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SRI LANKA SOYBEAN DEVELOPMENT PROGRAM

Report Number 7

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On assignment in Sri Lanka under Contract No. UNDP/SRL/73-007-1/AGOF INTSOY

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ACKNOWLEDGMENTS

I am grateful to many persons who made my short visit to Sri Lanka more productive than it otherwise might have been, and more enjoyable. P. A. Samaratunga, my counterpart during the latter part of my assignment, deserves special mention. He participated actively in planning the comparative advantage research in the Dry Zone. He translated the questionnaires and instructions into Sinhalese and conducted the training sessions at Tirappane and Elahera. His competence, hard work, and pleasant, unassuming manner made him a highly valued co-worker.

Among others who deserve special mention are W. B. Medagama, H.M.E. Herath, Mrs. Chandra Breckenridge, V. Arulnandhy, Dr. Nimal Ranaweera, Professor T. Jogaratnam, Dr. Walter Fernando, and Dr. N. Vignarajah. Three project managers, Dan S.B. Wijesinghe, P. Pinidiya-Aratchy, and R. Doluweera, along with Sarath Semasinghe of the Anuradhapura D.A.E.O. office, were most cooperative in making arrangements for the comparative advantage studies. The helpfulness of all these staff members reflects favorably on the institutional environment established by Dr. Ernest Abeyratne, Dr. Christopher Panabokke, Dean R. R. Appadurai, and Dr. Henry Fernando.

John McLeod of CARE provided strong support and valuable ideas for the newsletter. Dr. Carl Hittle gave me sound counsel and administrative backing in my various endeavors.

SUMMARY OF ACTIVITIES

Nearly seven of my eight weeks in Sri Lanka were spent in Peradeniya and Kandy. The exceptions included two brief trips to Colombo, two trips to the Dry Zone to arrange for research on the comparative advantage of soybeans, and two subsequent trips to give training sessions to the field workers involved in that research. On one of these trips I gave a seminar at Maha Illuppallama.

I spent approximately 40 percent of my time in developing plans and possible material for a soybean newsletter. Perhaps 35 percent was spent in making plans and preparing material for the research in the Dry Zone, including modifying the questionnaires, developing instructions, and attending the training sessions.

The rest of my time was spent in preparing for and giving a seminar at C.A.R.I. (repeated at Maha Illuppallama), in writing this report, and in other activities related to this assignment. My seminar was attended by 20-25 persons at CARI and by 30-35 at Maha Illuppallama. I attended, as an observer, the tripartite review of the Sri Lanka Soybean Development Project on 8 June and the Soybean Committee meeting on 14 June.

SOYBEAN NEWSLETTER

One of the two specific objectives of this assignment was to help start a soybean newsletter. That objective was not attained for reasons beyond my control. Nevertheless, about two-fifths of my time was spent on that project. Tentative ideas as to principles to follow in determining the content and point of view of the newsletter were developed and are enumerated in the following paragraphs. Also, I prepared tentative drafts of 15 short articles to suggest types of items which might be included in the newsletter.

Purpose: Guiding Principles

The purpose of the newsletter is to disseminate information that will promote efficient production and marketing of soybeans in Sri Lanka and their optimum utilization in enriching the diets of the people, with emphasis on those persons most in need of better nutrition. To meet that objective, I believe the following principles should be among the criteria that guide the preparation and review of material and the other editorial policies of the newsletter.

1. Balanced Coverage of Material. The newsletter should attempt to provide material on all aspects of the production, marketing and processing, and utilization of soybeans. For example, preferably every issue should contain at least one article on marketing (including processing) and/or utilization, as well as material on production.

2. Reliable Information. Material for the newsletter should be carefully developed and checked in order to make it as reliable as possible. At least one expert in the subject-matter field covered by an article should review that article critically and offer constructive suggestions for its improvement. The soybean project leaders should share responsibility for checking all material in each issue. It is unreasonable to place all responsibility for reliability upon the editor. No one person has the breadth of knowledge needed to review effectively all the wide variety of material to be included in the newsletter.

3. Credible Opinions. To the extent that the newsletter reports judgments, forecasts, and other subjective material, care should be taken to provide credible statements. The long-run welfare of the soybean industry in Sri Lanka is too precious to risk undermining it by making exaggerated claims, wild forecasts, or other immoderate statements.

4. Adapted to Sri Lanka. For the newsletter to serve the interests of the soybean industry in Sri Lanka and the people of the country, it needs to be oriented to local conditions. This applies, for

example, to suggested practices, recommended technology, recipes, and other proposed uses of soybeans. Meeting this need will require that persons intimately acquainted with conditions in the country help prepare and/or review all material.

5. Timely Information. For the newsletter to be most valuable, information that is of seasonal interest or of short-term value needs to reach the readers when it will be useful to them. Items about cultural practices need to be timed to reach farmers and agricultural workers when they can use the information promptly. Suggestions for marketing and market reports may be most needed by farmers at about harvest time, just before the period in which many of them may sell their crops.

6. Encourage Reproduction. The objective of the newsletter is to disseminate information as widely as possible. To do that, reproduction of material taken from newsletter should be encouraged, both in the press and by radio. While giving of credit for reproduced items might be encouraged, it should not be required. The farm press could greatly extend the reach of the newsletter in disseminating recommended soybean production practices. Newspapers could take suggested recipes and recommendations for the use of soybeans into many homes.

7. Solicit Material. Interested readers should be encouraged to provide material for the newsletter. These contributions might include items of human interest about soybeans, suggestions for improved production or utilization of soybeans, reports of new buyers or industries interested in acquiring soybeans, and the like.

8. Understandable and Readable. The newsletter needs to be written at a level which is comprehensible and readable without difficulty by the majority of its readers. It needs to carry a mixture of material that will attract and hold reader interest. A competent editor can take major responsibility in making decisions on these matters.

Suggested Regular Features

A few categories of material should be published in every issue of the newsletter. Their purpose would be to provide timely information in a form and place where it may be found and read quickly by a hurried reader especially interested in such information. These categories include:

1. Market Information. Wholesale prices for soybeans in Colombo in a recent period or on a fixed day of the month should be reported. Probably similar information for major competing grain legumes should be quoted. This information should be readily available from the Marketing Department, which collects prices daily for

the Colombo market. These prices should be supplemented with reports of prices currently being paid for soybeans by Markfod, the Marketing Department, and any other major buyers. Representative prices on retail stalls in Colombo for soybeans and major competing grain legumes also could be reported for approximately or exactly the same dates as the wholesale prices. The price data should be supplemented with a brief summary of market conditions for soybeans and grain legumes, and of recent and prosective changes in them. New market outlets and buyers should be publicized.

2. Farmer's Corner. This section would provide timely suggestions about seasonal production practices, new pests or diseases and how to cope with them, comparative profits from soybeans and competing crops, and the like. At harvest time it might focus on qualities needed in soybeans to be used for food and how to attain them.

3. Letters to the Editors. The purpose of this section would be to provide human interest material, to introduce new ideas without assuming full responsibility for them, to foster discussion of controversial ideas, and the like.

