* of the population. *Maize* is by far the most extensively used and most versatile of the field crops. It is eaten as a vegetable (cobs) in soups, as maize cakes, in soaked and roasted form, or it is even made into a beverage. The next most important staple crop is of special importance because there are a number of ways in which the tubers can be preserved so that they remain edible over a period of several years. A number of steps have been taken to encourage the cultivation of wheat and barley since the present level of production only satisfies about 25% of the need.

Rice has also attained great importance as a *staple* food and also as a *cash crop*, although many producers are put off by the pricing and marketing problems associated with it.

For 15 years the lowland farmers regarded *sugar cane* as a safe marketable product. Various factors had led to a rapid and continuous expansion in the sugar industry in the 50's. To start with, the completion of the highway from Cochabamba to Santa Cruz opened up the domestic market in the highlands. For several years, forest clearance loans were provided by USAID and the national development organisation (CBF) encouraged the cultivation of sugar cane by founding colonies of highland Indians and building State sugar factories.

The 1971 harvest was marked by an unexpected *drop in production* which made it necessary to import sugar from Brazil. There are several reasons for this alarming state of affairs:

a) Badly distributed and also reduced amounts of precipitation (the 1970 rainfall was only 64% of that in 1969) led in 1970 and 1971 to appreciably lower yields per hectare. Furthermore as a result of *drought* the sugar cane crop suffered scorching so that in 1970 about 23% of the caña (cane) supplied was badly scorched and had a much reduced saccharose content.

b) The system of *cultivation and supply permits* had upset the stable cultivation structure. A brisk trade was carried on with these permits and only about one third of the permit-holders actually cultivated any cane crop themselves, and then usually on exhausted land.

c) Since 1969 more and more sugar cane producers have been turning in addition and sometimes exclusively to the production of *cotton*. According to estimates made by the "Cámara Agropecuaria" 18,000 hectares of sugar cane plantation were turned over to cotton production in the 1971/72 season in Santa Cruz.

In 1972 the amount of cane processed once more reached the 1970 level so that by the start of 1973 it was possible to recommence exports to the USA and Chile.

The cultivation of *cotton*, which is centred in the Santa Cruz region, is expanding faster than that of any other Bolivian crop. At the start of the 60's barely 1,500 hectares were given over to cotton-growing, while in 1968/1969 this figure had risen to 5,000 hectares. From that date on the cotton-growing area increased in leaps and bounds. In 1969/70 it covered 7,500 hectares, in 1970/71 it was 16,000 hectares, in 1971/72 45,000 hectares and in 1972/73 the area of land under cotton totalled 68,000 hectares.

The quality and yields of the cotton crops are well above average and there is a secure export market for the product. Cotton plants are by nature very undemanding and with their deep taproots they are able to grow on soil whose surface layers have been depleted. However, if the area of land used for cotton cultivation continues to expand, the *danger of infestation* by pests will increase. It is also uncertain whether the cotton plants will be affected by rot in the years of high precipitation which frequently occur in Santa Cruz. This danger could be acute in the more humid regions (e. g. Portachuelo) as well as in the flood-endangered low-lying areas into which cotton-growing is somewhat irresponsibly being expanded.

Coffee, the most important agricultural export in recent years, owes its high quality to the special climatic conditions of the mountain forest region of Las Yungas. The 10,000 families of small farmers, which are grouped together into 34 cooperatives, have managed to double their production since 1965. Coffee growing has been encouraged as part of a Government programme with assistance from British experts on tropical agriculture and Peace Corps volunteers from North America.

Livestock farming has gained particular importance in recent years as a source of foreign currency earnings. Special mention should be made here of sheep and alpaca farming in the mountain regions. Cattle raising is carried on extensively, though the total number is still considerable, mainly in the lowland regions in the Department of Beni, in the Santa Cruz region and in the western part of the Chaco. An almost "wild" form of animal husbandry involving mixtures of criollos and zebus is aimed at producing meat and leather. Dairy farming is carried on with black-and-white lowland cattle in Cochabamba and Santa Cruz.

The World Bank (here the IDA) has already provided two loans (US \$ 3.4 million) to support livestock farming in Bolivia. A third loan amounting to US \$ 6.8 million granted in 1971/72 was intended to enable 150 sheep rearers and 250 cattle breeders to boost their yields. A further US \$ 0.9 million was aimed at encouraging the processing and marketing of meat

2. Indicators of Agricultural Productivity

2.1 Number of workers per unit area, intensive-extensive use of land, worker efficiency

The low *yields per hectare* are characteristic of the underdeveloped state of Bolivian agriculture. Not only is the production of the traditional field crops such as potatoes, maize and barley 45% below the results achieved in comparable tropical countries (see Table 3), but even the yield of lowland crops fails to rise above a modest level. For example, coffee production only manages to attain 46% of the output of San Salvador, while the sugar cane and rice yields barely exceed more than 25% of the output of neighbouring Peru. On the other hand, cotton production has achieved some remarkable results and the 1969/70 yield, for example, of 690 kg/ha put Bolivia in fourth place in the world, outranking even the USA, with 600 kg/ha, as well as Peru and the Sudan. However, in 1972/73 the yield per hectare had dropped to only about 330 kg/ha. By European standards the wheat production of the country is particularly low; it is in fact only about 1/7 of the yield per hectare achieved in Denmark.

If we compare the gross income and net profit per hectare in the case of selected crops, we are struck in particular by the high earnings per hectare brought in by potatoes. Excluding the not very widespread cultivation of pineapples, it is found that potatoes bring in more money than any other

Table 3 - *Yields per Hectare in Bolivia Compared with Other Countries (1966)*

Products	World-best yield		Best yield among tropical countries		Bolivia's yield per hectare (kg)	Percentage of Bolivian yield related to best tropical country
	Country	kg	Country	kg		
Bananas	Spain	35.000	Pakistan	30.000	23.500	77 %
Soybeans	Canada	2.380	Mexico	2.110	1.500	70 %
Cotton fibre	Israel	1.140	Nicaragua	800	590	61 %
Coffee	El Salvador	1.000	El Salvador	1.000	460	46 %
Potatoes	Holland	31.600	Cuba	12.200	5.000	45 %
Maize	Canada	5.170	Taiwan	2.320	1.100	44 %
Barley	Denmark	3.750	Kenya	1.400	590	42 %
Sugar cane	Hawaii	221.800	Peru	149.100	41.000	28 %
Rice	Australia	6.976	Peru	4.240	1.092	26 %
Wheat	Denmark	4.160	Mexico	2.350	590	25 %

Based on C. COSTO, 1971, pp. 10 et seqq.; USAID, 1970, inter al.

lowland product. The figures show that with irrigation the mountain farmer can make highly intensive use of his land, while in the lowlands, where there are vast expanses of land available for agriculture, the farmer does not have to intensify his procedures.

