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The Economics of Producing and Marketing Soybeans in Oregon

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THE ECONOMICS OF PRODUCING AND MARKETING SOYBEANS IN OREGON

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SUMMARY

The economics of producing and marketing soybeans in three Oregon regions was assessed in this research. Regions considered were the Willamette Valley, the Columbia Basin, and the Ontario area.

Irrigated crops considered to be primary competitors of soybeans were identified in each region. Typical costs and returns were estimated for the competing crops based on 1976 production costs and normal yields and prices.

Yield, price, and cost data, along with agronomically sound crop rotations, were analyzed using linear programming models for a typical farm in each region. An estimate of the minimum price necessary for soybeans to compete with other crop alternatives was determined. Results indicated that, for the successful introduction of soybeans the price per bushel could be no lower than $11.22 in the Willamette Valley, $10.15 in the Columbia Basin, and $8.25 in the Ontario area.

Four potential marketing alternatives for Oregon-grown soybeans were identified: (1) exporting raw soybeans to Japan; (2) exporting raw soybeans to other regions of the United States; (3) processing soybeans at Portland to meet the Pacific Northwest demand for meal and oil; and (4) processing soybeans at Portland and exporting meal and oil to other regions of the United States. These alternatives were evaluated using a Decatur, Illinois, base-point pricing scheme to determine maximum Portland soybean prices that could be offered. Results indicate these maximum Portland prices range from $2.62 to $10.07 per bushel based on transportation costs and Decatur prices for the last seven years.

The economic feasibility of soybean production in the three regions was analyzed by first subtracting average transportation costs to Portland from the maximum Portland soybean prices. These maximum on-farm prices were compared with minimum prices required for soybeans successfully to compete with alternative crops in each production area. Based on the assumptions of this analysis, it was concluded that soybean production in Oregon is not economically feasible at this time.

INTRODUCTION

Introduction of a new crop is dependent upon its agronomic adaptability and interrelated economic aspects of production and marketing. Agronomic adaptability will determine if a new crop <u>can</u> be grown while economic issues determine if it <u>will</u> be grown.

There is interest in soybeans as a possible "new crop" in Oregon. This interest is stimulated by (1) a relatively strong soybean price compared to prices for some crops presently grown; (2) the increasing use of soybean meal and oil in Oregon; (3) an advantageous seaport location relative to Oriental export markets; and (4) the search for other crop alternatives on newly irrigated croplands.

Soybean variety trials conducted by the Oregon State University Agricultural Experiment Station indicate that soybeans can be grown in Oregon. Yields of more than 60 bushels per acre have been achieved in these trials. However, commercial soybean production in the Pacific Northwest has been limited. In 1978, 6,500 acres of soybeans were grown in Washington and Idaho and none were grown in Oregon. While soybean production appears agronomically feasible, information is lacking on economic feasibility.

This research analyzes the economic feasibility of soybean production in Oregon. The study integrates production and marketing considerations to assess the viability of soybeans as a new crop. Not only is this information important to potential producers, but it also can be useful to processors, seed companies, marketing agencies, and Extension personnel. First, some characteristics of the U. S. soybean industry are described.

PRODUCTION TRENDS IN THE UNITED STATES

Soybeans first were introduced into the United States in the early 19th century. Until about 1940, soybeans primarily were used for hay, silage, and in combination with corn as a pasture feed for hogs and sheep. As demands for soybean meal and edible fats and oils increased, production of soybeans for beans increased from about 90 million bushels in 1939 to an estimated 1.8 billion bushels in 1978.

Acreage

Growth of soybean production in the United States has been phenomenal. Acreage of soybeans harvested for beans grew from less than a half million acres in 1924 to an estimated 63.3 million acres in 1978, an increase of about 127 times in only 55 years (Caldwell, p. 8; Table A-1). From 1960 to 1972, U. S. soybean acreage nearly doubled. Ten million more acres came into production in 1973. The trend in the soybean acreage has continued upwards since 1973 (Table A-1).

In 1919, the leading soybean-producing states were in the East and South (Caldwell, pp. 9-11). By 1924, soybean production reached the Corn Belt and expanded rapidly. More than 84 percent of the U. S. soybean acreage harvested for beans was in the Corn Belt in 1939. As the production of soybeans spread into still other areas, the relative dominance of the Corn Belt decreased. Today, more than half of the total U. S. soybean acreage falls outside the Corn Belt (Table A-2).

Yields

Average soybean yields for 1960 to 1978 ranged from 22.8 to 30.6 bushels per acre. Generally, average yields have been increasing, with the exception of the 1974 and 1976 growing seasons when lack of rainfall limited production (Table A-1).

The Corn Belt States lead in average yields with more than 30 bushels per acre. Illinois reported the highest average state yield in 1977 with 38 bushels per acre (Table A-3). Farmers around the country have recorded yields from 60 to more than 80 bushels per acre (Soybean Digest).

Farm Prices

From 1960 through 1971, average annual prices farmers received varied little. During that period, the average U. S. farm price was slightly more than $2.50 per bushel. Since then, average annual and monthly prices have been sporadic but substantially higher (Tables A-1 and A-4). From 1974 through 1978, average monthly prices farmers received ranged from $4.28 to $9.24 per bushel.

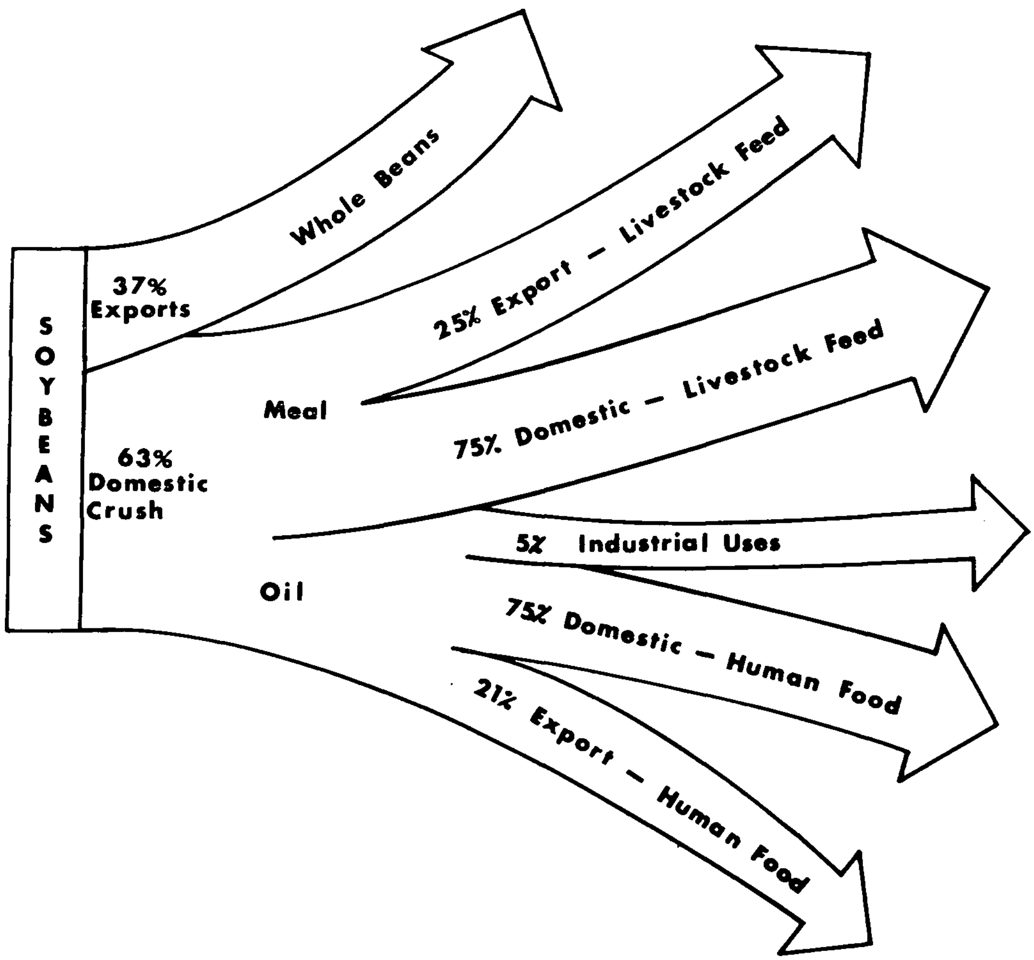
Utilization and Processing

Sharp increases in U. S. soybean production have been stimulated, in part, by rapidly expanding foreign demand for soybeans and soybean products. In recent years, exports of soybeans, meal, and oil amounted to more than 50 percent of the United States' annual production (Steyn, p. 50). Approximate percentages of U. S. soybeans and soybean products exported and used domestically are shown in Figure 1.

About 63 percent of the annual U. S. production of soybeans is processed into meal and oil domestically using mechanical or solvent methods. Mechanical processes - the hydraulic press and the continuous expeller or screw press methods - yield less oil and more meal, but with less protein, than chemical solvent processes. The chemical solvent method, used on more than 95 percent of the soybeans processed, recovers about 18 pounds of oil and 76 pounds of 44 percent protein meal from 100 pounds of beans (Chapman, p. 356).

The first step in the chemical solvent process is cracking the soybeans to loosen the hulls and break each bean into about eight pieces. Shakers and aspirators remove the hulls, and rollers flake the pieces. Soybean oil is extracted from the flakes by adding a solvent (purified petroleum hydrocarbons known as hexane). After the solvent has been recovered, the crude oil is mixed with water and the soybean lecithin and oil are separated by centrifugation. Most soybean lecithin is used commercially as a natural emulsifier for food and drugs. Oil is used by industry in such things as paints and varnishes or is refined with alkali, bleached, hydrogenated, deodorized, and then used in salad oil, shortening, margarine, etc. Soybean oil provides 60 percent of the domestic supply of edible fats and oils (Steyn, p. 58).

WHAT HAPPENS TO U.S. SOYBEANS?



55% OF OUR SOYBEANS ARE EXPORTED AS BEANS, MEAL, OR OIL.

Figure 1. Approximate percentage distribution of soybeans and soybean products exported and used domestically (Steyn).

Raw soybeans contain a number of antinutritional factors still present in defatted flakes (Caldwell, p. 619-46). However, when the flakes are heated with 20 to 30 percent moisture, the antinutritional factors are inactivated and the flakes can be milled into feeds. Because of its quality and dependable supply, soybean meal accounts for 65 percent of the high-protein concentrates found in livestock and poultry rations (Steyn, pp. 51-57). Use of soybean meal in baked goods, meat substitutes, and other human foods accounts for only two percent of the domestic soybean meal use.

Although the chemical solvent process is preferred, the mechanical processes still are used to make certain products (Caldwell, p. 621). The extruder-cooker (a modification of the continuous screw press method) has shown promise for full-fat soy flour, cereal grain-soybean combinations, and pet foods.

Interest in processing and feeding whole or ground soybeans on the farm has grown because of the development of relatively inexpensive soybean roasters. Antinutritional factors are inactivated by heat produced in the roaster and the cooked, full-fat soybeans can be fed. However, a full-fat soybean product in a swine ration causes "soft pork" (more liquid fat in the meat). No problems are encountered with feeding a full-fat product to poultry or cattle, but soybean oil is usually more valuable for human food than as a source of fat in feed rations (Caldwell, p. 647).

