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SOYBEAN PRODUCTION IN PERU

by

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SOYBEAN PRODUCTION IN PERU

As a part of the evaluation of the progress of the Soybean Project it is of interest to study the changes in acreage and production which have occurred over the past several years; to examine the imports of soybeans and soybean products in relation to present and estimated future needs; and finally to look at the costs of production of soybeans in relation to prices established by the GOP for purchase by EPSA and the role these levels play as incentives for the rapid expansion of soybean production.

The original agreement of the soybean project between the GOP and AID was signed in September, 1976. The contract between AID and INTSOY to furnish technical assistance was signed in November, 1977 and the four INTSOY technicians arrived in Peru in February and March, 1978.

Historically most of the soybean production has been in the coastal area. The areas of emphasis under the Soybean Project are all in the Selva Alta or high jungle area. The three locations are Bagua-Jaen, Tarapoto-Tingo Maria, and San Ramón-Satipo.

ACREAGE AND PRODUCTION

The acreage, production and yields of soybeans for the period 1969-78 are given in Table 1. Over this period the trends have been increasing with a rather sizable increase in acreage in 1976 and again in 1978.

National statistics on the location of soybean production are not available for 1978 but in prior years the bulk of the acreage has been located in the coastal area with a heavy concentration in the Tumbes area in the North and a second concentration in the Lima-Callao area in the Central zone.

* Paper prepared by Alfred G. Harms, Production Economist, INTSOY-PERU, April, 1979.

TABLE 1. Soybean Acreage and Production, PERU, 1969-1978

YEARS	AREA HARVESTED (HA)	PRODUCTION (MT)	YIELD (KG/HA)
<hr/>			
1969	135	151	1118
1970	370	399	1078
1971	655	817	1247
1972	555	607	1094
1973	745	938	1259
1974	1350	1793	1328
1975	1055	1473	1396
1976	2020	2869	1420
1977	1947	2943	1512
1978	2947	4456	1512

SOURCE. Los Anuarios de Estadística Agropecuaria. Ministerio de Agricultura y Alimentación, Oficina Sectorial de Estadística e Información de Alimentación.

Table 2 presents the acreage and production data for 1977 and 1978 in the areas of emphasis of the soybean project. Overall the acreage increased 215 percent from 625 hectares to 1445 with an even greater percentage increase in production due to a substantial increase in reported yields.

The Bagua-Jaen area has the greatest acreage which increased 273 percent in 1978. This area is basically an irrigated rice production area. Restricted by governmental decree to one rice crop a year due to disease problems, soybeans fit into the cropping pattern as a second crop following the main rice crop which occupies the area from January to June. The irrigation capability of the area helps to insure success against unfavorable rainfall conditions of the semi-arid climate. Agricultural development has progressed so that the area has tractors and machines to provide much mechanized production. In addition, farmers use animals (bullocks) as a source of power, a practice that is missing in most areas of the Selva Alta.

TABLE 2. Commercial Soybean Acreage and Production,
Project Areas 1977-1978

AREA	AREA HARVESTED (HA)	PRODUCTION (MT)	YIELD (KG/HA)
<u>1977</u>			
Bagua-Jaen	394	540	1371
Tarapoto-Tingo María	197	241	1223
San Ramón-Satipo	34	61	1794
TOTAL	625	842	1347
<u>1978</u>			
Bagua-Jaen	1077	1754	1629
Tarapoto-Tingo María	199	271	1362
San Ramón-Satipo	169	222	1314
TOTAL	1445	2247	1555

SOURCE. Soybean Project Evaluation Reports for 1977 and 1978, Ing.
Rodolfo Vargas S., Coordinador Nacional de Soya Convenio con AID.

The San Ramón-Satipo area has the smallest acreage but showed almost a five-fold increase in 1978. Soybeans are moving into the cropping patterns of this area, especially as in intercrop in the early stages of papaya production and in coffee areas which are suffering or are expected to be lost due to "la roya" or coffee rust. Farmers are quite enthusiastic and hope for needed resources, especially tractors and machinery.

