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Soybean Production on Small Farms of Peru

Fourth Interim Report
of Agency for International Development Contract

LA-C-1206



International Soybean Program

INTSOY

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COLLEGE OF AGRICULTURE
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

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SOYBEAN PRODUCTION ON SMALL FARMS OF PERU

Fourth Interim Report of Progress

July 1 - December 31, 1979

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

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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
International Soybean Program (INTSOY)
University of Illinois at Urbana-Champaign
113 Mumford Hall
Urbana, Illinois 61801
3. Contract Period: November 11, 1977 - November 10, 1979
4. Period Covered by Report: July 1, 1979 - December 31, 1979
5. Total AID Funding of Contract to Date: \$497,364
6. Total Expenditures to Date: \$576,008
7. Total Expenditures for Report Period: \$121,246

B. Narrative Summary of Accomplishments

Action plans were developed for the research, production and utilization activities in 1980. In 1979 it is estimated that approximately 5,900 metric tons of soybeans were produced on about 3,950 hectares. For 1980 cultivation and yield targets are 6,600 hectares and 9,900 metric tons respectively.

Soybean research studies are being conducted at four areas in the high selva (Tarapoto, Tingo Maria, Satipo and Bagua) with satisfactory progress. A total of 700 breeding lines have been studied in Tarapoto over the life of the project, from which 68 appear to be potential high yielders. A hybridization program is underway to combine characteristics of different varieties and to generate new materials for testing in succeeding growing seasons. A new variety has been identified at Tingo Maria, with resistance to Cercospora leaf spot, to replace variety Jupiter, the commercial variety of the region which is highly susceptible to the disease. Experiments in the use of rhizobium inoculants have resulted in increased yields of up to 100 percent when properly inoculated soybeans were planted in rhizobium-free soils.

Project activities in extension have improved considerably over the past two years. Production agents and sectoristas have received short-term training both in soya management procedures and extension techniques. Project personnel located in the high selva are able to function more efficiently through increased direction and support from Lima offices. Literature on soya production and materials to conduct on-farm demonstrations have been provided.

Extension personnel are currently better informed on technical aspects of production as well as matters relating to marketing and bank loans. Cooperative projects were carried out with researchers of the CRIA system in each region during 1979. Ings. and sectoristas met with representatives of the Agrarian Bank, EPSA and officials of other agricultural sectors in meetings organized just prior to the soya campaign in each of the project regions.

Efforts to increase effectiveness and coordination in technology transfer will continue during 1980. Emphasis will be placed on development of extension materials to support project activities in the coming months. It is considered that a well established network for soybean extension will result in continued expansion of the crop in Peru.

Utilization work has focused on the development of a soy beverage (milk replacer) and soy-fortified popular Peruvian bread and noodles. Formulations and processes for bread and noodles have been tested at two bakeries (Tarapoto) and one noodle company (Lima). A process for preparing a liquid and powdered soy beverage is being finalized.

During the course of the project, industrial processing of soybeans has greatly increased as illustrated in the processing of soy flour at a Lima cereals company (25 MT in 1978 compared to 350 MT in 1979) and the establishment of at least five smaller private companies which are processing soybeans into soy beverages, flours, coffee, cheese, and toasted snacks. A most important aspect of soybean processing and utilization activities has been the continued contact with various private food companies desiring to enter the soybean processing area.

Activities at IIA have increased in support of soybean processing as evidenced by the inclusion of soybeans in appropriate applied research programs. Soy/cereal blends are to be prepared at IIA for use in government feeding programs.

Direct contact with potential consumers of soybeans has been maintained through participation in demonstrations for the home-use of soybeans, conferences, and short courses and the preparation of published recipes and booklets. The initial lack of a transfer mechanism for promoting soybean food uses is being reversed through a strong emphasis on promoting commercial soybean foods.

The results of four studies on the economics of soybean production and pricing were issued. Work continued on modification of an intermediate size soybean thresher. The network for collection of various economic data was refined resulting in greater confidence in the reliability of collected data and subsequent analyses. Useable records for studies of production costs of soybeans increased from 13 in 1978 to 61 in 1979 reflecting increased competence and interest on the part of production agents and producers.

