PN-AAG-906

SOYBEAN PRODUCTION ON SMALL FARMS OF PERU

Third Interim Report of Progress

January 1 - June 30, 1979

Submitted to
The U.S. Agency for International Development
Department of State, Washington, D.C.

by
International Soybean Program INTSOY
College of Agriculture
University of Illinois at Urbana-Champaign
Urbana, Illinois

Report Summary

A. Statistical Summary

1. Project Title and Contract Number: Soybean Production On Small Farms - AID/la-c-1206

2. Principal Investigator, Contractor and University Address

William N. Thompson, Director
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3. Contract Period: November 11, 1977 - November 10, 1979

4. Period Covered by Report: January 1, 1979 - June 30, 1979

5. Total AID Funding of Contract to Date: $443,922

6. Total Expenditures to Date: $472,077

7. Total Expenditures for Report Period: $168,884

B. Narrative Summary of Accomplishments

Action plans were developed for the research, production and utilization aspects of the project. For 1979 two-hundred twenty-four metric tons of soybeans are expected to be produced.

Soybean research highlights include identification of a cultivar with a late flowering early maturing characteristic which could be used to develop, through hybridization and selection, lines with vigorous and long vegetative growth but of short reproductive growth which could make better use of the short rainy seasons of tropical environments.

Technology transfer was enhanced by a series of three workshops for extension personnel held at Tarapoto, Satipo and Tingo Maria. Current technical information was made available to participants and they exchanged information and methods of dealing with small farmers. Literature and visual materials were produced and distributed.

A pest management program was organized for four areas of the selva alta, so focussed on small farmers that permits them to gather the data necessary to supervise their own fields. Insects are the primary interest of the program, which can be expanded to include diseases and weeds as growers gain in experience and confidence in the operation of the system.

Soybean utilization continued in support of the industrial processing of soybeans for new product development and soy-fortified flour for bread and noodles.

Collection of economic data on costs of production and labor use continued. A study of purchases of soybeans by the government buying agency EPSA was initiated to provide information to bring about a more equitable marketing system for producers and processors.

In-country training efforts continued at various locations. Plans were developed for a training course for production agency personnel to be conducted at the Instituto Colombiana Agropecuario, Colombia, from November 25 - December 14, 1979. Trainees have been identified and responsibilities for implementation assigned.

Two project staff members were deputed to the University of Illinois at Urbana-Champaign to participate in INTSOY short courses dealing with soybean production and the use of soybeans as human food.

Report of Progress

A. Objectives

The general purpose of the project is to assist the Government of Peru (GOP) to expand the cultivation of soybeans in high jungle areas and the use of improved varieties of highland corn in the mountains of Peru, and to achieve increased consumption of improved corn, soybeans and soybean products. The project will contribute to increased productivity, employment and income and improve nutrition among the rural and urban poor. The project aims at achieving self sustaining growth in the production and consumption of soybeans and soybean food products thus increasing productivity and incomes among selected segments of the rural poor and increasing the national food supply while improving the quality of foods used by the rural and urban poor. The project will promote action programs to increase small farmer production of soybeans in the high jungle areas and the increased consumption of soy-fortified and soybean food products by nutritionally deficient groups.

Six continuing objectives describe the various services to be provided by the contractor. They include:

1. Assisting GOP Ministry of Agriculture and Food (MAA) to develop and adjust comprehensive action plans in corn and soybean research, production, processing and marketing in order to reach targeted production and consumption objectives for the two commodities.

2. Providing technical information and assisting MAA to identify appropriate soybean and corn varieties through research, to develop agronomic practices that are transferable to small farm conditions and to identify soybean products and processes appropriate for Peru.

3. Assisting in performance of periodic financial and economic analyses to measure the real or potential impact of project activities in the several project areas.

4. Assisting in project evaluations in cooperation with MAA.

5. Performing in-country training as required by the project and assisting in the selection of candidates for academic training abroad.

6. Coordinating academic and short-term training in the United States and other appropriate locations.

B. Background

This report concentrates on activity conducted in the first half of CY-79, with an overview of total accomplishments over the life of the project.

The first interim report discussed the process by which two separate commodity development projects, one dealing with an established crop,

corn, and the other dealing with soybeans, a crop new to Peru, had been combined. The technical assistance component, for which the contractor assumed responsibility was weighted in the staff allocation toward soybean production, research and utilization reflecting the levels of expertise existing in Peru - high for corn, low for soybean.

Four highly qualified soybean scientists in fields specified in the contract were recruited and placed in Peru early in CY-78. The specialty area for the single corn scientist allocated under the contract was changed at the request of MAA personnel. Subsequent delay in determining an appropriate subject matter area and recruiting a qualified candidate led to a mutually acceptable decision on the part of MAA to seek alternative sources for the technical assistance requirements of the corn component of the project.

During the first full year of field operations of the project, useful technical information on soybean research and utilization was generated and disseminated to soybean producers and consumers in rural and urban areas. Recommendations were made on appropriate soybean varieties and on cultural practices. Soybean beverage and food recipes were developed for commercial and in-home processing. Economic data, primarily on use of labor and other costs of production, have been gathered and are being analyzed. In-country training was addressed by means of specially developed short courses, workshops and on-the-job training. Degree training, at the MS level, was conducted for four Ministry of Agriculture and Food staff at the University of Puerto Rico, Mayaguez Campus. Two other MAA staff participated in the INTSOY-sponsored short course on Technical and Economic Aspects of Soybean Production at the University of Illinois at Urbana-Champaign. Two consultants provided timely assistance in soybean processing and weed control.

Project core staff on assignment throughout the report period included:

1. Dr. Thomas M. Fullerton, Soybean Extension Agronomist and INTSOY Principal Representative

2. Dr. Luis H. Camacho, Soybean Research Agronomist

3. Dr. Alfred G. Harms, Agricultural Economist

4. Dr. Alvin Siegel, Soybean Food Processing Specialist

In addition two consultants and an administrative visitor provided useful service during the period:

1. Dr. Michael E. Irwin, INTSOY Integrated Pest Management Specialist. Initiated insect pest management program for the high selva, February 26 - March 20, 1979.

2. Dr. John W. Santas, INTSOY Training and Communications Officer. Visited Colombia and Peru to assist in design of a short course for production personnel, April 15 - 22, 1979.

3. Dr. W. N. Thompson, Director INTSOY. Program review and planning for phase two, December 26 - January 17, 1979.

C. Summary Report of Accomplishments by Objectives

The responsibilities and duties of each team member necessarily involves more than a single contract objective. Their individual reports of progress, comprising the Appendix of this report, reflect their broad range of activities. This section summarizes the work of the team as it applies to each of the specific contract objectives listed in Section A.

Objective 1. Comprehensive Action Plans

Action plans for 1979 were developed by MAA for the research, production and utilization aspects of the project, with INTSOY staff participating in the preparation and review of the plans. For 1979 two hundred twenty-four metric tons of soybeans are planned. Upon signing of Project Agreement No. 3 the action plans were approved.

Objective 2. Provide Technical Information

As the project moved well into the second year the amount and flow of technical information generated increased. Soybean research work during the report period has followed the plan proposed in 1978 and includes 1) statistical evaluation of experimental data, 2) evaluation of introduced soybean germplasm, 3) evaluation of yield potential of introduced cultivars compared with local adapted ones, 4) selection of promising lines in hybrid populations and 5) studies in agronomic practices to increase yields. Work is conducted primarily at the following sites in the high jungle area: El Porvenir Experiment Station, Tarapoto; Tulumayo Experiment Station, Tingo Maria; Huarongopompa Experiment Substation, Bagua; and Pichanaki Experiment Substation, Pichanaki.

