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THE ECONOMICS OF SOYBEANS IN NEW YORK 1979

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THE ECONOMICS OF SOYBEANS IN NEW YORK STATE IN 1979

Soybeans in the United States

Trends -

United States production of soybeans has experienced phenomenal growth. In the 1920s and 1930s soybeans planted were used for hay or plowed under as a cover crop. In 1925 only 415 thousand acres were harvested for beans, and total production amounted to less than 5.0 million bushels.

Today the United States is the leading producer of soybeans. Total production in 1979 was estimated to be 2,267.6 million bushels (Figure 1). In that year the number of acres devoted to soybeans approached the number of acres of grain corn for the first time. Soybean acreage was estimated at 70.5 million acres compared to 71.0 million acres of corn for grain.

Although soybean acreage has expanded almost every year since 1940, unprecedented increases have occurred in the last few years. Between 1960 and 1979 soybean acreage increased almost three-fold, while production increased four-fold (Figure 1). Average yield increased 30 percent during that period, but the major portion of this expansion has occurred since 1976. Between 1976 and 1979 acreage soared from 49.4 to 70.5 million acres, while total production increased from 1,287.6 to 2,267.6 million bushels.

Since 1960 there have been subtle changes in the pattern of soybean supply and utilization (Table 1). In the early 1960s and again in 1978, approximately 92 percent of domestic supply came from production. However, during the mid-1970s soybean stocks increased and accounted for an increased share of supply. Stocks grew in response to increased production stimulated by foreign demand and high prices.

In the early 1960s about 62 percent of the domestic soybean supply was crushed. Between the early 1960s and 1978 the quantity processed increased from 445 to 1,020 million bushels. Despite the significant increase in crushing, by 1978 domestic processing represented only 50 percent of the total.

Exports have been responsible for a major portion of the growth in soybean production. Exports increased from an average of 173 million bushels in 1960-64 to 770 million bushels in 1978. This represented an increase of 445 percent in about fifteen years. The primary foreign buyers of United States soybeans are located in Western Europe and Japan.

