

January 1973

A.E. Ext. 73-1

**THE
ECONOMICS OF
SOYBEANS FOR PROCESSING
IN NEW YORK
1972**

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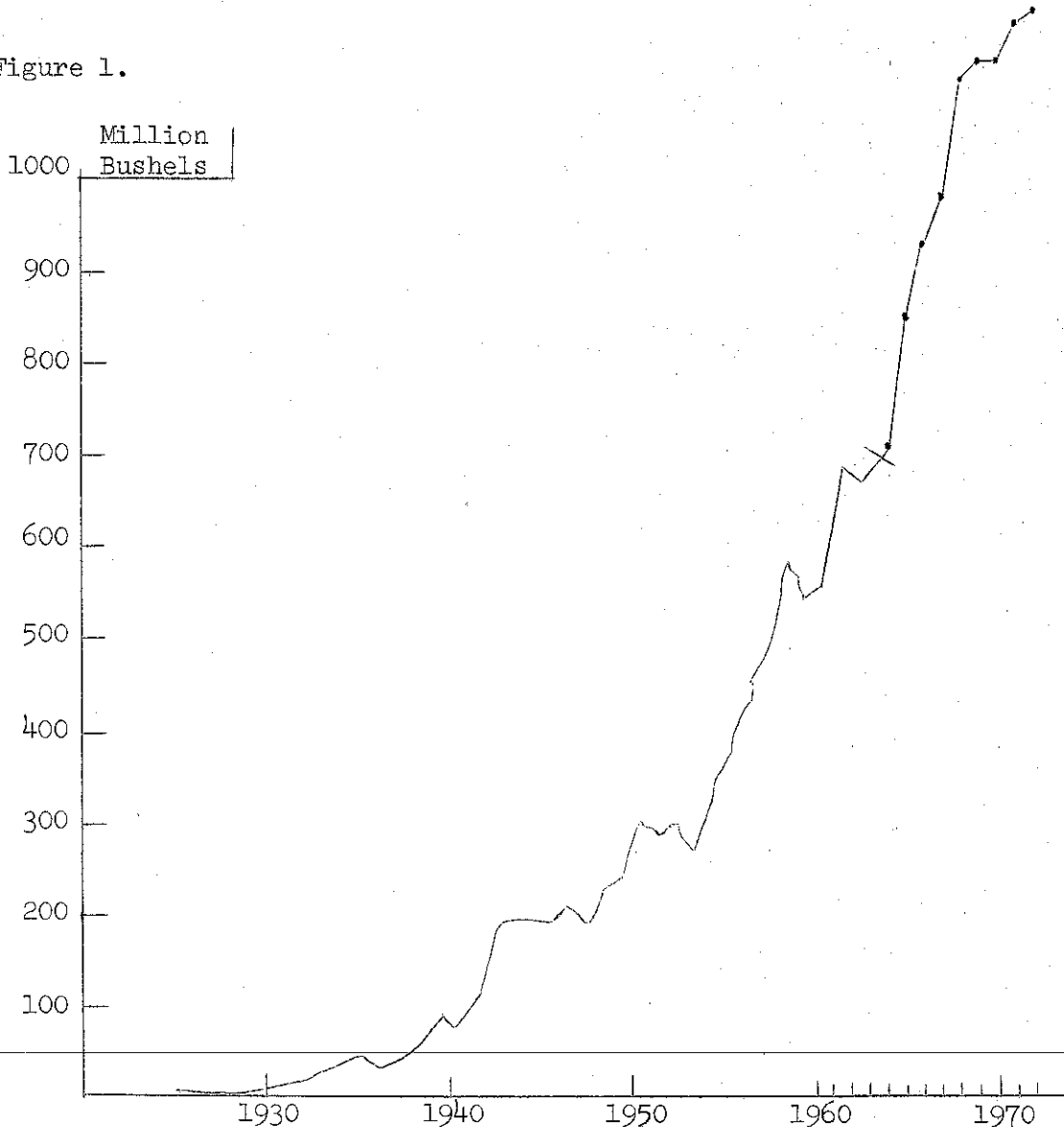
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Soybeans in the United States

The United States is the world's leading producer of soybeans, and the change in recent years in the quantity of soybeans produced in this country is almost unbelievable. In 1924 there were 4.9 million bushels produced (Figure 1). Commencing just prior to 1940, the quantity began to increase rapidly and the end of the expansion does not appear to be in sight. In 1965, there were 846 million bushels of soybeans produced on 34 million acres of land and in 1972, 1,276 million bushels were produced on 45 million acres.

Figure 1.



The 1972 soybean crop estimate was 1,276 million bushels. However, some of the crop was still standing in the field at the end of the year. How much of this will be harvested and what the quality of these beans will be are big questions. This situation and the high demand for soybeans was reflected in the December prices at Chicago of \$3.80 per bushel.