Highlights of soybean research activities include identification of a cultivar (Acc 2120 from Taiwan) with late flowering early maturing characteristic which could be used to develop through hybridization and selection, lines with vigorous and long vegetative growth but of short reproductive growth which could make better use of the short rainy seasons of tropical environments. A hybridization program using cultivar Acc 2120 has been initiated at the El Porvenir Station. An experiment to compare three strains of soybean Rhizobium inoculants developed by the Universidade de San Marcos of Lima with three imported commercial brands was begun. Experiments on agronomic practices, chiefly fertilization, inoculation, sowing methods and plant density were evaluated at the Tulumayo Station and seven new or continuing experiments were planned for the 1979 growing season. In the Jaen/Bagua area the commercial soybean planting follows the rice harvest. Two soybean experiments, a preliminary observation trial and a variety evaluation experiment were planted at Huarangopompa Substation to determine cultivars with favorable yield and other characteristics. Two Brasilian cultivars (IAC-734013 and IAC-734085), which were good yielders at El Porvenir, also showed high yield potential at Huarangopompa, indicating the possibility of adapting these cultivars to commercial cultivation. In the variety evaluation experiment Nacional, a local variety, had a disappointingly low yield while the highest yields were Bossier (U.S.) and Tumir (Colombia). At Pichanaki Substation lack of adequate experimental land makes obtaining reliable experimental data difficult. Some

experiments have been planted on private land. An experiment on planting dates was established to clarify confusion as to what should be the most appropriate planting period in the area. Preliminary observations suggest that planting from mid-February to mid-March would stand a better chance of receiving sufficient rainfall to promote satisfactory growth and yield than earlier or later plantings.

A series of workshops for "sectoristas," those government agricultural extension workers who have most direct contact with small farmers, was conducted in Tarapoto, Satipo and Tingo Maria during the February-April period. The workshops were designed to provide current technical information and give opportunity for the sectoristas to exchange information among their peers with respect to soybean production and related matters.

On-farm demonstrations were recommended as an extension technique for the introduction of soya to farmers unfamiliar with the crop and to compare recommended management practices with traditional procedures. Because most sectoristas have had little experience with soya, a variety of demonstration plots were seeded by sectoristas and small farmers at Tarapoto to better prepare them for subsequent on-farm demonstration projects. Plans to establish demonstration plots in connection with the workshops at Satipo and Tingo Maria were curtailed by rain but were eventually completed.

The workshops were considered a success by Ministry officials. The general objectives were accomplished and Ministry efforts to promote soybean production in the selva alta received wide publicity. Workshop participants were prepared to be better advisers on both technical and commercial aspects of soybean production to producers in their sectors.

Information in the form of literature and visual materials was prepared and distributed. Literature on production and utilization of soybeans was provided to other technical assistance groups, including the Dutch and Swiss teams and the North Carolina State University/AID Tropical Soils Project, as well as a number of government agencies and organizations. Photographic monitoring of soybean growth and development continued. A slide series, with recorded text, on soybean production was developed cooperatively with staff of the Technical Communications Department of Agrarian Region VIII. It has been used at a number of agricultural fairs and producer meetings.

Special literature was developed for representatives of the Agrarian Bank who attended the Satipo workshop and a seminar on soybean culture was presented for the director and agronomists of the bank. Production cost figures were developed cooperatively with bank personnel and the local production agent. The result was the issuance by late May 1979 of eight small farmer loans for soybean production as compared to only one the previous year.

Continued support was extended to both research and production agronomists of the soybean program throughout the high selva in acquiring seed, agricultural chemicals, replacement parts and other supplies and in matters related to seed conservation and problem soils. Several meetings and discussions were held with the AID project manager, the national soybean coordinators and representatives of government and private groups regarding appropriate equipment for small soybean farmers.

Under supervision of INTSOY Pest Management Specialist Michael Irwin, a supervised insect control program was organized for four areas of the high jungle (Jaen, Bagua, Tarapoto and Satipo) during his TDY in February/March. The program is focused on the individual farmer/grower and the data to be gathered is elementary enough so that the growers can supervise their own fields. While insects are the current primary interest, the program can be expanded to include diseases and weeds in the future as growers gain in experience and confidence in the operation of the system. Preliminary discussions for a project to monitor insect pest populations throughout the season was discussed with entomologists at Bagua, Tarapoto and Pichanaki. The project would determine which insects are actual pests in each area, when each species reaches maximum numbers and something about the life history of these species.

The soybean utilization portion of the project continued in support of the industrial processing of soybeans for new product development (soy beverage) and soy-fortified flour for bread and noodles. These activities are centered at the Institute of Agro-Industrial Research (IIA), La Molina. Research on the IIA soy beverage process concentrated on product improvement using small process modifications. Work has also been initiated on the preparation of a powdered soy beverage, a spray-drying process using the basic IIA beverage base. Chemical evaluations and reconstitution procedures will be conducted.

Trial runs of commercial processing of soy flour continued at a Lima cereal processing company. The full fat soy flour produced is subsequently being used in the preparation of soy-fortified bread and noodles. Research continued on bread preparation methods, sugar and fat levels, water absorption and kneading. Soy bread is being produced at two bakeries in Tarapoto and closer monitoring of this product is planned for 1979/80.

Soy-fortified noodle samples are being prepared and evaluated for water absorption, texture and nutrient content at a Lima noodle factory. In one test, noodles fortified with soy at 15, 20, and 25 percent were compared with 100 percent wheat noodles for nutritional qualities. The percent protein content of the control (100 percent wheat) product and products fortified at the levels listed above were 11.5, 15.7, 16.6 and 17.4 respectively. This represents an increase in protein content ranging from 35 to 50 percent directly related to soy flour fortification. Moisture levels for all products averaged 10.6 percent. Fat content ranged from 0.7 percent in the control noodles to 4.4 percent in the 25 percent fortified noodles. The introduction of soy-fortified noodles into the commercial market is anticipated later in 1979.

Limited work on the in-home use of soybeans was done during this reporting period. The draft of a Soybean Recipe Book containing approximately 80 recipes was prepared. Accordingly, a final edited manuscript has been completed and it is in the process of being printed. The first printing will be 5,000 copies, jointly funded by the INTSOY (USAID contract project), Cereales S. A. (cereal processing company), and Nicolini Bros. (flour mill and noodle company).

Objective 3. Perform Periodic Financial and Economic Analyses

During the period covered by this report the Production Economist continued with the activities which had been initiated during 1978 concerning the collection and analysis of information of the cost of production and labor used in the production of soybeans. Data for the second cropping season of 1978 were analyzed and the results reproduced for use in soybean production training programs, as guides for 1979 budgets, as guides for loan limits in the credit programs of the lending agencies, and to help establish realistic price levels by the GOP for soybean purchases by EPSA for the soybeans offered for sale by the farmers.

The management implication for the soybean project that stands out in this study is the need to develop and transfer to the farmers new technologies that will reduce labor use and also result in higher yields. Increased machinery use, especially planters and threshers, when possible is one answer but probably more significant is the use of herbicides, with innovative methods, and reduced costs, to control weeds plus timely and efficient work methods in all phases of production.

Plans were made to broaden the study to all soybean production areas in the soybean project in 1979 and to increase the number of participating farmers to provide a larger and firmer base of cost and labor use data.

A study of the purchases of soybeans by EPSA was initiated and a preliminary analysis was carried out to provide information that will be useful in the improvement of grade standards and schedule of discounts and premiums to bring about a more equitable marketing system for both producers and processors.

Further attention was given to the problem of providing soybean threshers of small capacity. The soybean project needs threshers to aid production. The results of the testing of the intermediate size thresher which was constructed at Tingo Maria were not as satisfactory as hoped. It is planned to equip the thresher with V-Belts and pulleys and mount a small gas engine (5-7 hp) as an integral part of the machine. Also the cleaning screen needs additional holes to allow the soybeans to drop through and may need to have the shaking action diminished to lessen the amount of beans thrown over the rear end. These changes will allow the thresher to be ready for the harvest season during August-October.

Objective 4. Project Evaluation

A Mission Evaluation was performed in May 1978 as part of USAID's evaluation schedule. Monthly meetings conducted by the Mission on current projects serve as a convenient evaluation mechanism but comprehensive studies, performed at least annually, are needed to focus on accomplishments, shortfalls and remedial action.

Repeated visits by project staff to production and research offices serve to compare progress in the field with workplan objectives. Specific information is often obtained at the request of the USAID Project Manager.

Objective 5. Perform In-Country Training

Training continued to be a focus of the work of the INTSOY team, especially the production agronomist who helped organize and conduct several workshops. A soybean production workshop was held at Tarapoto February 20-23, with good representation from several government agencies. Demonstrations were developed that could serve as the basis for future field days with farmers. In March, a similar workshop was held at Satipo. Of special interest was the involvement of EPSA, the government buying agency, and the Banco Agrario del Peru. Increased interest in soybeans was shown by farmers and production agents due in part to the perceived threat of coffee rust to the local coffee crop. A third workshop was conducted April 24-26 at Tingo Maria. Excellent cooperation was given by Production Agency and Experiment Station personnel as well as by EPSA and Banco Agrario officials.