Progress to Date

A man who had been hired to edit the newsletter prior to my arrival was expected to work with me in initiating the project. He spent one day per week in Kandy on this activity during the first two weeks of my assignment, but resigned on his third visit. At that time we believed we were well along with material for the first issue. Issuing the newsletter was then postponed until a new editor could be hired and there was reasonable assurance that, once started, the project could be continued.

I, then, devoted myself to preparing tentative drafts of what I hoped might be potential articles for the newsletter. The titles of the 15 articles are listed below. Many of them are far outside my areas of specialization and were developed only after studying the limited background information available. Some are on subjects requiring more intimate knowledge of conditions in Sri Lanka than I possess. For these reasons as well as the benefits which can be expected from critical review, all of these materials need to be carefully evaluated by persons competent to pass judgment on them. Some, which provide vehicles for expressing ideas that I believe need to be considered by leaders of the Sri Lanka soybean industry, may be too technical for publication in the newsletter. Nevertheless, I hope most of them may either be modified for publication or else will stimulate preparation of material along the lines which are suggested.

The tentative titles to the items I have prepared are:

1. Benefits from the use of soy milk in curries.

2. High quality soybeans are needed for food.

3. Inoculation: A key to successful soybean production.
4. Get soybeans off to a fast start with a good seedbed.
5. Grow soybeans, not weeds!
6. Fertilizing soybeans for profit.
7. Start with a suitable variety and good seed.
8. Good stands help to produce good yields.
9. Soybeans, your money's worth in nutrition.
10. Package of practices for soybean production.
11. A way to adjust soybean prices for differences in quality.
12. Should soybeans be grown under contract?
13. There are good markets for soybeans.
14. Supplies and prices of pulses affect soybeans.
15. Considerations in setting incentive prices for soybeans.

Numbers 11 and 15 of these articles are vehicles for what I consider to be important ideas that need consideration by persons with overall responsibility for the soybean program. Number 13 is dated and will need updating before publication. Number 9 is long but could be a feature article.

Topics far beyond my competency on which other articles might be written include:

1. CARE's use of soybeans in triposha, and use of triposha.
2. Serious soybean pests in Sri Lanka and their control.

ECONOMICS OF SOYBEAN PRODUCTION

Status of Soybean Production; Changes that May Affect It

Estimates by the Extension Division of the Department of Agriculture of acreages and production of crops by seasons are the only comprehensive data available on crop production in Sri Lanka. The reports for the years 1974-1976 of production of soybeans and of the major grain legumes for Sri Lanka and for the dry zone are shown in Tables 1 and 2. Adjustments have been made in the Department's estimates for soybeans to correct for their reported failure to include production on large governmental and private farms.

Table 1. - Reported Acreage and Production of Major Grain Legumes in Sri Lanka, Maha, Yala, and Annual, 1974 - 1976

Season	Soybeans[a/]	Green gram	Black gram	Cowpeas	Groundnuts
	Thousand acres				
Maha 73 - 74	2.8	20.7	2.7	4.8	16.4
Yala 74	1.1	5.7	0.8	2.6	2.6
1974	3.9	26.4	3.5	7.4	19.0
Maha 74 - 75	2.8	18.5	4.3	13.5	15.5
Yala 75	0.9	4.4	0.7	8.1	3.7
1975	3.7	22.9	5.0	21.6	19.2
Maha 75 - 76	1.3	16.8	10.7	25.0	13.2
Yala 76	0.9	3.8	1.9	22.5	3.4
1976	2.2	20.6	12.6	47.5	16.6
	Production, thousand hundredweights				
Maha 73 - 74	17.5	85.6	9.7	31.4	120.3
Yala 74	9.7	30.4	3.1	15.7	27.2
1974	27.2	116.0	12.8	47.1	147.5
Maha 74 - 75	22.3	91.1	15.9	86.3	113.8
Yala 75	8.6	26.1	4.6	63.1	36.3
1975	30.9	117.2	20.5	149.4	150.1
Maha 75 - 76	9.8	80.5	39.3	133.8	91.0
Yala 76	8.7	20.3	9.5	102.9	28.8
1976	18.5	100.8	48.8	236.7	119.8

Data from Extension Division, Department of Agriculture, Ministry of Agriculture and Lands.

a/ Adjusted to include estimated acreage and production on government farms and revised estimates for Anuradhapura District.

Table 2. - Reported acreage and Production of Major Grain Legumes in the Dry Zone, Sri Lanka, Maha, Yala, and Annual 1974 - 1976

Season	Soybeans[a/]	Green gram	Black gram	Cowpeas	Groundnuts
	Thousand acres				
Maha 73 - 74	0.5	10.2[a/]	2.7	3.2	12.2
Yala 74	0.4	3.5	0.8	1.3	1.9
1974	0.9	13.7	3.5	4.5	14.1
Maha 74 - 75	1.2	12.5	4.3	9.8	14.2
Yala 75	0.3	2.4	0.7	3.1	2.8
1975	1.5	14.9	5.0	12.9	17.0
Maha 75 - 76	0.7	11.1	10.4	13.3	11.7
Yala 76	0.7	2.0	1.7	10.2	2.5
1976	1.4	13.1	12.1	23.5	14.2
	Production, thousand hundredweights				
Maha 73 - 74	3.8	37.9	9.7	18.6	91.1
Yala 74	3.2	20.8	3.1	6.1	18.5
1974	7.0	58.7	12.8	24.7	109.6
Maha 74 - 75	12.3	64.9	15.5	54.1	100.8
Yala 75	3.1	15.8	4.5	24.8	28.7
1975	15.4	80.7	20.0	78.9	129.5
Maha 75 - 76	5.9	53.0	37.5	95.0	80.6
Yala 76	7.1	13.3	8.7	50.4	22.3
1976	13.0	66.3	46.2	145.4	102.9

Data from Extension Division, Department of Agriculture, Ministry of Agriculture and Lands.

a/ Adjusted for revised data for Anuradhapura District and to include an estimated 70 percent of acreage and production of soybeans on government and large private farms.

During the years 1974-1976, total soybean production in Sri Lanka did not increase. Production in the Dry Zone, however, was larger in 1975 and 1976 than in 1974. By 1976 approximately two-thirds of the country's reported soybean production was in the Dry Zone as compared with less than half in 1974. This may represent a start toward centralizing soybean production heavily in the Dry Zone, where it may be expected to be more competitive with other crops. A factor in this concentration may be that in 1975 and 1976 the reported average yield in the Dry Zone -- from 9 to 10 hundredweight per acre -- was above the national average, which included the Dry Zone.

During this same period, production of cowpeas expanded more than fivefold while production of black gram quadrupled. Even though production of green gram and of groundnuts showed little change, the aggregate production of grain legumes other than soybeans in Sri Lanka increased during that period relative to the production of soybeans. That was barely true, however, in the Dry Zone.

Reasons for the sharp expansion in production of cowpeas and black gram during that period are readily apparent. After curtailment of imports of pulses in 1973, prices were at high levels for an extended period. Cowpeas could be produced easily with a relatively small investment in inputs, and there was a ready market for them. Expanded production of black gram, which is grown largely in Vavuniya and Jaffna districts, could have been in response to a strong demand for that pulse by Tamils.