PRODUCTION FEASIBILITY

The economic feasibility of producing soybeans in three major agricultural areas of Oregon is analyzed in this section. Crops most likely to be competing with soybeans for producer's cropland were identified and net returns budgeted. A linear programming model was then used to determine the minimum price producers must receive to make soybeans competitive with other crops.[1/]

[1/] "Linear programming is a planning method that is often helpful in decisions requiring a choice among a large number of alternatives." (Beneke, p. 3). In farm management, linear programming is usually used to maximize profits for given levels of resources (e.g., land labor, and capital).

Potential Producing Areas

Six major agricultural centers in Oregon were identified as potential soybean-producing areas. The six centers were: (1) Medford; (2) Willamette Valley; (3) The Dalles; (4) Columbia Basin; (5) Union; and (6) Ontario. Other Oregon areas may offer potential for soybean production (e.g., Roseburg vicinity), however, they were not considered because of the limited acreage involved. Agronomic and climatic conditions in the six identified areas were compared with general requirements for soybean production. Based on these comparisons, the Willamette Valley, the Columbia Basin, and the Ontario areas offered the greatest agronomic potential for soybean production and hence are the only areas of the state considered in this study.

Selection of Competing Crops

Assuming producers are profit motivated, cropping patterns including soybeans are desirable only if economic returns are equal to or greater than returns from existing cropping patterns. This assumption also ignores any change in risk because of a change in the crops grown.

The first step in analyzing economic feasibility was to identify those crops most likely to compete with soybeans. In the Willamette Valley competing crops included wheat, alfalfa, silage corn, sweet corn, and bush beans. Competing crops in the Columbia Basin included wheat, alfalfa, field corn, sugar beets, potatoes, and dry beans. In the Ontario Area, wheat, alfalfa, field corn, sweet corn, sugar beets, potatoes, and onions were identified. These competing crops were chosen because they are the major irrigated crops and have growing requirements similar to soybeans.

Budgeting Net Returns

Typical costs and returns were estimated for the competing crops based on 1976 costs and "normal" prices and yields. Prices and yields were based on recent historical data and trends expected over the next five years. Cost data also were developed for establishing alfalfa in each region and planting cover crops in the Columbia Basin. Land investment costs were not included in these budgets. Net returns estimated for each crop represent the residual return to land investment after all other costs of production are paid.

Basic information regarding cultural operations was obtained from enterprise cost studies prepared by the Oregon State University Extension Service. Additional information regarding machinery, irrigation, and production input costs and requirements was obtained from local suppliers, machinery dealers, Extension agents, and others familiar with irrigated crop production in each region.

Certain assumptions were made in developing these data. A commercially viable farm of 650 acres of irrigated cropland was chosen to be representative for each of the three regions. The owner/operator of this farm uses above average management efficiency, sound agronomic practices, and has the necessary resources to grow soybeans, as well as any of the competing crops within each region.

These data are representative of irrigated crops grown in the three regions. However, they do not necessarily represent any real farm situation. Therefore, farmers must use caution in applying these cost and return data to their operations.

Cost of producing soybeans in each region was estimated using the same assumptions as for the competing crops. Results are presented in Tables B-1 through B-3.

With little or no commercial production of soybeans in each region, it is difficult to determine specific production input requirements and cultural operations. General soybean production guidelines were consulted (Holst and Fitch). Fertilizer and herbicide rates used in these budgets should provide adequate nutrients and weed control. Soybeans were assumed to be grown as a row crop. In this context, the cultural operations required would be similar to those for other row crops presently grown in each region. Farmers may need to adjust these data to their own circumstances.

Since commercial soybean production in Oregon has been limited, historical production data could not be used to determine normal soybean yields in each region. Expected yields were developed considering: (1) experimental yield trials; (2) agronomic potential of soybean production in each region, and (3) above-average management and competing crop yield assumptions. Reasonable soybean yields were estimated at 30 bushels per acre in the Willamette Valley and 40 bushels per acre in the Columbia Basin and the Ontario area.

Budget data for crops under consideration are summarized in Tables 1 through 3. (Detailed budgets are presented in Appendix B.) The price per bushel of soybeans is not indicated, hence, neither are returns to land. Information contained in these tables provides the basis for the analysis that follows.

Required Farm Prices

An important consideration in assessing the feasibility of soybeans, or any new crop, is how this crop will fit into existing crop rotations. These rotations are an important constraint to crop production because of needs for soil conservation, fertility maintenance, and disease and insect control.

Agronomically acceptable crop rotations were developed based on the competing crops for each region. In addition, new rotations combining competing crops with soybeans were identified (Appendix C lists the rotations considered). Each of these crop rotations was included as an activity in the linear programming model. These rotational activities were limited by the total acreage available and by constraints on individual crops.

Individual crop acreage constraints were based on historical and projected agronomic considerations and marketing trends. For instance, in the Columbia Basin, potatoes could not exceed 40 percent of the total acreage, while alfalfa was required to be grown on at least 15 percent of the acreage (Table C-4).

The linear programming model was used to maximize returns to land by combining prices, yields, and total costs (presented in Tables 1-3), crop rotation activities; and individual crop acreage constraints. Results are presented in Tables 4 through 6.

The soybean price was varied from low to high levels to determine its effect on cropping patterns. The minimum price required for soybeans to enter

Table 1. Yield, Price, Cost, and Return Assumptions for the Competing Crops and Soybeans, Willamette Valley, Oregon

Crop	Unit	Yield per acre	Price per unit	Gross returns per acre	Total costs per acre[a/]	Returns to land per acre
			($)	($)	($)	($)
Wheat	bu.	100	3.25	325.00	228.70	96.30
Silage corn	T.	25	19.00	475.00	405.10	69.90
Sweet corn	T.	8.6	60.00	516.00	324.62	191.38
Bush beans	T.	4.6	140.00	644.00	442.74	201.26
Alfalfa prod.	T.	6	65.00	390.00	299.31	90.69
Alfalfa est.[b/]	-	0	--	0	210.69	-210.69
Soybeans	bu.	30	?	?	240.36	?

[a/] Excludes a charge for land investment.

[b/] One acre of the alfalfa establishment enterprise is required for every four acres of alfalfa production, assuming a stand life of four years. See rotation sequences listed in Table C-1.

Table 2. Yield, Price, Cost, and Return Assumptions for the Competing Crops and Soybeans, Columbia Basin, Oregon

Crop	Unit	Yield per acre	Price per unit	Gross returns per acre	Total costs per acre[a]	Returns to land per acre
			($)	($)	($)	($)
Wheat	bu.	90	3.25	292.50	236.89	55.61
Sugar beets	T.	28	25.00	700.00	521.14	178.86
Potatoes	T.	25	55.00	1375.00	924.32	450.68
Alfalfa prod.	T.	7	65.00	455.00	320.05	134.95
Alfalfa est.[b]	-	0	-	0	121.98	-121.98
Field corn	bu.	155	3.00	465.00	396.87	68.13
Dry beans	cwt.	18	18.00	324.00	255.27	68.73
Soybeans	bu.	40	?	?	258.95	?
Cover crop[c]	-	0	0	0	45.71	-45.71

[a] Excludes a charge for land investment.

[b] One acre of the alfalfa establishment enterprise is required for every four acres of alfalfa production, assuming a stand life of four years.

[c] Cover crops were required in some cropping rotations (see Table C-2).

Table 3. Yield, Price, Cost, and Return Assumptions for the Competing Crops and Soybeans, Ontario Area, Oregon

Crop	Unit	Yield per acre	Price per unit	Gross returns per acre	Total costs per acre[a]	Returns to land per acre
			($)	($)	($)	($)
Wheat	bu.	100	3.25	325.00	193.77	131.23
Sugar beets	T.	27	25.00	675.00	555.09	119.91
Potatoes	T.	17.5	55.00	962.50	711.96	250.54
Alfalfa prod.	T.	6	60.00	360.00	244.33	115.67
Alfalfa est.[b]	-	0	--	0	104.10	-104.10
Field corn	bu.	130	3.00	390.00	274.18	115.82
Sweet corn	T.	8	55.00	440.00	293.80	146.20
Onions	cwt.	450	3.75	1687.50	1132.86	554.64
Soybeans	bu.	40	?	?	209.76	?

[a] Excludes a charge for land investment.

[b] One acre of the alfalfa establishment enterprise is required for every four acres of alfalfa production, assuming a stand life of four years. See rotation sequences listed in Table C-3.

the Willamette Valley farm plan was $11.22 per bushel (Table 4). At this price, soybeans substituted for some wheat acreage. Further increases in the soybean price caused an increase in soybean acreage with reductions in bush bean acreage. Raising the price of soybeans beyond $14.73 per bushel had no effect on the Willamette Valley farm plan because of rotation and acreage restrictions.

The minimum price for soybeans to enter the Columbia Basin farm plan was $10.15 per bushel (Table 5). Soybeans entered the farm plan with a reduction in wheat acreage. Further increases in the soybean price caused an increase in soybean acreage with reductions in sugar beet and potato acreage. Raising the price of soybeans beyond $17.75 per bushel had no effect on the Columbia Basin farm plan because of rotation and acreage restrictions.

The minimum price required for soybeans to enter the Ontario area farm plan was $8.25 per bushel (Table 6). Soybeans substituted for sugar beet production. Further increases in the soybean price caused an increase in soybean acreage with reductions in acreages of wheat, sweet corn, and, finally, potatoes. Raising the price of soybeans beyond $11.51 per bushel had no effect on the Ontario area farm plan because of rotation and acreage restrictions.

Conclusions of the Production Feasibility Analysis

To measure the ability of soybeans to compete for resources, typical costs and returns were estimated for each of the competing crops in the Willamette Valley, Columbia Basin, and Ontario area. These data, along with agronomically sound crop rotations, were analyzed for each region to determine the combination of crop rotations which maximized returns to land. The soybean price was varied from low to high levels to determine its effect on the optimum combination of crop rotations. Results of these analyses indicated that soybeans could compete with the alternative crops provided the soybean price per bushel was $11.22 in the Willamette Valley, $10.15 in the Columbia Basin, and $8.25 in the Ontario Area.

Table 4. Projected Cropping Pattern at Various Soybean Price Levels, Willamette Valley, Oregon

	Soybean price levels ($/bu.)		
Crops	0.00 - 11.21	11.22 - 14.72	14.73 & above
	(percent)	(percent)	(percent)
Wheat	30	15	15
Silage corn	0	0	0
Sweet corn[a/]	35	35	35
Bush beans[b/]	35	35	0
Alfalfa prod.	0	0	0
Alfalfa est.	(0)	(0)	(0)
Soybeans	0	15	50
TOTAL	100	100	100
Returns to land per acre [c/]	$166	$166 - $182	$182 & above

[a/] Sweet corn was constrained to be less than or equal to 35 percent of the acreage.

[b/] Bush beans were constrained to be less than or equal to 35 percent of the acreage.

[c/] Calculated from yield, price, and cost assumptions for crops presented in Table 1 and the soybean price levels above.

Table 5. Projected Cropping Pattern at Various Soybean Price Levels, Columbia Basin, Oregon

Crops	Soybean price levels ($/bu.) 0.00 - 10.14	10.15 - 10.94	10.95 - 17.74	17.75 & above
	(percent)	(percent)	(percent)	(percent)
Wheat	27	7.5	7.5	7.5
Sugar beets[a/]	18	18	0	0
Potatoes[b/]	40	40	40	36.9
Alfalfa prod.[c/]	15	15	15	15
Alfalfa est.[d/]	(3.8)	(3.8)	(3.8)	(3.8)
Corn	0	0	0	0
Dry beans	0	0	0	0
Soybeans	0	19.5	37.5	40.6
Cover crop[d/]	(34.8)	(73.8)	(73.8)	(73.8)
TOTAL	100%	100%	100%	100%
Returns to land per acre e/	$227	$227 - $233	$233 - $355	$335 & above

[a/]Sugar beets were constrained to be less than or equal to 18 percent of the acreage.