The profit margins of US \$ 10 to 15 per hectare reflect the extensive farming methods used to cultivate rice and also maize (in the lowlands). These products are grown mainly by the resettled highland colonists as cash crops and they must therefore be cultivated over very wide tracts of land. Since cultivation of these crops only brings in sufficient profits for two to three years at most, the farmers have to penetrate deeper and deeper into the mountain forests. As a result, this "rapacious" approach to tropical agriculture leaves behind increasingly degraded areas of secondary bush which are suited for little else than extensive livestock raising.

For some crops it is possible to determine the number of producers and thus, after deducting the production costs, to calculate the *net profit per producer* for the various products. On average, the Bolivian potato farmer cultivates only 0.4 hectares of land, therefore each farmer earns only US \$ 68 per annum. On the other hand, the approximately 2,100 sugar cane producers in the lowlands earn more than US \$ 1,300 per farm. The recent developments in the cotton boom are still not quite clear. In September 1971 the cotton-producers' association was made up of 25 partners ("empresas") of whom 12 were individual farmers with 100-200 hectares of land under cultivation (net profit: approx. US \$ 13,500). The remaining partners are cooperative associations and only vague data ("a few thousand") are available on the size of their membership and the areas cultivated by them. In 1972/73 the producers' association was made up of 114 members, of whom 53 were listed as individual owners, 27 as companies and 34 as cooperatives.

It is very informative to contrast the regional results for the following parameters (calculated by Department):

- I Area of land under cultivation
- II Size of labour force
- III Gross yield (see Table 4)

Following recent development activity, the Department of Santa Cruz has the largest *area under cultivation*. In the immediate vicinity of the city the area under rice doubled in the period 1961-1970, that under sugar cane was tripled and that under cotton increased tenfold. The next largest Department in terms of cultivated area is La Paz followed by Potosí and Cochabamba. If we exclude the Departments of Beni and Pando, because their agricultural areas are too small for comparison, we find that the

Table 4 - Yield per Hectare, Number of Workers per Unit Area, Worker Productivity in Bolivian Agriculture (1968)

	Departments	Cultivated area	Work force	Gross yield	Yield per hectare	Number of workers/	Worker productivity
		(1000 ha)	(1000 Pers.)	(US \$ Mio)	(US \$/ha)	100 ha	(US \$/worker)
		I	II	III	IV	V	VI
CORDILLERA ALTIPLANO	La Paz	194,0	442,5	26,4	136	228	59,5
	Oruro	40,0	90,2	4,3	107	225	47,5
	Potosí	176,3	235,4	15,3	87	133	65,0
VALLES	Cochbba.	158,5	209,4	36,0	227	132	171,0
	Sucre	106,9	154,4	14,7	138	144	95,5
	Tarija	45,6	38,4	6,1	134	84	159,0
ORIENTE	Pando	1,1	7,1	0,2	190	645	30,7
	Beni	6,9	41,7	1,3	187	604	31,2
	Sta. Cruz	213,0	76,2	26,0	122	36	344,0
	Total	942,3	1.295,3	130,3	138	137	105,0

Calculated from data in Estrategia, 1970, pp. 198 et seqq.

lowest number of workers is employed in Santa Cruz and Tarija while the figures are three to six times higher in La Paz and Potosí. Even though the lowland agriculture brings in important foreign earnings, the *total gross yields* (in 1970) were 40% higher in Cochabamba and slightly higher in La Paz. The intensively irrigated areas of the Cochabamba and Titicaca basins are in part responsible for this, but also these two Departments include the tropical regions of the Yungas - Alto Beni or the Chapare.

Evaluation of the three comparative parameters gives the following indicators:

IV gross yield per unit area (i. e. III/I in US \$/ha)

V number of workers per unit area (i. e. II/I in workers/100 ha)

VI worker efficiency (i. e. III/II in US \$/worker).

The highest *gross yield per unit area* (again, disregarding Beni and Pando) is attained by the Mediterranean-type agriculture in the valley region. Within this region the yields decline in direct proportion to the increasing dryness towards the south. The distance from the consumer centres of the Altiplano also certainly has an effect (in Thünen's sense) on the growing extensiveness of farming operations. A decline in yield towards the south is also apparent in the Departments of Altiplano and Cordillera. Because of its extensive methods of growing rice and maize, Santa Cruz occupies fifth place among the seven Departments being compared here.

Given the high population density in the agriculturally useful areas in the highlands it is not surprising to find an extremely high *number of workers per unit area* in the Altiplano. In comparison, the work force requirement in the Valles is lower while simultaneously the gross yields are higher, but this is certainly due to the more favourable geographical conditions. Nevertheless, it also shows the greater willingness on the part of the very agile and dynamic inhabitants of the Valles, who are descendants of the Quechua, to use meliorative methods (simple agricultural machinery, fertilizers, selected seed).

Strikingly few workers per unit area are needed on the farms in the Departments of Tarija and Santa Cruz. These low values result from the extensive farming methods employed in the tropical parts of the two Departments, but they are also due to the fact that a high percentage of the population are of Spanish descent and use European methods of agriculture. For example, in La Paz 6.5 times as many workers are employed per hectare as in Santa Cruz. However, the seasonal labour force requirement in Santa Cruz has risen considerably as a result of the cotton boom (in 1973 there were 50,000 workers).