Because data are not yet available, one cannot determine what changes, if any, occurred in these trends in Maha 1976 - 1977. However, there are indications that by Yale 1977 the situation was changing. As is discussed in more detail in the section on marketing, prices of pulses have declined sharply. At mid-1977 some agricultural workers and farmers were strongly convinced that soybeans had become a more profitable crop than the pulses. The effect of this changed situation upon soybean production in Yala 1977 is unclear because in much of the Dry Zone Yala production still is limited by water shortages and by a strong preference of many producers to grow rice if they believe that sufficient water is available. But at the time this report is being written, there is expectation of considerable expansion in soybean production on the high land and chenas of the Dry Zone in Maha 1977-1978.

Availability of Mahaweli water is making possible limited expansion in soybean production during the Yala season in a small part of the Dry Zone. As the area served by the Mahaweli Diversion Scheme is enlarged and other improvements are made in irrigation facilities, further increases will occur in potential soybean production during Yala.

Recent Cost and Returns Studies

Largely completed questionnaires were made available to me from studies of costs of production and returns from soybeans and competing crops in the Dry Zone in Yala 1976. The numbers of questionnaires by crops by districts were:

Area District	Elahera, Polonnaruwa	Various, Anuradhapura
	(Number)	
Soybeans	21	13
Cowpeas	4	6
Green gram	3	--
Chillies	4	--
Groundnuts	2	--
Paddy (not used)	1	--

The limited background information I have about this research has handicapped my appraisal of its finding. Although the data are reported on a per-acre basis, many of them apparently were for smaller plots. The accuracy with which the size of those plots was measured or estimated obviously affects the reliability of the per-acre data, especially if plot size was small. Except for soybeans there are few records. With wide variance among farms, averages are not reliable.

There are serious questions of representativeness of the data, at least for soybeans and perhaps also for other crops. The soybean growers apparently were provided with seed and inoculum and their soybeans are valued at a relatively high price. There is a higher level of uniformity in some charges, as for seed and for insecticide if used, than one would expect in a random sample.

I made two adjustments before summarizing the cost data for Yala 1976. A charge for land rent had been made on the majority of the farms. The average of these reported charges in that area was included as a cost item on questionnaires showing no charges for the use of land. In all questionnaires, interest on half the production costs was charged at 3 percent, which assumed the production season averaged one-third year in length. With these adjustments, the questionnaires appeared to reflect all items conventionally included as costs.

In addition to these questionnaires, summaries were given me of the costs of production and returns in Maha 1976-1977 from soybeans, cowpeas, green gram, and black gram in the Anuradhapura District. These data were obtained in a survey of 50 farmers. An estimated 80 percent of the reported production represented chena crops, with the remainder being other high land. As with the Yala 1976 data, findings are reported on a per-acre

basis. The estimated numbers of farmers producing the crops and average acreage per grower were:

Crop	Estimates of Number of growers included	Average acreage per grower
Soybeans		2.
Cowpeas		1.
Green gram		0.5
Black gram		0.5

Since these Maha crops were largely grown on chena land, no fertilizer was applied. No charge was made for land rent for these crops. Land rent is difficult to determine for chena crops because, at least in the Anuradhapura District, land generally is available for chena cropping if farmers wish to use it. In the detailed tables by crops (Appendix tables A1-A3, A5) I attempted to report these Maha 1976 - 1977 costs on a basis comparable with that used for the Yala 1976 data. However, that was not completely possible. The charges for interest on costs were larger in these than in the Yala 1976 data for reasons I could not determine to my satisfaction.

The Yala 1976 surveys (Appendix tables A1 - A4) reported generally higher production costs for soybeans in Elahera (Polonnaruwa District) than in the Anuradhapura District. Yields also appeared to be higher in Elahera and, on farms where yields were reported, returns above costs likewise were higher. In both areas computed costs were roughly Rs.1.10 per pound.

In both areas computed costs of cowpea production per acre were 20 to 30 percent below costs of soybeans. Cowpea yields were somewhat below soybean yields, with calculated production costs per pound approximately Rs.0.90 - 1.00.

In Elahera per acre costs of producing green gram were similar to those for soybeans, with average cost per pound Rs.0.98. Per acre costs of producing chillies were more than double those of soybeans and green gram with calculated cost per pound Rs.2.49. For two farms, average production costs per acre for groundnuts were slightly above those for soybeans but, because of much higher yields, the cost per pound was only half as much.

Only tentative and partially hypothetical comparisons may be made among these crops of returns above costs. Not only are there the limitations in the data pointed out previously but also prices received by Elahera farmers were not reported for green gram or chillies and only

partially reported for cowpeas and groundnuts. Using either averages for farms for which prices were available or the hypothetical prices shown, these estimates were obtained:

Crop	Elahera (Returns per acre above costs)	Anuradhapura
Soybeans		
At Rs. 4 per pound [a/]	Rs 3800[b/]	Rs 2800
At Rs. 3 per pound [c/]	2570	1820
Cowpeas		
At Rs. 2.39 per pound [d/]	1300	1300
Green gram		
At Rs. 3 per pound [c/]	2340	--
Chillies		
At Rs. 8 per pound [c/]	6490	--
Groundnuts		
At Rs. 2 per pound [e/]	3860	--

a/ The price reported
b/ Average for 17 farms that reported yields and pri
c/ Hypothetical price
d/ Average price for farms in Anuradhapura
e/ Price reported by one farm

At the prices used, chillies were much more profitable than any other crop. At Rs. 4 per pound, soybeans in Elahera were about as profitable as groundnuts and more profitable than either green gram or cowpeas. Even at Rs. 3 per pound soybeans would have been slightly more profitable than green gram and much more profitable than cowpeas.

On the farms in the Anuradhapura District soybeans, whether priced at Rs. 4 or Rs. 3 per pound, were more profitable than cowpeas.

The Maha 1976-1977 Survey in Anuradhapura. In this survey, mainly of production in chena land, soybean yield per acre was nearly one-third larger than the yield of cowpeas, three-fifths above that of green gram, and one-fourth larger than the yield of black gram. At the reported prices shown in the tabulation below, returns for soybeans above the costs included in this study were approximately equal to those for green gram, about one-fourth above those for black gram, and more than double those for cowpeas. The computed cost per pound on the basis of the costs included in this study was Rs. 0.79 for soybeans as compared with roughly Rs. 0.90 for the two types of gram and cowpeas.

Crops	Returns per acre above costs
Soybeans	
At Rs. 3.00 per pound	Rs. 2,720
Cowpeas	
At Rs. 2.23 per pound	1,200
Green Gram	
At Rs. 4.46 per pound	2,760
Black Gram	
At Rs. 3.12 per pound	2,160

Research on Comparative Advantage in the Dry Zone

My earlier report proposed studies of costs and returns from soybeans and competing crops in the Dry Zone. These were to be supplemented with information and observations about soybean production for use in appraising growers' performance.