[b/]Potatoes were constrained to be less than or equal to 40 percent of the acreage.

[c/]At least 15 percent of the acreage was required to be in alfalfa production.

[d/]The establishment of alfalfa and the planting of cover crops were assumed to be performed in the fall after the prior crop was harvested, thus no additional land was required. Cover crops were required between successive row crops to control wind erosion.

[e/]Calculated from yield, price, and cost assumptions for the crops presented in Table 2 and the soybean price levels above.

Table 6. Projected Cropping Pattern at Various Soybean Price Levels, Ontario Area, Oregon

Crops	Soybean price levels ($/bu.)				
	0.00-8.24	8.25-8.52	8.53-8.89	8.90-11.50	11.51 & above
	(percent)	(percent)	(percent)	(percent)	(percent)
Wheat[a]	30	30	10	10	10
Sugar beets	5	0	0	0	0
Potatoes[b]	25	25	25	25	20
Alfalfa prod.[c]	20	20	20	20	20
Alfalfa est.[d]	(5)	(5)	(5)	(5)	(5)
Corn	0	0	0	0	0
Sweet corn[e]	10	10	10	0	0
Onions[f]	10	10	10	10	10
Soybeans	0	5	25	35	40
TOTAL	100	100	100	100	100
Returns to land ($/ac) [g]	$196	$196 - $197	$197 - $200	$200 - $237	$237 & above

[a] Wheat was constrained to be between 10 to 30 percent of the acreage.

[b] Potatoes were constrained to be less than or equal to 25 percent of the acreage.

[c] At least 20 percent of the acreage was required to be in alfalfa production.

[d] The establishment of alfalfa was assumed to be performed in the fall after the prior crop was harvested, thus no additional land was required.

[e] Sweet corn was constrained to be less than or equal to 10 percent of the acreage.

[f] Onions were constrained to be less than or equal to 10 percent of the acreage.

[g] Calculated from yield, price, and cost assumptions for the crops presented in Table 3 and the soybean price levels above.

MARKETING FEASIBILITY

The economic feasibility of marketing Oregon soybeans is analyzed in this section. Alternative market outlets were identified and evaluated utilizing a base-point pricing scheme to determine the maximum soybean price that could be offered producers.

Marketing Alternatives Identified

Potential marketing alternatives for Oregon-grown soybeans were based on two assumptions. The first assumption was that a soybean processing plant would not be built in Oregon. Two marketing alternatives identified under this assumption were that soybeans produced in Oregon could be (1) exported to Japan, or (2) exported to a U. S. processor in another area. The second assumption was that a soybean processing plant would be built in Oregon. In this case, the marketing alternatives were that processed meal and oil (1) could help meet Oregon's demand for these products, or (2) be exported to other regions of the United States.[2/] The Decatur base-point pricing scheme was used to evaluate these alternatives and to derive estimates of prices that could be offered producers of Oregon soybeans.

[2/] Two more potential marketing alternatives may exist for Oregon-grown soybeans: on-farm use of raw soybeans and exporting meal and oil to Japan. On-farm use of raw soybeans is not considered because:

- the nutritional value of Pacific Northwest grown soybeans has not been assessed for livestock although it has been assessed for poultry (see three publications by Paradis, et al.);
- soybeans usually are more valuable for human food than as a source of fat in feeds (Caldwell, p. 647); and
- national disposition trends indicate less than one-tenth of one percent of the U. S. soybeans produced are fed raw (USDA, Economic Research Service, "U. S. Fats and Oils Statistics 1961-76.").

Exporting meal and oil to Japan is not considered because:

- only about three percent of the U. S. meal exports are imported by Japan (Ryan, p. 6); and
- Japan imports no U. S. soybean oil (Holz).

Derived Soybean Prices at Portland

Decatur, Illinois, a historically important processing point, is used by the soybean industry as the "base-point" for pricing soybeans, meal, and oil produced in the United States. Suppliers of meal and oil price their products at the Decatur price plus freight from Decatur, whether the seller actually ships from Decatur. Under this system of pricing, the price producers receive for soybeans sold is the Decatur price less freight to Decatur, regardless of whether the soybeans actually are shipped to Decatur.

Assuming a processing plant was not built in Oregon, Oregon soybeans could be exported to Japan or to a U. S. processor in another area. By using the Decatur base-point pricing scheme, the derived Portland prices of Oregon-grown soybeans were determined for each of these alternatives as follows:

1. Export Oregon Soybeans to Japan:

   Decatur soybean price
   + Transportation cost, Decatur to Japan
   - Transportation cost, Portland to Japan
   = Derived price of soybeans in Portland

2. Export Oregon Soybeans to Other U. S. Areas:

   Decatur soybean price
   - Transportation cost, Decatur to Portland
   = Derived price of soybeans in Portland

If it is assumed a processing plant was built at Portland, soybeans could be processed, the crude oil refined, and the resulting meal and oil products used to meet all or part of the demand for these products in Oregon or exported to other areas of the United States. Using the Decatur base-point pricing scheme, the derived Portland prices of Oregon-grown soybeans were determined for these two alternatives as follows:

1. Meet Oregon's Demand for Meal and Oil:

   Decatur meal and oil prices

   \+ Transportation costs, Decatur to Portland

   X Conversion factor to raw soybeans

   \- Processing costs

   = Derived price of soybeans in Portland[3/]

2. Export Meal and Oil to Other U. S. Areas:

   Decatur meal and oil prices

   \- Transportation costs, Portland to Decatur

   X Conversion factor to raw soybeans

   \- Processing costs

   = Derived price of soybeans in Portland

Conclusions of the Marketing Feasibility Analysis

Results of the method used to derive maximum Portland soybean prices are summarized in Table 7 (see Appendix D for the derivation of these values). The average Decatur soybean, meal, and oil prices for the 1971 to 1977 marketing years were adjusted to 1976-77 marketing year dollars to account for the change in the value of the dollar using the Implicit Price Deflator for the Gross National Product. This made the prices consistent with the time frame of the linear programming analyses. Costs of transporting soybeans, meal, and oil were obtained from Baumel, Bell, and The Journal of Commerce and Commercial. Processing costs were estimated from Helgeson, et al. The Portland soybean price ranged from $2.62 to $10.07 per bushel (adjusted to 1976-77 dollars) over the last seven marketing years.

[3/] An upper limit equal to the Decatur soybean price plus transportation cost, Decatur to Portland, was imposed on this price assuming that the Oregon processor would pay no more for Oregon soybeans than the total cost of shipping soybeans from the Midwest.

Table 7. Summary of Maximum Soybean Prices by Marketing Alternatives in 1976-1977 Dollars, Portland, Oregon

Marketing year a/	Without processing plant: Export to Japan b/	Without processing plant: Ship to other states c/	With processing plant: Use meal and oil in PNW d/	With processing plant: Ship meal and oil to other states e/
	($/bu.)	($/bu.)	($/bu.)	($/bu.)
1971 - 72	4.87	3.21	5.57	2.62*
1972 - 73	8.64	6.98	10.07**	7.12
1973 - 74	7.70	6.04	9.14	6.24
1974 - 75	7.30	5.64	8.18	5.23
1975 - 76	5.85	4.19	6.61	3.67
1976 - 77	7.68	6.02	8.34	5.39
1977 - 78	6.16	4.50	7.00	4.06
Average f/	6.89	5.23	7.84	4.90

a/ Begins in September for beans, October for meal and oil.

b/ From Table D-1.

c/ From Table D-2.

d/ From Tables D-3 and D-4.

e/ From Table D-5.

f/ Simple average of the data presented for the marketing years analyzed.

*This is the lowest price derived.
**This is the highest price derived.

THE ECONOMIC FEASIBILITY OF SOYBEANS IN OREGON

The economic feasibility of soybean production in Oregon is assessed by combining the results of the production and marketing feasibility analyses. The minimum price required for soybeans to successfully compete with alternative crops in the Willamette Valley, the Columbia Basin, and the Ontario area (estimated by the linear programming analyses) was compared with the maximum Portland soybean price range resulting from the analysis of the marketing alternatives.

Figures 2 through 4 graphically summarize this approach for the three regions. Solid lines in these figures represent results of the production feasibility analysis (Tables 4-6). Vertical-dashed lines represent results of the marketing feasibility analysis (Table 7).

Willamette Valley Results

To assess the economic feasibility of soybean production in the Willamette Valley, costs of transporting soybeans from the farm to Portland must be subtracted from the Portland soybean price range. Assuming an average length of haul, transportation costs would be about 13 cents per bushel (Hickerson). The maximum on-farm soybean price a Willamette Valley farmer may anticipate would range from \$2.49 to \$9.94 per bushel (represented by the vertical dashed lines in Figure 2). The solid line in Figure 2 represents the percent of the Willamette Valley acreage in soybeans as the price of soybeans increases (the production feasibility results). The minimum price required for soybeans to successfully compete with alternative crops in the Willamette Valley is \$11.22 per bushel, \$1.28 per bushel higher than the highest price farmers could anticipate based on the analysis of marketing alternatives for the last seven years (Table 7). The highest average maximum price for the seven years analyzed, assuming a processing plant at Portland with the resulting meal and oil used in the Pacific Northwest, is \$7.71 per bushel after subtracting transportation costs to Portland (\$7.84 - \$0.13 = \$7.71). If Willamette Valley farmers require \$11.22 per bushel, soybean production is not economically feasible based on the assumptions of this analysis.