The gross yield per worker is also of great interest. Here, the tropical agriculture of Santa Cruz attains values which are about 6 times the average reached in the Altiplano Departments. The results achieved in Cochabamba are also remarkable – here the output per worker is about three times that in the Department of La Paz.

The three parameters of gross yield per unit area, number of workers per unit area and worker efficiency (IV, V and VI) are mathematically closely related:

$$\text{IV (US \$/ha)} = \text{V (workers/ha)} \times \text{VI (US \$/worker)}$$

The values for livestock farming and gathering are not included in the above yield data. Altogether they account for about 17% of the total gross yield. About a third comes from the Departments of Beni and Pando, which in any case have not been considered here.

2.2 *Mechanization and use of machinery*

The intensive use of labour in Bolivian agriculture goes hand in hand with a very *low degree of mechanization*. Of the barely 1,500 tractors in the country (1971) about 80 are used in Government research stations. Another 300 (20%) were unfit for service because of technical defects. If we nonetheless include these unserviceable tractors in our calculations, we arrive at a figure for the whole country of an average one tractor for every 640 ha of cultivated land. Since without doubt at least half of all the tractors are being used in the lowlands of Santa Cruz, the average tractor/area ratio is correspondingly worse in the highland farms.

The *index figures* for other agricultural machines and equipment are equally significant. For example, there is only one harvesting machine for every 300 hectares of potatoes and one for every 310 hectares of wheat, and there is only one well with a pump for every 9,000 hectares of cultivated land.

Mechanization is not always delayed by lack of capital or an excess of cheap labour. It is known that the operators of the medium-sized sugar cane plantations in Santa Cruz (10–20 hectares) use their first major earnings to buy *transport vehicles*. The cane farmers believe that these vehicles will bring in greater profits than any mechanization of cultivation methods.

It should also be noted that not all agricultural work can be done by machines. For example, the many terraced slopes in the mountains can only be farmed by applying *horticultural methods*. The harvesting of certain tropical field crops (cotton, sugar cane, coffee) where a *selection* of the product must be made, also requires a significant amount of manual labour. The ripe cotton bolls, for instance, are plucked (by an average of 2 harvesters/3 ha) in three passes through the field. This is the only way to obtain the high quality cotton needed for the export market. However, mainly manual labour is used in forest clearance and rice-growing operations because it costs so much to operate the machinery.

Considerable progress has been made by mechanization in the lowlands with the rapid expansion that has taken place since 1969/70 of the area under cotton. Heavy tractors, which are mainly imported from Brazil and Argentina, are needed to prepare the fields (removal of tree stumps, deep ploughing, grading). In addition, in 1971, agricultural vehicles, machinery and equipment worth US \$ 2.1 million were imported, and this figure has been increasing annually.

2.3 *Use of fertilizers and insecticides*

Since the country still does not have a domestic fertilizer industry, the

quantities imported (about $\frac{4}{5}$ from France and the USA and recently also from Japan) are the same as the amounts consumed. The consumption figures are extremely low (about 1 ton per 245 hectares of farmland in 1971) and there has been little increase since 1965. A large proportion of the artificial fertilizer is used in potato-growing because an increase in production here yields the largest profits and this is the quickest way to convince the traditional farmer of the need to intensify his procedures. Also, increasingly large amounts of fertilizer are being used to grow wheat and a special national campaign has been launched to promote the cultivation of this crop.

Artificial fertilizer was virtually unknown up until a few years ago to the tropical farmer of eastern Bolivia. (The only exceptions were a few large, well-known farms). A change seems to be taking place here, too, as the area under cotton expands, but in 1970/71 the proportion of fertilized land (25%) was still very low. This value must be raised at all costs if the high yields and superior quality of the cotton are to be maintained.

The importation of insecticides will also multiply in coming years in order to keep pace with the increasing demand of the cotton-growers (in 1971 the value of the imports was US \$ 585,000).

2.4 Irrigation and anti-erosion measures

Altogether 84,000 hectares (9%) of Bolivian farmland are artificially irrigated. This figure includes two large projects at Oruro and Cochabamba totalling 8,500 hectares. The remaining area is accounted for by small projects, about $\frac{4}{5}$ of which are located in the valley region. About 7,500 hectares are irrigated in the Altiplano and 2,000 hectares in the tropical lowlands.

In the central and southern parts of the country the climate features a distinct rainy period and a distinct dry period; as a result, probably about 75% of the area under cultivation requires irrigation. Crop failures are a frequent occurrence, especially in the (southern) highlands because the rainfall is so poorly distributed. In the Altiplano one in every five harvests is destroyed and three out of five harvests suffer losses (admittedly not just because of drought but also sometimes because of snowfalls and hail).

The importance of *irrigation* is not so much that it increases production, for example by permitting several harvests to be gathered each year (as in the case of green barley, alfalfa, etc.) but more particularly that it *guarantees productivity and yield*.

Most of the irrigation water is applied to the land through *simple networks* of channels dug in the ground in which the water flows under the

influence of gravity. Also, a large number of terraced slopes have been developed. In all these cases valuable results have been obtained by villages cooperating on joint projects.

On the other hand, there is complete ignorance about methods of *preserving the soil*. The *afforestation programmes* being conducted in Bolivia serve only the peripheral urban regions of La Paz and Cochabamba. For the first time, a quantitative analysis has been made of the annual rate of erosion in the catchment area of the Rio Pilcomayo which includes about one quarter of the endangered valley region. At Villamontes 57 million tons of material per annum are carried to the foothills. This is equivalent to a soil cover 10 cm thick over an area of 40,000 hectares.

Soil protection measures in the highlands (such as afforestation programmes, the construction of transverse drainage systems, anti-goat campaigns, etc.) are totally lacking, a fact which points up the poor state of the country's long-range planning. The same lack of concern can be seen in the lowlands where, as more and more forest is cleared and windbreaks are felled to make way for cotton-growing, there is a serious increase in the risk of aeolian erosion.