A major training effort for 15 MAA officers was conducted at the Instituto Colombiano Agropecuario, Colombia in November/December. Workshops,

short courses and field days were held in-country. Four MAA staff neared completion of MS level programs at the University of Puerto Rico, Mayaguez Campus and two MAA staff completed short courses in soybean processing and soybean production at INTSOY headquarters.

Report of Progress

A. Objectives

The general purpose of the Peru Soybean Development Project is to assist the Government of Peru (GOP) to expand the cultivation of soybeans in high jungle areas and to achieve increased consumption of 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 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 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 second half of CY-79, with an overview of total accomplishments over the life of the project.

The first two interim reports 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 two years 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 and pricing, have been gathered and published. 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. Other MAA staff participated in the INTSOY-sponsored short courses on Technical and Economic Aspects of Soybean Production at the University of Illinois at Urbana-Champaign and Soybean Processing for Food Uses. A special short course for production personnel was held at ICA, Colombia.

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 four 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, October 26 - November 11, 1979.
2. Dr. William H. Judy, INTSOY Variety Trials Officer. Visited soybean breeding sites, November 3-11, 1979.
3. Dr. William M. Walker, Soil Fertility Consultant. Advised on soybean chlorosis problems in high selva, November 9-23, 1979.

4. Dr. Guillermo Riveros, INTSOY Weed Specialist. Visited production zones and advised on integrated approaches to weed control, December 10-16, 1979.
5. Mr. Thomas A. McCowen, Campus Coordinator, August 5-18, 1979.

C. Summary Report of Accomplishments by Objectives

The responsibilities and duties of each team member necessarily encompasses more than a single contract objective. This section summarizes the work of the team as it applies to each of the specific contract objectives listed in Section A above.

Objective 1. Comprehensive Action Plans

As in 1978, action plans for 1980 were developed during the final quarter of 1979. The plans were prepared by MAA personnel for the research, production and utilization aspects of the project. INTSOY staff participated in the preparation and review of the plans. For 1980 it is planned to cultivate 6,600 hectares of soybeans with an anticipated yield of 9,900 metric tons.

Objective 2. Provide Technical Information

As the project neared the end of its first two years the amount and flow of technical information continued to increase. Through research and extension activities, the benefits of soya are reaching more and more Peruvians in both urban and rural locations.

a. Research

Soybean research activities continued at four experiment stations in the high selva, El Porvenir, Tulumayo, Pichanaki and Huarangopampa. Limited support, principally in terms of seed and inoculant, was given to soybean researchers at the La Molina, Vista Florida and Sullana stations in the coastal area. The research included variety trials, line selection in hybrid populations, screening for tolerance to iron chlorosis, response to fertilizers, methods of sowing, plant densities and studies on rhizobium strains.

At the Experiment Station El Porvenir in Tarapoto researchers planted three variety trials, a germplasm collection of 180 entries, 12 hybrid populations from different crosses, and one experiment on reaction to iron chlorosis. Due to shortage of rainfall, weather conditions were more favorable for early varieties but very detrimental for late maturing ones. While the seed yield of the former ranged from 1,300 to 1,700 kg per hectare, the latter produced only from 300 to 700 kg per hectare. None of the 24 varieties, with the exception of Jupiter, proved to be tolerant to chlorosis in the experiment of reaction to iron deficiency in calcareous soils. Twelve hybrid population in the F₅ generation were visually evaluated and 68 promising lines were selected from them for preliminary yield trials. A total of 25 different hybridizations were made in El Porvenir of which only six gave positive results and were advanced to the F₂ generation.

Planted at the Tulumayo Station in Tingo Maria were four variety trials, one trial on fertilizer response, one trial on planting methods in combination with plant density, and one trial to compare different rhizobium strains. Weather conditions were good and the seed yields were consequently good. New lines or varieties tested for the first time gave yields from 2,500 to 3,000 kg per hectare indicating the availability of promising materials among the entries tested in Tulumayo. The experiments on response to fertilizer did not show a clear response to phosphorus and potassium. Two methods of planting, hill and row planting, appear to have no effect on seed yield but high density of plants is definitely detrimental to yield with any of the two planting methods due to early lodging of plants. Two students of the Universidad Nacional Agraria de la Selva (UNAS) are using data of these experiments for thesis requirements. About 50% increase in seed yield was obtained with one local strain of rhizobium in comparison with the rhizobium-free treatments in the rhizobium strain experiment. An important finding in Tulumayo was the identification of a variety tolerant to Cercospora Leaf Spot which will probably replace variety Jupiter in the area.