FIGURE 1. ACREAGE AND TOTAL PRODUCTION OF SOYBEANS IN THE UNITED STATES, 1960-1979

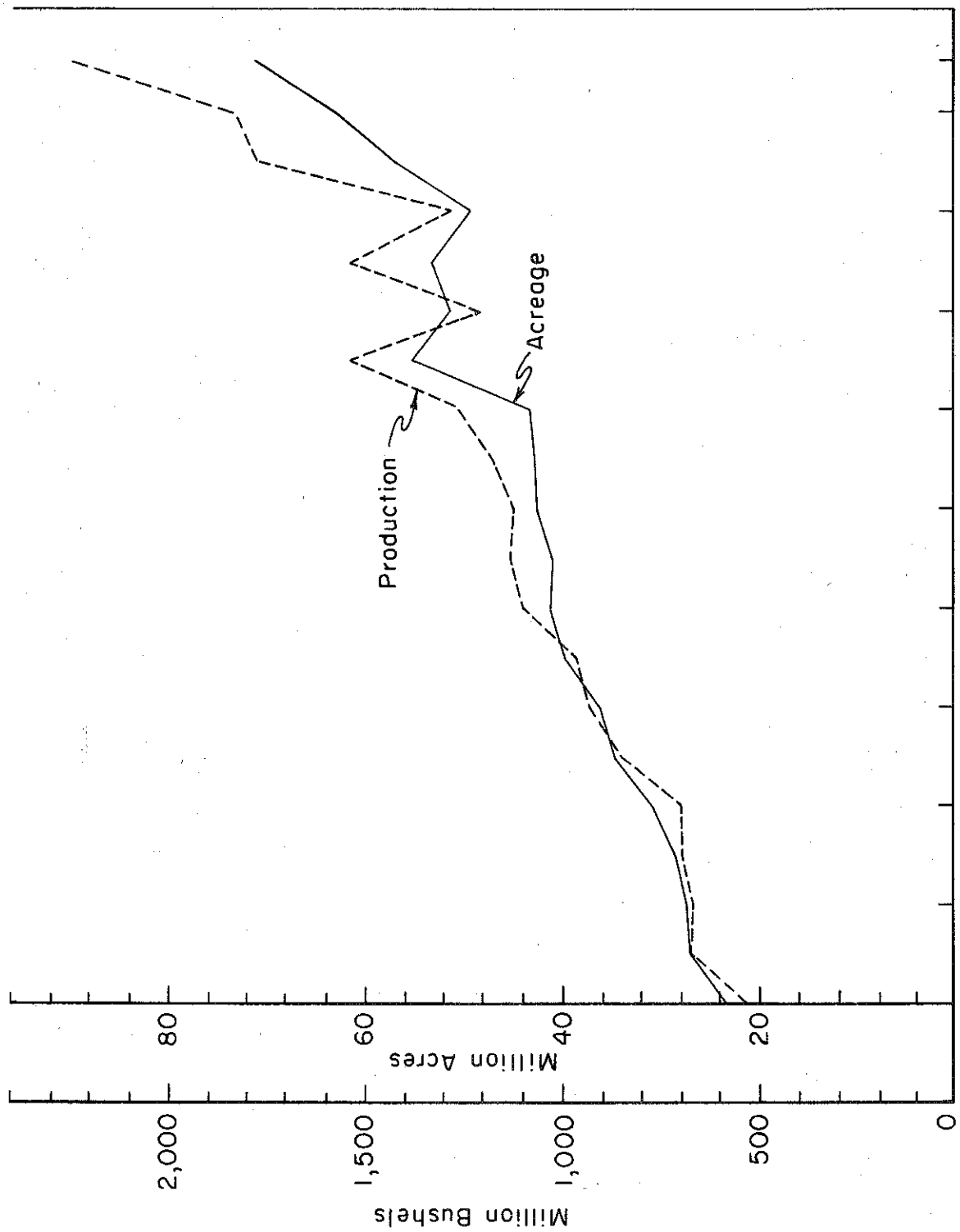

Table 1. SOYBEAN BALANCE SHEET
United States

	1960-64 Average	1965-69 Average	1970-74 Average	1975	1976	1977	1978
			- million bushels -				
Supply							
Stocks, Sept. 1	54	130	126	185	245	103	161
Production	661	998	1,268	1,548	1,288	1,762	1,843
Total	715	1,128	1,394	1,733	1,533	1,865	2,004
Utilization							
Crushings	445	603	745	865	790	927	1,020
Exports	173	300	458	555	564	700	770
Seeds and Feed	36	48	56	55	62	69	75
Residual	11	7	18	13	14	8	4
Total	665	958	1,277	1,488	1,430	1,704	1,869
Stocks, Aug. 31	50	170	117	245	103	161	135

Source: Fats and Oils Situation, ESCS, USDA, Washington, D.C.

Not only have soybean exports increased, but exports of soybean meal have also soared. Meal exports, which averaged 1,329 million tons in 1960-64, climbed to 6,250 million tons in 1978. This is an increase of 470 percent. Meal exports represented 12.6 and 26.0 percent of domestic meal production in the two periods, respectively.

Soybeans used for seed and feed have increased in direct proportion to production. But both end uses account for a very small portion of total production.

Location of U.S. Production -

United States soybean production is concentrated in the Midwest and Southeast (Figure 2). Soybeans compete with corn for land throughout the Corn Belt. In Arkansas, soybeans have taken over much of the land once used for cotton. In the other Southeastern states, most of the increased soybean acreage is land recently brought into crop production.

In 1978 seven states produced over 100 million bushels of soybeans (Table 2). The seven leading states accounted for over 68 percent of total Unites States production.

New York ranked 29th in soybean production in 1978. The state's total production is insignificant compared to states in the Corn Belt and the Southeast.

Figure 2. The Location of U.S. Soybean Production, Million Bushels Per State, 1978.

Table 2. SOYBEAN PRODUCTION
Leading States and New York
1960, 1970, 1975 and 1978

State	Rank in 1978	Production, Million Bushels			
		1960	1970	1975	1978
Illinois	1	129	211	299	303
Iowa	2	66	185	237	287
Missouri	3	50	88	114	155
Minnesota	4	41	79	99	142
Indiana	5	65	102	121	140
Ohio	6	37	73	103	124
Arkansas	7	51	99	117	113
New York	29	0.1	0.1	0.3	0.5

Source: Fats and Oils Situation, ESCS, USDA, Washington, D.C.

Soybean Yields -

The average United States yield per acre of soybeans increased from 23.5 in 1960 to approximately 30 bushels per acre in 1978. Twelve states had an average yield of 30 bushels per acre or more (Table 3). States with the highest yields are located in the Midwest. However, three Eastern states (Maryland, Pennsylvania and New Jersey) had average yields greater than 30 bushels per acre. In 1978, New York ranked 24th among producing states in yield. The state has not experienced the dramatic and stable increase in bushels per acre that some other states have.

Table 3. SOYBEAN YIELDS
Leading States and New York
1960, 1970, 1975 and 1978

State	Rank in 1978	Average Yields, Bushels Per Acre			
		1960	1970	1975	1978
Iowa	1	25.5	32.5	34.0	38.0
Minnesota	2	19.5	26.0	27.0	35.0
Indiana	3	27.0	31.0	33.5	34.0
Nebraska	3	28.0	22.0	27.0	34.0
Illinois	5	26.0	31.0	36.0	33.0
Ohio	5	24.5	28.5	33.0	33.0
Maryland	7	26.0	24.0	28.0	32.0
Wisconsin	7	17.0	24.0	25.5	32.0
Pennsylvania	9	23.0	32.0	28.0	31.5
South Dakota	10	17.0	17.5	25.0	30.5
Kentucky	11	22.0	27.0	27.0	30.0
New Jersey	11	24.5	25.0	26.0	30.0
New York	24	17.0	20.0	27.0	23.0

Source: Fats and Oils Situation, ESCS, USDA, Washington, D.C.

Soybean Prices -

Between 1960 and 1970 prices received by farmers for soybeans ranged between $2.13 and $2.85 per bushel (Table 4). Prices experienced significant increases in 1972, 1973 and 1974. These increases were due to unusually high foreign demand.