The INTSOY production agronomist helped personnel of Region Agraria VIII, Huancayo, develop a soybean slide presentation that was shown at the Region VIII Agricultural Fair May 13-20.

The INTSOY agricultural economist participated in a short course for producers of soybeans at Tarapoto May 8 and 9, with a presentation and discussion of costs of producing soybeans and labor use.

There has been an increased interest in promoting the home preparation of soybeans, as indicated by several visits to IIA by individuals with government and private affiliations. Accordingly, a Workshop-Demonstration course is being planned for this July. Ten (10) people will be invited to attend at IIA a four (4) day program on the home preparation of soybeans. A cross-section of people from Ministry and private organizations will be represented. Various recipes covering main dishes, desserts, and soy milk will be included.

A training course for production agency personnel, to be given at the Instituto Colombiana Agropecuario, Colombia from November 25 - December 14, 1979, was cooperatively planned with national staff, ICA personnel and the INTSOY Training Officer, Dr. John Santas. Dr. Santas and Dr. Rudolfo Vargas S. spent three days in Colombia in April planning the course followed by three days in Lima for wrap-up. Trainees have been identified and responsibilities for implementation assigned. USAID/Lima will prepare a contract with ICA/ Colombia to do the training.

Objective 6. Coordinate Academic and Short Term Training in the United States

Four MAA staff continued MS programs at the University of Puerto Rico Mayaguez Campus. Dr. Rudolfo Vargas S. attended the Second World Soybean Research Conference at Raleigh, North Carolina in March.

Two project staff members were deputed to the University of Illinois at Urbana-Champaign to participate in short courses. Dr. Ricardo Villamonte is a participant in "Technical and Economic Aspects of Soybean Production" May 14-August 18 and Ms. Nancy Fuentes de Jimenez is enrolled in "Soybean Processing for Food Uses" June 18-July 29.

D. Administration and Budget

Dr. Thomas M. Fullerton continued his excellent performance in the dual role of Soybean Agronomist and INTSOY Principal Representative, in which capacity he acts as team leader. His relationships with the MAA Coordinators and the USAID Project Manager have been characterized by professionalism and collegiality. The team is backstopped at the UIUC campus by a quarter-time campus coordinator who links to the team members' academic departments and to INTSOY administration.

Summary of Expenditures

Line item	Nov. '77-Dec. '78	Jan. '79-June '79	Total
1. Salaries	$121,093	$ 69,611	$190,704
2. Fringe*	43,550	33,532	77,082
3. Indirect Cost	43,152	25,266	68,418
4. Travel and Transportation	26,107	9,475	35,582
5. Allowances	65,865	29,706	95,571
6. Other Direct Costs	2,238	220	2,458
7. Materials & Supplies	1,188	1,074	2,262
	$303,193	$168,884	$472,077

* Includes annual premium for Defense Base Contractor Act insurance as required.

APPENDIX

Reports of Resident Field Staff

Report on Soybean Research: Luis H. Camacho
Soybean Agronomist

The soybean research work during the first half of 1979 has been developed according to the plan proposed in 1978. The work accomplished during the reporting period includes (1) statistical evaluation of experimental data (2) evaluation of introduced soybean germplasm (3) evaluation of yield potential of introduced cultivars compared with local adapted ones (4) selection of promising lines in hybrid populations and (5) studies on agronomic practices to increase yield.

The information contained in this report comprises results of experiments initiated in 1978 and finalized in 1979, and experiments being conducted or to be established during the present year at four experimental sites of the high jungle area, namely: Experiment Station El Porvenir in Tarapoto, Experiment Station Tulumayo in Tingo Maria, Experiment Substation Huarangopampa in Bagua, and Experiment Substation Pichanaki in Pichanaki.

1. Experiment Station El Porvenir

At the end of September during the second planting season of 1978 a Soybean Preliminary Observation Trial (SPOT) was planted at this Station. The trial comprised 11 cultivars from Brazil, Taiwan and the United States compared with the adapted cultivar Jupiter. The rainfall during the entire growing season was only 265 millimeters which was insufficient. Consequently, the seed yield was highly variable and relatively low for all cultivars. In spite of the high experimental variation, some cultivars did show high yield potential while others showed little adaptability to the environmental conditions of the area. The good yield performers were Brazilian cultivars IAC 73-4085, IAD 73-4013 and adapted cultivar Jupiter which yielded from 1500 to 1700 kilograms per hectare. These three cultivars were also top yielders, during the same growing season, at the Huarangopampa substation in Bagua. Some cultivars with intermediate yield potential in this experiment have other agronomic traits which could be of value in hybridization programs in tropical regions; such case is found in variety Acc 2120 from Taiwan which flowers relatively late at this latitude (46 days after planting) and reaches maturity within a relatively short period of time (100 days from planting). This characteristic could be used to develop through hybridization and selection, lines with vigorous and long vegetative growth but of short reproductive growth which could make better use of the short rainy seasons of the tropical environments. A hybridization program using cultivar Acc 2120 has already been started at the El Porvenir Station in an effort to develop this type of soybean materials.

During the first growing season of 1979, which started in March, the following experiments were planted at the El Porvenir Station:

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-- The International Soybean Variety Experiment (ISVEX) with 16 tropical cultivars.

-- The Soybean Preliminary Observation Trial (SPOT) similar to the SPOT conducted in 1978.

-- Uniform Yield Experiment (UYE) with cultivars selected for yield performance in coast and jungle areas.

-- Experiment to study agronomic traits in a group of 196 germplasm introductions.

-- Experiment to select promising lines in a group of 287 hybrid populations in the F5 generation.

-- Experiment to screen cultivars for tolerance to Iron Chlorosis

-- Experiment to compare the performance of three local soybean inoculants with three imported ones.

At the time of writing this report the above mentioned experiments had not been harvested but all relevant data on plant growth had already been recorded. Harvest is expected to commence in early June and be terminated in mid-July.

It is anticipated that from 60 to 80 promising lines will be selected from the germplasm and hybrid populations which will then be tested in preliminary yield trials. These trials will begin at El Porvenir Station during the second growing season of 1979 and at other experimental sites of the high jungle area in 1980. Since such trials will be composed of new lines developed by the project for the specific conditions of the high jungle of Peru, a great deal of importance is attached to them.

The experiment on reaction iron chlorosis is being conducted near the Experiment Station in a farm with high pH soil. Cultivars found tolerant will be used on the breeding program to incorporate this trait into otherwise improved cultivars. Preliminary findings of this trial were presented in the 1978 annual report.

The experiment on soybean inoculants was established to compare three strains of rhizobium of the Universidad de San Marcos of Lima with three commercial imported brands; the same experiment will be established this year in other high jungle sites.

2. Experiment Station Tulumayo

The results of two experiments on agronomic practices conducted last year were not available at the time of writing the annual report of 1978. The following are the results of these experiments:

a. PK fertilization and Rhizobium Inoculation

As reported in 1978, this experiment consisted of a factorial arrangement of three levels of phosphorus (0, 50, 100 kg/ha P_2O_5), three levels of potassium (0, 30, 60 kg/ha K_2O) and three levels of inoculation applied to the seed (0, 200, 400 g/50 kg of seed).[1] A statistical analysis was made to determine the effect of the three factors and their interactions on yield and other growth traits. The analysis showed that phosphorus alone or in association with the other two factors did not have a significant effect on yield. Potassium and rhizobium had a significant effect on yield but the effect of one was dependent upon the effect of the other; low levels of inoculation tended to increase yield in the presence of high levels of potassium while high inoculation levels did better in combination with low potassium levels. The experiment will be repeated in 1979 in order to obtain more information on these interrelationships.

b. Sowing Methods and Plant Density

As explained in the 1978 report, this experiment was carried out to compare two methods of sowing - stick or tacarpo and row or cola de buey - with five plant densities namely, 166,600, 250,000, 333,300, 416,600 and 500,000 plants per hectare within each sowing method. A split plot design and cultivar Jupiter were used in this experiment. The preliminary results indicated that the two sowing methods performed about equally. A plant population of 333,300 plants per hectare produced higher yields but its difference with the other plant populations was not statistically significant. The same experiments will be planted again in June 1979.

The following experiments will be planted at Tulumayo during the growing season of 1979:

--Experiment ISVEX with 16 tropical cultivars provided by INTSOY

--Experiment SPOT with tropical cultivars provided by INTSOY

--Uniform Yield Experiment (UYE) with cultivars selected for yield performance in coast and jungle areas.