In Pichanaki only two variety trials were conducted in 1979; one was the ISVEX trial and the other the Uniform Yield trial designed by the soybean scientists of La Molina. Most varieties yielded relatively poor but Improved Pelican and Hardee produced 1,800 kg per hectare.

The harvest of experimental plots at Huarangopampa Station will be completed in February 1980. There were two variety trials, one fertilizer trial and one rhizobium strain trial. Varieties Jupiter, UFV-1 and Tunia produced 3,800, 3,500 and 3,400 kg of seed per hectare. In the rhizobium trial, the average seed yield of all inoculated plots was 3,840 kg per hectare while the average for the rhizobium-free plots was 1,900 kg/ha indicating an average increase in yield of 100% due to rhizobium.

In 1980 work will continue on the variety trials at all four locations, including in the tests new breeding lines developed at El Porvenir. Studies on rhizobium will continue to determine the survival potential of the strains under rainfed and irrigated conditions to provide answers to small farmers' questions as to how many times they need to inoculate soybeans before the bacteria are naturalized under their production systems. Crossing work will continue at El Porvenir to develop new breeding lines, including one with seed characteristics more suitable for soy beverage preparation. Seed conservation experiments which take into account the time of harvest of the seed will be conducted at Tulumayo and El Porvenir.

b. Extension

Soybean extension activity continued at a high level during 1979. Soya workshops for project personnel and combination short courses/field days for producers were planned, organized and conducted

with program collaborators in Agrarian Regions II, VII, VIII and XI in 1979. The meetings were held prior to or during the soya campaigns on the following dates.

Agrarian Region	City	Workshop	Dates
			Short course/ Field day
XI	Tarapoto	Feb. 20-22	May 9-10
VIII	Satipo	March 11-13	May 30-31
VII	Tingo Maria	April 24-26	August 4-5
II	Jaen	July 24-26	Oct. 18-19

The workshops were designed to increase coordination within the region and to discuss and develop solutions to problems which limit the achievement of project goals. Sectoristas were instructed in the use of field demonstrations as a method in technology transfer. Approximately 160 individuals including ministry representatives, farm leaders and others attended the workshops. A panel composed of members of the Agrarian Zone, INIA, the Agrarian Bank, EPSA, SENAMA (Tarapoto), and the Experiment Station of the Central National University of Peru (Satipo) defined policies of their respective offices regarding soya production and marketing for workshop participants. Employees of agribusiness and farm cooperative managers also attended some of the workshops.

A primary objective of the extension program has been to promote on-farm demonstrations as a method in technology transfer. Sectoristas were instructed in the use of field demonstrations at the workshops. Participants established 40 demonstrations (10 per workshop) related to soya production practices during the meetings. The plots were subsequently visited by producers during the field days. Materials to conduct demonstrations in the sector were distributed.

A total of 104 producers attended the short course in soya. Program personnel of the Direccion General de Agricultura y Crianzas, the experiment station system (INIA) and INTSOY served as lecturers. The field day was sponsored the second day of each course for practical considerations. Coordination between production and research sectors of the soya project was excellent in conducting the courses.

Information was obtained through questionnaires, interviews and other means in each of the project areas during 1979 to determine factors which:

- (1) prevent the introduction of soya in existing agricultural systems of the high selva or;

- (2) limit the attainment of acceptable yield levels once the crop has been accepted by farmers.

The data was collected from farmers, sectoristas, and project engineers representing both production and research. The information is currently being condensed and interpreted.

Efforts were continued in the development of technology transfer materials for support of extension programs in the selva. Numerous slides of soya in farmers' fields and research/demonstration plots were taken. INTSOY consultant reports, experiment station results and other sources of information are providing the basis for the release of slide series and various forms of literature on soya production.

Limited assistance was extended to INIA researchers in the areas of weed control, problem soils and seed conservation over the past twelve months. Participation was mainly in planning and initiation of field tests. Subsequent responsibilities for conducting and evaluating the tests has remained with research personnel.

Considerable time was utilized for increased logistic support of soya program efforts in the high selva during 1979. Frequent trips to the project zones resulted in improved coordination between Lima offices and personnel located in these areas. All activities were carried out in collaboration with the National Coordinators and the AID project manager.