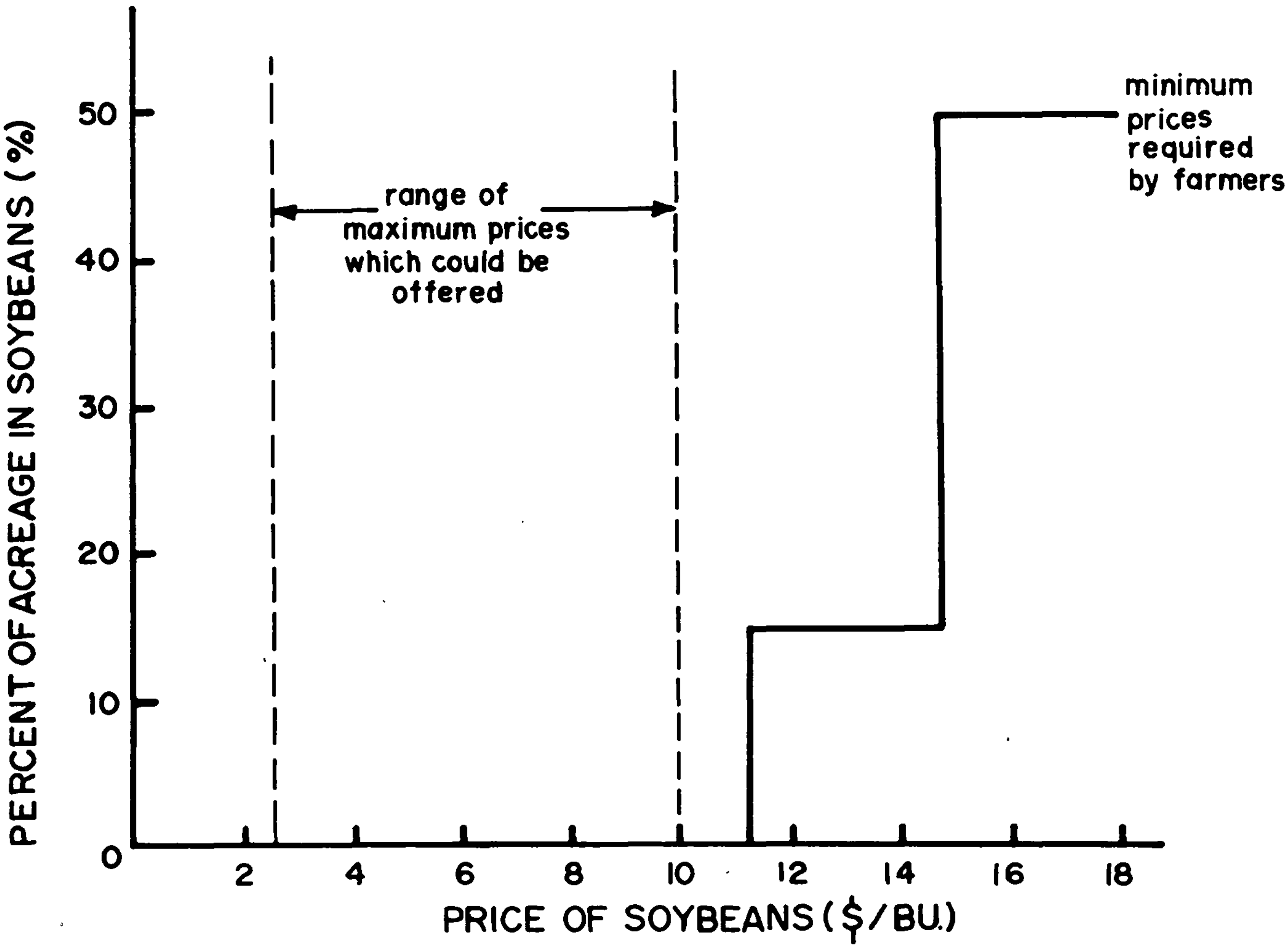


Figure 2. Comparison of the maximum prices which could be offered and the minimum prices required by producers of soybeans, Willamette Valley, Oregon.

Columbia Basin Results

The cost for transporting soybeans from the Columbia Basin to Portland would average about 28 cents per bushel (Fitch). Subtracting these transportation costs from the Portland soybean price range results in a Columbia Basin soybean price range of $2.34 to $9.79 per bushel (the vertical dashed lines in Figure 3). The average maximum price, assuming a processing plant in Portland with the resulting meal and oil used in the Pacific Northwest, is $7.56 per bushel after subtracting transportation costs to Portland (Table 7).[4/] The minimum price required for soybeans to successfully compete with the alternative crops in the Columbia Basin is $10.15 per bushel, $2.59 higher than the average maximum price farmers could expect.[5/] Therefore, based on the assumptions and data used in this analysis, Columbia Basin soybean production is not economically feasible.

[4/] The processor could locate in Hermiston, for example, instead of Portland. The Hermiston processor would be closer to (1) soybeans grown in the Columbia Basin and (2) the source of demand for meal in livestock rations. Some transportation costs could be saved, vis-a-vis the Portland location, and might result in a higher on-farm soybean price for Columbia Basin farmers. However, the Hermiston processor would be farther away from the Willamette Valley, the center of demand for meal in poultry rations. Unless a refinery also were to locate in Hermiston, crude oil produced at the Hermiston processing plant would have to be transported to Portland, refined, and transported back to the Columbia Basin before it could be utilized by the potato processing industry. The saving in transportation costs could be offset by these other factors and thus have no effect on the soybean price Columbia Basin farmers might anticipate.

[5/] A total cost of $91.42 is required to grow the cover crops in a potatoes (cover crop), soybeans (cover crop) rotation (see Tables B-5 and C-2). Dividing $91.42 by 40 bushels of soybeans per acre implies that the $10.15 price per bushel of soybeans is inflated by $2.29 to cover cost of cover crops. The difference between $10.15 and $2.29 is $7.86. Assuming the cover crops were not required, the minimum price at which soybeans would become a part of the farm plan is $7.86 per bushel given that the rotations and crop acreages remain constant at this lower price. However, the average maximum price Columbia Basin farmers may expect ($7.56 per bushel) is still lower.

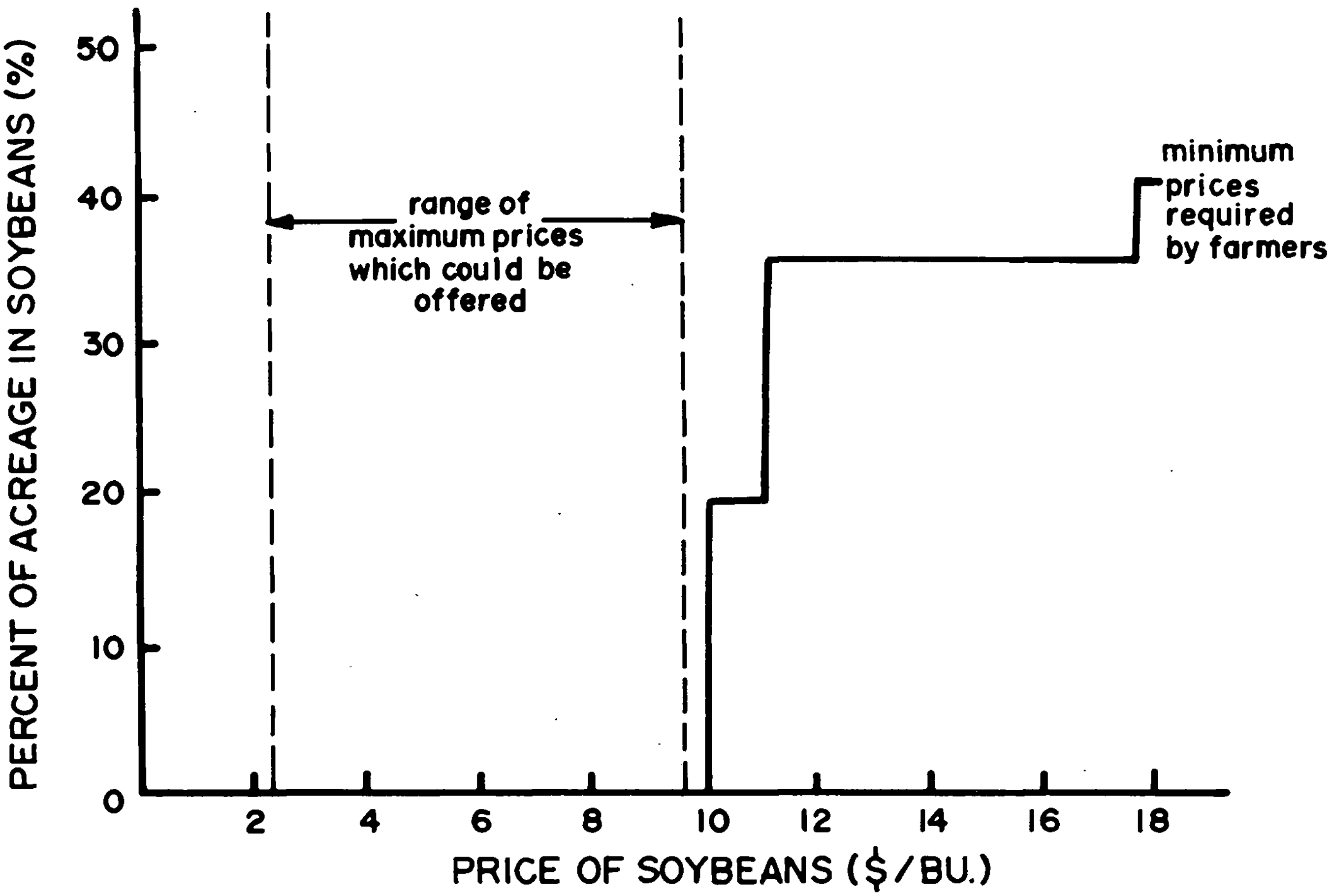


Figure 3. Comparison of the maximum prices which could be offered and the minimum prices required by producers of soybeans, Columbia Basin, Oregon.

Ontario Area Results

The average transportation costs involved in getting soybeans from the Ontario area to Portland would be about 39 cents per bushel (Burr). Subtracting the transportation costs from the maximum Portland soybean price range (Table 7) indicates that the on-farm price of soybeans in the Ontario area would range from $2.23 to $9.68 per bushel (indicated by the vertical dashed lines in Figure 4). The solid line in Figure 4 represents the percent of the Ontario area acreage in soybeans as the price of soybeans increases. The minimum price necessary for soybeans to successfully compete with the alternative crops in the Ontario area is $8.25 per bushel. The highest maximum price which could be offered for Ontario area soybeans is $1.43 per bushel higher than the minimum price required by farmers to grow soybeans. At this price, 35 percent of the Ontario area acreage would be in soybeans. However, only three of the 28 estimates of the maximum Portland price (Table 7) result in a price higher than or equal to that required by Ontario area farmers after subtracting transportation costs to Portland. The average maximum price for the seven years analyzed, assuming a processing plant at Portland and the resulting meal and oil used in the Pacific Northwest, is $7.45 per bushel after subtracting transportation costs to Portland. With a minimum price required by Ontario area farmers of $8.25 per bushel, the economic feasibility of soybean production in the Ontario area is marginal at best.

Some Conditions for Feasible Soybean Production

The preceding analyses indicate that required producer soybean prices exceed the expected on-farm prices. The minimum per bushel prices required were found to be $11.22 in the Willamette Valley, $10.15 in the Columbia Basin, and $8.25 in the Ontario area (Tables 4 through 6). Assuming the soybeans were processed and the meal and oil used in the Pacific Northwest, the average maximum Portland soybean price, based on data for the last seven years, would be $7.84 per bushel measured in 1976-77 dollars (Table 7). These findings are based on several assumptions regarding crop production costs, prices, and yields for soybeans and for competing crops. Different assumptions could affect the conclusions regarding the economic feasibility of soybean production. This section is an analysis of some conditions required to make soybean production economically attractive in each of the regions.

Figure 4. Comparison of the maximum prices which could be offered and the minimum prices required by producers of soybeans, Ontario area, Oregon.

Over the last few years, crop prices have varied considerably in these regions. Prices assumed for competing crops were based on normal expectations. However, developments during the next few years could result in lower prices for one or more of these crops. The question then becomes how low would the competing crop prices be before soybeans become economically attractive. To answer this question, break-even prices were calculated for the major competing crops in each region. The Portland soybean price was assumed to be equal to $7.84 per bushel less transportation costs from each region. Yield and cost assumptions are the same as presented in Tables 1 through 3.

Assumed normal prices are compared to required break-even prices in Table 8. For example, if the price of wheat in the Columbia Basin were $3.11 per bushel or lower, soybeans would compete with wheat for the producer's irrigated cropland. Results for the other crops are interpreted in the same manner with the break-even price indicating when soybeans would be an economically attractive substitute for that crop with all other assumptions unchanged. Use caution to interpret these results, however. The analysis does not consider crop rotation restrictions or other agronomic requirements such as cover crops to control wind erosion. Soybeans are simply compared with each crop independently.