3. *Facilities and Measures for Boosting Productivity*

3.1 *The problems of agricultural overproduction*

A major problem in Bolivian agriculture is the *overproduction of a large number of commodities for domestic consumption* such as maize, oca, manioc, rice and plantains. The prices paid to producers are extremely low so that family incomes, especially in the highlands, are correspondingly modest. It would definitely be possible and sensible to increase yields per hectare, but this should not lead to an increase in overall production.

Instead, *cultivation areas* should be freed in the highlands for the additional cultivation of the traditional imports wheat and barley, the per capita consumption of which (for bread and beer) is continuously increasing with the rising standard of living (the annual value of these imports is between US \$ 10 and 15 million). Irrigated areas could be used above all for expanding the cultivation of fodder plants (alfalfa, green barley). This would make it possible to increase the number of cows and sheep (dairy products worth US \$ 3.2 million are imported annually).

Apart from the *production of maize* for human consumption, which is restricted to the valley region, it would be desirable to shift more maize production into the lowlands in order to free additional areas in the highlands.

Similarly, the cultivation of highland crops (with the exception of wheat, barley, vegetables, fodder plants) can be cut back if *consumer habits* go on

changing as strongly as they have over the past 10 years. In the highlands, the plants that yield starch and flour (potatoes, oca, quinoa, etc.) are increasingly being joined and replaced by the cheaper to produce lowland crops (manioc, plantains, rice, etc.).

This change in dietary habits in the highland regions is due in no small measure to the approximately 65,000 seasonal itinerant labourers who help harvest the rice, sugar cane and cotton crops and also to the 31,000 resettled colonist families who maintain close contact with their home communities. But, here too a carefully directed advertising campaign (billboards, radio commercials, etc.) should be able to achieve even more. For example, using these methods, the sugar industry has been able to boost the per capita consumption of sugar by 70% over a period of 10 years. The annual consumption of potatoes was 90 kg per inhabitant in 1969 (30 kg less than in 1958). This is still one of the highest consumption levels in the world and there is no doubt that further reductions can be achieved.

Productivity in the highlands should be raised by increasing the yields and above all by intensifying and stepping up the cultivation of hitherto imported commodities. The aim of all measures taken to aid the relatively more productive agriculture in the lowlands is to expand the presently very limited *market*. In addition to opening up the domestic market, efforts should above all be made to expand and secure the export market for cotton, coffee, sugar, citrus fruit and bananas.

3.2 *Aid organisations and advisory systems*

Altogether there are 22 large organisations in Bolivia which are concerned with the development and promotion of the country's agriculture. Six *official and semi-official agencies*, whose work is coordinated by the Ministry of Agriculture, are entrusted with the task of granting agricultural loans, encouraging cooperatives ventures, building up a processing industry or relocating the highland Indians in the tropical lowlands.

There are eight privately operated institutions which have only loose contact with the Ministry. Some of them are concerned primarily with the question of replacing imports by domestically produced goods, such as the committees for milk, oil and fat production and the wheat institute (CONAL, CONOA and INT). The committees for sugar, tropical fruits and rice and also the coffee institute (CNECA, CONCOFRUT, INBOLCA) are responsible for encouraging the production of export-oriented commodities. The society for the promotion of wool production (COMBOFLA) is concerned with guaranteeing the national supply of mutton and also with promoting the export of wool.

Of the eight *foreign institutions* working to assist Bolivian agriculture, the most important is USAID. This agency coordinates all North American-Bolivian cooperation. For example, USAID was in charge of the "Point IV" programme and the "Alliance for Progress" programme. Nowadays the university missions (particularly that of the State of Utah) work closely with USAID. Another example of successful bilateral cooperation is the research mission on tropical agriculture which Great Britain has sent out to work in the lowlands.

Inter-American organisations (IICA and BID) are concerned with the problems of agricultural training and also with the resettlement of the Indians. Several FAO and UNO experts are assigned to various Government agencies.

The "Agricultural Advisory Service" ("Extensión Agrícola"), which is a department of the Ministry of Agriculture, is responsible for directly promoting cultivation methods. This service has only 90 agricultural advisers and 30 home economics advisers and is thus severely understaffed, quite apart from the fact that vehicles are available only to the field managers in the various Departments of the country.

The advisory service is *concentrating its efforts* in the Departments of La Paz, Cochabamba and Santa Cruz, which are the parts of the country with the highest gross agricultural production and the main focus of its work is on promoting four large and several small special projects. It is worth noting that the four large projects – "Potatoes – Quinoa", "Sheep Rearing", "Wheat" and "Milk" – are almost exclusively of benefit to farmers in the highlands. A number of the above-mentioned aid organisations also play a role in the individual programmes.

It is very pleasing to note that these are all "*vertical programmes*" ("proyectos verticales"), which simultaneously promote cultivation or breeding, processing and marketing, in contrast to the various fragmentary programmes that have been initiated at one time or another in Bolivia. For example, a few years ago young fiber plants (cabuyas, a species of agave) were cultivated in the Las Yungas region, but the harvest could not be purchased from the farmers because the necessary processing plants had not been built. On the other hand, the three abattoirs (El Alto near La Paz, Todos Santos near Montero and Caneare in Beni) which at times operate at only 5% capacity are examples of processing plants that were constructed at the wrong time and perhaps even in the wrong place.

3.3 *Credit and cooperatives*

The *National Agricultural Bank (BAB)* is responsible for awarding agricultural loans amounting to about US \$ 8 million (1969/70). About 50%

of the funds come from USAID "aid", about $\frac{1}{3}$ from the Inter-American Bank (BID) and about 10% from the World Bank (in this case the IDA). The highest loan for *any single crop* was awarded in the case of sugar cane in 1968/69 for the construction of the CBF-factory St. Leigh near Bermejo. Next came rice production and rice marketing, then potatoes – as the first highland crop. In addition loans up to and exceeding US \$ 100,000 were awarded to support coffee and cotton (even then!) production. Altogether about 75% of the agricultural credit was made available for tropical crops. Livestock farming, which was more strongly favoured than crop-growing in 1968/69, received a similarly high percentage of the available loan funds to encourage the raising of beef cattle in Beni.