Table 4. SOYBEAN PRICES RECEIVED BY FARMERS
U.S. and New York, 1960-1978

Year	Price Per Bushel	
	United States	New York
1960	$2.13	
1961	2.28	
1962	2.34	
1963	2.51	
1964	2.62	
1965	2.59	
1966	2.75	
1967	2.49	
1968	2.43	
1969	2.35	$2.10
1970	2.85	2.65
1971	3.03	2.65
1972	4.37	3.50
1973	5.68	5.20
1974	6.64	7.00
1975	4.92	4.25
1976	6.81	6.50
1977	5.79	5.68
1978	6.56	6.25

Source: Fats and Oils Situation, ESCS, USDA, Washington, D.C.

Soybean prices dropped sharply to $4.92 per bushel in 1975, but rebounded the following year to $6.81. The average price in 1978 was $6.56 per bushel.

Prices received by farmers in New York State were generally lower, but followed the United States trend. In 1978, New York farmers received $6.25 per bushel.

Factors Affecting the Soybean Market -

Meyers and Hacklander studied the impact of various factors on the market for soybeans and soybean products.1/ Their results are presented in Table 5 and highlights are summarized below.

A 100 million bushel increase in soybean production would increase domestic crushings by approximately 28 million bushels, exports by 27 million bushels and carry-over by 45 million bushels. It would also depress soybean prices by about 63 cents per bushel. Such an increase in soybean production is likely to increase soybean meal supplies by 658,000 tons, while oil production would increase by about 300 million pounds.

A 10 cent per bushel increase in the price of the previous year's price of corn would likely reduce supplies of soybeans, meal and oil. As corn prices increase farmers plant more acres of corn and devote less land to soybeans.

If the number of animals consuming high protein feed increases by 10 percent, domestic crushings of soybeans will increase by 26 million bushels while stocks will decrease by about 34 million bushels. This change in utilization is due to increased demand for soybean meal. A 10 percent increase in animal units will increase meal consumption by 1,476,000 tons. Meal exports may even decrease to meet the higher domestic demand.

The major impact of a 100 million pound increase in the consumption of competing oils will be a 106 million pound decrease in the domestic use of soybean oil.

A one million metric ton decrease in the Brazilian export of soybeans will increase United States export by 25 million bushels and reduce domestic processing by 12 million bushels. Domestic availability of soybean meal and oil will also diminish. If Brazil reduces its exports of soybean meal by one million metric tons, domestic U.S. consumption of meal will fall, while United States exports fill the void left by Brazil.

Devaluation of the United States dollar by 10 percent will increase soybean exports by 43 million bushels, but reduce meal and oil exports. Devaluation of the dollar reduces the domestic crush and, therefore, the availability of meal and oil.

1/ Meyers, W.H. and D.D. Hacklander, "The Vulnerability of Soybean and Product Markets to Key Supply and Demand Variables", Fats and Oil Situation, ESCS, USDA, May 1979, pp. 18-21.

Table 5. THE IMPACT OF SELECTED FACTORS ON THE SUPPLY AND DEMAND OF SOYBEANS, SOYBEAN MEAL AND SOYBEAN OIL

Supply and Demand Components Affected	Units	Soybean Production +100 Mil. Bu.	Corn Price +$.10/bu. Current Year	Corn Price +$.10/bu. Previous Year	Number of Animals Consuming High Protein Feed +10%	Consumption of Competing Oils +100 Mil. Lbs.	Brazilian Exports Beans -1 MMT	Brazilian Exports Meal -1 MMT	Deval-uation -10%
Soybeans									
Supply	Mil.bu.	100	0	-23	0	0	0	0	0
Crush	"	28	-.2	-6	26	-2.1	-12	4.7	-18
Export	"	27	3.6	-6	8	-0.6	25	1.4	43
Stocks	"	45	-3.4	-10	-34	2.7	-13	-6.1	-25
Price (Decatur)	$/bu.	-.63	.10	.15	171	-.06	.28	.13	.52
Planted Acres	Mil.ac.	-2.8	0.7	0.1	3.1	-.2	1.2	0.6	2.3
Soybean Meal									
Supply	1,000 S.T.	658	-6	-150	624	-50	-285	114	-435
Domestic	"	404	32	-92	1476	-31	-175	-253	-396
Export	"	254	-38	-59	-852	-19	-110	367	-39
Price (Decatur)	$/S.T.	-16.6	4.4	3.8	55.9	1.3	7.2	10.4	16.3
Soybean Oil									
Supply	Mil.lb.	299	-3	-60	284	-23	-130	52	-198
Domestic	"	26	-2	-6	37	-106	-12	7	-18
Export	"	134	-10	-32	198	66	-56	34	-80
Stocks	"	139	9	-21	49	17	-61	10	-100
Price (Decatur)	¢/lb.	-2.0	0.2	0.5	-2.9	-1.0	0.9	-0.6	1.4
Margin	$/bu.	0.1	.02	*	.32	-.03	*	.06	.02

* Absolute value less than .002.