Briefly stated, the major objectives of the research were:

1. To determine comparative returns from soybeans and competing crops.
2. To assess grower performance in soybean production.
3. To obtain information that might be useful in setting government price supports for soybeans.

One of the two major objectives of this visit was to assist in getting that research started. My counterpart and I can report the following accomplishments on the project during my stay in Sri Lanka:

1. Moderate revisions of the questionnaires proposed in my first report.
2. Development of a detailed set of instructions for field workers.
3. Translation of the questionnaires and instructions into Sinhalese, and duplication of needed supplies of them.
4. Development of working plans for the research.
5. Holding two training sessions for field workers. Arrangements were made at that time for these workers to start enumeration.

The research is to be conducted in five areas in the southern portion of the Dry Zone of northern Sri Lanka. Questionnaires will be completed by KVS' working under the supervision of the agricultural instructor and

project manager or field crops officer of that area. Overall supervision will be provided by P. A. Samaratunga, Agricultural Economist, Department of Agriculture. He will be responsible for summary and analysis of the data and publication of findings.

Summarized information about the areas to be studied follows:

District and area	Key Personnel	Description (Yala 1977)
Polonnaruwa Elahera	Dan S.B. Wijesinghe Project Manager K.M.D. Kumarasebane Agr. Instructor	Mahaweli water; paddy on poorly drained soils; chillies, green gram, cowpeas, groundnuts, black gram possible competing crops.
Matale Kandalama	P. Pinidiya-Aratchy Project Manager	Mahaweli water; paddy on heavy soils; considerable vegetable production to compete with soybeans
Matale Devahuwa	R. Doluweera Project Manager	Limited supply of tank water plus a little pump irrigation from a stream; paddies irrigated by tank water to be used only for soybeans
Anuradhapura Tirappane	Sarath Semasinghe Dist. Field Crops Officer K.B. Ratnayake Agr. Instructor	18-acre paddy area used solely for soybeans (their first year) by 22 growers; limited supply tank water
Anuradhapura Payirimaduwa	Sarath Semasinghe Dist. Field Crops Officer K.B. Ratnayake Agr. Instructor	Soybeans to be planted starting 8 July is one area. The same farmers produce rice on similar soil so cost and returns data will be obtained for that also.

The goal is to obtain at least 15 sets of questionnaires for soybeans in each of the five areas. Hopefully a minimum of 10 questionnaires will be obtained for each major competing crop in each area (where grown), with smaller numbers for less important competing crops. For our purposes, a competing crop is a crop other than soybeans produced in the same season and on the same type of soil as is used for soybeans. We encouraged field workers to obtain cost and returns data for rice in their areas to the extent they can. One reason for this is that many farmers will try to produce rice even on well drained soil if they believe sufficient water is available. The consensus of informed opinion is that rice produced in the Yala generally is less profitable than soybeans and some of the other possible crops. Data are needed to evaluate that judgment and to use in educating growers as to crops of greatest profitability.

Other Considerations

One season's research of the type getting under way in the Dry Zone in Yala 1977 is not enough. Such research should be repeated for at least

two more seasons. This is necessary in order to provide a dependable indication of relative profitability of and performance in soybean production under more than one season's weather and market conditions. It is a matter of judgment whether that research should be repeated in subsequent years in all the areas surveyed in Yala 1977 and only in those areas. We were unable to find many areas with substantial soybean production in which competing crops also were important in Yala 1977. This suggests the desirability, if possible, of including other areas that have more competing crops in subsequent years. For reasons already indicated, costs and returns data also are needed on Yala rice crops in those parts of the Dry Zone, like the Anuradhapura District, where farmers by tradition grow rice in that season on land suitable for other crops whenever they believe they can.

Maha season production of soybeans in the Dry Zone is substantial. Moreover, agricultural leaders suggest that considerable expansion in soybean production may occur on the high lands and chenas of the Dry Zone during Maha 1977-1978. In view of this possibility, comparative advantage research of the type that has been described should be considered in the Maha as well as in the Yala season.

UPDATED IDEAS ABOUT SOYBEAN MARKETING

In developing plans and potential material for the soybean newsletter, I attempted to obtain information about the current soybean marketing situation. On the basis of that information, impressions gained during visits to the Dry Zone, ideas developed for my seminar, and as an outgrowth of my earlier recommendations, I have developed the material that follows.

Apparent Market Situation, Mid-1977

The market for Maha 1976-1977 soybeans in the Dry Zone appears to have been relatively good. The Department of Agriculture purchased about 250,000 pounds for CARE. It offered 25 cents per pound over the reported local wholesale price. This resulted in buying prices of Rs.3.00 to Rs. 4.00 per pound. Markfed, also buying for CARE, purchased 35,000 to 40,000 pounds at a net price to producers of Rs.3.50 for soybeans of acceptable quality. The Marketing Department purchased about 6,000 pounds at Rs.2.50. In late May two wholesalers in Kandy reported a buying price of Rs 250 per hundredweight for "yellow" soybeans.

With greatly expanded production of cowpeas and black gram, prices of pulses have declined sharply in comparison with prices of one to two years ago. The following data for the Kandy market provide some indication of the extent of the change. Even though prices are expected to be seasonably higher in the late fall than in the late spring, the sharp drop in the price of pulses indicates that there has been fundamental change in the market situation. While retail prices of pulses dropped by from approximately 40 to 50 percent, the price of soybeans declined only 4 percent.

Approximate average retail price in Kandy

Grain legume	20 November, 1975	26 May, 1977
	(Rs. per pound)	
Cowpeas, whole	4.42	2.34
Cowpea dahl	5.24	2.75
Green gram, whole	n.a	4.02
Green gram dahl	7.30	4.24
Black gram, whole	n.a	2.99
Black gram dahl	6.00	3.54
Soybeans, whole[a/]	4.01	3.84

n.a. Not available
a/ "Yellow"

Purchases for CARE at relatively high prices appear to have been a major factor in supporting the price of soybeans. Information is not available about Maha 1976-1977 soybean production. If we assume a crop of about the same size as that in the previous Maha, roughly 500 tons, and assume one-eighth of the production was either saved for seed or used by producers, it appears that only about one-third of the remainder was purchased for CARE. It is reported that a large quantity of soybeans also has been used to produce coffee substitutes. I would assume most of the rest has been purchased by hotels, public institutions that serve meals, and consumers.

Market Outlook

While pulses were scarce and high in price, the shortage apparently supported the price of soybeans. High prices for those crops helped them to compete with soybeans for the resources used in production, thereby limiting the production of soybeans. At the same time, the shortage and high prices of pulses apparently led consumers to substitute soybeans for pulses to some extent.