--Preliminary Yield Experiment with lines selected at Tulumayo Station in 1978 (see 1978 annual report)

--Experiment to compare the performance of three local soybean inoculants with three imported ones

--Experiment to compare PK fertilization in combination with rhizobium inoculation.

--Experiment to study two methods of sowing in combination with five plant populations.

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[1] Soybean inoculant URBANA from Urbana Laboratories, USA.

3. Experiment Substation Huarangopampa

In the Jaen/Bagua region the commercial soybean planting follows the rice planting. Experimental soybean plantings are also established following the experimental rice harvest. Two soybean experiments, one SPOT and one ISVEX were planted in September 1978 and harvested in January 1979. The experimental results, which were not included in the 1978 annual report, were as follows:

a. Soybean Preliminary Observation Trial (SPOT)

This experiment was the same carried out at El Porvenir Station during the second growing season of 1978. It comprised 11 cultivars compared with cultivar Jupiter. At Huarangopampa the yields of this experiment were extremely good. Cultivar Dowling was the lowest yielder with 2,400 kilograms per hectare, while cultivar Jupiter was the highest yielder with 4,600 kilograms per hectare. Cultivars IAC-734-13 and IAC-734085 from Brazil, which were good yielders at El Porvenir Station, also showed high yield potential at Huarangopampa. This trend indicates the possibility of adapting some Brazilian cultivars to commercial cultivation in the high jungle area of Peru.

b. International Soybean Variety Evaluation Experiment (ISVEX)

This experiment comprised 16 tropical cultivars and it was similar to the ISVEX trials planted in Tulumayo and El Porvenir in 1978. In Huarangopampa the experiment was harvested in January 1979. Cultivars Improved Pelican and Nacional were used as local checks. In spite of the supplementary irrigation provided, the yields obtained in this experiment were not as good as the ones of the SPOT experiment due in part to unfavorable soil conditions and in part to low yield potential of some cultivars. One of the lowest yielding cultivars was Nacional, the local check from Peru, with 1300 kilograms per hectare. The highest yielding cultivars were Bossier of US and Tumir from Colombia, with 2900 and 2800 kilograms per hectare respectively.

The experiments to be planted during the next growing season in September of 1979 include the following:

--Experiment ISVEX with 16 tropical cultivars provided by INTSOY

--Uniform Yield Experiment (UYE) with cultivars selected for yield performance in coast and jungle areas.

--Preliminary Yield Experiment with new soybean lines provided by the INTSOY Project

--Experiment to compare PK fertilization in combination with rhizobium inoculation.

--Experiment to compare the performance of local and imported soybean inoculants.

4. Experiment Substation Pichanaki

The lack of adequate experimental ground in this Substation makes it difficult to obtain reliable experimental data. An ISVEX trial planted in 1978 in a private farm was affected by drought and difficient weed control. In addition, the cultivars used were more adapted to temperate than to tropical conditions and their yield and plant growth were consequently poor. Cultivars Jupiter, Nacional and Improved Pelican used as local checks developed relatively good growth but yields were not satisfactory. Some of the less adapted cultivars yielded 700 kilograms per hectare and grew only from 14 to 20 centimeters in height.

In March 1979 another ISVEX comprising tropical cultivars was planted at this Substation. At the time of writing this report the experiment was two months old and the cultivars were going through the stage of pod filling.

An experiment on planting dates was also established in 1979, since there seems to be a confusion as to what should be the most appropriate planting period in the area. The observations so far recorded in this experiment indicate that plantings from mid-February to mid-March would stand a better chance of receiving sufficient rainfall to promote satisfactory plant growth and seed yield than earlier or later plantings.

5. Assistance to Soybean Programs in the Coastal Region.

Although the responsibility of the project concerns the high jungle area, a minor relationship has been developed with soybean programs of Experiment Stations in the coastal area such as La Molina in Lima, Vista Florida in Chiclayo and Sullana in Sullana. The interactions with these Stations have been mainly in terms of seed supply for experimental purposes. The coastal region has in turn provided some fresh seed for mid-year plantings in the selva area.

Report on Technology Transfer: Thomas M. Fullerton
Soybean Agronomist

GENERAL:

Technology transfer efforts were concentrated in Agrarian Regions VII, VIII and XI for the time period covered by this report. Principal activities included:

- Organization and participation in soybean workshops for sectoristas in Tarapoto, Satipo and Tingo Maria.
- Conducting farmer short courses in soybean production and field days in Tarapoto and Satipo.
- Establishment of 30 field demonstrations concerned with comparisons of soybean management procudures.
- Distribution of seed, Rhizobium and other materials to 40 production agents and sectoristas in support of on-farm demonstration programs.

All activities were carried out in collaboration with Ministry of Agriculture and Food (MAA) personnel. Preparations are currently in progress for similar projects in the Jaen/Bagua region.

ACTIVITIES TO DATE:

1. Workshops - Under the direction of production agents,[1] farmer contact with the MAA is maintained through sectoristas.[2] The sectorista has a variety of responsibilities including technology transfer. Regional soybean workshops for sectoristas were organized just prior to the planting seasons in Tarapoto (Feb. 20-22), Satipo (March 11-13) and Tingo Maria (April 24-26). A limited number of farmers were invited to attend each of the workshops.

   The main purpose of the workshops was to provide an opportunity for sectoristas to exchange information with respect to soybean production and related matters. Specific objectives were as follows:

   a. Define and assign priorities related to soya production and marketing; discuss solutions or alternatives to constraints which prevent achievement of goals established in the PIDES[3] plan of operation.

   b. Determine sources of information for the development of production guidelines for soybeans according to area conditions and producer circumstances.

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1 Ingenieros Agronomos

2 Técnicos Agropecuarios

3 Proyecto Integral de Desarrollo de la Soya

c. Review services offered by several government agencies in relation to the needs of soybean producers; improve coordination between the sector and these offices.

d. Discuss methods and materials necessary to conduct effective extension programs in the sector.

e. Establish demonstration plots as a means of becoming familiar with or testing new practices and as an exercise in preparation for producer short courses and field days.

The same format was followed in the three workshops. Briefly, a roundtable discussion involving sectoristas and farmers was held following initiation ceremonies. Topics covered included production practices, credit and costs, marketing and government services offered to producers. The discussion provided a basis for the development of questions during the second session for subsequent presentation to a panel of representatives from various offices of the agricultural sector.

Panelists were invited from the Agrarian Bank, EPSA,[1] the Agrarian Zone and regional experiment stations of INIA[2] for the third session. Other entities represented were SENAMA[3] (Tarapoto) and the experiment station of the Central National University of Peru (Satipo). It was common to have from two to four persons officially designated as panelists for each of the agencies involved. Most panelists choose to attend several sessions of a workshop.

Questions prepared for the panel reflected priorities of concern in a number of areas related to soybean production and marketing. The responsibilities of the entities represented were defined by panelists as well as the limitations they faced in carrying out these functions for the ensuing soybean campaign. Commitments were made during the workshops by INIA personnel to develop guidelines for soybean production and to sponsor field days for sectoristas.

Most sectoristas of the selva alta have had little experience with soya. On-farm demonstrations were recommended as an extension technique for the introduction of soya to farmers unfamiliar with this crop and to compare improved management practices with traditional procedures. Field plot exercises would also provide an opportunity for both sectoristas and producers to gain experience with soya. However, lack of funds for purchase of materials to conduct field work has prevented a serious effort of this nature.

Session four consisted of a discussion on appropriate methods and materials necessary to conduct an effective extension soybean program. The use of field demonstrations was emphasized in the discussion. A list of suggested demonstrations in soybean management together with field plans and instructions were distributed. Materials including

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[1] Empresa Pública de Servicios Agropecuarios

[2] Instituto Nacional de Investigacion Agropecuaria

[3] Servicio Nacional de Maquinaria

units of ten 1 kg packages of seed, 225 g of Rhizobium, a "touch-on" herbicide applicator, herbicides and other items for the development of demonstration programs on return to the sector were also distributed.

The establishment of demonstration plots was scheduled for the last day of the workshops. Other activities were carried out in Satipo and Tingo Maria due to rain. In Tarapoto, ten demonstrations were seeded by sectoristas and producers in order to observe differences in soybean management related to fertilizer use, seed inoculation (2), seed treatment with fungicide, methods of seeding, seed depth, plant population, weed control (2) and varieties.