Soybeans in New York State

Trends -

Soybeans were a relatively unimportant crop in New York for many years. Throughout the 1960s acres harvested ranged between 3,000 and 6,000 acres. During that time yields varied between 16 and 23 bushels per acre.

Recent interest in alternative field crops by New York farmers has resulted in a doubling of soybean acreage over the past five years (Table 6). Thus, New York soybean acreage has increased from about 11,000 acres in 1975 to about 23,000 acres in 1979 according to the New York Crop Reporting Service. This acreage and its production amount to only three hundredths of one percent of the total United States soybean crop. Even so, there is interest enough among growers to explore the feasibility of establishing a soybean processing plant in central New York.

Table 6. SOYBEAN ACREAGE, YIELD AND PRODUCTION
New York State, 1960-1979

Year	Acres Harvested (1,000 Ac.)	Yield (Bu/Ac.)	Production (1,000 Bu.)
1960-64 averages	4	17.8	68
1965-69 averages	4	20.2	87
1970	6	20.0	120
1971	7	22.0	154
1972	8	21.0	168
1973	11	23.0	253
1974	13	26.0	338
1975	11	27.0	297
1976	12	26.0	312
1977	19	23.0	437
1978	22	23.0	506
1979	23	26.0	598

Source: Crop Production; 1979 Annual Summary, Crop Reporting Board, ESCS, USDA, Washington, D.C.

The Study -

Because of the interest in soybeans in the State, a study to provide current production practices and costs for the crop was suggested. As a result, a group of 20 growers cooperated to provide information about their 1979 soybean crop. Because of the wide range in acreage, the largest and the smallest size enterprises were not included in the results of the study. The remaining 18 soybean enterprises totalled 3,478 acres which amounted to just over 15 percent of the total State acreage. With an average yield of 30 bushels per acre (compared to the 1979 State average of 26 bushels per acre) this acreage produced 18 percent of the State's crop.

Production Practices -

Soybeans grow best on high lime soils. A survey of twenty growers in Central New York indicated the pH of the soybean acreage ranged between 6.0 and 7.1. In addition, soybeans prefer deep and well-drained soils.

Early maturing soybean varieties must be grown in New York State. Although late maturing varieties generally have higher yields they are susceptible to frost damage prior to ripening. The survey indicated the acreage and number of growers using various leading varieties in New York State in 1979. The results are presented in Table 7.

In 1979, New York growers surveyed planted soybeans from May 8 to June 21. However, most soybeans were planted in late May and were drilled in 30 inch rows.

Table 7. ACREAGE AND NUMBER OF NEW YORK GROWERS Using Various Soybean Varieties, 1979

Variety	Acreage	Number of Growers Using
Amsoy	734	10
Corsoy	230	5
Evans	253	3
Hodgson	398	8
Viking	353	4
Wells	847	5
Wilkins	111	2
Other	1,492	11
Total	4,418	20 1/

1/ Many growers use more than one variety.

At harvest, soybeans occasionally need drying. Eight growers indicated they dried soybeans as needed. Seven said they seldom dry and five indicated they never dry soybeans.

Marketing Practices -

Despite the lack of local processing facilities most growers were relatively satisfied with their current markets for soybeans. Thirteen growers sold all or a majority of their soybeans to local buyers. These buyers typically ship the soybeans to export facilities in Philadelphia and Baltimore. Six growers sold directly to the Philadelphia and Baltimore markets. Two growers used their soybeans as feed. Several growers used more than one of these outlets to market their crop.

Most of the twenty growers surveyed considered the outlook for soybeans in New York State to be good to excellent.

Production Costs for Soybeans in New York State

Data collected from the 18 growers included growing and harvesting costs to the point where the crop was placed in farm storage or on a truck to be hauled off the farm. No storage or hauling costs have been estimated because of wide variations in marketing practices. An average return of $6.00 per bushel was used to represent a value for the soybeans on the farm at the time of the 1979 harvest. The same return per bushel was used for all soybean enterprises so that the estimated profits are the result of size of enterprise, yield and production cost variations.

All 18 soybean enterprises are averaged together to produce the basic growing and harvesting costs per acre. Acreage for these 18 growers ranged from about 50 to 500 acres each. To study the effect of size of enterprise, average costs for growers with 50 to 150 acres per enterprise are compared with larger enterprises ranging from 200 to 500 acres.

Finally, the group of 18 growers are divided into three groups based on yield per acre. This produced groups with yields ranging from 19 to 27, 28 to 31 and 31 to 45 bushels per acre. Yields for the three groups averaged 23, 30 and 38 bushels per acre, respectively.

Overall Results for the State -

All of the soybean producers included in this study except four were located in Seneca County. One grower from Yates County provided information and the remaining three records came from growers in Livingston County.

The growing and harvesting costs for the 18 soybean enterprises included in the study are summarized in Table 8. These enterprises ranged in size from 53 to 480 acres and averaged 193 acres per enterprise. Yields for this group of growers averaged 30 bushels per acre. The New York Crop Reporting Service estimated a State average yield of 26 bushels per acre for 1979.