With the greater decline in the price of pulses than of soybeans, agricultural workers and farmers in growing numbers appear to believe that soybeans have become a more profitable crop than the pulses. If this changed price and profit relationship continues, some agricultural workers expect sharply increased production of soybeans starting with Maha 1977-1978. If soybean production increases to a volume in excess of current demand, expanded supplies can be expected to exert downward pressure on the price of soybeans. The extent of the drop in price could be affected by decisions of the government of Sri Lanka as to whether to support the price and, if so, at what level. Governmental price-support decisions,

in turn, will reflect the degree of interest the Government of Sri Lanka has in an incentive price high enough to encourage production of sufficient soybeans for extensive wheat-flour fortification or some similar use. These points may be made in favor of a program of fortifying wheat flour with soybean flour:

1. It would save the country a large amount of foreign exchange.

2. It would greatly improve the nutritive quality of the flour or of bread made from it. This would result from the sharply increased protein content of the flour and from the improved quality of the protein due to a better balance of amino acids.

3. These benefits could be obtained at much lower cost through fortification of flour than by making a soybean beverage or beverage powder to substitute for part of Sri Lanka's imports of dried milk.

4. Acceptability very likely would be less of a problem in flour fortification than in other possible extensive uses for soybeans, as for beverage.

The decision of when to start a program of fortifying wheat flour with soybean flour involves a number of questions:

1. What is the minimum percentage of fortification at which a program would be feasible? Some persons may believe that a significant proportion of soybean flour, say 5 percent, is needed. This writer sees merit in starting at a low level, one percent or even less, and gradually increaisng the proportion of soybean flour as supplies permit.

2. Is it essential to be reasonably certain of a continuing supply of soybean flour before starting the program? Such assurance appears to be highly desirable. It is of more consequence than the specific rate of fortification.

3. If full fat soybean flour is used in the program, as seems logical, will technology considered suitable by competent food technologists, and the expertise to apply it, be available? Obviously, the program should not be started until that question can be answered in the affirmative.

Regardless of whether soybean flour is being used to fortify wheat flour, the Government of Sri Lanka may have to make significant pricing decisions about soybeans within a year or two. Those decisions may be especially difficult if downward pressure on the price of soybeans occurs before a fortification program is initiated. The current price of soybeans in Sri Lanka is considerably above the usual price in major exporting countries. Any price sufficient to provide adequate incentive to produce the volume of soybeans needed for a substantial fortification program within the next few years quite likely will be above the world price. Consequently, if temporary surpluses accumulate, the price-supporting agency would take a loss if it exported soybeans.

Nevertheless, the potential benefits to be obtained from a flour fortification program justify supporting the price of soybeans at an incentive level even though doing so may involve short term losses. Soybeans are a rich source of both protein and calories. They provide more than half again as much protein as the pulses -- protein of as high quality as that in any commonly used plant product. With their oil content, soybeans also provide nearly one-third more calories per pound than do the pulses. If soybeans are used, as full-fat flour could be in wheat flour fortification, in ways which make these superior nutritional qualities available to the people who consume them, they should be worth at least one-third more per pound than the pulses, and maybe one-half more.

These considerations should be taken into account if price support is needed before a flour fortification program is started. They also should affect the decision as to the price which can be offered for soybeans used in the fortification program if an incentive price continues to be needed after the program is started.

Price Incentive for Quality

In Sri Lanka, direct food use of soybeans is the rule. Experts in food processing emphasize that attractive soybean foods cannot be produced unless the soybeans used in them are of high quality.

Despite this need, there is no indication that any systematic method has yet been used in Sri Lanka to adjust the buying price for soybeans according to their quality. Yet it is certain that if the buying price is not varied for differences in quality the average quality of soybeans marketed will go down. To avoid that, superior quality must be rewarded and inferior quality penalized.

Some major buyers have indicated that quality problems are not serious in soybeans purchased in the Dry Zone. They maintain that moisture content is likely to be within acceptable limits and disease and weather damage unimportant because the soybeans mature and are harvested during dry weather. I have no basis for challenging that contention.

In purchasing soybeans on the Kandy market for use in the seminar, however, I found a different situation. Two pounds which I considered representative of average quality on the market graded out as follows:

	Lot 1	(Percent)	Lot 2
Usable soybeans	89.2		89.6
Foreign material	2.0		0.8
Unusable soybeans	4.9		9.6
Splits	3.9		nil
	100.0		100.0

High percentages of unusable soybeans characterized these lots, which may have been produced in the wet zone, or possibly in the intermediate zone. This finding reinforces my belief that a systematic means of adjusting price for quality differences is essential to the future well-being of the soybean industry in Sri Lanka. Equitable price differentials for differences in quality are needed for fair treatment of growers whose soybeans differ in quality. Moreover, in the future quality will decline if there is not adequate price incentive to supply soybeans which have the quality attributes that are essential for use in food.

An equitable, simple, and logical method of adjusting the price paid for soybeans for differences in quality is discussed in Appendix D. It may be modified, if desired, to provide flexibility in setting additional price differentials for quality differences that are not of appreciable concern in some food uses, but which may significantly affect the value of soybeans for use in other foods.

In brief outline the proposal involves:

1. Deducting 1.0 percent from the basic price for each percentage point of moisture in soybeans over a standard percentage, tentatively suggested to be 13 percent. For each percentage point moisture is under the standard percentage, 1.0 percent would be added to the price.

2. Deducting 1.0 percent from the basic price for each percent of foreign material and/or unusable soybeans they contain.

If soybeans contain so much foreign material, unusable soybeans, and/or moisture that extra cleaning or processing involving added expense is needed, this added cost could be charged to the soybean seller in the form of an appropriate whole-percentage deduction from the pay price. The size of this deduction should be the buyer's estimate of the equivalent addition to his processing cost.

Example of application to a lot of soybeans:

Specification	Content	Percent adjustment (Percent)
Moisture	16.0	-3.0
Foreign material	7.0	-7.0
Unusable soybean	3.0	-3.0
Aggregate adjustment		-13.0

Price adjustment at base price of Rs.3: Rs.-0.39 (3.00 x -0.13)

Probably the greatest difficulty in putting this proposal into practice will be in deciding what qualities of soybeans are usable for food and what

qualities are unusable. This decision should be made by experts in food processing. In order to make that decision they will need a large number of samples of soybeans produced under a wide variety of conditions and hopefully containing all conceivable types of defects. Once the decision is reached, a record should be made of it so it can be applied as uniformly as possible in buying soybeans. Perhaps the best way to do this is to obtain carefully made, detailed color photographs of both usable and unusable soybeans which could be duplicated and circulated widely among buyers.

The proposal outlined above does not provide penalties for split soybeans, for green or purple mottled hulls, or for other defacts which may be important in some food uses. However, it can be easily modified to incorporate price adjustments for such defects if they make soybeans unsuitable or of inferior value for a particular food use. Likewise, if no feasible means of determining the exact moisture content is available, or if soybeans are believed to be sufficiently dry, the adjustment for moisture may be omitted. Unusable soybeans may be the most serious type of defect in Sri Lanka. It is important to have a simple, logical, and equitable method of adjusting price for differences in the percentage of such soybeans and of foreign material.

At the seminar, this proposed method of adjusting price for differences in quality was discussed with representatives of CARE and of Markfed, who were interested in it. The possibility of using such a method of price adjustment also was discussed in a meeting including H.M.E. Herath, W. B. Medagama, Mrs. Chandra Breckenridge, P. A. Samaratunge, C. N. Hittle and me on 5th July, 1977. At that meeting it was decided to analyze samples of soybeans purchased by the Department of Agriculture for CARE to determine the extent and nature of the quality problem.