The production in the Tarapoto-Tingo María area has been static. The new access road to the coast was finally opened in 1978 providing less costly delivery of agricultural inputs and outlet for agricultural products. The area is woefully short of tractors and machines to mechanize production, and financial credit for soybean production is difficult to obtain from the Agrarian Bank. The area is basically a rainfed area of general crop production and soybeans have to compete for inclusion in the cropping system. Because of labor restraints, the slash and burn agriculture, and shortage of power and machines, very little increase in crop acreage occurs. Under present cost and product prices soybeans can compete successfully with corn, sorghum, and other bean crops.

The 1979 acreage and production goals, shown in Table 3, call for a 277 percent increase in acreage.

TABLE 3. Goals for Soybean Acreage Expansion in 1979

<u>AREA</u>	<u>HECTARES</u>	<u>METRIC TONS</u>
Bagua-Jaen	2450	3675
Tarapoto-Tingo Maria	1124	1686
San Ram6n-Satipo	<u>440</u>	<u>512</u>
TOTAL	4014	5873

SOURCE. Soybean Project: 1979 Plan of Operations.

SUPPLY OF FATS AND OILS

Table IV shows the production of fats and oils in Peru for the years 1976-1978 and the forecast for 1979. Fish oil is first with an annual production of a little over 100,000 metric tons. Palm oil exhibits an increasing production with the development of the palm oil project at the Tocache, and other vegetable oils (including the oil equivalent from imported soybeans) have varied from 5,000 - 9,000 metric tons. The production of lard and tallow has been steady at 8,000 and 5,000 metric tons.

In addition to the domestic production, Peru has imported rather large volumes of soybean oil and whole soybeans which are processed locally for the oil and meal. Table 5 reports the volume of imports of soybeans and soybean oil for recent years and the estimate for 1979. The only other major oil and fat import is tallow which has been steady at about 4,000 metric tons.

The United States has supplied the soybeans and tallow and the bulk of the soybean oil imported. The remainder of the soybean oil has come from other South American countries.

TABLE 4. Output of Fats and Oils, PERU, 1967-79

ITEM	1976	1977	1978 ^{1/}	1979 ^{2/}
	In 1,000 metric tons			
Cotton Seed Oil	21	18	20	22
Palm Oil	3/	3	4	5
Other Veg. Oils ^{4/}	7	5	7	9
Fish Oil	101	101	103	100
Lard	8	8	8	8
Tallow	5	5	5	5
TOTAL	142	140	147	149

^{1/} Preliminary^{2/} Forecast^{3/} Less than 500 MT^{4/} Includes oil equivalent from imported soybeans

SOURCE. Peru: Agricultural Situation Reports, 1978 and 1979.
Foreign Agricultural Service, U.S. Department of Agriculture

Table 5. Imports of Soybeans and Soy Oil, PERU, 1975-1979

YEAR	SOYBEANS (MT)	SOYBEAN OIL (MT)
1975	34,649	57,263
1976	34,306	74,726
1977	26,154	58,800
1978	35,000	81,985
1979*	43,500	64,000

*Estimated

SOURCE. Personal communication from Dr. J. Jorge Fernández Lañas,
EPCHAP, Apartado 1373, Lima, February 1, 1979.

A comparison of the actual domestic production of soybeans in relation to the amounts of soybean and soybean oil imports indicates the scope of the possible expansion of soybean production to meet domestic demand. Another favorable factor for increased domestic production of soybeans is a recent shift in the policy of fish oil exports. In 1978 the domestic consumption of fish oil was 67,813 metric tons and none was exported. In 1979 the domestic consumption is estimated at 7,968 metric tons with the remainder destined for export.^{1/} Although partly due to a buildup of supply of edible oil during 1978 it may be a change in policy to a greater export of the fish oil.

It is difficult to make comparisons of world soybean prices and Peruvian prices because the world market price for soybeans varies quite frequently and sometimes by rather sizable amounts, while in Peru the prices are set by governmental regulation and the value of the sol has been steadily decreasing in relation to the dollar.