The largest single cost to grow soybeans in New York is the cost of land. With real estate taxes averaging about $10 per acre of open cropland, the major cost component of owned land is interest on the value of the land. Interest cost is a factor of the rate charged and the value placed on an acre of cropland. The land cost averaged $47 per acre or $1.53 per bushel of soybeans. This amounted to about one third of the total soybean production costs.

Three other major growing costs were the out-of-pocket costs for fertilizer, seed and chemicals. These direct costs totalled $50 per acre or $1.66 per bushel. The total cost to grow soybeans averaged $128 per acre or $4.21 per bushel at the 30 bushel yield level.

Table 8. SOYBEANS
Growing and Harvesting Costs
3,478 Acres, 18 Farms
New York, 1979

Item	Rates per Acre	Cost Per Acre	Cost Per Bushel
Number of farms		18	
Acres per enterprise		193	
Yield per acre, bushels		30	
Growing Costs:			
Labor	1.3 hr	$ 8	$ .24
Tractor	1.2 hr	7	.24
Equipment, large truck		8	.25
Custom work, equipment rent		2	.08
Land use		47	1.53
Manure, lime, cover crop		2	.06
Fertilizer: lbs. N-12, P-36, K-50		19	.63
Seed	69 lbs	13	.44
Chemicals		18	.59
Interest on operating capital		1	.04
All other		3	.11
Total growing cost		$128	$4.21
Harvesting Costs:			
Labor	.5 hr	$ 3	$ .11
Equipment, self propelled		12	.38
All other		1	.03
Total harvesting cost		$ 16	$ .52

The major cost to harvest the crop was for the combine itself. The portion of the total combine cost allocated to harvest the soybean crop on these farms amounted to $12 per acre to cover ownership and operating costs. With high capacity combines and a low volume (less than one ton per acre) crop to harvest, only half an hour of labor per acre was used to harvest the crop and place it in farm storage. Total harvesting costs averaged $16 per acre or $.52 per bushel of soybeans.

Table 9 summarizes production costs and returns for the 18 New York soybean enterprises. Growing and harvesting costs together resulted in production costs averaging $144 per acre and $4.73 per bushel. In using an estimated harvest time return of $6.00 per bushel for all growers, returns averaged $183 per acre. The resulting profit was $49 per acre and $1.27 per bushel. With those figures, these enterprises were profitable in 1979 showing a return of $1.27 for each dollar of cost invested in the crop. The available figures for soybeans indicate that the yield for New York in 1979 was above average which would, in itself, normally indicate above average returns for a crop.

Table 9. SOYBEANS
Costs and Returns
3,478 Acres, 18 Farms
New York, 1979

Item	Cost	
	Per Acre	Per Bushel
Number of farms	18	
Acres per enterprise	193	
Yield per acre, bushels	30	
Costs to: Grow	$128	$4.21
Harvest	16	.52
Total production costs*	$144	$4.73
Returns	$183	$6.00
Profit	$ 49	$1.27
Return per dollar of cost	$1.27	

* Includes costs to place the soybeans into farm storage or on a truck if hauled off the farm at harvest time. Excludes storing costs and hauling costs to a buyer.

Average figures for these soybean enterprises are comprised of 18 individual enterprises representing a variety of inputs and conditions under which the crop was grown. Therefore, considerable variation may be

expected when individual results are compared. Table 10 lists several factors for each enterprise to illustrate this variation for some of the more important points of interest in the production of soybeans. Acreage has been omitted to protect grower identity.

Table 10. SOYBEANS
Selected Factors
3,478 Acres, 18 Farms*
New York, 1979

Farm No.	Yield per Acre	Average Per Acre			Average per Bushel		Return per $ of Cost
		Grow Cost	Harvest Cost	Profit	Costs	Returns	
	bu	$	$	$	$	$	$
8	21	102	12	10	5.52	6.00	1.09
3	45	204	19	47	4.96	6.00	1.21
9	32	116	14	61	4.10	6.00	1.46
12	30	127	13	40	4.68	6.00	1.28
19	23	102	8	30	4.73	6.00	1.27
2	41	138	17	93	3.75	6.00	1.60
17	33	119	16	65	4.04	6.00	1.49
7	27	107	15	38	4.56	6.00	1.31
13	31	145	19	25	5.22	6.00	1.15
5	29	123	18	30	4.94	6.00	1.22
18	28	132	20	17	5.40	6.00	1.11
6	21	120	18	-12	6.56	6.00	0.91
14	28	128	15	24	5.12	6.00	1.17
16	31	106	13	69	3.81	6.00	1.58
1	24	119	25	0	5.98	6.00	1.00
20	31	98	14	77	3.56	6.00	1.69
15	33	142	50	9	5.74	6.00	1.05
4	19	149	11	-48	8.61	6.00	0.70
Range	19 to 45	98 to 204	8 to 50	-48 to 93	3.56 to 8.61	6.00	0.70 to 1.69
Weighted Average	30	128	16	39	4.73	6.00	1.27

* Listed in descending order by acreage from 480 to 53 acres.

Results Based on Size of Enterprise -

Size of enterprise usually has some effect on various factors related to the enterprise. Economies of scale are generally experienced when specialized equipment or fixed costs can be spread over more units of production. To study the effects of size, this group of soybean enterprises were divided into two groups averaging 93 and 319 acres per enterprise.