The same demonstrations were later planted in Satipo and Tingo María following an improvement in weather conditions. In each of the three locations, sectoristas and producers were instructed in the use of Rhizobium, herbicide application, methods of seeding and other techniques.

The workshops were considered a success. Generally, each of the objectives listed above were accomplished. Ministry efforts to promote soybean production in the high selva were publicized through attendance of farmers and the various agency officials as well as radio broadcasts and newspaper articles generated as a result of the meetings. Most important, participants were better prepared to advise producers on both technical and commercial aspects of soybean production on return to the sector.

2. Short courses/Field days - Combination short courses and field days for producers were organized in Tarapoto (May 9-10) and Satipo (May 30-31). The first day of the meetings was utilized for lectures on soybean cultural procedures, plant protection and other topics. Demonstration plots established during the workshops were toured the following morning. Seed treatment with Rhizobium and a fungicide, herbicide application techniques and methods of seeding were demonstrated for farmers as a part of the field activities.

   Ingenieros Agrónomos from the Agrarian Zones and INIA served as lecturers for the short courses. Members of the INTSOY Project also presented lectures. Attendance was good both in Tarapoto and Satipo. Farmer interest was reflected through strong participation in discussions and question/answer sessions following lectures and in the field.

   Several agrarian region, agrarian zone, production agency and experiment station directors of areas where the workshops and short courses/field days were held participated in all or part of these events. Much of the success of the meetings can be attributed to the enthusiasm and support extended by these officials. Excellent cooperation was received from the AID project manager and national soybean program coordinators in organizing both the workshops and short courses/field days.

3. MISCELLANEOUS - Literature on production and utilization of soybeans was provided to COPERHOLTA, the Swiss Technical Cooperation Program, the North Carolina State University/AID Tropical Soils Project, the

Agrarian Bank of Satipo, the Technical Communication Departments of Agrarian Region VIII and the Ministry in Lima, Instituto Peruano de Fomento Educative (IPFE) and the Centro de Investigación y Promoción Popular (CENDIPP).

Photography in soybean fields was continued over the past semester. A large number of slides were loaned for duplication to Mr. Fred Van Sluys, Rural Sociologist, in support of COPERHOLTA extension efforts in the Huallaga Valley. A seminar on weed control in soybeans was presented at the request of Mr. Ben Mensink of COPERHOLTA for Ministry personnel involved in soybean production through the Model Farms Program. A cooperative project to demonstrate herbicide application methods has been initiated.

A slide series and recorded text with change signals and music background on soybean production was developed with Ing. Oswaldo Sáenz of the Technical Communications Department of Agrarian Region VIII. The series was shown continuously during the Region VIII Agricultural Fair in Huancayo. Photographic paper was also provided. Large black and white photos of soya plants in various growth stages taken by Sr. León Piña were displayed. The soya exhibit was one of several highlights of the fair featured on national television (Channel 7 - Peru Vision). The slide series has also been used for producer meetings in Pichinaki and Satipo. The slides and other exhibit materials are programmed for use in agrarian fairs of the selva.

Several Agrarian Bank representatives attended most sessions of the workshop in Satipo. Subsequently, literature was made available to the bank at the request of these officials. A seminar on soybean culture was presented for the director and agronomists of the bank. Ing. Antonino Lermo, Production Agent of Satipo, developed production costs with bank personnel. A total of eight soybean loans had been extended to small farmers by late May as compared to one for the previous growing season.

A radio campaign for the promotion of soybeans was conducted in Satipo. Brief announcements on soybean management tips, home utilization and nutrition of soybeans and ministry services available to soybean producers were developed with Ing. Lermo. Each topic was broadcast three times daily over a two week period of time. Response to the announcements was reflected through a large number of farmer requests for seed from the Satipo Production Agency which was unavailable.

An interview on the soybean project was taped in Tarapoto. It was broadcast as a part of programs called "Agropecuario" and "Agroimagen" of Radio Tropical in early May.

Participated with Ing. Darío Maldonado of the El Porvenir Experiment Station (Tarapoto) in the design and establishment of a field experiment on weed control. The test involved minimal rates of Roundup (glyphosate) for control or inhibition of nutsedge (cyperus rotundus L.). Ground cover by the weed was permitted to develop after soil preparation. Soybeans were seeded following application of the herbicide. The test was confounded through late germination of the soybeans resulting from inadequate soil moisture. Harvest is currently in progress.

Continued support was extended to both research and production agronomists of the soybean program throughout the high selva in acquiring seed, agricultural chemicals, replacement parts and other supplies and in matters related to seed conservation and problem soils. Several meetings and discussions were held with the AID project manager, the national soybean coordinators and representatives of government and private groups regarding appropriate equipment for small soybean farmers.

PROJECT EVALUATION ACTIVITIES:

Long-term and immediate objectives of the AID/MAA soybean project are presented annually in the form of an operational plan by the national soybean coordinators. Production and research activities, personnel lists, equipment purchases and distribution, financing and other aspects of the program are also described in the plan. INTSOY technicians participate with both Lima and selva counterparts in the development of project plans. Suggested modifications of the final draft of the plan were prepared for the AID project manager.

Information concerning progress or problems encountered by agronomists of the program in achieving goals is obtained continuously through frequent visits to the selva. The information is made available to the project manager and national coordinators for project evaluation purposes.

TRAINING:

Lectures on weed control and technology transfer were presented in the workshops and short courses described above. Training was also extended through direct participation with Ing. Agronomos, sectoristas and producers in the establishment and subsequent evaluation of research and demonstration plots. Cooperated with the AID project manager and national soybean coordinators in candidate selection and other functions related to international training.

PROJECTED ACTIVITIES:

A regional soybean workshop for sectoristas will be held in Jaen during the last week of July. Producer short courses and field days are tentatively scheduled for August and October in Tingo María and Jaen, respectively. Considerable information on soybean production and related aspects has been collected to date during workshops through questionnaires and panel discussions. The information will be condensed and interpreted over the coming months.

Participation with research counterparts of Tingo María and Huarangopampas in weed control are projected during the respective planting seasons. A continued advisory role is anticipated for project personnel involved in seed conservation and problem soils studies.

Production agents of the soybean project will be encouraged to conduct extension meetings similar to those described above through better coordination and support from Lima. Technology transfer materials will be provided to these agents as they are developed. Supplies such as fertilizers and herbicides will also be made available to agents in support of field efforts.

Report on Soybean Food Processing: Alvin Siegel
Food Scientist

Introduction

In accordance with the Project Agreement between the Agency for International Development (AID) and the Ministry of Agriculture and Food, Peru, a program for soybean processing is underway as part of the project activity entitled "Soy and Corn Production on Small Farms."

The soybean processing activities address the development and promotion of soybeans as a food source. Soybean utilization is concentrating on the development of three soy food products, namely, a soybean beverage (soy milk), and soy-fortified popular bread and noodles. These activities are based at the Instituto de Investigaciones Agro-Industriales (IIA), (Institute of Agro-Industrial Research), La Molina.

Activities

The soybean utilization program during this period is in continued support of the industrial processing of soybeans for both new product development (soy milk) and for use in popular food items (bread and noodles containing soy flour). Soybean utilization for home use, a small part of this soybean program, dealt with the finalization of the Soybean Recipe Book.

Industrial Soybean Processing and Utilization

1. Soy Milk

Research on the preparation of a soy milk product is following the earlier-developed IIA pilot-scale process (batch). Whole, cleaned, dehulled soybeans are coarsely ground, steam exhausted, steeped in water, and finely ground in a colloidal mill. Further homogenization produces a milk-type product.

Related work has concentrated on product improvement using small process modifications. In addition, as a continuation and extension to soy milk research activities, work has been initiated on the preparation of powdered soy milk. The powdered product (spray-dried) is prepared from liquid soy milk, previously made using the basic IIA method. Soy milk powder will be evaluated chemically, physically, and organoleptically. Reconstituted samples will be prepared from both 100% soy milk powder and a 50/50 blend of soy powder with skim milk powder. The proximate analysis for an initial soy powder sample was as follows: moisture, 3.1%, protein, 32.5%; fat, 22.8%; ash, 8.1%; fiber, 2.4%; and carbohydrate (by difference), 31.1%.

2. Soy Flour

The commercial processing of soy flour has continued (trial runs) at a local cereal processing company. This soy flour (full fat) is subsequently being used in the preparation of soy-fortified popular bread and noodles.

a) Bread

Preliminary trials were completed for the preparation of soy bread at substitution levels of 5, 10, and 15% full-fat soy flour for wheat flour. Testing parameters involved bread preparation methods (direct vs re-mix), sugar and fat levels, water absorption, and kneading. Popular Peruvian bread (pan labranza) was prepared in all tests.