Project agronomists of the selva were highly involved in all aspects of organizing the regional meetings held during 1979. In addition to stated objectives, the workshops and short courses were intended to provide a model for continued activities of this nature. Future events will be organized and conducted by personnel located in work areas of the project with a minimum of input from Lima staff. Extension events tentatively scheduled for 1980 include:

1. Regional coordination meetings similar to the workshops described above in Tarapoto, Satipo, Tingo Maria and Jaen. The main purpose of the meetings will be to coordinate efforts of production and research personnel in order to accomplish goals programmed for the 1980 growing season. A secondary objective will be to advise Lima coordinators of needs well in advance of the soya campaign.
2. Short courses for producers:

<u>Agrarian Region</u>	<u>No.</u>
II	10
VII	3
VIII	6
XI	6

3. CIAG field days for production personnel and farmers sponsored by the Huarangopampa, Tulumayo, Pichanaki and El Porvenir

Experiment Stations. Each event will be organized over a two-day period. The first day will consist of plot revision by production engineers and sectoristas with the second day scheduled for farmer visitations.

Other extension activities will include soya demonstrations in farmer fields. Approximately 120 plots for comparisons of cultural practices have been programmed. Extensive radio campaigns in the project zones concerned with production, marketing and utilization of soya have also been planned. All activities described above for 1980 will depend on timely availability of project funds in order to be realized.

The INTSOY extensionist will provide support for selva project personnel in conducting the programmed activities for 1980 as described above. Maximum time and effort will be concentrated on the release of extension materials including information sheets and slide series. Continued minor participation in applied research is anticipated during 1980.

Four INTSOY staff on TDY assignments provided useful inputs to the program. Dr. Michael E. Irwin, INTSOY pest management specialist, returned to Peru 10/26/79-11/11/79 to continue supervision of the insect control program implemented in February/March.

This project is an integral part of the overall soybean project. Its aim is to protect soybean fields from yield-reducing attacks by a complex of insect pests, and, at the same time, to minimize the amount of pesticides used to keep pests from lowering yields and seed quality. When farmers plant soybean for the first time, or even the second time, a crop failure will discourage future plantings of that crop. Likewise, if pesticide usage is high, net profits from the crop could become very low, even negative, discouraging farmers from planting soybeans the next season. As one of the important plant protection disciplines, entomology has begun a project to minimize possibilities of crop failure due to insect pests, and to minimize overuse and overdependence on costly chemical insecticides.

The project incorporates the tenets of pest management and has three basic phases: 1) establishment of a supervised control scheme based on best estimates of monitoring pest populations tolerable; 2) establishment of research programs to adjust the best estimates used under phase 1, and 3) the incorporation of these newly acquired data into the supervised control scheme. This triad is a continual process, the end result being an ever improved and ever more efficient management system.

Dr. William H. Judy, coordinator of the INTSOY variety trials, visited the project November 3-11. Travelling to project activities at Tarapoto and Tingo Maria, Dr. Judy identified means by which greater support to the project could be provided by the INTSOY soybean breeder stationed at the University of Puerto Rico. From work done in Puerto Rico, more appropriate plant types and varieties can be forwarded for use in Peru. Lines can be selected which have greater potential for adaptation thereby reducing the time, effort and cost to screen lines and varieties at El Porvenir while providing material of greater potential use.

In response to requests for assistance in defining the cause of chlorotic soybean plants in the area around Tarapoto, Dr. William M. Walker, professor of soils at UIUC, served as a consultant to the project from November 9-23. Time constraints did not permit Professor Walker to visit other sites where chlorosis of soybean plants had been observed. Based on his experience at Tarapoto, Professor Walker prepared a technical analysis of the chlorosis problem so that the resident staff would have information to provide soybean growers.

Based on the chemistry of the soil, reports from agronomists, and soil test reports, one or more micronutrient deficiencies are probably causing the chlorotic conditions in the soybean fields around Tarapoto. Observations of iron deficient soybeans in Illinois and the conclusions of other scientists suggest that iron could be at least one of the deficient nutrients, although it is possible that more than one nutrient is deficient. Professor Walker recommended a regime of foliar application of selected nutrients to soybean foliage exhibiting chlorosis. Among the recommended nutrients are Cu, Zn, Fe and Mn. Depending upon environmental conditions and the metabolic condition of the plants a change in color should be observed in 6 - 48 hours. Once identified, rates, times of application and source of nutrient experiments will be necessary to determine those conditions that optimize yields and minimize costs.