In early March 1978 when the official exchange rate was 208 soles to the dollar the C&F value of imported soybeans in the port, Callao, was S/. 62,400 per metric ton or \$300 (\$8.17 per bushel). The price paid by EPSA for soybeans purchased in the Selva is S/. 65,000 per metric ton or \$312.50 (\$8.51 per bushel), while on the coast the price is S/. 72,000 per metric ton or \$346.15 (\$9.42 per bushel). Finally, the price of the imported soybean to local processing plants is set at S/. 75,588.33 per metric ton, or \$363.41 (\$9.89 per bushel). As the sol declines in value the difference between imported and domestic prices will lessen.

The current cost of transporting soybeans, which is paid by EPSA, from Tarapoto in the Selva to processing plants in Piura, which is located in the coastal area of northern Peru is S/. 10,400 per metric ton. From the Bagua-Jaen area the cost is S/. 2,000 per metric ton and from Satipo to Lima the cost is S/. 7,950. Yet the purchase price to farmers in all three Selva locations is S/. 63 per kg thus eliminating the advantages of location in relation to markets.

^{1/} Personal communication from Dr. J. Jorge Fernández Lañas, EPCHAP, Apartado 1373, Lima, February 1, 1979.

Presently it is the policy of the GOP to foster the expansion of soybean and other oil seed production to meet domestic demand. Peru has been under severe economic stress and only recently has the balance between imports and exports become favorable. To what extent the GOP will continue to subsidize domestic production depends upon the amount of incentives needed to bring forth increased production and the goals of the import policy in the controlled economy.

SUPPLY OF PROTEIN SUPPLEMENTS

Table 6 shows the output of protein supplement in Peru for the years 1975-78 and estimates for 1979. Fish meal is by far the most important but varies widely from year to year as the size of the catch and the variety of fish changes. The other two important sources are cotton seed cake and soybean meal which are relatively minor compared to the fish meal.

TABLE 6. Output of Protein Cake and Meal, PERU, 1975-78

ITEM	<u>1975</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1979</u> ^{1/}
	In 1,000 Metric Tons				
Fish Meal	706	886	496	586	460
Cottonseed Cake	22	17	17	47	43
Soybean Meal	28	28	21	29	36
TOTAL	756	931	534	662	539

^{1/} Estimated

SOURCES. Fish meal data by personal communication from Dr. J. Jorge Fernández, EPCHAP. Cottonseed and soybean meal data calculated from data in Peru: Agricultural Situation Report, 1978, Foreign Agricultural Service, U.S. Department of Agriculture.

By law the cottonseed cake is to be utilized in the dairy industry and currently is priced quite low at S/. 6,000 - 8,000 per metric ton or \$29 - 38. On the other hand soybean meal is priced at S/. 54,000 per

metric ton, the same price as fish meal which has from 65 - 66 percent protein compared to 44 percent in soybean meal. With these prices it is not difficult to see why soybean meal does not move as fast as the other supplements.

Although the supply of fish meal is greater, feed rations, especially for poultry, are limited in the amount of fish meal that can be used due to health reasons, so there is a demand for the other protein supplements. Additionally, fish meal is an important export product.

The demand for soybean meal, if priced realistically, would encourage further domestic production of soybeans.

COSTS OF PRODUCTION

Very little previous work has been done on the cost of producing soybeans in Peru. COPERHOLTA Specialists, as a part of the model farm program have gathered cost and labor use data for several years. Table 7 reports the per hectare cost of production for farms in the Bajo Mayo and Huallaga Central for the primary cropping season of 1977. Due to drought conditions the reported yields were depressed. Income failed to cover even the direct costs and the actual returns to family labor was S/. 3,421 and in the Huallaga Central S/. 744 with no returns for management and capital invested in the production process.

Table 8 reports 1978 costs of production for corn and soybeans during the primary cropping season. With an average yield of 1060 kgs/ hectare and the increased purchase price of S/. 50/kg the soybeans returned a per hectare profit margin of S/. 7,515.

However, income from corn failed to cover the total costs of production by S/. 1,953. Examination of budgets prepared by Ministry staff for 1978 and 1979 production also indicates the relatively greater profitability of soybean production as compared to corn. This advantage of soybeans will help to promote the expansion of soybeans acreage.

TABLE 7. Costs of Production of Soybeans per Hectare, Tarapoto Area, First Cropping Season, 1977.