The re-mix method, in which sugar is added in two fermentation stages, was found to be better than the direct one. Fat content in soy bread can be reduced from 3 to 2% without affecting bread volume. Bread volumes decreased with increasing levels of soy flour; whereas, water absorption levels increased. This latter finding resulted in a higher bread yield.

Sensory analysis (taste panel) results of the bread samples indicated that all samples had a regular flavor, normal aroma and color, and a slightly hard texture as compared to regular bread (control: 100% wheat flour). Overall, the 10% soy flour bread was not appreciably different from the control product.

Further studies are being conducted on the volume, yield, water absorption, bread preparation procedure, and acceptability of soy-fortified bread. Bread containing 12.5% soy flour will be investigated.

b) Noodles

Soy-fortified noodles were prepared at a local noodle company. These samples contained 10 and 15% full-fat soy flour substituted for wheat flour. Also, samples were prepared containing these same levels of soy flour with an addition of wheat gluten calculated at the protein substitution level.

Water absorption studies indicated that there was an increase in noodle volume with an increase in soy flour levels. In addition, the glutinated soy-fortified noodles absorbed more water than the soy noodles which did not contain added gluten. The effect of added gluten was illustrated in the analyses for total solids (%) remaining in the cooking water, i.e., this amount was a little less (1%) than that for non-glutinated ones.

The texture of the glutinated soy noodles was judged to be somewhat better than non-glutinated soy noodles. Overall, all soy-fortified noodles were rated relatively equal to the control (100% wheat) samples with the 15% glutinated soy noodles being judged the best.

In another study, noodles were prepared containing 15, 20 and 25% full fat soy flour, with and without added gluten. All chemical, physical, and organoleptic analyses have not been completed by the preparation time of this report.

However, in reference to nutrient content, the protein content (dry product basis) for the control (100% wheat), 15% soy-fortified, 20% soy-fortified, and 25% soy-fortified products were 11.5%, 15.7%, 16.6% and 17.4%, respectively. This illustrated an increase in protein content ranging from 35 to 50% as directly related to soy flour fortification. Moisture levels for all products averaged 10.6%. Fat content ranged from 0.7% in the control noodles to 4.4% in the 25% soy noodles. The content of fiber was less than 1.0% for all samples.

Continued soy-noodle development is planned at the industrial level. The introduction of soy-fortified noodles into the commercial market is anticipated for this year.

2. In-Home Soybean Processing and Utilization

Limited work on the in-home use of soybeans was done during this reporting period. The draft of a Soybean Recipe Book containing approximately 80 recipes was prepared. Accordingly, a final edited manuscript has been completed and it is in the process of being printed. The first printing will be 5,000 copies, jointly funded by the INTSOY (USAID contract project), Cereales S. A. (cereal processing company), and Nicolini Bros. (flour mill and noodle company).

There has been an increased interest in promoting the home preparation of soybeans, as indicated by several visits to IIA by individuals with government and private affiliations. Accordingly, a Workshop-Demonstration course is being planned for this July. Ten (10) people will be invited to attend at IIA a four (4) day program on the home preparation of soybeans. A cross-section of people from Ministry and private organizations will be represented. Various recipes covering main dishes, desserts, and soy milk will be included.

Other Activities

- A motor and telescoping drive have been ordered for the Brady Cooker/Extruder. The extruder will be used for preparing pre-cooked full-fat soy flour for use in bread and noodle fortification.

- The author participated in the Second International Low-Cost Extrusion Cooker (LEC) Workshop which was held in Dar es Salaam, January 15-18, 1979. Principles of LEC systems, indicative of intermediate technology were overviewed.

- A visit was made to the Tropical Products Institute (TPI), London, to discuss appropriate technology research for new nutritious foods.

Conclusion

Soybean processing and utilization activities have a continued focus on the industrial development of a soy beverage and soy-fortified bread and noodle products for the commercial market. These activities are enhanced by promoting the in-home utilization of soybeans. The commercial development of soybean foods is geared to the ultimate goal of establishing three small-scale processing lines for market (pilot) production. Product acceptability will be based on flavor, texture, nutritional qualities, and the product's relation to the Peruvian diet.

Report on Soybean Production Economics: Alfred G. Harms
Production Economist

1. General

During the period covered by this report the Production Economist continued with the activities which had been initiated during 1978 concerning the collection and analysis of information of the cost of production and labor used in the production of soybeans. Data for the second cropping season of 1978 were analyzed and the results reproduced for use in soybean production training programs, as guides for 1979 budgets, as guides for loan limits in the credit programs of the lending agencies, and to help establish realistic price levels by the GOP for soybean purchases by EPSA for the soybeans offered for sale by the farmers.

Plans were made to broaden the study to all soybean production areas in the soybean project in 1979 and to increase the number of participating farmers to provide a larger and firmer base of cost and labor use data.

A study of the purchases of soybeans by EPSA was initiated and a preliminary analysis was carried out to provide information that will be useful in the improvement of grade standards and schedule of discounts and premiums to bring about a more equitable marketing system for both producers and processors.

Further attention has been given to the problem of providing soybean threshers of small capacity.

Trips were made to all production areas of the project to make observations, collect data, and to widen the scope of the cost of production and labor use study.

2. Cost of Production and Labor Use Study

Although the number of farmers who recorded cost and labor use information was disappointing, a good base of data was collected and analyzed for the second cropping season of 1978. Three levels of mechanization are presented in Tables Nos. 1, 2, and 3. The wide variations between farms in the sample for costs and labor use tend to obscure the cost differences that might be expected between the different levels of mechanization.

As expected, the lowest average cost per hectare, S/.41,427, was for the group of farms that were the most mechanized. On these farms the preparation of the soil, the planting, and the threshing was done by machine. The greatest saving of this group of farms was in the planting operation where the use of a planter costing S/. 1104 replaced the manual planting of the other two groups, 22 and 33 days, which cost S/. 6275 and S/. 8175 respectively.

The second lowest average cost per hectare, S/. 47,273, was for the group of farms operated in the more traditional manner. All major operations were done manually except the threshing on the farm with the lowest yield. The use of the thresher on this farm did not involve a very high expenditure because the yield was only 500 kgs per hectare but the low yield reduced the number of man days expended in the threshing operation. On the other farm both herbicide and insecticide were used which reduced the amount of labor needed for weeding and no doubt helped to produce the highest yield recorded, 1800 kgs per hectare.

The highest average cost per hectare, S/. 66,227, was for the group of farms with intermediate technology. In this group soil preparation and the threshing were done mechanically. This group of farms consistently used more labor in the operations than the other two groups. It is not entirely clear why this occurred but the data show the labor use was especially high on the two irrigated rice farms where the soybeans were planted following the rice crop in the primary season. The weed problems were much greater on these farms than on other farms where the soybeans were planted on fields that were unirrigated and in a non-rice rotation or the soybeans were the first crop following pasture or bush.

There are two reservations of these reports that should be kept in mind. First, although the costs of hiring tractors and machines are those actually reported by the farmers, they tend to be subsidized because in all but one instance the machinery was furnished by the Ministry, SENAMA, or COPERHOLTA and the rates do not reflect the total costs involved. The one farmer who had his own tractor reported a rate of S/.2500 per hour which was about two and one-half time greater than rates for similar equipment furnished by the other sources. Additional information indicates another farmer charging S/.2800 per hour for tractor and plow or harrow. If the available equipment is to be maintained and new equipment is to be introduced the custom rates will have to be adjusted to cover actual costs.

Second, in these cost calculations the administrative costs or overhead was based on the standard used by the Ministry staff, 8% of direct costs. This percentage has been challenged as being inadequate to cover the overhead costs of maintaining the farm and supporting structures and other costs of the management function. Plans have been made to research this matter in the present year of operations.

Table No. 4 presents a budget of estimated cost of production of soybeans in the Selva area for the primary cropping season, 1979. The coefficients of production are based on the information gained from the 1978 study and the costs used are those current in the market. With an estimated average yield of 1300 kgs per hectare the average cost per kg is S/. 51.87 resulting in a per hectare profit of S/. 17,073 based on the current purchase price of S/. 65 per kg by EPSA. This is a rate of return on the investment of 25.3%. Whether this is a sufficient return (incentive) to call forth a rapid expansion of soybean acreage will be discussed later.