As shown in Table 11, the larger enterprise group had higher yields, growing costs per acre and profits. The larger enterprises had lower labor costs per acre and somewhat lower tractor and equipment costs. Land costs averaged $48 per acre for larger enterprises as compared to $42 per acre for the smaller ones. Fertilizer and seed costs were essentially the same for both groups with a $2 per acre lower cost for chemicals by the larger size group.

Harvesting costs per acre were significantly lower for larger soybean enterprises. Most of this lower cost resulted from lower equipment costs per acre. Increased cost efficiency was realized as the combine was used to harvest more acres.

Profits between the two size groups were significantly different. The larger enterprises had profits averaging $45 per acre compared to $20 per acre profit for the smaller size group. With the harvest time return for soybeans estimated at $6 per bushel for all growers, price had no effect on the variation in profits. Thus, cost and yield differences accounted for this variation.

The effect of size of enterprise was most notable in harvest equipment costs. Lower harvesting costs explain some of the higher profits. However, the greatest effect on profits between these two size groups occurred because of the difference in yields. The eight larger enterprises had yields averaging 31 bushels of soybeans per acre - three bushels or 10 percent higher than the smaller size group. With lower costs and higher yields per acre the larger enterprises proved to be more profitable not only on a per acre and bushel basis but also, of course, in total enterprise profits.

The following two tables - Tables 12 and 13 - indicate the range of selected factors between enterprises for the two groups.

Table 11. SOYBEANS
Costs and Returns
by Size of Enterprise
18 Farms, New York, 1979

Item	Size of Enterprise		All Farms
	50 to 150 acres	200 to 500 acres	
Number of farms	10	8	18
Acres per enterprise	93	319	193
Yield per acre, bushels	28	31	30
		- per acre -	
Costs:			
Growing	$127	$129	$128
Harvesting	20	14	16
Total production costs	$147	$143	$144
Returns	$167	$188	$183
Profit	$ 20	$ 45	$ 39
Return per dollar of cost	$1.14	$1.32	$1.27
		- per bushel -	
Costs:			
Growing	$4.54	$4.10	$4.21
Harvesting	.70	.46	.52
Total production costs	$5.24	$4.56	$4.73
Returns	$6.00	$6.00	$6.00
Profit	$ .76	$1.44	$1.27

Table 12. SOYBEANS
Selected Factors
for Enterprises of 50 to 150 Acres*
10 Farms, New York, 1979

Farm No.	Yield per Acre	Average Per Acre			Average per Bushel		Return per $ of Cost
		Grow Cost	Harvest Cost	Profit	Costs	Returns	
	bu	$	$	$	$	$	$
13	31	145	19	25	5.22	6.00	1.15
5	29	123	18	30	4.94	6.00	1.22
18	28	132	20	17	5.40	6.00	1.11
6	21	120	18	-12	6.56	6.00	0.91
14	28	128	15	24	5.12	6.00	1.17
16	31	106	13	69	3.81	6.00	1.58
1	24	119	25	0	5.98	6.00	1.00
20	31	98	14	77	3.56	6.00	1.69
15	33	142	50	9	5.74	6.00	1.05
4	19	149	11	-48	8.61	6.00	0.70
Range	19 to 33	98 to 149	11 to 50	-48 to 77	3.56 to 8.61	6.00	0.70 to 1.69
Weighted Average	28	127	20	20	5.24	6.00	1.14

* Listed in descending order by acreage.

Table 13. SOYBEANS
Selected Factors
for Enterprises of 200 to 500 Acres*
8 Farms, New York, 1979

Farm No.	Yield per Acre	Average per Acre			Average per Bushel		Return per $ of Cost
		Grow Cost	Harvest Cost	Profit	Costs	Returns	
	bu	$	$	$	$	$	$
8	21	102	12	10	5.52	6.00	1.09
3	45	204	19	47	4.96	6.00	1.21
9	32	116	14	61	4.10	6.00	1.46
12	30	127	13	40	4.68	6.00	1.28
19	23	102	8	30	4.73	6.00	1.27
2	41	138	17	93	3.75	6.00	1.60
17	33	119	16	65	4.04	6.00	1.49
7	27	107	15	38	4.56	6.00	1.31
Range	21 to 45	102 to 204	8 to 19	10 to 93	3.75 to 5.52	6.00	1.09 to 1.60
Weighted Average	31	129	14	45	4.56	6.00	1.32

* Listed in descending order by acreage.

Results Based on Yield -

To study the effects of yield on soybean profits, the group of 18 enterprises were divided in thirds after being ranked according to yield. For the three groups, yields averaged 23, 30 and 38 bushels of soybeans per acre. Overall, yields for this group ranged from 19 to 45 bushels per acre as shown in Table 14.