Miscellaneous Suggestions

Extending market information. Once publication of a soybean newsletter begins, a means will be available to disseminate market information about soybeans promptly and regularly. Much of this can be done through the proposed "market information" section included in each issue of the newsletter. When a considerable amount of special market information should be publicized, that section could be enlarged or supplemented with one or more articles about marketing. It is important that as complete market information as is available be extended as quickly and widely as possible.

Exploiting timely uses of soybeans. At current price relationships, substitution of soybeans for pulses probably is considerably reduced from that of one or two years ago. On the other hand, the present high price of coconuts favors substitution of soybean milk for coconut milk in curries. This latter substitution materially improves the nutritive quality of curries. Consequently, it could lead to a lasting change in the source of the "milk" used in curries by some consumers. This opportunity emphasizes the importance of keeping alert to new possible uses for soybeans. To develop these new uses effectively, information about them should be

widely publicized. The soybean newsletter can play an important role in doing this.

Take advantage of seasonal variation in prices of pulses. While supporting data are not available, it appears that there continues to be considerable seasonal variation in the price of pulses, with high prices in the fall. Such a phenomenon is to be expected. Pulse production in Maha greatly exceeds that in Yala. Moreover, some of the pulses, such as green gram, have limited storage life. Even though the greater decline in prices of pulses than of soybeans probably has reduced substitution of soybeans for pulses, relatively high prices for pulses in the fall may favor some substitution during that season. Soybeans have longer storage life and could be available in that season. This possibility also should be widely publicized by timely suggestions of good ways to substitute soybeans for pulses, perhaps starting in September.

World price data for soybeans and related products. As the soybean industry develops in Sri Lanka, decision-makers concerned with it may increasingly wish to relate domestic prices for soybeans to world prices for soybeans, soybean products and competing oils and meals. Commercial reports providing such information are expensive. But the Foreign Agricultural Service, United States Department of Agriculture, Washington, D.C. 20250, U.S.A. issues such information at intervals in its "fats and oils" circulars. Although that information is not current, it could provide valuable perspective. Upon request, arrangements might be made to have those circulars sent air mail from Washington. If not, it might be possible to have them sent to U.S.A.I.D., Colombo, by U.S. State Department pouch, and then mailed to Peradeniya from there.

APPENDIXES

Appendix A: Organizations and Persons Visited

Department of Agriculture, Colombo and Peradeniya

Dr. Ernest Abeyratne, Director of Agriculture
Dr. Christopher R. Panabokke, Deputy Director of Research
Mr. Earl Jayasekera, Deputy Director of Extension
Dr. Nimal Ranaweera, Senior Agricultural Economist
Mr. M. Kopalasuntharam, Assistant Director of Agricultural Development
Mrs. L. D. Dissanayake, Assistant Director, Administration
Mr. W. B. Madagama, Production Agronomist, Extension
Mr. P. A. Samaratunga, Agricultural Economist
Mr. Marcus Hulangamuwa, Economic Assistant
Mr. O. G. Senevaratne, Agricultural Instructor, Extension Division
Mr. N. Wijewarnasuriya, Extension Division

Central Agricultural Research Institute, Peradeniya

Dr. Henry Fernando, Head
Mr. H.M.E. Herath, Coordinator, Sri Lanka Soybean Development Program
Mrs. Chandra Breckenridge, Food Technologist
Mr. V. Arulnandhy, Plant Breeder
Mr. C.A.C. de Silva, Agricultural Officer
Mr. Devasiri Siriwaradane, Experimental Officer

Faculty of Agriculture, University of Sri Lanka, Peradeniya

Dr. R. R. Appadurai, Dean
Dr. T. Jogaratnam, Professor of Agricultural Economics
Miss Nancy Waxler, Visiting Professor
Dr. Sathyapala Pinnaduwage, Lecturer in Agricultural Extension

Agricultural Research Center, Maha - Illuppallama

Dr. Walter G. Fernando, Director
Dr. N. Vignarajah, Research Officer, Grain Legumes and Coarse Grains
Dr. P. Shivanathan, Research Officer, Plant Pathology
Miss Mallika Weerasinghe, Research Officer, Soybeans
Mr. V. Rasiah, Research Officer, Water Management
Mr. Mervyn Sikurajapathy, Research Officer, Cropping Systems
Mr. Jerry Winstanley, British Volunteer (VOS), Agricultural Mechanization

Anuradhapura District

Mr. M.C.M. Mustapha, District Agricultural Extension Officer (Acting)
Mr. H.M.M. de Silva, Additional District Agricultural Extension Officer

Anuradhapura District (cont.)

Mr. Sarath Semasinghe, Field Crops Officer
Mr. K. B. Ratnayake, Agricultural Instructor, Tirappane

Dry Zone Special Projects

Mr. Dan S.B. Wijesinghe, Manager, Elahera
Mr. P. Pinidiya - Aratchy, Manager, Kandalama
Mr. R. Doluweera, Manager, Devahuwa
Mr. K.M.O. Kumarasekane, Agricultural Instructor, Elahera

Agrarian Research and Training Institute

Mr. C. Narayanasamy, National Director
Miss T. Sanmugam, Research and Training Officer

Markfed

Mr. L.M.V. de Silva, Chairman
Mr. Eric R. Jayakody, General Manager
Mr. T. Ganesh, Deputy General Manager
Mr. Sonnie L.B. Palugaswewa, Coordinating Officer, Peradeniya

Department for Development of Marketing

Mr. M. Vamadeva, Commissioner
Mrs. Soma Kotakadeniya, Senior Assistant Commissioner

UNDP - FAO

Mr. Mike Priestley, Resident Representative
Mr. Lionel de Silva, Administrative Assistant
Mr. Chris Lemaire, Program Officer
Mr. F. G. Saunders, Senior Adviser, Peradeniya
Mr. M. J. Watt, Plant Protection Adviser, Peradeniya
Mr. W. B. Deckelmann, Animal Breeding Officer, Kandy
Dr. Y. R. Mehta, Seed Production and Certification Specialist, Peradeniya

CARE, Sri Lanka

Mr. Neil R. Huff, Director
Mr. William Schellstede, Director
Mr. John McLeod
Mr. Jay Jackson
Mr. S. Sountharnrajan, Kundasale cereal factory
Mr. Ranjit Mulleriyawa, Newsletter Editor (resigned)

UNICEF

Dr. (Mrs.) H. Wijemanne, Assistant Program Officer, Health and Nutrition, Program Planning and Evaluation

USAID

Mr. Clark H. Billings, Program Officer
Mr. Jeffery Evans, Loan Development Officer

Canadian International Development Agency

Mr. Richard Dryden, Hyderabad, India

IRRI Rice Project

Mr. James E. Wimberly
Mr. Russell Freed, IRRI

Agrar-und Hydrotechnik GMBH

Mr. Jacob Broersma, Soil Fertility and Fertilizer Marketing Specialist

Appendix B: Economic Considerations in Buying and Processing Soybeans

I. Economics of soybean processing

A. Extraction of oil and meal

1. Decision to extract oil may be affected by

a. Need for soybean oil
b. Probable volume of soybeans to be processed
c. Quantity of other oil-bearing material to share use and overhead costs of extraction facility
d. Extraction equipment already available