	BAJO MAYO 19 Farms	HUALLAGA CENTRAL 16 Farms
<u>DIRECT COSTS</u>		
Family Labor	S/. 6,144	S/. 4,740
Hired Labor	8,772	7,146
Soil Preparation	3,080	1,524
Seed	1,504	856
Chemicals	118	86
Trucking	365	847
Other Costs	167	53
TOTAL DIRECT COSTS	S/. 20,150	S/. 15,252
<u>INDIRECT COSTS</u>		
Overhead (8% of direct costs)	S/. 1,612	S/. 1,220
Interest Charge (14% per annum, 4 months)	940	712
TOTAL INDIRECT COSTS	S/. 2,552	S/. 1,932
<u>TOTAL COSTS</u>	S/. 22,702	S/. 17,184
Average Yield (kgs)	778	502
Cost per kg	29.18	34.23
Purchase Price by EPSA	22.40	22.40
Profit Margin per kg	-6.78	-11.83
Profit Margin per Hectare	-5,275	-5,939
Man-days of Labor	130	103

SOURCE. Calculated from data reported in COPERHOLTA study, "La Soya en la Primera Campaña, 1977" by Jan Vogelzang, December, 1977.

TABLE 8. Comparison of Per Hectare Costs of Production, Corn and Soybeans, Tarapoto Area, First Cropping Season

	<u>CORN (11 farms)</u>	<u>SOYBEANS (7 farms)</u>
<u>DIRECT COSTS</u>		
Family Labor ^{1/}	S/. 8,247	S/. 12,264
Hired Labor	6,997	16,780
Other Inputs	<u>6,395</u>	<u>10,680</u>
TOTAL	S/. 21,639	40,134
<u>INDIRECT COSTS</u>		
Overhead (8% of Direct Costs)	1,731	3,211
Interest Charge (16% per Annum) ^{2/}	<u>1,731</u>	<u>2,140</u>
TOTAL	3,462	5,351
<u>TOTAL COSTS</u>	S/. 25,101	S/. 45,485
Average Yield (kgs)	S/. 1,157	S/. 1,060
Cost per kg	21.69	42.91
Purchase Price by EPSA	20.00	50.00
Profit Margin per kg	-1.69	7.09
Profit Margin per Hectare	S/. -1,955.33	S/. 7,515.40 ^{3/}
Man-days of Labor	141	148

^{1/} Family labor valued at hired rates

^{2/} Period of 6 months for corn, 4 months for soybeans

^{3/} Rate of exchange April 1, 1979: S/. 210 = \$1.00 (U.S.)

SOURCE. Calculated from data supplied by Jan C. Schoenmaker, Economist, COPERHOLTA, Tarapoto, Peru.

Table 9 presents the results of the current survey of the costs of production of soybeans during the second cropping season of 1978. Although the costs of inputs increased during the year, the higher average yield of the second crop produced a profit margin per hectare of S/. 13,439.

A budget of costs and returns for the primary cropping season of 1979 in the Selva area is presented in Table 10. The production coefficients are based on the results of the survey of production data during 1978. The estimated yield of 1300 kgs per hectare was based on the 1978 area average yield of 1225 kgs plus a 6 percent increase due to increased use of technology by the farmers. The 118 man-days of labor was based on the average labor use reported in 1978. This labor requirement is considerably higher than commonly used in budgets, 50 - 90 man-days depending upon the level of mechanization. The estimated daily wage rate was increased 10 percent above the average rate reported for the second cropping season of 1978. Other costs are based on the current prices of inputs.

Under the newly established purchase price of S/. 65 per kg in the Selva area the estimated profit margin per hectare is S/. 17,073 as returns to management and risk of the farmer. This amounts to a 25.3 percent return on total costs for the 4 - 5 months production period.

TABLE 9. Per Hectare Costs of Production of Soybeans. Tarapoto-Tingo María Area, 1978 Second Cropping Season.