Table 14. SOYBEANS
Costs and Returns
According to Yield
18 Farms, New York, 1979

Item	Yield Range, Bushels per Acre 19 to 27	28 to 31	31 to 45	All Farms
Number of farms	6	6	6	18
Acres per enterprise	202	144	233	193
Yield per acre, bushels	23	30	38	30
		- per acre -		
Costs:				
Growing	$107	$128	$147	$128
Harvesting	13	16	18	16
Total production costs	$120	$144	$165	$144
Returns	$135	$178	$227	$183
Profit	$ 15	$ 34	$ 62	$ 39
Return per dollar of cost	$1.12	$1.24	$1.38	$1.27
		- per bushel -		
Costs:				
Growing	$4.76	$4.32	$3.87	$4.21
Harvesting	.58	.54	.48	.52
Total production costs	$5.34	$4.86	$4.35	$4.73
Returns	$6.00	$6.00	$6.00	$6.00
Profit	$ .66	$1.24	$1.65	$1.27
		- per acre -		
Other factors				
Land cost	$ 39	$ 45	$ 54	$ 47
Fertilizer cost	$ 16	$ 26	$ 19	$ 19
LB per acre : N	7	12	15	12
P	18	41	49	36
K	43	71	42	50
Seed cost	$ 12	$ 13	$ 15	$ 13
Chemical cost	$ 14	$ 13	$ 24	$ 18
Harvest equipment cost	$ 9	$ 12	$ 13	$ 11

There was a definite, direct relationship between yield and several factors shown in the analysis of these groups of soybean enterprises. Growing costs increased as yields increased. While this was most significant with land and seed costs per acre, costs for chemicals, labor and equipment also tended to increase as yields improved. Chemical costs will be treated in greater depth later in this report. Fertilizer costs varied greatly but cost per acre and the quantity of nutrients per acre also tended to increase with yield.

Harvesting costs, primarily for equipment, increased with higher yields. However, the additional quantity of soybeans harvested and placed in storage did not account for much of the added cost. Higher harvest equipment costs were more related to the age and value of the combine and, particularly, to the number of total acres harvested by the combine.

With a constant return of $6 per bushel for all producers and in spite of higher costs, enterprises with higher soybean yields had significantly higher profits. Table 14 shows a substantial difference in profit per acre and per bushel as well as in return per dollar of cost as the three yield level groups of enterprises are compared.

Tables 15, 16 and 17 indicate the range of several selected factors within each yield level group of enterprises.

Table 15. SOYBEANS
Selected Factors
Enterprises with Yields of 19 to 27 Bushels per Acre
6 Farms*, New York, 1979

Farm No.	Yield per Acre	Average per Acre			Average per Bushel		Returns per $ of Cost
		Grow Cost	Harvest Cost	Profit	Costs	Returns	
	bu	$	$	$	$	$	$
8	21	102	12	10	5.52	6.00	1.09
19	23	102	8	30	4.73	6.00	1.27
7	27	107	15	38	4.56	6.00	1.31
6	21	120	18	-12	6.56	6.00	0.91
1	24	119	25	0	5.98	6.00	1.00
4	19	149	11	-48	8.61	6.00	0.70
Range	19 to 27	102 to 149	8 to 25	-48 to 38	4.56 to 8.61	6.00	0.70 to 1.31
Weighted Average	23	107	13	15	5.34	6.00	1.12

* Listed in descending order by acreage.

Table 16. SOYBEANS
Selected Factors
Enterprises with Yields of 28 to 31 Bushels per Acre
6 Farms*, New York, 1979

Farm No.	Yield per Acre	Average per Acre			Average per Bushel		Returns per $ of Cost
		Grow Cost	Harvest Cost	Profit	Costs	Returns	
	bu	$	$	$	$	$	$
12	30	127	13	40	4.68	6.00	1.28
13	31	145	19	25	5.22	6.00	1.15
5	29	123	18	30	4.94	6.00	1.22
18	28	132	20	17	5.40	6.00	1.11
14	28	128	15	24	5.12	6.00	1.17
20	31	98	14	77	3.56	6.00	1.69
Range	28 to 31	98 to 145	13 to 20	17 to 77	3.56 to 5.40	6.00	1.11 to 1.69
Weighted Average	30	128	16	34	4.86	6.00	1.24

* Listed in descending order by acreage.

Table 17. SOYBEANS
Selected Factors
Enterprises with Yields of 31 to 45 Bushels per Acre
6 Farms*, New York, 1979

Farm No.	Yield per Acre	Average per Acre			Average per Bushel		Return per $ of Cost
		Grow Cost	Harvest Cost	Profit	Costs	Returns	
	bu	$	$	$	$	$	$
3	45	204	19	47	4.96	6.00	1.21
9	32	116	14	61	4.10	6.00	1.46
2	41	138	17	93	3.75	6.00	1.60
17	33	119	16	65	4.04	6.00	1.49
16	31	106	13	69	3.81	6.00	1.58
15	33	142	50	9	5.74	6.00	1.05
Range	31 to 45	106 to 204	13 to 50	9 to 93	3.75 to 5.74	6.00	1.05 to 1.60
Weighted Average	38	147	18	62	4.35	6.00	1.38

* Listed in descending order by acreage.

Effects of Weed Control on Yields and Profits -

Good weed control is essential to good yields in soybeans. Chemical herbicides were used to various extents by all growers in this study. Eight growers planted all of their soybeans in 30 inch rows; eight growers used a drill to plant soybeans, and two growers used both wide and narrow row systems. Seven of those who planted in 30 inch rows used some cultivation in addition to herbicides to control weeds.