2. Expeller vs solvent extraction

a. Capital investments for feasible capacities
b. Fixed costs and economies of scale
c. Extraction efficiency
d. Conditions under which each might be adapted

B. Preparation of whole soybean foods

1. Farm type extruder (Brady cooker)
2. Commercial extruder (Wenger and others)
3. Soy beverage

a. Commercial
b. Home or village production

4. Soybean dahl
5. Home-cooked soybean foods

II. Equitable pricing of soybeans of different qualities

A. Introduction

1. High quality soybeans needed for use in human food
2. Will price differentials by quality be needed in Sri Lanka?

B. Pricing of 3 hypothetical lots of soybeans

1. Specifications

Lot	Moisture	Foreign material & unusable beans	Splits
	%	%	%
1	12.8	1.0	2.0
2	17.8	12.0	12.0
3	17.8	1.0	2.0

United States Grades for Soybeans
Maximum percentage allowed in grade

U.S. Grade	Moisture	Foreign material	Damaged kernels	Splits
	%	%	%	%
1	13.0	1.0	2.0	10
2	14.0	2.0	3.0	20
3	16.0	3.0	5.0	30
4	18.0	5.0	8.0	40

2. Price adjustments for differences in specific attributes
   a. Dry matter
   b. Foreign material and unusable soybeans
   c. Splits, green skins

C. Price by specifications rather than by grades
   1. Better information for buyer
   2. Stronger incentive to maintain quality

D. Why equitable pricing by quality is important

Table 3: Rough Estimates of Investments, Operating Costs at Various Levels of Volume, and Areas Needed in Soybeans for Capacity Operations, Selected Soybean Processing Equipment.

Basic & ancillary equipment for	Approx. investment U.S.$	Annual fixed costs U.S.$ [a/]	Approx. daily capacity	Variable cost per ton	Total cost per ton at volume of operation of (300 days for capacity)					Area needed in soybeans for cap. vol. at yield of 1200 lb per acre
					30,000 T/yr	15,000	6,000	1,500	300	
			Tons	U.S. $	100 T/day	50	20	5	1	Acres per year
					U. S. $ per ton					
Solvent extraction	2,500,000 - 3,500,000	500,000	100	10 - 12	28	44	94	344		50,000
Expeller	350,000 -	65,000	20	23 - 25	35	35	35	67		10,000
Processing of whole-soybean foods										
Extrusion cookers										
Farm type	40,000 - 60,000	10,000	6-8	10 - 15		17	17	19	46	3,500 700 [b/]
Commercial	1,000,000 - 1,200,000	220,000	20-25	15 - 20	50	50	54	164		11,250 2,250 [b/]
Soybean beverage										
Home, village	small	small	small	?	(economies of scale negligible)					small
Commercial	150,000 - 170,000	29,500	1	85 - 90	(would expect costs per ton to be lower in bigger plants)				233	500
Soy dahl	small	small	1	70					90	500

a/ At midpoint of investment with interest on capital at 10% per year and depreciation based on lives of 15 years for solvent extraction, various years for soy beverage, 10 years for others.

b/ Acreages needed if raw material is 20% soybeans, 80% grains.

Appendix C. Costs and Returns from Soybeans and Competing Crops, Yala 1976 and Maha 1976-1977

Table A1 - Soybean Costs and Returns per Acre, Yala 1976 and Maha 1976 - 1977.

Item	Elahera (Polonnaruwa) 21 farms Yala, 1976 Quantity	Value, Rs.	Anuradhapura 13 farms Yala, 1976 Quantity	Value, Rs.	Anuradhapura 25 farms Maha, 1976-1977 Quantity	Value, Rs.
Costs						
Land rent		230.38		144.73		b/
Human labor	77 days	616.19	72 days	492.23	69 days	561.09
Tractor, bullock		117.76		43.15		45.75
Seed	62 lb.	246.48	60 lb.	240.00	b/	174.00
Fertilizer, inoculum		156.14		82.92		c/
Insecticide		34.85		58.04		46.75
Miscellaneous		- -		27.69		60.82
Interest on costs		21.03		16.35		80.12
Total costs		1422.83		1105.11		968.53
Returns						
Soybeans	1330 lb. a/	5318.12 a/	976 lb.	3902.76	1229 lb.	3685.92
Return above costs		3899.31 a/		2797.65		2717.39
Cost per pound		1.07 a/		1.13		0.79

a/ Average for 17 farms for which data were reported.

b/ Information not available

c/ Inoculum perhaps included with seed.

Table A2 - Costs and Returns per Acre of Cowpeas, Yala 1976 and Maha 1976 - 77.

Item	Elahera (Polonnoruwa) 4 farms Yala 1976		Anuradhapura District 6 farms Yala 1976		Anuradhapura District 50 farms Maha 1976-1977	
	Quantity	Value	Quantity	Value	Quantity	Value
Costs		Rs.		Rs.		Rs.
Land rent		221.00		118.00		c/
Human labor	60 days	550.45	68 days	460.83	61 days	506.06
Tractor, bullock		150.62		5.50		115.75
Seed		107.00	20 lbs.	66.67		103.35
Fertilizer	115 lb.	40.25	37 lbs.	20.00		- -
Insecticide		52.75		39.17		45.00
Miscellaneous		- -		50.00		74.23
Interest on costs		16.80		11.40		58.02
Total costs		1138.87		771.57		902.41
Returns						
Cowpeas	1022 lb. a/	2442.58 b/	869 lb.	2073.33	939 lb.	2095.00
Return above costs		1303.71 b/		1301.76		1194.61
Cost per pound		1.00		0.89		0.96

a/ Average for 3 farms.

b/ At average price of Rs.2.39 per pound reported for farms in Anuradhapura.

c/ Information not available.

Table A3 - Costs and Returns per Acre of Green Gram, Yala 1976 and Maha 1976 - 1977.

Item	Elahera (Polonnoruwa) 3 farms Yala 1976		Anuradhapura 15 farms Maha 1976-1977	
	Quantity	Value	Quantity	Value
Costs		Rs.		Rs.
Land rent		233.33		b/
Human labor	94 days	700.00	40 days	322.00
Tractor, bullock		180.00		104.00
Seed	27 lb.	133.33		98.40
Fertilizer	135 lb.	54.00		- -
Insecticide	37 oz.	84.00		24.40
Miscellaneous		- -		45.86
Interest on costs		20.77		79.51
Total costs		1405.43		674.17
Returns				
Green gram	1250 lb. a/	b/	768 lb.	3430.00
Return above costs		b/		2755.83
Cost per pound		0.98		0.88

a/ Average for 2 farms.

b/ Information not available.