If soybean production is to be expanded on soils deficient in plant nutrients, research will be necessary to determine the effect of these deficiencies on both the agronomics and economics of soybean production. In the absence of a variety more efficient in nutrient uptake than most current varieties there will be a need for micro-nutrient fertilizer applications on soybeans in some areas or regions.

Another area of concern to the economically viable production of soybeans is the control of weeds. To address this major problem area, Dr. Guillermo Riveros, INTSOY weed specialist stationed at the University of Puerto Rico, Mayaguez Campus, spent from December 10 - 16 in Peru working primarily with the extension specialist. His report, issued in Spanish for immediate use in-country, contains many practical recommendations on an integrated approach to weed control combining more careful cultivation practices with simple "wipe-on" herbicide application methods.

c. Utilization

In keeping with the spirit of the Project Paper regarding the promotion of consumption of soybeans through development of soybean based on soy-fortified foods emphasis in research and development work has focused on the development of a soy beverage (milk replacer) and soy-fortified popular Peruvian bread and noodles. Formulations and processes for bread and noodles have been tested at two bakeries (Tarapoto) and one noodle company (Lima). A process for preparing a liquid and powdered soy beverage is being finalized.

During the course of the project, industrial processing of soybeans has greatly increased as illustrated in the processing of soy flour at a Lima cereals company (350 MT in 1979) and the establishment of at least five smaller private companies which are processing soybeans into soy beverages, flours, coffee, cheese, and toasted snacks.

A most important aspect of soybean processing and utilization activities has been the continued contact with various private food companies desiring to enter the soybean processing area.

Activities at IIA has increased in support of soybean processing as evidenced by the inclusion of soybeans in appropriate applied research programs. Soy/cereal blends are to be prepared at IIA for use in government feeding programs.

Direct contact with potential consumers of soybeans has been maintained through participation in demonstrations for the home-use of soybeans, conferences, and short-courses and the preparation of published recipes and booklets.

The initial lack of a transfer mechanism for promoting soybean food uses is being reversed through a strong emphasis on promoting commercial soybean foods.

Interest in soya for human consumption has increased considerably over the past two years both in rural and urban areas. One or more articles usually appear each week in Lima newspapers which vary from recipes to editorials on the value of soya food under present economic conditions. The following examples reflect a trend of acceptance and increasing use of soya for culinary purposes.

- Eleven indigenous communities in the Satipo region cultivate small plots of soya to produce milk for children. The plots are reported to increase correspondingly as the price of Gloria (condensed milk) increases.
- Soya is sold for food purposes in markets of small towns of the high selva. Street venders sell "fresca de soya" in many of these towns.

- The number of workers employed by Instalaciones Selva, S.A. (Iquitos) fluctuates between 800 and 1,500 men who reside in camps. Two cooks were sent to IIA for training in preparation of whole soybeans. Soya has become a normal part of the weekly menus in the camps.
- Other initiatives by Instalaciones Selva to promote soya foods include sponsoring a course on home preparation for women in Iquitos and the distribution of soya recipes.
- The Sociedad "Bien del Hogar" periodically offers special courses in cooking for children presented by Profesora Josefina de Marín. Preparations include several soya foods.
- A nutrition course was offered at the Hospital del Niño which included a large section on soya food. Dr. Siegel participated as a lecturer.
- The Birch/Banner Institute of Lima operates a highly successful combination natural foods restaurant and store in which soya is a major item. Courses on preparation of soya are presented regularly. Dr. Siegel will participate as a lecturer in February.
- A soya preparation course sponsored by the soybean project was conducted at IIA. The 19 participants were mainly nutritionists and dieticians representing the Ministry of Health and various hospitals.
- Whole soya is prepared in several ways and regularly served as a part of the Tarma Hospital diet.
- The Berlinger Bakery in San Isidro regularly sells soya bread.
- Wheat-soya flour mixtures and processes appropriate for existing equipment in the San Gabriel and América bakeries of Tarapoto have been developed by Dr. Siegel. Bread sold to date has been highly acceptable.
- Small packages of whole soya are starting to appear regularly in Todos supermarkets throughout Lima.
- Small plants utilizing simple processes on whole soybeans are marketing a variety of products ranging from powdered soya milk to soya coffee. Plants* of this nature are located in Lima and:

Huancayo	producing	Soya-Vid
Huanuco	producing	Nutri-Soya
Tingo Maria	producing	Dino

Other small businesses include soya cheese producers in both Lima and Arequipa. A large number of whole soya operations could exist in Peru which are unknown to the soya project.