The distribution of credit according to *Departments* shows a similar pattern (1969/70), with 70.2% of the money going to the lowland regions. But the average amount of credit at US \$ 200 per family shows that in Santa Cruz the small and medium-sized farms were also supported while in Beni and Pando, where the average credit was US \$ 13,750, only the large-scale operation was assisted.

The small farms obtain their loans mainly through the agency of the *Agricultural Cooperatives* which put up the security for their members. Since there are only very few agricultural service cooperatives as we know them in Europe (103), the vast majority of the small farms have no chance of getting a loan. This is in particular the case when the farms are on land which was distributed under the agrarian reform legislation where the farmer must wait 10 years before he acquires title to the land, because no loan can be granted until such title is acquired.

The agricultural cooperatives have not advanced very far in their development. There have been innumerable examples of mismanagement and misappropriation of funds and these foster the distrust which the rural population already has for anonymous organisations larger than the extended family.

The national association of cooperatives concentrates its work in the highland regions. In the lowlands the term cooperative ("cooperativa") seemed to be despised in 1971 because producer *associations* ("asociaciones") were formed here (e. g. the sugar cane producers), although they had exactly the same goals as the cooperatives; also, in Beni the cattle farmers and cotton producers joined together to form large organisations.

3.4 *Agricultural training and research*

A fundamental requirement of any measure to promote agricultural production is the availability of well *trained agriculturists*, who are natives

of the particular country, to work in senior and middle-rank positions in the country's agricultural structure. Bolivia has eight specialist institutes for training agricultural technicians although one single institute in each of the three main geographical regions, perhaps providing specific training, would be sufficient. Until 1966 the only place at which it was possible to take a degree in agriculture was the agricultural faculty in Cochabamba, which has an international reputation. Since that date fragmentation has occurred in this sector too. Of the four faculties newly founded since 1966, only the faculty for tropical agriculture in Santa Cruz can really be regarded as useful and necessary.

About a third of the graduate agriculturists trained in Cochabamba have left the country to work abroad. The career opportunities in the above-mentioned organisations and in the Government research establishments are very limited. For example, about 30 graduate agriculturists have to work as agricultural consultants, work which can be handled by technicians. It is not as if there was not enough work for them to do; instead, there are no funds available to establish the urgently needed new positions.

The *Tamborada research station*, which is doing research into a broad range of Mediterranean-type methods of cultivation, is closely connected with the agricultural faculty in Cochabamba. In addition, there are seven large Government research stations, three of which are located in the Altiplano and Cordillera region and three in the tropical lowlands. The highland establishments work closely together with the "Misión Utah" and the lowland establishment *Saavedra* (Montero) operates with assessors from the "Misión Británica".

All these establishments are responsible for running short training courses for advisory personnel and farmers and they also issue instructional material. The *Saavedra* establishment, in particular, is carrying out some quite advanced work such as studies in phytopathology and the problems of soil exhaustion.

4. *Supra-Regional Measures to Improve the Agricultural Structure in the Highlands*

4.1 *Agrarian reform*

Since the *Agrarian Reform Act* was promulgated in 1953 great strides have been made in breaking up large estates and latifundia and redistributing the land. At the start of 1970 about 11,000 former large estates had been distributed to 235,000 small farmers. More than half of the families who benefited from this action live in the Altiplano and Cordillera regions, about 1/4 in Cochabamba and only 8% in the tropical lowlands. Here, apart

from the areas colonised by the highland Indians, very little change has occurred in the conditions of land tenure.

While prior to the reform only 0.7% of the agricultural land was distributed among 77% of the landowners, the number of small proprietors afterwards rose to 97.8% and they owned about 20% of the land. The mean size of the small farms (up to 20 hectares) is 3.9 hectares. This value indicates that the property units are too small, particularly in the highlands. Here the effect of the reform has been to create many more small farms to exacerbate the already *fragmentary ownership structure* in the free Indian communities.

The economic setbacks suffered in the first few years following promulgation of the Act were severe, but the *social benefits* which have derived from the Act for the Indians, such as abolition of servitude on the haciendas and the elevation of the Indian to the status of a citizen with full rights, have been extremely important for the country as a whole.

4.2 *Internal colonization*

With their liberation from the patriarchal hacienda system, the highland Indians were also given the freedom to migrate to the tropical lowlands either on their own initiative or with the support of Government institutions (unions, army, CBF, colonization institute). By 1973 about 31,000 families comprising approximately 118,000 persons had settled in the three *colonization regions* of Yungas-Alto Beni, the Chapare district near Cochabamba, and north of Santa Cruz. However, at the same time, the population increase in the highlands amounted to at least one million people, which proves that the policy of relocation is not very effective as a means of *reducing population pressure* in the highlands.

On the other hand, the highland Indians have done much to help *integrate* the previously remote tropical parts of the country and *produce important tropical crops* for the domestic market. More than 50% of the country's rice and bananas are produced by colonies of highland Indians, yet only a small minority, namely the producers of coffee (Yungas), cocoa (Alto Beni) and sugar cane (Santa Cruz) – altogether no more than 2,000 to 3,000 families – have a guaranteed income. It is regrettable but true to say that the others have done little more than transfer subsistence farming from the highlands to the lowlands.

The colonization areas are usually located far from the consumer centres with which they are connected via poor transportation routes. (An exception is Chapare which has an asphalt road linking Cochabamba and Chimore). In addition the internal transportation system, even in the colonies

which were established at such great expense by the national colonization institute, is in a horrifying state. This is just one example of the many planning errors which have occurred in the *resettlement which is so vital for Bolivia's future*.

4.3 Irrigation projects

A further project that is intended to ease the load on the densely settled agricultural regions of the highlands is the *large irrigation project of Abapó-Izozog*. It is intended to irrigate 470,000 hectares (i. e. about 75% of the total planned irrigated area of the country) at the point where the Rio Grande emerges from the Andes (100 km south of Santa Cruz and handily located along the railway line to Yacuiba). The high costs of US \$ 68 million have temporarily put a stop to the preparatory work which was started in 1963 by the "Deutsche Projektunion". In 1968 a project company ("Corporación Gestora del Proyecto Abapó-Izozog") was founded and in 1970 it received US \$ 1.53 million in international aid.