The labor requirements of soybean production are presented in Table No. 5. As in the case of costs there is a very wide variation in the use of labor reported by the farmers. Data from COPERHOLTA were incorporated with the study farms data in this grouping. The important aspect to be noted from this information is the amount of labor used as compared with the labor requirements, which ran from 60-90 man days depending on the level of mechanization, that have been estimated in most budgets prepared by production extension workers in the Ministry.

The management implication for the soybean project that stands out in these reports is the need to develop and transfer to the farmers new technologies that will reduce labor use and also result in higher yields. Increased machinery use, especially planters and threshers, when possible is one answer but probably more significant is the use of herbicides, with innovative methods and reduced costs, to control weeds plus timely and efficient work methods in all phases of production.

3. Paper Prepared on "Soybean Production in Peru"

The paper was prepared for two purposes. Firstly, to look at the changes in acreage and production of soybeans over the past several years and to examine the imports of soybeans and soybean products in relation to domestic production and to the production of competing products. Secondly, in response to a request of Ing. Villamonte, National Coordinator for Soybean Production, to look at the costs of production of soybeans in relation to the prices established by the GOP for purchases by EPSA and the role these price levels play as incentives for the rapid expansion of soybean production.

It is interesting to note that the national expansion of acreage and production in 1978 took place primarily in the areas of emphasis in the soybean project, mainly the Bagua-Jaen area.

Examination of the statistics of oil and meal production, imports, and use indicate the opportunity available to soybeans for expansion to supply an increasing share of the demand for these products.

The most important incentives for the rapid expansion of soybean production are: the providing of extension programs for the education and training of the farmers, the providing of physical resources to aid production, the providing 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.

Examination of the cost data for 1978 indicate that a price level 40% above the average cost of production would cover the actual costs of about 90% of the producers. A price level of 30% above the average cost would cover about 80% of the producers. It was recommended that a purchase price of 30-50% above the estimated cost be established to encourage increased production. Actually, the present purchase price of S/. 65 per kg. is a little over 25% above the estimated average cost of production as developed in the budget.

4. Analysis of Soybean Purchases by EPSA

The purpose of this study is to gain a better understanding of the condition of the soybeans purchased by EPSA with respect to the moisture levels and percentage of impurities or foreign material in the lots. Information of this type will provide the basis for future adjustments of the discount schedule to provide an equitable settlement for both farmers and processors.

The results of the preliminary analysis of the data collected from EPSA in Tarapoto, Tingo Maria, Bagua and Jaen is shown in Table 6.

Purchases at Tarapoto and Tingo Maria reflect the greater rainfall and relative humidity prevailing in these areas. Almost all of the lots purchased were in the 14-16% range in moisture levels. Unfortunately, no record was kept of the lots turned down because of moisture levels higher than 16%. In the Bagua-Jaen area, which is semi-arid and partially irrigated, the highest moisture level was 15%, the lowest 8%, with the bulk in the 10-13% range.

In the matter of percent of impurities the picture is not so clear. The data show some lots in the Bagua-Jaen area with impurities up to 8%, but this is the result of buying differences. In Tarapoto and Tingo Maria lots above 6% were turned down for further cleaning but lots with up to 8% were purchased in Bagua-Jaen.

The information regarding the weight of purchases probably indicates that size of farm and extent of soybean acreage per farm is greater in the Bagua-Jaen area. The percentage of weight discounted for moisture and impurities was almost double in Tarapoto and Tingo Maria as compared to Bagua-Jaen.

According to "Dictan Reglamento de Comercializacion de Los Grenos Oleaginosos de Produccion Nacional", Resolucion Ministerial No. 0482-77 AL, dated 18 May 1977, the moisture limit for the purchase of soybeans is 16% with a weight discount of 1% for each percent above 14%. For impurities the limit is 6% with a weight discount of .5% for each one half percent above 4%.

The above schedule of limits and discounts was in effect in the Tarapoto and Tingo Maria areas but in Bagua and Jaen soybeans with more than 12% moisture were discounted at the rate of 1/2% per 1/2% of moisture at least up to 15% moisture as indicated in the data. For impurities the discount was the same but soybean lots were purchased up to the 8% level. At the present time the reasons for the divergence from the limits set by the regulations is not known. From a practical standpoint a few lots of soybeans with higher levels of impurities could be blended with other lots without problem. On the other hand, high moisture beans, even though blended with lower moisture beans, will spoil. The 16% moisture limit is probably too high for more than a very short time storage of soybeans especially in areas of high temperatures and relative humidities.

A more fundamental concern is the purchase of a large proportion of the soybeans with moisture levels less than 12% without a corresponding premium in price. This is a direct loss to the producer because of loss in weight due to the lower percentage of moisture and a direct gain to the processors in greater output of oil and meal.

It is planned to continue this area of study with 1979 data in order to gain a broader base of information for making recommendations in regard to the adjustments of grades and discounts to a more equitable basis. See Appendix "C", Report prepared by Paul H. Klinefelter, Consultant for Soybean Processing and Utilization, December 1978.

5. Bank Credit for Soybean Production

Soybean producers are still facing difficulty in obtaining credit and if available, sufficient funds to cover costs of production. This condition is especially prevalent in the Tarapoto area but is also present in the Bagua-Jaen area. The officials of the Banco Agrario are not enthusiastic about soybean production. One official reported that they did not have funds for experiments!

The early use of the special fund for the promotion of oilseed production in Peru with the concessional interest rate of 18% is urgently needed to speed the expansion of soybean production.

6. Development of Soybean Thresher

The soybean project still is in need of threshers to aid production. The results of the testing of the intermediate size thresher which was constructed at Tingo Maria were not as satisfactory as hoped. It is planned to equip the thresher with V-Belts and pulleys and mount a small gas engine (5-7hp) as an integral part of the machine. Also the cleaning screen needs additional holes to allow the soybeans to drop through and may need to have the shaking action diminished to lessen the amount of beans thrown over the rear end. These changes will allow the thresher to be ready for the harvest season during August-October.

Additional efforts are being made to produce a small manually operated thresher based on a design from the U.S., which has been out of production for 10-15 years. INDEME is preparing a bid for local construction.

In this connection, Mr. Donald Kuether, Agricultural Engineer, IRRI, who visited Peru regarding the manufacture and use of the portable thresher, designed in IRRI, was consulted. He feels that it may be possible to adapt this model for use in soybeans by changing the concave and cylinder somewhat. This model is powered by a 5 hp gas engine.

7. Official Visitors

During the period three official visitor-consultants visited Tarapoto for observations and talks.

Dr. W. N. Thompson, Director INTSOY, visited in early January for discussions on work plans and progress of the projects. Local Ministry officials were contacted and soybean production fields were visited.

In March, Dr. Mike Irwin, Consultant in Integrated Pest Management, visited Tarapoto to arrange for his program on pest control.

Dr. Owen Carter, Soybean Agronomist, Hawkesbury Agricultural College, Richmond, Australia visited in April. Conferred with him on costs of soybean production and problems connected with the expansion of production in the Tarapoto area.

8. Farmers Short Course

Participated in the short course for producers of soybeans in Tarapoto, May 8 and 9, with a presentation and discussion of costs of producing soybeans and labor use.

TABLE No. 1: Cost of Production of Soy per Hectare, 1978
Land Preparation and Mechanical Threshing,
Tarapoto (4 farms)

Direct Costs	Average	Highest	Lowest
1. Land Preparation			
Machinery	S/ 7,171.	S/ 11,500.	S/ 4,920.
Hand labor*(4 work days)	938.	(15) 3,750.	(o)
2. Seeding			
Seed	3,075.	3,360.	2,100.
Hand labor (33 work days)	8,175.	(58)14,500.	(40) 9,000.
3. Weeding			
First (41 work days)	10,700.	(80)20,000.	(20) 4,500.
Second (32 work days)	8,438.	(68)17,000.	(10) 2,250.
Herbicide	438.		
Application (1 work day)	150.		
4. Harvesting			
Threshing (56 work days)	14,525.	(100) 25,000.	(24) 5,400.
--Threshing (machinery)	1,523.	1,500.	1,600.
--Sacks	769.	455.	1,120.
--Transportation	865.	800.	960.
Total Direct Costs	56,767.	97,865.	31,850.
Total work days	(167)	(321)	(94)
Indirect Costs			
5. Administrative Costs (8% of D.C.)	4,541.	7,829.	2,548.
6. Interest (26% of D.C., 4 months)	4,920.	8,482.	2,760.
Total Indirect Costs	9,461.	16,311.	5,308.
Total Costs	66,227.	114,176.	37,158.
Yield (kgs.)	1,522.	1,500.	1,600.
Unit Costs	43.51	76.12	23.22
EPSA Price	50.	50.	50.
Profit per kg.	6.49	-26.12	16.78
Profit per ha.	S/ 9,873.	S/ 39,176.	S/ 42,848.