*Small plants of this nature have also been reported in Cuzco and Trujillo - but not verified.

- The Alimentos Glutinados Especiales (AGE) company of Lima prepares and markets special foods containing soya for diabetics and dieticians.
- INDUCIL produces and sells "Almendrigos" of soya.
- Company representatives from Arequipa recently visited the AID/Colorado State University project in Fort Collins, Colorado to review Brady extruder processes. A Brady cooker was purchased to produce food blends. We assume soya blends will be among the products released.
- Cereales, S. A. purchased 25 tons and 350 tons of soya for flour in 1978 and 1979, respectively. The company markets through Nicolini, S. A. which has 500 outlets.
- Molitalia, S. A. is conducting preliminary research on soya blends and is considering the purchase of equipment for production.
- Interestingly, presidential candidate Alejandro Villanueva del Campo listed as a point of his platform the distribution of milk to school children (1/2 lt/day). He specified "leche vegetal" produced in Peru which could only mean soya.

This soya "popularization" will gain added impetus from the publication of "Recetario Frijol Soya" in cooperation with IIA, Cereales S. A. And Nicolini. Eighty-one recipes using soya in beverages, pastries, appetizers, soups, and main dishes are offered with care given to taste preferences and preparation methods acceptable to Peruvian practice. Of the 10,000 copies published, the project funded 2,800 to be given wide, free of cost distribution throughout Peru and Spanish speaking countries.

During the coming year, the Food Processing Specialist will continue to assist in the development of milk substitutes based on soybeans in both liquid and powder form and promote introduction of full-fat soy-fortified bread, noodles and other new products. He will also develop activities for the transfer of technology of preparation of soy-fortified products for use by companies in the high selva, particularly Tarapoto and Tingo Maria. As the Brady Cooker, purchased with project funds and now being set up for operation at IIA, comes on line he will develop blends of soy with yuca, potatoes and corn of high nutritional value. He will also continue to develop activities in the transfer of technology for the home use of soybeans through improvement of methods for non-industrial preparation of soy beverages and foods and development and distribution of a soybean recipe book focussed on the rural community.

Objective 3. Perform Periodic Financial and Economic Analyses

Several studies were completed on costs of production and pricing soybeans as the data collection network set up in 1978-1979 was refined and improved.

The cost of production and labor utilization data collected for 1978 was analyzed and reported in "A Study of the Costs of Production and Utilization of Labor in the Production of Soybeans, Peru Soybean Project, 1978," August 1979. For 1979 sixty-one usable records were collected from all the project area. Preliminary cost tables for 1979 were distributed.

The paper "Analysis of Soybean Purchases by EPSA, 1978", December 1979, reported the findings of the study regarding the moisture levels, percentages of impurities, weight discounts, and purchase weights from five EPSA locations. Recommendations were made to alleviate problems in the marketing process revealed in the data.

"Soybean Production in Peru", April 1979, provided an overall look at the expansion of soybeans acreage under the soybean project, the position of soybean oil and meal in regards to competing products, costs of production, and incentives for expansion.

"Merits of Uniform Pricing of Soybeans Throughout Peru," December 1979, is a study of the possibility of providing extra incentives for the expansion of soybeans in the areas of the selva which have high production risks.

The development of the intermediate size soybean thresher at Tingo Maria continued with the purchase of V-belts and pulleys to modify the drive system and the acquisition of a gasoline engine to power the thresher. Additional changes will be made to the concaves to improve the threshing action. Much delay was encountered in the receipt of parts and in starting the work of modification.

Cooperation with personnel of the Dirección General de Comercialización and ENCI was initiated in the area of improving the marketing process for soybeans especially in the adjustment of grades and standards to provide more equitable settlements between producers and processors and to improve the quality of soybeans moving to the processors.

Data on costs, labor requirements, and output per man day of labor of various threshing methods was collected for analysis as a part of the study of the economic use of machinery.