Another critical assumption in this analysis is expected soybean yield in each region. These yields were based on variety trials and observations made by a few commercial growers. Improved production practices and higher yielding varieties could result in yields higher than those assumed. The question then becomes what level of soybean yield would be required in each region for soybeans to be competitive with alternative crops. These break-even soybean yields were calculated for each region based on the same assumptions as the linear programming analysis. Again, the Portland soybean price was assumed to be $7.84 per bushel with soybeans processed and the meal and oil used in the Pacific Northwest.

The assumed soybean yields are compared to the break-even soybean yields in Table 9. The percentage increase in the assumed yield required for soybeans to become competitive also is indicated. For example, if the yield of soybeans in the Columbia Basin could be increased to yield 54 bushels per acre, they would become a viable crop alternative. This 34 percent increase assumes that cover

Table 8. "Assumed Normal" Prices and Break-even Prices for Regional Competing Crops with a Portland Soybean Price of $7.84 and All Other Assumptions Unchanged a/

Region and competing crops		Units	Assumed normal price	Break-even price
			($/unit)	($/unit)
Willamette Valley:	Alfalfa	ton	65.00	59.22
	Wheat	bu.	3.25	2.20
	Bush beans	ton	140.00	94.28
Columbia Basin:	Alfalfa	ton	65.00	57.31
	Wheat	bu.	3.25	3.11
	Sugar beets	ton	25.00	20.16
	Potatoes	ton	55.00	38.71
Ontario Area:	Sugar beets	ton	25.00	23.83
	Wheat	bu.	3.25	2.82
	Sweet corn	ton	55.00	47.76
	Potatoes	ton	55.00	45.73

a/ This soybean price is the average for the marketing years 1971-77 in 1976-77 dollars as derived assuming a processing plant in Portland and use of meal and oil in the Pacific Northwest (Table 7).

Table 9. Assumed Soybean Yields and Soybean Yields Required to Break-even by Region with a Portland Soybean Price of $7.84 and All Other Assumptions Unchanged a/

Region	Assumed yield	Break-even yield	Percent increase required
	(bu/ac)	(bu/ac)	%
Willamette Valley	30	43.7	46
Columbia Basin	40	53.7	34
Ontario Area	40	44.3	11

a/ This soybean price is the average for the marketing years 1971-77 in 1976-77 dollars as derived assuming a processing plant in Portland and use of meal and oil in the Pacific Northwest (Table 7).

crops are required to control wind erosion. If crop rotations were agronomically feasible without these cover crops, the required increase in soybean yield would be significantly less. Another consideration for the interpretation of these break-even yields for all three regions is additional harvest cost associated with the higher yields. These were ignored. Break-even yields may be slightly higher than those calculated if additional harvest costs are considered.

CONCLUSIONS

Based on the assumptions and data used in this study, soybean production in Oregon is not considered economically feasible at this time. Assuming the soybeans were processed and meal and oil used in Oregon, the average farm price offered for the last seven years would have ranged from $0.80 to $3.51 per bushel lower than the minimum prices required by farmers to grow soybeans.

An analysis was conducted to determine some conditions that would make soybean production more economically attractive in each region. Soybeans could become an economically viable crop alternative if competing crop prices were lower or soybean yields higher.

Further analysis may be necessary. The applicability of the Decatur base-point pricing scheme to the pricing of soybeans in Oregon should be reevaluated. As export demand for unprocessed soybeans increases, the importance of Decatur as a pricing center may decrease. U. S. soybeans competing in the world market may be better priced at Rotterdam minus transportation costs from the Gulf of Mexico to Rotterdam. Also, the Decatur base-point pricing scheme may not be applicable if a processing plant were located in Oregon. Additional research may be required to evaluate soybean processing in Oregon. This feasibility study would assess the costs of processing soybeans and, hence, the price the processor could offer producers of Oregon soybeans. Changes in energy costs for transportation, irrigation pumping, and fertilizer production, as well as the development of new, higher-yielding varieties adapted to Oregon's soils and climate may improve the outlook for soybean production in Oregon.

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A P P E N D I X A

United States Soybean Acreages, Yields, and Prices

Tables A-1 to A-4

Table A-1. U.S. Soybean Acreage Harvested for Beans, Average Yield, and Price Per Bushel, 1960-1978

Year	Acres harvested	Average yield per acre harvested	Price per bushel
	(thousand)	(bushels)	($)
1960	23,655	23.5	2.13
1961	27,003	25.1	2.28
1962	27,608	24.2	2.34
1963	28,615	24.4	2.51
1964	30,793	22.8	2.62
1965	34,449	24.5	2.54
1966	36,546	25.4	2.75
1967	39,767	24.5	2.49
1968	41,104	26.8	2.43
1969	40,982	27.5	2.35
1970	42,249	26.7	2.85
1971	42,701	27.5	3.03
1972	45,698	27.8	4.37
1973	55,796	27.7	5.68
1974	52,368	23.2	6.64
1975	53,579	28.9	4.92
1976	49,358	26.1	6.81
1977	57,612	30.6	5.79
1978 (est.)	63,268	28.6	6.19

Sources: U.S. Department of Commerce and U.S. Department of Agriculture, "Crop Production Annual Summaries" and "Crop Production."

U.S. Department of Agriculture, U.S. Fats and Oils Statistics 1961-76 and "Fats and Oils Situation."

Table A-2. U.S. Soybean Acreage Harvested for Beans by Regions and States

Region	States	1960	1965	1970	1975	1976	1977	1978 (est.)
		Year						
		(1,000 acres)						
Corn Belt:								
	Illinois	4,973	6,021	6,800	8,320	7,560	8,850	9,200
	Iowa	2,599	4,850	5,680	6,970	6,450	7,080	7,500
	Missouri	2,344	3,051	3,465	4,370	4,200	4,650	5,500
	Indiana	2,415	2,871	3,278	3,630	3,280	3,900	4,100
	Ohio	1,499	2,044	2,550	3,100	2,880	3,380	3,720
	TOTAL	13,830	18,837	21,773	26,390	24,370	27,860	30,020
Delta:								
	Arkansas	2,409	3,550	4,400	4,700	4,320	4,600	4,800
	Mississippi	916	1,461	2,580	3,120	3,250	3,650	3,900
	Louisiana	216	622	1,688	1,920	2,250	2,680	2,950
	TOTAL	3,541	5,633	8,668	9,740	9,820	10,930	11,650
Lake States:								
	Minnesota	2,090	3,166	3,030	3,650	3,020	3,770	4,000
	Michigan	221	440	500	610	565	720	810
	Wisconsin	96	160	153	207	152	192	210
	TOTAL	2,407	3,766	3,683	4,467	3,737	4,682	5,020
Atlantic:								
	N. Carolina	499	806	1,010	1,380	1,190	1,300	1,460
	S. Carolina	545	776	867	1,420	1,120	1,320	1,600
	Virginia	320	345	339	433	398	440	440
	Maryland	225	202	213	330	295	325	345
	Delaware	189	139	156	225	205	225	235
	TOTAL	1,778	2,268	2,585	3,788	3,208	3,610	4,080
Plains States:								
	Nebraska	164	696	812	1,200	980	1,130	1,270
	Kansas	586	873	930	1,080	865	990	1,430
	S. Dakota	100	333	247	342	271	315	360
	N. Dakota	176	211	181	149	147	175	185
	TOTAL	1,026	2,113	2,170	2,771	2,263	2,610	3,245
Others:								
	Tennessee	394	732	1,150	1,850	1,800	2,220	2,420
	Alabama	133	228	600	1,260	1,170	1,600	1,950
	Kentucky	199	295	530	1,100	1,070	1,320	1,450
	Georgia	75	209	475	1,160	870	1,090	1,700
	Texas	75	82	158	370	347	760	750
	Florida	30	78	184	281	253	327	400
	Oklahoma	124	152	185	237	250	340	315
	New Jersey	33	37	54	102	138	177	185
	Pennsylvania	7	16	28	52	50	67	67
	New York	3	3	6	11	12	19	16
	TOTAL	1,073	1,832	3,370	6,423	5,960	7,920	9,253
TOTAL U.S.		23,655	34,449	42,249	53,579	49,358	57,612	63,268

Sources: U.S. Department of Agriculture, "Crop Production Annual Summaries" and "Crop Production."

Table A-3. Average Soybean Yields by Regions and States

Region	States	1960	1965	1970	1975	1976	1977	1978 (est.)
		(Bushels per acre)						
Corn Belt:								
	Illinois	26.0	29.5	31.0	36.0	33.0	38.0	33.0
	Iowa	25.5	26.0	32.5	34.0	31.0	35.5	37.0
	Missouri	21.5	26.0	25.5	26.0	20.0	32.0	29.0
	Indiana	27.0	28.0	31.0	33.5	34.0	37.0	33.0
	Ohio	24.5	24.5	28.5	33.0	33.0	35.5	32.0
	AVERAGE	25.2	27.3	30.2	33.1	30.4	35.9	33.1
Delta:								
	Arkansas	21.0	21.5	22.5	25.0	19.0	23.0	23.0
	Mississippi	22.0	22.5	22.5	22.5	22.0	21.5	21.0
	Louisiana	24.0	21.5	24.0	25.0	28.0	23.5	24.0
	AVERAGE	21.4	21.8	22.8	24.2	22.1	22.5	22.6
Lake States:								
	Minnesota	19.5	18.5	26.0	27.0	22.0	35.5	35.0
	Michigan	20.0	22.0	26.5	26.0	20.5	30.0	23.0
	Wisconsin	16.0	19.0	24.0	25.5	22.0	35.0	28.0
	AVERAGE	19.4	18.9	26.0	26.8	22.7	34.6	32.8
Atlantic:								
	S. Carolina	19.5	21.0	20.0	22.0	18.0	20.5	20.0
	N. Carolina	22.5	25.0	24.0	23.5	22.0	22.0	24.0
	Virginia	22.5	20.5	20.0	25.0	20.5	19.0	27.0
	Maryland	26.0	27.0	24.0	28.0	25.0	27.0	32.0
	Delaware	24.0	25.0	21.0	25.0	24.0	24.0	27.0
	AVERAGE	22.3	23.1	21.7	23.6	20.7	21.7	23.7
Plains States:								
	Nebraska	28.0	23.5	22.0	27.0	20.0	36.0	34.0
	Kansas	21.5	21.0	15.0	21.0	15.0	28.5	17.0
	S. Dakota	17.0	17.0	17.5	25.0	17.0	30.5	27.0
	N. Dakota	13.0	19.0	15.0	19.5	12.5	20.0	21.0
	AVERAGE	20.6	21.0	17.9	24.0	17.2	31.4	25.0
Others:								
	Tennessee	22.5	23.5	23.0	25.0	22.5	23.5	23.0
	Alabama	24.0	22.0	23.0	24.5	24.0	21.0	21.0
	Kentucky	22.0	24.0	27.0	27.0	27.0	31.0	28.0
	Georgia	17.0	20.5	23.0	25.5	23.5	20.0	18.0
	Texas	27.0	26.0	28.0	25.0	26.0	26.5	24.0
	Florida	26.0	26.0	28.0	24.0	26.0	25.0	26.0
	Oklahoma	20.0	16.5	18.0	22.0	22.0	23.0	21.0
	New Jersey	24.5	23.5	25.0	26.0	24.0	24.0	26.0
	Pennsylvania	23.0	24.0	32.0	28.0	29.0	31.0	28.0
	New York	17.0	15.0	20.0	27.0	26.0	23.0	23.0
	AVERAGE	22.4	22.7	24.0	25.2	24.2	24.2	22.7
AVERAGE U.S.		23.5	24.5	26.7	28.9	26.1	30.6	28.6

Sources: U.S. Department of Agriculture, "Crop Production Annual Summaries" and "Crop Production."