The project is aimed at promoting cultivation of oil and fiber plants, cereals and fodder. Differentiated studies of the water economy of the project are being carried out as part of a four-year series of tests at an experimental farm. The studies are concentrating on the questions of the regime of the river, the pressure at which water infiltrates into the walls of the canal, salination and sedimentation and also the distribution and effect of precipitation. It is still too soon to give the go ahead on such a massive project, but the preliminary trials are producing valuable results and the expenditure on them is fully justified.

5. *The Significance of Agricultural Production in the Country's Balance of Payments*

5.1 *The exportation of agricultural products*

In 1972 agricultural products and gathered materials worth about US \$ 22.9 million, i. e. 9.7% of the country's total export earnings (see Table 5) were exported.

Agricultural products from the *highlands*, such as those from rearing sheep and auchenids and also the production of pyrethrum*, contributed only a modest 1% to the country's agricultural exports. However, there is a growing demand abroad for the high-grade wool and hides of alpacas – Bolivia together with Peru has a world monopoly in these products. Pro-

* *Chrysanthemum cinerifolium* is processed into insecticides and has gained in importance since the side effects of DDT were discovered.

Table 5 - *Export Value of Agricultural Products and Gathered Products (US \$ 1000)*¹

	1969	1970	1971	1972	1973 ⁴
Cotton	(282) ²	734	3.319	6.920	7.722
Cottonseed and cottonseed cake	— ³	42	136	300	1.289
Coffee	2.784	3.724	3.512	4.700	4.714
Sugar	860	885	937	—	9.560
Coca	622	602	742	848	1.496
Rice	—	120	15	238	—
Cocoa and cocoa butter	—	—	15	54	248
Citrus fruits, pineapples	12	69	108	80	118
Bananas	50	—	—	—	26
Pyrethrum	—	11	21	16	22
Others	85	78	94	63	40
Agricultural products	4.413	6.265	8.899	13.219	25.235
Auchenid products (wool, hides, manufactured goods)	136	140	80	198	398
Sheep products (wool, manufactured goods)	50	33	7	4	4
Cattle on the hoof	—	42	1.827	1.331	400
Beef	—	12	1.966	1.692	2.318
Cattle hides	—	—	163	410	399
Others	19	25	20	47	58
Livestock products	205	252	4.063	3.682	3.577
Luxury woods	834	2.008	2.759	3.167	23.971
Brazil nuts	1.193	1.067	1.120	1.228	1.082
Wild rubber	754	924	837	1.031	2.640
Wild animal skins	511	397	294	282	2
Cinchona bark	60	93	91	127	96
Others	—	—	4	3	14
Gathered products	3.352	4.489	5.105	5.838	27.805
Miscellaneous products	68	10	40	133	141
Total	8.038	11.016	18.107	22.872	56.758
Total exports	198.191	228.300	212.300	235.100	268.300

¹ According to data from the Statistics Department of the Ministry of Agriculture (La Paz) 1970/74.

² UGEPEX, 1971, p. 7. This figure was not included in the total.

³ Export value < US \$ 10,000.

⁴ Some of the data given in the publications of the Ministry of Agriculture for 1973 seem questionable (e. g. that for the export of wood). Therefore, the remarks made in the text are based on the 1972 data.

duction of the medicinal plant pyrethrum has been steadily increasing and there is a guaranteed market for this product in Buenos Aires.

Gathered products accounted for 26% of the country's total "agricultural" production in 1972, a figure which is not sufficiently emphasized in the usual agricultural statistics. These products are subject to considerable price fluctuations on the world market, even more so than cultivated crops or livestock. The price for cinchona bark (the raw material for the production of quinine) dropped, for example, in mid-1967 to a fraction of its previous level so that in 1969 the value of this export was down to less than $\frac{1}{25}$ of its worth in 1966. This is mentioned just to explain why, among other things, the value of the "agricultural products" ("productos agropecuarios") fell from US \$ 12.1 million (1966) to US \$ 9.0 million (1969). Only the special rate at which the exportation of luxury woods continued to grow prevented a further decline in the value of gathered products which earned a total of US \$ 5.8 million in 1972.

These gathered products include, on the one hand, *regeneratable harvested products* such as Brazil nuts and wild rubber whose yield in Bolivia could be increased by 100% without any damage if the price were attractive enough. On the other hand, genuine *plundering* is practised only in the case of luxury woods, cinchona bark and skins. No inhabitant of the tropics would dream of replacing the felled mahogany, ochóo or cinchona bark trees. But, since 1966, the exportation of luxury woods has increased alarmingly (by about 65%). Exports of lizard skins and the hides of wild animals dropped to one fifth in the period from 1966 to 1972. Obviously, the unsatisfactory methods of hunting – the poisoning of entire rivers by means of secret Indian toxins and the use of dynamite – have decimated the stock of lizards (caymans) to such an extent that a further decline in this export item can be expected.

The *cultivated tropical products* account for about 58% of the agricultural exports; of these, *coffee* was the leading export in the years 1966 to 1970. However, the value of the coffee exports fluctuates by more than 100%, among other things mainly because of the crop failures following bad weather.

Sugar exports, which account for about 4–8% of the production (see Figure 1), developed very steadily up to 1970. Since 1961 the high transportation costs have made it unprofitable to supply sugar to northern Chile. Since 1966 subsidised sugar (financed by a low tax on the national sugar consumption) has been bought from the United States. The strong competition from Argentina makes it almost impossible to export sugar to Uruguay, the second most important sugar-importing country in South America after Chile. While in 1972 Bolivia had to import sugar (mainly

from Brazil), it was possible, at the start of 1973, to export almost 7,000 tons to the USA and 9,200 tons to Chile (for a total export value of US \$ 2.9 million).

The present considerable increase in *cotton production* is almost all exported. In 1972 cotton fiber worth US \$ 6.9 million and cotton cake (torta de algodón) worth US \$ 0.3 million were exported. In mid-1973 it was estimated that the export revenue from the 1972/73 cotton campaign was US \$ 25.0 million, but the sales boycott which was imposed in the second half of the year in response to the unilateral change in prices (by about 70%) involved considerable expenses which ate into the revenue. For the 1973/74 campaign US \$ 24.8 million were made available through the Banco Agrícola de Bolivia. The money was used for cultivating 80,000 hectares of cotton ("Presencia" 23. 12. 73).