Table A4 - Costs and Returns per Acre of Chillies and Groundnuts
Yala 1976, Elahera, Polonnaruwa District

Item	Chillies 4 farms Quantity	Value	Groundnuts 2 farms Quantity	Value
Costs		Rs.		Rs.
Land rent		250.00		267.00
Human labor	233 days	1693.75	60 days	743.00
Tractor, bullock		140.00		70.00
Seed	1 lb.	40.50	2 cwt.	290.00
Fertilizer		433.25	1.4 cwt.	72.50
Insecticide		321.75		52.58
Miscellaneous		- -		- -
Interest on costs		43.19		22.43
Total costs		2922.44		1517.51
Returns				
Chillies	1176 lb.	a/	2688 lb.	a/
Return above costs		a/		a/
Cost per pound		2.49		0.56

a/ Not available

Table A5 - Costs and Returns per Acre of Black Gram, Maha 1977 - 1978, Anuradhapura District

Item	20 farms Quantity	Value
Costs		Rs.
Land rent		a/
Human labor	56 days	449.65
Tractor, bullock		124.57
Seed		120.57
Fertilizer		- -
Insecticide		22.00
Miscellaneous		61.04
Interest on costs		98.12
Total costs		875.95
Returns		
Black gram	972 lb.	3038.00
Return above costs		2162.05
Cost per pound		.90

a/ Information not available

Appendix D: A Way to Adjust Soybean Prices for Differences in Quality

The value of soybeans for use in making soybean foods depends upon (1) their moisture content, (2) the amount of foreign material they contain, and (3) the percentage of soybeans which are so badly diseased, insect damaged or weathered that they should not be used in foods. For some food uses, the proportion of split or other broken beans and the extent to which the soybeans have green or purple-mottled hulls may also be of consequence.

To compensate producers or other sellers fairly for the value of their soybeans, the price paid for them needs to vary with the quality of the soybeans in an equitable manner. Equitable price differentials for differences in quality are necessary to provide producers with incentive to supply soybeans of the desired qualities.

The method of adjusting price for differences in quality described here is equitable, simple, and logical. It may be modified, if desired, to provide flexibility in setting additional price differentials for quality differences that are of no appreciable concern in some food uses of soybeans but which significantly affect the value of soybeans for other food uses.

Adjusting Price for Differences in Moisture Content

Soybeans with excess moisture have less food or feed value per pound than drier soybeans. On the other hand, soybeans with less than normal moisture content are worth more per pound than soybeans containing higher percentages of moisture.

One way to adjust price for differences in moisture content is to select a certain moisture content as standard and vary the price directly with differences in the dry matter content of the soybeans as their moisture content varies from that standard. The standard selected is a matter of judgment. A widely used standard is 13 percent. This may be as high a percentage as should be used because soybeans containing more moisture may not store well.

Soybeans containing 13 percent moisture have 87% dry matter. A direct price adjustment would involve deducting 1/87 of the base price (approximately 1.15 percent) for each additional percentage point of moisture. The same amount would be added to the price for each percentage point by which the moisture content is below 13 percent.

In practice, in order to integrate the price adjustment for differences in moisture with other price adjustments for differences in quality, it may be made at the rate of 1.0 percent rather than 1.15 percent per percentage point difference in moisture. Over the relatively narrow range in moisture content likely to be experienced in the dry zone of Sri Lanka, use of the 1.0 percent rate will not affect the amount of the adjustment materially. The 1.0 percent rate is simpler to use and to incorporate with other price adjustments for differences in quality.

Adjusting for Foreign Material and Unusable Soybeans

Foreign material may include dirt, stones, pieces of the soybean plant, weed or other grain seeds, and any other substances than soybeans. The price paid for soybeans should be reduced from the base price directly in proportion to the percentage of this material in the soybeans. Thus, if a lot of soybeans contain 3 percent of foreign material, the price paid for that lot should be reduced 3 percent below the base price.

Soybeans which are badly damaged by rain or other unfavorable weather conditions, by disease, or by insects are unsuitable for use in food. The price paid for a quantity of soybeans should be reduced directly in proportion to the percentage of these unusable soybeans the lot includes. This price adjustment may be made in the same way as price is adjusted for the percentage of foreign matter.

The biggest problem in adjusting price for unusable soybeans is in determining what qualities of soybeans may be used in food and what qualities are not usable. A possible way to deal with this problem is to have persons experienced in processing soybeans into human foods sort a substantial quantity of soybeans which contains all likely types of defects into usable and unusable soybeans. Replicates of the two classes, or detailed and precise pictures of them, may then be provided to buyers to promote uniformity in classifying soybeans between those that are usable and those that are not usable.

Other Price Adjustments

Whether or not price adjustments should be made for split and other broken soybeans should depend upon the extent to which those characteristics affect the value of soybeans for the use which will be made of them. The same applies to price adjustments for green or purple mottled hulls. Any of these qualities may make a lot of soybeans unacceptable for certain food uses. If so, appropriate price adjustments may be made for soybeans of those qualities when purchased for processing into these foods. On the other hand, there is no point in reducing the price for these defects in buying soybeans for other uses in which these defects are not objectionable.

Overall Price Adjustments

In paying the seller for soybeans, the price adjustments for differences in quality may be combined into an aggregate adjustment. Two illustrations of this aggregation are given below to illustrate the process. The assumed basic price for soybeans is Rs. 3.00 per pound. Price adjustments for moisture differences are at the rate of 1.0 percent for each percentage point departure from a standard of 13 percent.

Specification	Lot I		Lot 2	
	Content	Price adjustment	Content	Price adjustment
	Percent			
Moisture	16.0	-3.0	11.0	+2.0
Foreign material	1.0	-1.0	4.0	-4.0
Unusable soybeans	6.0	-6.0	3.0	-3.0
Aggregate adjustment		-10.0		-5.0
Adjustment in base price (Rs. 3.00) per pound		Rs.-0.30		Rs.-0.15

Price computation by buyers may be simplified by use of a table which shows the total adjustment in price per pound at different levels of the base price for various aggregate percentages of price adjustment.

Pricing by Specification Rather Than by Grade

At least two general reasons can be suggested for pricing soybeans by specifications, as described previously in this proposal, rather than by establishing grades with price differentials between those grades.

Pricing by specification provides incentive to the seller to hold all defects to a minimum. By doing this he keeps his price discounts as small as possible. Differences in grades, however, are based upon differences in a combination of various defects. If soybeans in a given grade exceed specifications in terms of some of these defects, pricing by grade gives the seller no incentive to keep quality as high as possible in those respects.

Pricing by specification can be more accurate. Pricing by grade implies that different lots of soybeans differ in combinations of the various defects. In fact, however, differences in only one characteristic, such as moisture content, may cause soybeans that are similar in other respects to be classified in different grades. If so, the differences in price among such lots of soybeans should be based only on differences in their moisture content. Those differences in price should not assume that such lots of soybeans also differ in foreign matter content, in percentages of unusable soybeans, and so forth.

The variation among different lots of soybeans may be in a characteristic or characteristics that are of much importance in the use for which they are intended. But it may be in a characteristic or characteristics that are of little importance for that use. With sale by specification, this additional information is provided to the buyer, and permits more precise pricing.