Table A-4. Average Monthly Prices Received by U.S. Farmers for Soybeans, 1972 to 1978

Year	Month											
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1972	2.92	3.00	3.20	3.37	3.35	3.32	3.34	3.36	3.26	3.13	3.38	3.95
1973	4.11	5.49	6.04	6.14	8.27	10.00	6.69	8.99	5.81	5.63	5.14	5.65
1974	5.87	6.07	5.96	5.15	5.21	5.13	6.11	7.55	7.32	8.17	7.44	7.03
1975	6.30	5.72	5.31	5.61	5.00	4.90	5.28	5.80	5.32	4.92	4.45	4.28
1976	4.46	4.50	4.46	4.52	4.87	6.16	6.73	6.07	6.65	5.90	6.11	6.56
1977	6.81	7.06	7.83	9.05	9.24	8.13	6.52	5.48	5.17	5.28	5.61	5.69
1978	5.75	5.53	6.20	6.49	6.77	6.69	6.39	6.21	6.19	6.26	6.39	6.49

Sources: U.S. Department of Agriculture, "Agricultural Prices Annual Summary 1977."
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A P P E N D I X B

Soybean and Competing Crop Budgets

Tables B-1 to B-6

Table B-1. Estimated Cost of Producing Soybeans in the Willamette Valley, 1976

	INPUTS PER ACRE						
	Labor		Machinery & equipment		Other		Total
Item	Hrs.	Cost ($)	Operating ($)	Ownership ($)	Item	Cost ($)	cost ($)
Cultural Operations							
Lime[a]					Custom	6.79	6.79
Fertilize	.171	.77	.27	.49	Spreader rental	.75	
					20#N	5.00	
					35#P	16.80	
					20#K	1.80	
					20#S	3.60	29.48
Disc	.143	.64	.99	1.48			3.11
Plow	.209	.95	1.34	3.84			6.13
Disc & pack (2X)	.286	1.28	2.20	3.55			7.03
Herbicide					½# Lorox	2.13	
					1½ qt. Lasso	6.00	
					Custom appl.	2.25	10.38
Disc & pack (2X)	.286	1.28	2.20	3.55			7.03
Plant	.183	.82	.70	1.80	1 bu. seed	18.00	21.32
Cultivate	.172	.77	.70	1.51			2.98
Irrigate	8.0	28.00	29.16	35.00			92.16
Harvest							
Combine	.402	1.81	5.07	11.44			18.32
Haul (30 bu. @ 8¢/bu.)					Custom	2.40	2.40
Other Charges							
Land taxes[b]						11.00	11.00
Operating capital interest[c]						6.50	6.50
Management [d]						8.99	8.99
Overhead [e]						6.74	6.74
Total Non-Land Costs Per Acre		36.32	42.63	62.66		98.75	240.36

[a] Lime charge amortized over 4 years @ 9 percent.

[b] Farm use value.

[c] Cash expenses were assumed outstanding for half a year with a 9 percent annual interest charge.

[d] Estimated at 4 percent of all costs except land investment and overhead.

[e] Estimated at 3 percent of all costs except land investment and management.

NOTE: The operations and quantities of materials used in this budget should not be interpreted as recommendations because of the variability in soil conditions among farms. The use of trade names is solely for the purpose of preparing this budget and should not be construed as recommendations.

Table B-2. Estimated Cost of Producing Soybeans in the Columbia Basin, 1976

	INPUTS PER ACRE						
	Labor		Machinery & equipment		Other		Total
Item	Hrs.	Cost ($)	Operating ($)	Ownership ($)	Item	Cost ($)	cost ($)
Cultural Operations							
Fertilize	.171	.77	.27	.49	Spreader rental	.75	
					50#N	12.50	
					50#P	24.00	
					50#K	4.50	43.28
Disc	.143	.64	.99	1.48			3.11
Chisel plow (2X)	.230	1.04	1.39	3.15			5.58
Disc & pack	.143	.64	1.10	1.77			3.51
Herbicide					1 qt. Treflan	7.75	
					2 qt. Vernam	12.50	
					Custom appl.	2.25	22.50
Disc and pack	.143	.64	1.10	1.77			3.51
Plant	.183	.82	.70	1.80	1-1/3 bu. seed	24.00	27.32
Cultivate (3X)	.516	2.31	2.10	4.53			8.94
Irrigate	1.584	5.54	13.73	43.55	Water	12.00	74.82
Harvest							
Combine	.402	1.81	5.07	11.44			18.32
Haul (40 bu. @ 8¢/bu.)					Custom	3.20	3.20
Other Charges							
Misc. labor	.300	1.05					1.05
Truck (2-ton)	.300	1.35	1.31	3.12			5.78
Pickup	.400	1.40	1.23	1.69			4.32
Land taxes a/						10.00	10.00
Operating capital interest b/						6.77	6.77
Management c/						9.68	9.68
Overhead d/						7.26	7.26
Total Non-Land Cost Per Acre		18.01	28.99	74.79		137.16	258.95

a/ Farm use value.

b/ Cash expenses were assumed outstanding for half a year with a 9 percent annual interest charge.

c/ Estimated at 4 percent of all costs except land investment and overhead.

d/ Estimated at 3 percent of all costs except land investment and management.

NOTE: The operations and quantities of materials used in this budget should not be interpreted as recommendations because of the variability in soil conditions among farms. The use of trade names is solely for the purpose of preparing this budget and should not be construed as recommendations.

Table B-3. Estimated Cost of Producing Soybeans in the Ontario Area, 1976

	INPUTS PER ACRE						
	Labor		Machinery & equipment		Other		Total
Item	Hrs.	Cost ($)	Operating ($)	Ownership ($)	Item	Cost ($)	cost ($)
Cultural Operations							
Fertilize	.171	.77	.27	.49	Spreader rental	.75	
					35#N	8.75	
					45#P	21.60	
					43#K	3.87	36.50
Disc	.143	.64	.99	1.48			3.11
Chisel	.115	.52	.69	1.57			2.78
Plow	.209	.95	1.34	3.84			6.13
Disc & pack	.143	.64	1.10	1.77			3.51
Herbicide					1 qt. Treflan	7.75	
					2 qt. Vernam	12.50	
					Custom appl.	2.25	22.50
Disc & pack	.143	.64	1.10	1.77			3.51
Plant	.183	.82	.70	1.80	1-1/3 bu.seed	24.00	27.32
Cultivate (3X)	.516	2.31	2.10	4.53			8.94
Irrigate	4.5	15.75	.45	4.20	Water	10.80	31.20
Harvest							
Combine	.402	1.81	5.07	11.44			18.32
Haul (40 bu. @ 8¢/bu.)					Custom	3.20	3.20
Other Charges							
Land taxes[a/]						23.00	23.00
Operating capital interest[b/]						6.02	6.02
Management [c/]						7.84	7.84
Overhead [d/]						5.88	5.88
Total Non-Land Costs Per Acre		24.85	13.81	32.89		138.21	209.76

[a/] Farm use value.

[b/] Cash expenses were assumed outstanding for half a year with a 9 percent annual interest charge.

[c/] Estimated at 4 percent of all costs except land investment and overhead.

[d/] Estimated at 3 percent of all costs except land investment and management.

NOTE: The operations and quantities of materials used in this budget should not be interpreted as recommendations because of the variability in soil conditions among farms. The use of trade names is solely for the purpose of preparing this budget and should not be construed as recommendations.

Table B-4. Estimated per Acre Costs and Returns for Selected Crop Enterprises: Willamette Valley, Oregon, 1976

Crop	Wheat	Silage corn	Sweet corn	Bush beans	Alfalfa production	Alfalfa establishment	Soybeans
Income:							
Price	$3.25/bu.	$19.00/T.	$60.00/T.	$140.00/T.	$65.00/T.		?
Yield	100 bu.	25 T.	8.6 T.	4.6 T.	6 T.		30 bu.
Gross income	$325.00	$475.00	$516.00	$644.00	$390.00	0	?
Costs:							
Seed	10.59	16.25	13.50	64.00	0	35.00	18.00
Fertilizer & spreader	61.17	73.93	77.37	54.41	46.28	111.53	34.74
Chemicals & application	22.16	11.10	11.79	75.51	11.55	0	10.38
Other direct expenses a/	8.75	125.00	48.00	34.50	24.00	0	2.40
Machinery operating b/	9.55	11.52	14.73	12.83	15.19	11.01	13.47
Irrigation pumping	7.00	14.00	10.50	17.50	17.50	0 j/	17.50
Irrigation repairs	4.67	9.33	7.00	11.66	11.66	0 j/	11.66
Irrigation labor c/	10.50	21.00	15.75	28.00	28.00	0 j/	28.00
Other labor	5.30	11.96	15.79	17.31	16.65	9.82	8.32
Operating capital interest d/	6.29	13.24	9.65	14.21	7.69	7.53	6.50
Machinery ownership e/	21.76	25.23	33.30	37.85	55.21	22.01	27.66
Irrigation ownership f/	35.00	35.00	35.00	35.00	35.00	0 j/	35.00
Land taxes g/	11.00	11.00	11.00	11.00	11.00	0 j/	11.00
Management h/	8.55	15.14	12.14	16.55	11.19	7.88	8.99
Overhead i/	6.41	11.36	9.10	12.41	8.39	5.91	6.74
TOTAL COSTS	$228.70	$405.10	$324.62	$442.74	$299.31	$210.69	$240.36
RETURN TO LAND	$ 96.30	$ 69.90	$191.38	$201.26	$ 90.69	-$210.69	$?

a/ Includes such items as baling wire, rodent control, custom hauling, and custom topping of sweet corn.

b/ Includes fuel lubrication and repairs.

c/ Hired labor.

d/ Assumed that the cash expenses are outstanding for half a year with a 9 percent interest charge.

e/ Includes depreciation, interest on average investment at 9 percent, property taxes at 1.1 percent of purchase price, and insurance at 0.7 percent of average investment.

f/ Based on one hand-move system per 80 acres with an initial investment of $350 per acre.

g/ Based on farm use value.

h/ Estimated at 4 percent of all costs except land investment and overhead.

i/ Estimated at 3 percent of all costs except land investment and management.

j/ Since alfalfa is assumed to be established in the fall, no irrigation costs are incurred and the land taxes have been charged to the prior crop.