* Cost of family hand labor valued at cost of contract labor

TABLE No. 2: Costs of Production of Soy per Hectare, 1978
Land Preparation, Seeding and Mechanical Threshing

Huallaga Central (4 farms)

Direct Costs		Average		Highest		Lowest
1. Land Preparation						
Machinery	S/	6,494.	S/	4,100	S/	7,500.
2. Seeding						
Seed		4,768.		4,000.		3,750.
Machine		1,104.		492.		1,125.
Hand labor * (2 work days)		500.	(5)	1,500.	(2)	500.
3. Weeding						
Hand labor (34 work days)		9,200.	(62)	18,600.	(18)	4,450.
4. Phytosanitary control						
SEVIN		550.				200.
Aplicacion (1 work day)		312.			(1)	250.
5. Harvesting						
Threshing (32 work days)		8,825.	(71)	21,300	(20)	5,000.
Threshing (machinery)		1,777.		1,925.		2,750.
Transportation		1,979.		1,925.		2,750.
Total direct costs		35,509.		53,842.		28,275.
Total work days		(69)		(138)		(41)
Indirect Costs						
6. Administrative Costs (8% of D.C.)		2,841.		4,307.		2,262.
7. Interest (26% of D.C., 4 months)		3,077.		4,666.		2,450.
Total Indirect Costs		5,918.		8,973.		4,712.
Total Costs		41,427.		62,815.		32,987.
Yield (kgs.)		1,070.		1,283.		1,375.
Unit Costs		38.72		48.96		23.99
EPSA Price		50.		50.		50.
Profit per kg.		11.28		1.04		26.01
Profit per ha.	S/	12,073.	S/	1,335.	S/	35,763.

*Cost of family hand labor valued at cost of contract labor

TABLE No. 3: Cost of Production of Soy per Hectare, 1978, Traditional

Tarapoto and Tocache
(2 farms)

Direct Costs	Average		Highest		Lowest
1. Land Preparation * (25 work days)	S/ 7,250.	(20)	S/ 7,000.	(30)	S/ 7,500.
2. Seeding					
Seed	2,300.		1,950.		2,650.
Hand labor (20 work days)	6,000.	(20)	7,000.	(20)	5,000.
3. Weeding					
Hand labor (22 work days)	6,275.	(18)	6,300.	(25)	6,250.
Herbicide (24 D)	1,000		2,000.		----
Application (2 work days)	525.	(3)	1,050.		----
4. Phytosanitary control					
SEVIN	800.		1,600.		----
Application (1 work day)	350.	(2)	700.		----
5. Harvesting					
Threshing (41 work days)	12,700.	(49)	17,150.	(33)	8,250.
Threshing (machinery)	250.		----		500.
Sacks	520.		400.		640.
Transportation	2,550.		3,600.		1,500.
Total Direct Costs	40,520.		48,750.		32,290.
Total Work Days	111		112		108
Indirect Costs					
6. Administrative Costs (8% of D.C.)	3,241.		3,900.		2,583.
7. Interest (26% of D.C., 4 months)	3,512.		4,225.		2,798.
Total Indirect Costs	6,753.		8,125.		5,318.
Total Costs	47,273.		56,875.		37,671.
Yield (kgs.)	1,150.		1,800.		500.
Unit Costs	41.10		31.60		75.34
EPSA Price	50.		50.		50.
Profit per kg.	8.90		18.40		25.34
Profit per hectare	S/ 10,227.		S/33,125.		S/ 12,671.

* Cost of family hand labor valued at cost of contract labor

TABLE No. 4: Estimated Costs of Production of Soy per Hectare
Area of the Selva, New Land, 1979

Direct Costs	Unit	Quantity	Unit Value	Total
--Hand labor *	Work day	118	S/ 300.	S/ 35,400.
--Machinery	Hour	7	1,050.	7,350.
--Seed	Kg.	60	70.	4,200.
--NITRAGIN	Log	1	2,120.	2,120.
--DIPTREX	Kg.	1	2,550.	2,550.
--Threshing	Kg.	1,300	2.	2,600.
--Transportation	Kg.	1,300	2.	2,600.
Total Direct Costs				56,820.
Indirect Costs				
-- Administrative Costs (8% of D.C.)				4,546.
-- Interest (30% of D.C., 4 months)				6,061.
Total Indirect Costs				10,607.
Total Costs				S/ 67,427.
--Yield (estimated Kgs.)				1,300.
--Unit Cost				51.87
--Price paid by EPSA				65.
--Profit per Kg.				13.13
--Profit per Ha.				S/ 17.073

* Cost of family hand labor valued at cost of contract labor

TABLE No. 5: Summary of the Use of Hand Labor per Hectare in Production of Soy, 1978 (14 farms)

	Work Days		
Operation	Average	Highest	Lowest
--Seeding	23	14	2
--Weeding	44	81	18
--Applications	6	2	1
--Hand Harvesting	30	30	10
--Threshing	11	34	10
--Other	4	--	--
Total	118	161	41

TABLE No. 6: COMPARISON OF SOYBEAN PURCHASES MADE BY EPSA AT FOUR LOCATION; PERCENT MOISTURE, PERCENT IMPURITIES, WEIGHT OF PURCHASES AND DISCOUNTS

	TARAPOTO		TINGO MARIA		BAGUA		JAEN		TOTAL	
Percent Moisture	No.	%	No.	%	No.	%	No.	%	No.	%
7.1 - 8							1	-	1	-
8.1 - 9							13	6	13	2
9.1 - 10							36	17	36	7
10.1 - 11							45	21	45	8
11.1 - 12	1	1			122	78	53	25	176	33
12.1 - 13					28	18	50	23	78	14
13.1 - 14	65	43	1	5	5	3	14	7	85	16
14.1 - 15	37	25	2	11	1	1	2	1	42	8
15.1 - 16	47	31	16	84					63	12
TOTAL	150	100	19	100	156	100	214	100	539	100
Percent Impurities										
1% or less	4	3			2	1			6	1
1.1 - 2	8	5			14	9	3	1	25	5
2.1 - 3	27	18	2	11	74	47	33	15	136	25
3.1 - 4	50	33			44	28	125	59	219	40
4.1 - 5	21	14	5	26	14	9	39	18	79	15
5.1 - 6	40	27	12	63	1	1	10	5	63	12
6.1 - 7					3	2	3	1	6	1
7.1 - 8					4	3	1	1	5	1
TOTAL	150	100	19	100	156	100	214	100	539	100
Weight of Purchases (Kg)										
100 or less	27	19			1	1	1	1	29	5
101 - 500	66	44	4	21	8	5	35	16	113	21
501 - 1000	38	25	3	16	10	6	49	23	100	19
1001 - 2000	13	8	6	32	28	18	52	24	99	18
2001 - 3000	6	4	3	16	31	20	37	17	77	14
3001 - 4000			2	11	36	23	13	6	51	10
4001 - 5000					8	5	13	6	21	4
5001 - 6000					5	3	6	3	11	2
6001 - 7000					4	3	5	2	9	2
7001 - 8000					6	4	1	1	7	1
8001 - 9000					1	1	1	1	2	-
9001 -10,000			1	5	3	2			4	1
10,001 -15,000					9	6	1	1	10	2
Over 15,000					6	4			6	1
TOTAL	150	100	19	101	156	101	214	101	539	100
Purchases (Kgs)										
Gross Weight	77,039		35,555		631,415		406,195		1'150,204	
Discount for Moisture	755	1.0	467	1.3	1,403	.2	1,751	.4	4,376	.4
Discount for Impurities	850	1.0	268	.8	2,050	.3	1,643	.4	4,811	.4
Discount for Sacks	260	.4			4,871	.8	1,651	.4	6,782	.6
TOTAL DISCOUNTS	1,865	2.4	735	2.1	8,324	1.3	5,045	1.2	15,969	1.4
NET WEIGHT	75,174	97.6	34,820	97.9	623,091	98.7	401,150	98.8	1'134,235	98.6

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