Since 1967, cotton has been exported to Chile and in 1968 cotton was also supplied for one year to Argentina. In 1969 the first exports were shipped to Great Britain while in 1970 the cotton producers' association managed to break into the Japanese market. England took 57% of the exports and Japan 26%*. The most important customers for cotton in 1971/72 were Japan, the Federal Republic of Germany, Great Britain, Chile, Argentina and the USA. There should also be a potential market for Bolivian cotton, particularly when world prices are low, in nearby Uruguay which at present imports about 7,000 tons from Mexico and Peru.

The exportation of *tropical fruits* has developed erratically. In 1967 and 1968 no pineapples at all were exported and in 1969 oranges were completely missing from the list of exports. Crop failures alone are not to blame. For example, in 1969 the shipments of oranges destined for Chile were refused an import licence by the health inspectors; this illustrates the type of problem that shipping tropical fruit can involve. The Argentinian market has been taking Bolivian bananas and pineapples for many years and it can take very much greater quantities if good varieties are selected and the quality remains uniformly high.

Beef does not figure in the export statistics for 1969. Self-sufficiency in beef cattle production was not achieved until 1968/69. The annual requirement is about 45,000 tons (1970) with an annual growth rate of about 5%. It is expected that the annual surplus will be 10,000 tons by 1975 and 15,000 tons by 1980**.

Peru and northern Chile have been developed as markets for Bolivian beef; previously these countries imported their beef (40,000 and 50,000 tons

* Japan paid 8% higher prices than England.

** BAB, loc. cit., 1969; IDA: Third Livestock Development Project, Washington, May 1971.

respectively) mainly from Ecuador or Argentina. From 1970 to 1972 the exports of meat and cattle increased from US \$ 54,000 to over US \$ 3.0 million while there was a simultaneous increase in the exportation of cattle hide to US \$ 410,000. Recently, Italy has also expressed interest in purchasing Bolivian beef. Particularly at times when meat was in short supply at home (1972 and 1973), years which were followed by restriction on exports, very large quantities of meat were secretly exported (mainly to Brazil).

The "miscellaneous exports", which are increasing in quantity from year to year, include agricultural-industrial products such as "Whisky Bellows", canned fruit, palm tips, jams, etc.

5.2 Replacement of imported agricultural products by domestic products

Against the export earnings of US \$ 18.1 million brought in by crop cultivation, livestock farming and gathering must be set the expenditure of US \$ 26.8 million for imported agricultural products (see Table 6). This value is increased by a further US \$ 4.8 million if one includes finished products of organic origin (rubber goods, paper and pulp, textiles, etc.). The import statistics also include the commodities and goods required for agricultural purposes (artificial fertilizer, agricultural machinery, insecticides

Table 6 - Value of Agricultural Products Imported into Bolivia (in US \$ 1,000)¹

	1967	1968	1969	1970	1971
Milled products (wheat flour, barley malt, etc.)	14.059	10.378	9.774	15.419	4.962
Oils and fats	5.992	4.640	6.323	6.761	8.562
Grain (wheat, barley, etc.)	2.106	3.470	2.932	2.728	3.944
Dairy products (eggs and honey)	2.805	2.253	2.840	3.198	3.189
Cattle on the hoof	509	1.103	1.243	203	125
Others	5.361	5.862	4.282	4.971	5.974
Agricultural products	30.832	27.706	27.394	33.280	26.756
Finished products, organically based	9.479	7.498	7.651	6.362	4.772
Products for use in agriculture	1.574	1.783	2.042	2.756	3.230
Total goods connected with agriculture	41.885	36.987	37.087	42.398	34.760
Total imports	150.946	152.846	165.037	158.500	171.500

¹ Based on data from the Statistical Department of the Ministry of Agriculture (La Paz) 1971/1973.

etc.; in 1971 these imports were worth US \$ 3.2 million). This means that, at US \$ 34.8 million, total goods connected with agriculture account for 20.3 % of the country's total imports.

While the third group is of benefit to the country's agriculture – although unfortunately only to a modest extent – the first two groups contain items which for the most part could be produced domestically. It is necessary to distinguish between:

- a) Goods whose raw materials are cultivated in insufficient quantities in Bolivia, such as wheat, barley, oil plants, fodder plants (for dairy cattle), coarse fiber plants and others,
- b) Agricultural products whose raw materials are available domestically but which cannot be processed domestically because the necessary industry is still in its infancy (this holds true for nearly all the organically based products) or because the domestic industry cannot satisfy sophisticated consumer requirements (coffee, tea, canned meat and fish, alcoholic beverages, confectionery, tobacco products, cocoa products, canned fruit and vegetables – in 1971 these amounted to US \$ 1.9 million in value).
- c) Products which are available in the country but which cannot be properly distributed because of inadequate organisation (animal feed-stuffs, fruit, fish, vegetables worth US \$ 1.2 million).

The first group is of particular interest from the point of view of the tasks facing Bolivian agriculture. It is vitally urgent that the national production of *wheat and barley* be increased. As a result of a mismanaged import policy which went hand in hand with a "criminal acceptance of aid shipments"*, the importation of cereals and flour reached a peak in 1967 (US \$ 16.1 million). Since the wheat aid programme came into being it has been possible to reduce the importation of milled products, cereals and farinaceous goods to US \$ 8.9 million (1971). On the other hand, in a newspaper article in June 1973 the necessary wheat imports for 1973 were estimated at US \$ 25.0 million.