Table B-5. Estimated per Acre Costs and Returns for Selected Crop Enterprises: Columbia Basin, Oregon, 1976

Crop	Wheat	Sugar beets	Potatoes	Alfalfa production	Alfalfa establishment	Corn	Dry beans	Soybeans	Cover crop
Income:									
Price	$3.25/bu.	$25/T.	$55/T.	$65/T.		$3/bu.	$18/cwt.	$?/bu.	
Yield	90 bu.	28 T.	25 T.	7 T.		155 bu.	18 cwt.	40 bu.	
Gross income	$292.50	$700.00	$1375.00	$455.00	0	$465.00	$324.00	$?	0
Costs:									
Seed	9.98	16.05	187.00	0	35.00	21.45	22.50	24.00	15.00
Fertilizer & spreader	64.34	77.63	232.94	37.14	7.95	151.80	45.05	41.75	0
Chemicals & application	4.85	92.28	100.27	10.15	0	23.35	5.61	22.50	0
Other direct expenses a/	10.80	107.00	100.00	22.00	2.00	12.40	5.40	3.20	0
Machinery operating b/	9.41	16.13	32.73	22.35	14.69	14.07	17.13	15.26	5.41
Irrigation pumping c/	22.21	28.77	26.88	28.42	2.62 k/	23.84	20.45	20.45	2.62 k/
Irrigation repairs	6.38	10.48	9.30	10.26	1.64	7.40	5.28	5.28	1.64
Irrigation labor d/	6.70	11.00	9.76	10.77	1.72	7.77	5.54	5.54	1.72
Other labor	7.27	16.11	20.67	23.51	17.21	12.50	13.37	12.47	5.22
Operating capital interest e/	6.39	16.90	32.38	7.41	3.73	12.36	6.31	6.77	1.42
Machinery ownership f/	19.51	41.15	58.37	73.56	27.44	30.41	38.38	31.24	9.69
Irrigation ownership g/	43.55	43.55	43.55	43.55	0 k/	43.55	43.55	43.55	0 k/
Land taxes h/	10.00	10.00	10.00	10.00	0 k/	10.00	10.00	10.00	0 k/
Management i/	8.86	19.48	34.55	11.96	4.56	14.84	9.54	9.68	1.71
Overhead j/	6.64	14.61	25.92	8.97	3.42	11.13	7.16	7.26	1.28
TOTAL COSTS	$236.89	$521.14	$924.32	$320.05	$121.98	$396.87	$255.27	$258.95	$45.71
RETURN TO LAND	$ 55.61	$178.86	$450.68	$134.95	-$121.98	$ 68.13 l/	$ 68.73	$?	-$45.71

a/ Includes such items as land plane rental, bale wire, and rodent control for alfalfa, fire insurance for wheat, custom thinning and hoeing sugar beets and custom hauling.

b/ Includes fuel, lubrication, and repairs.

c/ Includes electricity and water district charges.

d/ Hired labor.

e/ Assumed that the cash expenses are outstanding for half a year with a 9 percent interest charge.

f/ Includes depreciation, interest on average investment at 9 percent, property taxes at 1.1 percent of purchase price, and insurance at 0.7 percent of average investment.

g/ Based on one center-pivot irrigation system per 130 acres with $35,620 initial investment in one sprinkler unit (1/4 mile), pumps, and miscellaneous. Additional investment for mainlines equals $87.50 per acre.

h/ Based on farm use value.

i/ Estimated at 4 percent of all costs except land investment and overhead.

j/ Estimated at 3 percent of all costs except land investment and management.

k/ The operations for these alternatives are performed in the fall following other crop enterprises thus, irrigation district charges, irrigation equipment ownership charges, and land taxes have been charged to the prior crop.

l/ This net return would be similar for a 25 ton per acre silage yield at a price of $19 per ton.

Table B-6. Estimated per Acre Costs and Returns for Selected Crop Enterprises: Ontario Area, Oregon, 1976

Crop	Wheat	Sugar beets	Potatoes	Alfalfa production	Alfalfa establishment	Corn	Sweet corn	Onions	Soybeans
Income:									
Price	$3.25/bu.	$25/T.	$55/T.	$60/T.		$3/bu.	$55/T.	$3.75	$?
Yield	100 bu.	27 T.	17.5 T.	6 T.		130 bu.	8 T.	450 cwt.	40 bu.
Gross income	$325.00	$675.00	$962.50	$360.00	0	$390.00	$440.00	$1687.50	$?
Costs:									
Seed	10.50	21.40	160.00	0	32.30	21.45	12.94	35.00	24.00
Fertilizer & spreader	63.65	112.35	103.24	11.31	24.41	82.59	70.58	172.07	34.97
Chemicals & application	4.85	100.50	120.25	12.03	10.00	23.35	30.53	113.25	22.50
Other direct expenses a/	8.00	105.50	78.00	20.50	0	10.40	45.00	410.00	3.20
Machinery operating b/	10.83	18.75	31.44	22.35	6.06	13.28	11.62	11.70	13.36
Irrigation pumping	10.80	10.80	10.80	10.80	0 i/	10.80	10.80	10.80	10.80
Irrigation repairs	.44	1.05	.99	.60	.10	.50	.40	.60	.45
Irrigation labor	8.75	37.00	35.00	21.00	3.50	17.50	14.00	21.00	15.75
Other labor	6.60	17.63	16.60	23.51	4.91	9.98	11.46	188.29	9.10
Operating capital interest c/	5.60	19.12	25.03	5.49	3.66	8.54	9.33	43.32	6.02
Machinery ownership d/	23.88	47.48	56.83	73.56	12.35	30.65	30.72	25.52	28.69
Irrigation ownership e/	4.20	4.20	4.20	4.20	0 i/	4.20	4.20	4.20	4.20
Land taxes f/	23.00	23.00	23.00	23.00	0 i/	23.00	23.00	23.00	23.00
Management g/	7.24	20.75	26.62	9.13	3.89	10.25	10.98	42.35	7.84
Overhead h/	5.43	15.56	19.96	6.85	2.92	7.69	8.24	31.76	5.88
TOTAL COSTS	$193.77	$555.09	$711.96	$244.33	$104.10	$293.80	$293.80	$1132.86	$209.76
RETURN TO LAND	$131.23	$119.91	$250.54	$115.67 j/	-$104.10 j/	$96.20 k/	$146.20	$554.64	$?

a/ Includes such items as custom hauling, custom thinning and hoeing sugar beets, bale wire, handling, harvesting, and weeding onions, and custom topping of sweet corn.

b/ Includes fuel, lubrication, and repairs.

c/ Assumes that the cash expenses are outstanding for half a year at 9 percent.

d/ Includes depreciation, interest on average investment at 9 percent, property taxes at 1.1 percent of purchase price, and insurance at 0.7 percent of average investment.

e/ Based on a siphon irrigation system.

f/ Based on farm use value.

g/ Estimated at 4 percent of all costs except land investment and overhead.

h/ Estimated at 3 percent of all costs except land investment and management.

i/ Since alfalfa is assumed to be established in the fall, water district charges, irrigation ownership costs, and land taxes have been charged to the prior crop.

j/ This net return per acre is assumed to be similar for alfalfa seed production and establishment.

k/ This net return per acre would be similar for a 20 ton per acre silage yield at a price of $19/ton.

APPENDIX C

Willamette Valley, Columbia Basin, and

Ontario Area Crop Rotations and Crop

Acreage Restrictions

Tables C-1 to C-4

Table C-1. Willamette Valley Crop Rotations

Rotation	Crop Sequence
(1)	Two years wheat, silage corn
(2)	Two years wheat, sweet corn[a]
(3)	Two years wheat, bush beans
(4)	Two years wheat, soybeans
(5)	Four years alfalfa production, two years wheat, silage corn (alfalfa establishment)[b]
(6)	Four years alfalfa production, two years wheat, sweet corn (alfalfa establishment)
(7)	Four years alfalfa production, two years wheat, bush beans (alfalfa establishment)
(8)	Four years alfalfa production, two years wheat, soybeans (alfalfa establishment)
(9)	Sweet corn, soybeans[c][d]
(10)	Silage corn, soybeans
(11)	Sweet corn, bush beans[a][c]
(12)	Silage corn, bush beans
(13)	Silage corn, wheat
(14)	Sweet corn, wheat
(15)	Bush beans, wheat[a][c]
(16)	Soybeans, wheat[d]

[a] These rotations comprised the optimal Willamette Valley farm plan for soybean prices between $0 and $11.21 per bushel at the farm.

[b] The establishment of alfalfa is indicated in parentheses because the operations for this enterprise were assumed to be performed in the fall; thus, additional land was not required.

[c] These rotations comprised the optimal farm plan for soybean prices between $11.22 and $14.72 per bushel at the farm.

[d] These rotations comprised the optimal farm plan for soybean prices of $14.73 per bushel at the farm and above.

Table C-2. Columbia Basin Crop Rotations

Rotation	Crop sequence
(1)	Wheat, sugar beets[a/]
(2)	Wheat, potatoes[a/]
(3)	Wheat, corn
(4)	Wheat, dry beans
(5)	Wheat, soybeans
(6)	Wheat (alfalfa establishment), four years alfalfa production, wheat, sugar beets b/c/
(7)	Wheat (alfalfa establishment), four years alfalfa production, wheat, potatoes a/c/d/
(8)	Wheat (alfalfa establishment), four years alfalfa production, wheat, corn
(9)	Wheat (alfalfa establishment), four years alfalfa production, wheat, dry beans
(10)	Wheat (alfalfa establishment), four years alfalfa production, wheat, soybeans d/e/
(11)	Wheat, sugar beets (cover crop), potatoes[a/]
(12)	Wheat, sugar beets (cover crop), corn
(13)	Wheat, sugar beets (cover crop), dry beans
(14)	Wheat, sugar beets (cover crop), soybeans
(15)	Wheat, potatoes (cover crop), corn
(16)	Wheat, potatoes (cover crop), dry beans
(17)	Wheat, potatoes (cover crop), soybeans
(18)	Wheat, corn (cover crop), dry beans
(19)	Wheat, corn (cover crop), soybeans
(20)	Wheat, dry beans (cover crop), soybeans
(21)	Sugar beets (cover crop), potatoes (cover crop), dry beans (cover crop)
(22)	Sugar beets (cover crop), potatoes (cover crop), soybeans (cover crop)
(23)	Potatoes (cover crop), corn (cover crop), dry beans (cover crop)
(24)	Potatoes (cover crop), corn (cover crop), soybeans (cover crop)
(25)	Sugar beets (cover crop), dry beans (cover crop), soybeans (cover crop)
(26)	Potatoes (cover crop), dry beans (cover crop), soybeans (cover crop)
(27)	Corn (cover crop), dry beans (cover crop), soybeans (cover crop)
(28)	Sugar beets (cover crop), potatoes (cover crop) a/c/
(29)	Sugar beets (cover crop), dry beans (cover crop)
(30)	Sugar beets (cover crop), soybeans (cover crop)
(31)	Potatoes (cover crop), dry beans (cover crop)
(32)	Potatoes (cover crop), soybeans (cover crop)[c/d/e/]
(33)	Corn (cover crop), dry beans (cover crop)
(34)	Corn (cover crop), soybeans (cover crop)
(35)	Dry beans (cover crop), soybeans (cover crop)

[a/] These rotations comprised the optimal Columbia Basin farm plan for soybean prices between $0 and $10.14 per bushel at the farm.

[b/] The establishment of alfalfa and the planting of cover crops are indicated in parentheses because the operations for these enterprises were assumed to be performed in the fall; thus additional land was not required.

[c/] These rotations comprised the optimal farm plan for soybean prices between $10.15 and $10.94 per bushel at the farm.

[d/] These rotations comprised the optimal farm plan for soybean prices between $10.95 and $17.74 per bushel at the farm.

[e/] These rotations comprised the optimal farm plan for soybean prices of $17.75 per bushel at the farm and above.