When the 18 soybean records are analysed on the basis of chemical cost per acre as a measure of weed control effort some significant relationships are evident. The assumption is made that, within reason, higher chemical costs and selective cultivation generally result in more effective weed control. Recognizing the general nature of that assumption, the group of records were ranked by chemical cost per acre to study the effect of weed control on yields and profits.

Table 18. Relationship of Weed Control Costs to Yield and Profits 18 Soybean Enterprises Ranked by Chemical Cost per Acre New York, 1979

Group	No. of Entr.	Acres per Entr.	Chemical Cost/Acre	Yield per Acre	Profit per Acre
		ac.	$	bu.	$
Low Half	9	210	12	26.3	31
High Half	9	177	24	35.3	48
Low Third	6	213	11	24.5	20
Middle Third	6	165	15	29.9	42
High Third	6	197	27	37.3	57
All Enterprises	18	193	18	30.5	39

Whether the group was divided in half or in thirds the direct relationship of good weed control to yields and profits persisted (Table 18). The effect of cultivation on yield was ignored because soybean acreage was cultivated in each group to a similar extent. Each of the group comparisons in Table 18 illustrates that yields and profits per acre improve as weed control becomes more effective when measured by chemical costs per acre. Weed control efforts must be determined by conditions to arrive at optimum levels of control. Appropriate chemicals applied in the proper way combined with selective cultivation seems to provide potential for the highest profits per acre.

Determining the Break Even Yield -

Good yields are critical to profitable crop production. However, profits are also affected by production costs and returns per unit of production. If any two of those three factors can be known or estimated, the third factor can be determined from Table 19. For example, the results of this study show that soybeans for these 18 enterprises cost an average of $144 per acre to produce. Assuming a $6 return per bushel for the crop, a grower can see, by interpolating, that he needs a yield of 24 bushels of soybeans per acre to break even or to cover all his costs. Similarly, a grower who knows his costs and expected yield can tell what price he needs to receive to break even on his crop.

Table 19. SOYBEANS
Break Even Yields
at Various Cost and Return Levels

Total Cost per Acre	Yield Necessary to Break Even with Returns per Bushel Averaging:				
	$5.00	$6.00	$7.00	$8.00	$9.00
	- Bushels per Acre -				
$100	20	17	14	13	11
125	25	21	18	16	14
150	30	25	21	19	17
175	35	29	25	22	19
200	40	33	29	25	22
225	45	38	32	28	25

Summary and Conclusions

The following comments and observations are made from this study and other available information:

1. Soybean production in the United States has doubled in the past decade - from 1.1 billion bushels in 1969 to 2.3 billion bushels in 1979. United States soybean acreage has increased 72 percent and yield has increased about 13 percent.

2. In the same period, United States corn grain production has increased 40 percent and acreage has increased 30 percent. Yield has increased about 24 percent.

3. In 1969, soybean acreage in the United States was equal to 75 percent of the corn grain acreage. By 1979, total soybean acreage fell only one percent short of surpassing the corn grain acreage as being the nation's number one crop in acreage.

4. In New York State, corn grain acreage has more than doubled in the past 10 years as it increased from 247 thousand acres in 1969 to 650 thousand acres in 1979. At the same time, soybean acreage in New York increased from five thousand to 23 thousand acres. These increased acreages resulted from decreased acreages of hay, wheat, oats and other crops. Even so, New York soybean production in 1979 accounted for less than three hundredths of one percent of total United States production.

5. Soybeans, as an alternative crop for New York farmers, are feasible in a relatively small area of the State where accumulated growing degree days during the frost free season exceed 2,400. This is generally located in an east-west strip north of the New York Thruway from Syracuse to Buffalo. It also extends five to 15 miles south of the Thruway from Auburn west to Canandaigua and in the Genesee River Valley south to Geneseo. This area is most likely to have the 2,400 plus growing degree days necessary to result in profitable soybean yields in New York State.

6. In 1979, soybeans cost $144 per acre to grow and harvest the crop. The records summarized in this study had an average yield of 30 bushels per acre - four bushels above the state average. Using the State average yield of 26 bushels per acre and production costs of $144 per acre, a return of $5.54 per bushel at harvest time was necessary to break even. With an assumed return of $6.00 per bushel, growers in this study received a profit of $39 per acre or $1.27 per bushel at the average yield of 30 bushels per acre.

7. The growers in this study indicated no serious problem in marketing their soybean crop. Several indicated an interest in developing a local processing facility but most were generally satisfied with local buyers and/or the arrangements they have developed directly with out-of-state buyers.

8. Production costs for soybeans in 1980 are expected to increase by 14 percent over 1979 costs. With the labor required to grow an acre of soybeans as low as it is already, future gains in productivity will come mostly as a result of improved yields. Yields and/or returns must improve to cover increased costs for the crop to remain profitable.

9. With large increases in energy and fertilizer costs soybeans can compete favorably with other field crops for the use of land where good yields are likely. However, increasing land values and production costs are causing the profitable production of field crops as a cash crop to become increasingly difficult in New York.