Although there has been a great deal of publicity in recent years to promote the cultivation of groundnuts, sunflowers and soybeans, the fact remains that in 1970 95 % of the national *oil and fat requirements*, valued at US \$ 5.6 million, still had to be imported. This value rose to US \$ 8.6 million by 1971. A total of 60,000 hectares under cotton would be sufficient to gain complete self-sufficiency in meeting vegetable oil requirements. It is also hoped that it will be possible to convince some of the population of the advantages of high-grade cotton seed oil compared with Argentinian

* G. BARJA, Geografía Agrícola de Bolivia, La Paz 1971.

lard so that the imports could be cut to 40%. On the other hand, the "Common Andean Market" already has such a great demand for edible oil (53,000 tons in 1970, 76,000 tons in 1975) that any overproduction of Bolivian cotton seed would find a guaranteed market and bring in foreign currency. The substitution product is in fact on its way to becoming an important export commodity.

In addition to the development of irrigated areas for the cultivation of *fodder plants*, dairy-farming also benefits to a great extent from the large quantities of agricultural waste products (such as cotton-seed cake, residue from the processing of sugar cane, bran, maize straw, etc.). There would be no problem in feeding many more cows and the size of the herds around Cochabamba and Santa Cruz could be greatly increased over a period of a few years.

The cultivation of coarse fiber plants (jute, agave, kenaf), which has been studied in detail and recommended since the early sixties, has not caught on to any great extent because there is no energetic coordination of cultivation and processing.

6. *The Specific Problems of Processing and Marketing*

The *problems* encountered in establishing agricultural processing plants are the same as those experienced in all other small industrial operations (tight market, transportation problems, competition from smuggled goods, reluctance of investors to put up money because of the unstable political situation, etc.). In addition, the processing of agricultural products is burdened with the problem of coordinating (encouraging) the production of raw materials and the processing of these materials. Furthermore, most of the agricultural products are so uneconomical to transport that the question of the site is another decisive factor – it should be close to the place of production or to the centres of population where there is a supply of skilled workers and also a market.

In Bolivia, by far the majority of the agricultural processing plants are located in the large cities of La Paz and Cochabamba and to the north of Santa Cruz. The often very great distances to the processing plants or to the direct consumer markets give rise to enormously high transportation costs which reduce the producers' profits. As a result, many small farmers in the highlands as well as in the lowlands can barely do better than achieve subsistence level results. In the rice trade, in particular, the army of rice buyers ("rescatadores") follow the unlaudable practice of exploiting the small farmer's chronic lack of cash before sowing takes place. As a result, the small farmers usually do not even get a chance to take part in the

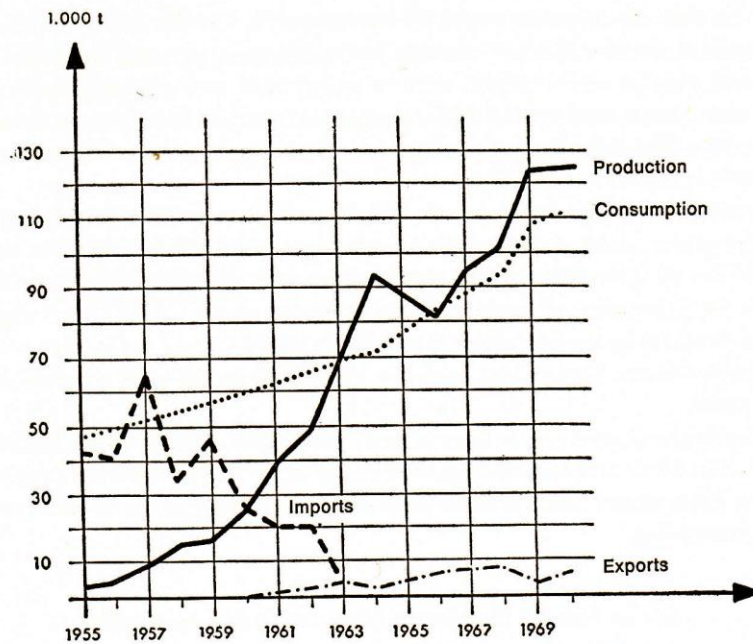


Figure 1 - Development of Bolivian Sugar Production
According to CNECA, 1969/70. See also W. SCHOOP, 1970, p. 234.

marketing process because in many cases they mortgage their harvest beforehand.

The Bolivia *sugar industry* which from 1955-1970 expanded at an annual rate of 8-10%*, can be regarded as an example of good coordination of cultivation, transportation, processing and marketing, including development of an export market. Following the drop in production that occurred in 1971, the 1972 output was back at the level achieved in 1970.

It is extremely important that the existing processing facilities be expanded over the coming months and years if the *cotton harvest* is to be secured. To avoid serious disruptions in the processing of cottonseed it will also be necessary to boost the daily capacity of the oil mills in Cochabamba.

There are not enough *grain mills* in the Valles to keep up with the planned doubling of production over the next few years. The *canning industry* is at present concentrated far too much in the highlands, but the export market for tropical fruit juices (particularly pineapple) and for palm tips is almost inexhaustible. Finally, in view of the increasing rate at which

* Figure 1 shows the steady development up to 1970. On the problems of sugar cane cultivation in 1971, see chapter 1.2.

meat is being exported from the lowlands, the need to can the lower quality cuts of meat will become more and more urgent.

Most of the 44 *abattoirs* in Beni are still small and not very hygienic. The CBF has put up a modern refrigerated storage plant in Reyes and it is planned to expand the plants in Trinidad. The area served by these abattoirs is admittedly very limited because if cattle have to be driven over great distances they lose a great deal of weight (1.5 kg per day and animal) and a subsequent fattening programme takes at least 3 months before it has any effect. Therefore several modern plants are not working at full capacity.

The *animal feed industry* (INBA) and the *dairy* (PIL) in Cochabamba are closely connected. The dairy is the only one in the country. Since October 1971 it has been joined by a powdered milk reconstituting plant in La Paz. So far, several private attempts to set up a dairy in Santa Cruz have failed. However, because of the low productivity of dairy cattle and also in view of its peripheral location, a plant in Santa Cruz would only have sufficient capacity to meet regional requirements.

Thus all investments in the area of agricultural processing and marketing must take account of both local and national needs. No investment can be considered in isolation but, instead, attention must be paid to important regional planning factors such as optimum production conditions, infrastructure or the distribution of the population and similar aspects. As a result, any decision taken in agricultural planning of necessity becomes a multi-disciplinary process.

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