Table C-3. Ontario Area Crop Rotations

Rotation	Crop sequence
(1)	Wheat (alfalfa establishment), four years alfalfa production, potatoes[a/][b/][c/][d/]
(2)	Wheat (alfalfa establishment), four years alfalfa production, corn
(3)	Wheat (alfalfa establishment), four years alfalfa production, sweet corn[d/]
(4)	Wheat (alfalfa establishment), four years alfalfa production, soybeans[d/][e/][f/]
(5)	Wheat, sugar beets
(6)	Wheat, potatoes[c/]
(7)	Wheat, corn
(8)	Wheat, sweet corn
(9)	Wheat, onions[b/][c/]
(10)	Wheat, soybeans[f/]
(11)	Sugar beets, potatoes, onions
(12)	Sugar beets, potatoes, soybeans
(13)	Potatoes, corn, soybeans
(14)	Onions, soybeans, sugar beets
(15)	Onions, soybeans, potatoes[c/][d/][e/]
(16)	Soybeans, sugar beets, corn
(17)	Soybeans, sugar beets, sweet corn
(18)	Soybeans, potatoes, sweet corn[d/]
(19)	Wheat, sugar beets, potatoes[b/]
(20)	Wheat, sugar beets, corn
(21)	Wheat, sugar beets, sweet corn
(22)	Wheat, sugar beets, onions
(23)	Wheat, sugar beets, soybeans
(24)	Wheat, potatoes, corn
(25)	Wheat, potatoes, sweet corn[b/][c/]
(26)	Wheat, potatoes, onions[b/]
(27)	Wheat, potatoes, soybeans[c/][d/]
(28)	Wheat, corn, soybeans
(29)	Wheat, sweet corn, soybeans
(30)	Wheat, onions, soybeans[e/]
(31)	Sugar beets, potatoes
(32)	Sugar beets, onions
(33)	Sugar beets, soybeans
(34)	Potatoes, onions
(35)	Potatoes, soybeans[e/][f/]
(36)	Corn, soybeans
(37)	Sweet corn, soybeans
(38)	Onions, soybeans[f/]

[a/] The establishment of alfalfa is indicated in parentheses because the operations for this enterprise were assumed to be performed in the fall; thus additional land was not required.

[b/] These rotations comprised the optimal Ontario Area farm plan for soybean prices between $0 and $8.24 per bushel at the farm.

[c/] These rotations comprised the optimal farm plan for soybean prices between $8.25 and $8.52 per bushel at the farm.

[d/] These rotations comprised the optimal farm plan for soybean prices between $8.53 and $8.89 per bushel at the farm.

[e/] These rotations comprised the optimal farm plan for soybean prices between $8.90 and $11.50 per bushel at the farm.

[f/] These rotations comprised the optimal farm plan for soybean prices of $11.51 per bushel at the farm and above.

Table C-4. Maximum and Minimum Acreage Restrictions for the Competing Crops by Region

Crop	Willamette Valley		Columbia Basin		Ontario Area	
	(max.%)	(min.%)	(max.%)	(min.%)	(max.%)	(min.%)
Wheat	35	10	40	0	30	10
Alfalfa	25	0	35	15	45	20
Field corn[a/]	15	0	10	0	15	0
Sweet corn	35	0	-	-	10	0
Sugar beets	-	-	18	0	20	0
Potatoes	-	-	40	0	25	0
Bush beans	35	0	-	-	-	-
Dry beans	-	-	5	0	-	-
Onions	-	-	-	-	10	0

[a/]Harvested either for grain or silage.

A P P E N D I X D

Marketing Alternatives Evaluated

Tables D-1 to D-5

Table D-1. Estimate of the Portland Soybean Price Based on Exporting Oregon Soybeans to Japan

	(1)	(2)	(3) (1) x (2)	(4)	(5) (3) + (4)	(6)	(7) (5) - (6)
Marketing year a/	Decatur soybean price b/	Price index c/	Value of soybeans d/	Decatur to Japan Transportation cost e/	Value of soybeans in Japan	Portland to Japan Transportation cost f/	Value of soybeans in Portland
	($/bu.)		($/bu.)	($/bu.)	($/bu.)	($/bu.)	($/bu.)
1971-72	3.24	1.3938	4.52	.70	5.22	.35	4.87
1972-73	6.22	1.3329	8.29	.70	8.99	.35	8.64
1973-74	6.12	1.2007	7.35	.70	8.05	.35	7.70
1974-75	6.32	1.0993	6.95	.70	7.65	.35	7.30
1975-76	5.26	1.0462	5.50	.70	6.20	.35	5.85
1976-77	7.33	1.0000	7.33	.70	8.03	.35	7.68
1977-78	6.14 g/	.9458	5.81	.70	6.51	.35	6.16

a/ Begins in September.

b/ Source: United States Department of Agriculture, "Fats and Oils Situation." The prices listed are for No. 1 yellow soybeans, Illinois points.

c/ Adapted for each marketing year from the quarterly Implicit Price Deflators for Gross National Product in "Economic Indicators" by the Council of Economic Advisors.

d/ Column one adjusted to 1976 marketing year dollars.

e/ Source: Baumel, et al.; Bell; and "The Journal of Commerce and Commercial," includes transportation and transfer costs and canal toll from Decatur to Japan via the Panama Canal for the fall of 1976.

f/ Source: Baumel, et al.; Bell; and "The Journal of Commerce and Commercial," includes transportation and transfer costs from Portland to Japan for the fall of 1976.

g/ Preliminary.

Table D-2. Estimate of the Portland Soybean Price Based on Exporting Oregon Soybeans to Other Regions of the United States

	(1)	(2)	(3) (1) x (2)	(4)	(5) (3) - (4)
Marketing year [a]	Decatur soybean price [b]	Price index [c]	Value of soybeans [d]	Decatur to Portland Transportation cost [e]	Value of soybeans in Portland
	($/bu.)		($/bu.)	($/bu.)	($/bu.)
1971-72	3.24	1.3938	4.52	1.31	3.21
1972-73	6.22	1.3329	8.29	1.31	6.98
1973-74	6.12	1.2007	7.35	1.31	6.04
1974-75	6.32	1.0993	6.95	1.31	5.64
1975-76	5.26	1.0462	5.50	1.31	4.19
1976-77	7.33	1.0000	7.33	1.31	6.02
1977-78	6.14 [f]	.9458	5.81	1.31	4.50

[a] Begins in September.

[b] Source: United States Department of Agriculture, "Fats and Oils Situation." The prices listed are for No. 1 yellow soybeans, Illinois points.

[c] Adapted for each marketing year from the quarterly Implicit Price Deflators for Gross National Product in "Economic Indicators" by the Council of Economic Advisors.

[d] Column one adjusted to 1976 marketing year dollars.

[e] Source: Bell, the fall 1976 cost of transporting soybeans from Decatur to Portland.

[f] Preliminary.

Table D-3. Estimate of the Portland Soybean Price Based on Processing Oregon Soybeans in Portland

Marketing year a/	(1) Decatur meal price b/	(2) Decatur crude oil price b/	(3) Price index c/	(4) (1)x(3) Value of meal d/	(5) (2)x(3) Value of crude oil d/	(6) Meal transportation cost e/	(7) Crude oil transportation cost e/	(8) (4)+(6) Value of meal in Portland	(9) (5)+(7) Value of oil in Portland	(10) Value of processed soybeans in Portland f/	(11) Processing costs g/	(12) (10)-(11) Price Portland processing willing to offer
	($/T.)	(¢/lb.)		($/T.)	(¢/lb.)	($/T.)	(¢/lb.)	($/T.)	(¢/lb.)	($/bu.)	($/bu.)	($/bu.)
1971-72	87.20	11.5	1.3938	121.54	16.0	43.60	4.2	165.14	20.2	6.05	.48	5.57
1972-73	220.60	15.2	1.3329	294.04	20.3	43.60	4.2	337.64	24.5	10.55	.48	10.07
1973-74	152.20	30.2	1.2007	182.75	36.3	43.60	4.2	226.35	40.5	9.67	.48	9.19
1974-75	131.20	32.1	1.0993	144.23	35.3	43.60	4.2	187.83	39.5	8.66	.48	8.18
1975-76	144.00	18.5	1.0462	150.65	19.4	43.60	4.2	194.25	23.6	7.09	.48	6.61
1976-77	202.80	24.1	1.0000	202.80	24.1	43.60	4.2	246.40	28.3	8.82	.48	8.34
1977-78	161.80 h/	23.8 h/	.9458	153.03	22.5	43.60	4.2	196.63	26.7	7.48	.48	7.00

a/ Begins in October.

b/ Source: United States Department of Agriculture, "Fats and Oils Situation."

c/ Adapted from the Implicit Price Deflators for Gross National Product in "Economic Indicators" by the Council of Economic Advisors.

d/ Columns (1) and (2) adjusted to 1976 marketing year dollars.

e/ Source: Bell; transportation costs for the fall of 1976 from Decatur to Portland.

f/ Assumes that 60 pounds of soybeans per bushel will yield 46.8 pounds of 44 percent protein meal and 10.8 pounds of crude oil.

g/ Includes the cost of processing an allowance for the processor's taxes, and a 7 percent return on investment before taxes assuming a 650-ton of-soybeans-per-day plant with a 300-day crushing season adapted from Helgeson. Does not include costs for refining crude oil.

h/ Preliminary.

Table D-4. Estimate of the Portland Soybean Price Based on Importing Midwest Soybeans for Processing

	(1)	(2)	(3)	(4) (1) + (2) + (3)
Marketing year a/	Value of Decatur soybeans b/	Decatur to Portland Transportation cost c/	Processing costs d/	Value of soybeans delivered to and processed at the Portland plant
	($/bu.)	($/bu.)	($/bu.)	($/bu.)
1971-72	4.52	1.31	.48	6.31
1972-73	8.29	1.31	.48	10.08
1973-74	7.35	1.31	.48	9.14
1974-75	6.95	1.31	.48	8.74
1975-76	5.50	1.31	.48	7.29
1976-77	7.33	1.31	.48	9.12
1977-78	5.81	1.31	.48	7.60

a/ Begins in September.

b/ From column 3, Table D-1. The prices have already been adjusted to 1976 marketing year dollars.

c/ Source: Bell, fall 1976 cost.

d/ From column 11, Table D-3.

Table D-5. Estimate of the Portland Soybean Price Based on Exporting Processed Oregon Soybeans to Other Regions of the United States

	(1)	(2)	(3)	(4)	(5) (1) - (3)	(6) (2) - (4)	(7)	(8)	(9) (7) - (8)
Marketing year a/	Value of decatur meal b/	Value of decatur oil b/	Meal transportation cost c/	Oil transportation cost c/	Processor's meal selling price	Processor's oil selling price	Value of processed soybeans sold d/	Processing costs	Price Portland processing willing to offer
	($/T.)	(¢/lb.)	($/T.)	(¢/lb.)	($/T.)	(¢/lb.)	($/bu.)	($/bu.)	($/bu.)
1971-72	121.54	16.0	43.60	4.2	77.94	11.8	3.10	.48	2.62
1972-73	294.04	20.3	43.60	4.2	250.44	16.1	7.60	.48	7.12
1973-74	182.75	36.3	43.60	4.2	139.15	32.1	6.72	.48	6.24
1974-75	144.23	35.3	43.60	4.2	100.63	31.1	5.71	.48	5.23
1975-76	150.65	19.4	43.60	4.2	107.05	15.2	4.15	.48	3.67
1976-77	202.80	24.1	43.60	4.2	159.20	19.9	5.87	.48	5.39
1977-78	153.03	22.5	43.60	4.2	109.43	18.3	4.54	.48	4.06

a/ Begins in October.

b/ From columns 4 and 5, Table D-3. The prices have already been inflated to the 1976 marketing year value of the dollar.

c/ Source: Bell, fall 1976 transportation costs, Portland to Decatur.

d/ Assumes that 60 pounds of soybeans per bushel will yield 46.8 pounds of 44 percent protein meal and 10.8 pounds of crude oil.