		<u>Average of 9 Farms</u>
<u>DIRECT COSTS</u>		
Machine Hire	S/.	8,031
Seed		3,702
Chemicals		839
Labor ^{1/}		31,806
Sacks		386
Trucking		<u>1,664</u>
TOTAL	S/.	46,428
<u>INDIRECT COSTS</u>		
Overhead (8 percent of Direct Costs)	S/.	3,714
Interest Charge (26 percent per annum) ^{2/}		<u>4,024</u>
TOTAL	S/.	7,738
Total Costs	S/.	54,166
Average Yield (kgs)		1,352
Cost per kg		40.06
Purchase Price by EPSA		50.00
Profit Margin per kg		9.94
Profit Margin per Hectare		13,438.88 ^{3/}
Man-day of Labor		117

^{1/} Family labor valued at hired rates

^{2/} Period of 4 months

^{3/} Rate of exchange April 1, 1979; S/. 210 = \$1.00 (U.S.)

TABLE 10. Estimated Cost of Production of Soybeans per Hectare, Selva Area, First Cropping Season, 1979, Estimated Yield 1300 kgs Per Hectare.

DIRECT COSTS

Labor	118 man-days x S/. 300	S/. 35,400.
Machine Hire	7 hours x S/. 1,050	7,350
Seed	60 kgs x S/. 70	4,200
Inoculant	1 bag x S/. 2,120	2,120
Insecticide	1 kg x S/. 2,550	2,550
Threshing	1300 kgs x S/. 2	2,600
Trucking	1300 kgs x S/. 2	2,600
TOTAL DIRECT COSTS		S/. 56,820.

INDIRECT COSTS

Overhead (8 percent of Direct Costs)	S/. 4,546
Interest (32 percent per annum for 4 months)	6,061
TOTAL INDIRECT COSTS	S/. 10,607

TOTAL COSTS

	<u>S/. 77,427</u>
Cost per kg	S/. 51.87
Purchase Price by EPSA	65.00
Profit Margin per kg	13.13
Profit Margin per Hectare	S/. 17,073.00
Rate of Return on Investment	25.3%

INCENTIVES FOR EXPANSION

In order to promote the rapid expansion of soybean production incentives must be provided to help the farmers meet the price and production risks of adopting a new crop.

Incentives can be of several types. The more important are: the provision of extension programs for the education and training of the farmers in the production of a new crop, the provision of physical resources to aid production, the provision of credit to facilitate the financing of the new crop, and purchase price levels to compensate for the risk and uncertainty involved in the production of the new crop and to adequately reward the entrepreneurs for their efforts.

Education and training are important to enable farmers to become reliable and confident producers of soybeans. Soybeans are subject to certain production risks that do not affect all crops equally. Heavy rainfall on recently planted soybean fields can cause damage severe enough to make replanting necessary. Weed competition especially during the first thirty to forty days of growth will stunt the soybeans and adversely affect the yields. Rainfall during the harvesting and threshing periods delay the operations and cause field losses as well as damage to the soybeans from diseases and fungi. Soybean seed is difficult to store under tropical conditions, and the loss in germination is rapid making necessary the bringing in of seed from other production areas, or the seed production program must be timed to provide fresh seed to meet the main planting seasons. On the other hand, soybeans are able to survive periods of drought and still produce because of the long period of flowering and pod development that is lacking in other crops such as corn and sorghum.

Presently the Ministry has a program of technology transfer to provide education and training in soybean production. Ministry staff members are assigned responsibilities in the soybean program, educational material is provided, farm visits are made, workshops and training courses are held to train both the extension workers and the farmers, and field days and demonstrations are conducted to show the techniques of production. Under the terms of the agreement between the GOP and

USAID, technical aid is provided in research and production and physical resources in the forms of equipment, machinery, operating funds, travel funds, educational funds, and training aids. This program is expanding and intensifying in its educational and training efforts.

The physical resources necessary for efficient production of soybeans are lacking in the areas of emphasis. The shortage of tractors and machines for land cleaning and soil preparation cause many delays in planting or abandonment of planned soybean production. Too few threshers cause delay in threshing which results in losses, especially during periods of rainfall. Needed planting equipment would reduce the time and labor now expended and should lead to more accurate planting and plant populations for effective production. Other inputs such as inoculation, insecticides, herbicides, seed treatment and fertilizer are necessary for efficient production.