The proposal to construct an oil extraction plant at Tarapoto has not advanced. The present level of oilseed production cannot justify economically the investment required. However, Calixto Romero, S. A., has purchased land near Tarapoto for the purpose of constructing a palm oil extracting plant that can also process soybeans, cottonseed, and sunflower seed. The development may be the answer for the intermediate future.

For 1980 studies similar to those mentioned above will be completed. A report on cost of production and labor use for 1979 will be issued and the results of an analysis of EPSA soybean purchase data for 1979 will be published.

Efforts to improve the marketing process and product quality will continue in cooperation with personnel of the Dirección General de Comercialización and ENCI. Modifications of soybean grades and standards will be recommended to provide a more equitable settlement between producers and processors. Collection of data on the economics of the use of machinery, especially threshers, will be completed.

Extension leaflets will be prepared for distribution to high selva farmers. Tentative topics include:

- a. Soybean marketing recommendations for farmers in different climatic zones.
- b. Analysis of costs of threshing soybeans by different methods, and
- c. Cost of owning and operating threshers in relation to custom rates charged to farmers.

Objective 4. Project Evaluation

A Mission Evaluation was performed in May 1978 as part of USAID's evaluation schedule. In August 1979 USAID proposed that an outside evaluation be conducted, the results of which could form the basis for a decision on further INTSOY participation beyond November 1979. Subsequent decisions were taken at Mission level to conduct an in-house evaluation. In order to provide time to complete the evaluation the TA contract was extended to March 1980.

Objective 5. Perform In-Country Training

Major training activities for soybean were conducted during the first half of 1979, as noted under objective 2. A soya workshop for project personnel was held in Jaen July 24-26 and a combination short course/field day for soybean producers was held in Tingo Maria August 4-5 and in Jaen October 18-19.

The workshops were designed to increase coordination within the region and to discuss and develop solutions to problems which limit achievement of project goals. Sectoristas, the production agents in closest contact with farmers, were instructed in the use of field demonstrations as a method in technology transfer. Ten demonstrations relating to soybean production practices were established at each workshop and these plots were subsequently visited by producers during the field days. Sectoristas were provided materials to conduct additional demonstrations in their sectors.

The short course/field days were well accepted by soybean producers. Program personnel of the experiment station system, the production agency and the INTSOY team served as lecturers. The field day was held on the second day of each course. Coordination between production and research sectors of the soya project was excellent in conducting the courses.

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

A major, and highly successful, training effort for 14 production agents and one extension officer was conducted by personnel of the Instituto Colombiano Agropecuario, (ICA), Palmira, Colombia November 26-December 14. Participating faculty included the INTSOY project soybean breeder, Dr. Camacho, and INTSOY protection specialists from the University of Puerto Rico, Mayaguez Campus, Drs. Paul Hepperly and Guillermo Riveros.

The course was well balanced with a careful blend of classroom, laboratory and field instruction. It included instruction in all disciplines related to soybean production, i.e., breeding and variety selection, plant pathology, inoculation, soil fertility and conservation, cultural practices and protection against insects, weeds and diseases. Mechanization of planting and harvesting, economics of production and marketing, methods of communication and technology transfer, and studies of seed production and seed processing industries. The course proceedings were issued to each participant on the last day of the course, and should serve as a valuable reference.

Four MAA staff neared completion of MS programs at the University of Puerto Rico, Mayaguez Campus. Plans are being made for their assignments upon return to Peru in the first half of 1980.

National production coordinator, Sr. Ricardo Villamonte, completed the INTSOY short course "Technical and Economic Aspects of Soybean Production." He visited ICA, Colombia on his return to Peru to participate in planning sessions for the November/December short course. Sra. Nancy Fuentes de Jimenez, of IIA, completed the short course on "Soybean Processing for Food Uses." The project has now trained three Peruvian counterpart staff in each short course since 1976.

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	11/77-6/79	6/79-12/79	Total
1. Salaries	\$190,687	\$ 58,275	\$248,962
2. Fringe	53,722	9,383	63,105
3. Indirect Cost	67,096	18,066	85,162
4. Travel and Transportation	34,982	7,158	42,140
5. Allowances	101,182	25,537	126,719
6. Other Direct Costs	3,681	2,375	6,056
7. Materials & Supplies	3,412	452	3,864
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	\$454,762	\$121,246	\$576,008