Although SENAMA has the responsibility to provide power and machinery, it has many problems acquiring and maintaining the equipment and up to now has not been effective in providing services to the soybean project. A vigorous program of machine acquirement, proper maintenance, and programmed use would provide a boost to farmers in the adoption of the new crop.

With the new road to the coast the other necessary inputs can be transported into the areas and made available at reasonable cost, or, if deemed necessary, a portion of the cost could be subsidized to promote expansion.

The availability of credit to finance the development of a new crop is essential. Presently, the Agrarian Bank in the Tarapoto area does not have much enthusiasm for the expansion of soybeans, is reluctant to make loans for their production, and, if credit is granted for soybeans, it is granted for less than anticipated costs of production. However, the bank is ready to grant loans to qualified lenders for other crops such as corn, with which the soybeans have to compete. The Agrarian Bank in the Bagua-Jaen and San Ramón-Satipo areas are more enthusiastic about soybean production but lack sufficient funds to cover credit needs.

Although not unique to the financing of soybean production, the current rate of interest charged by the Agrarian Bank, 32 percent is

extremely high. An immediate implementation of loans from the special fund for promotion of oil seeds production at the concessional interest rate of 18 percent will provide a potent incentive for soybean production. Because farmers lack knowledge of soybean production and face production failures, the loan program should be structured to absorb such losses until soybean production is well established. The close cooperation between bank officials and EPSA in settling for soybeans purchased and repayment of outstanding production loans is important in loan management.

Perhaps the most important area of incentives is the establishment of purchase price levels that will call forth the desired production of a crop. Examination of the buying prices established by law for the various crops for early 1976 to February 1979 indicates a 367 percent increase in the price of soybeans compared to a 293 percent increase in the price of corn. Rice production has been even more favored with an increase of 391 percent. These changes in purchase prices are deliberate actions to guide production and cope with rising production costs.

What guides can be developed to help establish the purchase prices that will promote rapid expansion?

The rate of return on the money invested in the production process is one guide. With banks paying up to 33 percent on regular savings accounts and up to 38 percent on savings for a fixed one-year term these interest rates become the minimum of expected returns from a farm enterprise. If a farmer cannot foresee earnings any higher than the minimum it would be to his advantage to deposit the money in a savings account and hire out to work for someone else. To conduct a farming enterprise he needs more than the minimum to compensate for his capital and management resources.

Also the rate of return from a farm enterprise can be compared to the rates of return received or expected from other types of business enterprise. The current rate of interest on loans from regular commercial banks is 40 percent per annum. Business entrepreneurs expect to earn more than 40 percent or they would not borrow the money. Although impossible to confirm without a detailed survey it is reasonable to

assume that businessmen expect a return of 50 percent or greater per year on their investment in the enterprise.

Another guide is to look at profit margins in relation to costs of production. With well established crops, economic theory postulates that production increases on contracts as changes in price and profit affect the marginal producers or those for whom the price and returns just covers the cost of production.

In the present stage of the expansion of soybean production the problem is not to bring into production additional high cost producers but to convince a great many more farmers to produce soybeans who will have reasonable costs of production, discouraging only the most inefficient.

Because of the lack of production knowledge and the possibility of failure with a new crop farmers have perceived costs that are greater than actual to cover their exposure to uncertainty. Also in many cases the actual cash costs associated with soybean production are greater than for traditional crops. This means the farmers lose more in cases of crop failure.

The purchase price should be set so as to cover the costs of production of a majority of the producers and also provide the extra return to cover uncertainty. Calculations with the limited cost of production data from 1978 indicate that a price level 40 percent above the average cost of production would cover the actual costs of about 90 percent of the producers and a price level of 30 percent above the average would cover about 80 percent of the producers. How much more is necessary to cover the added uncertainty is a matter of subjectivity. It seems reasonable that a purchase price set within the limits of 30-50 percent above estimated average cost of production would be sufficient to encourage increased production.

A balanced program of incentives should be used. This calls for the improvement in the supply of physical resources and a shift to production financing under the special fund for oilseed promotion. These improvements coupled with a strengthening of the extension program and purchase price incentives to cover reasonable costs of production and the uncertainty of adopting a new crop will push the expansion of soybean production.