Table 1. SOYBEAN BALANCE SHEET, UNITED STATES

	1965-69 average	1970-71	1971-72	1972-73 ^{1/}
	- million bushels -			
SUPPLY				
Carryover	129	230	99	72
Production	<u>996</u>	<u>1124</u>	<u>1169</u>	<u>1351</u>
Total	1125	1354	1268	1423
UTILIZATION				
Seed, feed	54	62	58	73
Crushings ^{2/}	603	760	721	765
Exports	<u>299</u>	<u>433</u>	<u>416</u>	<u>510</u>
Total	956	1255	1196	1348
Carryover	230	99	72	75

Source: USDA Fats and Oils Situation, and Crop Production

^{1/} November 1 indications and estimates

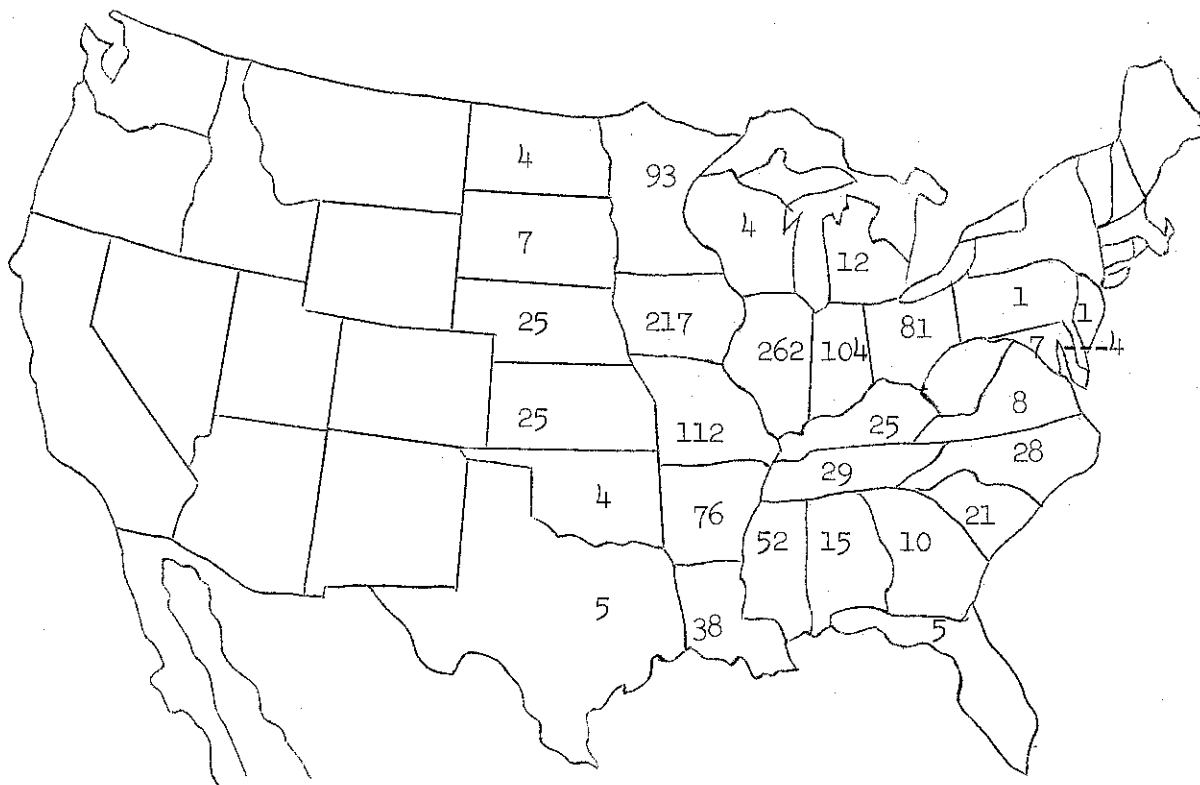
^{2/} Includes soybean meal exports equal to about 1/4 of crushings

Data for table by G. S. Casler, New York Economic Handbook, A.E.Ext. 72-20.

The major soybean producing areas in the United States are the Corn Belt and the Southeast. In recent years there has been a tendency for the production to be more concentrated in these areas. The increase in production has occurred there. The fringe areas of the north and west have tended to decrease in production.

The nation's main soybean producing area is the Corn Belt region, where, even though they are very important, soybeans are considered as a secondary crop. They cannot compete with corn for first choice on the best Corn Belt land because they are not generally as profitable as corn. They are used in rotation and on less productive land.

Figure 2.



The location of U.S. Soybean Production, 1972. (data are millions of bushels)

The soybeans in the Southeast have been planted largely on the land that was formerly in cotton. As a result of new technology and government programs, the cotton production in the area has declined. Corn was historically a poor second crop in the area and was too poor to move in and take the place of the cotton. Soybean yields in the Southeast are considerably below those in the Corn Belt states but the differentials between the yields of corn and soybeans in the area favor the soybeans. As a consequence, the soybean acreages in all of the states in the area have expanded.

In 1972 there were eight states that each produced over 50 million bushels of soybeans (Table 2). The combined production from these eight states was more than 78 percent of the total for the United States. Seven other states each produced 15 million bushels of soybeans or more.

Table 2. U. S. SOYBEAN PRODUCTION FOR LEADING STATES

State	Rank in 1972	1950 production (mil. bu.)	1966 production (mil. bu.)	1972 production (mil. bu.)
Illinois	1	96	159	262
Iowa	2	42	150	217
Missouri	3	28	85	112
Indiana	4	37	73	104
Minnesota	5	18	81	93
Ohio	6	25	60	82
Arkansas	7	12	84	76
Mississippi	8	9	43	52

Source: Annual Crop Summary, 1966 and 1972, Crop Reporting Board, SRS, U.S.D.A.

Yields

The United States average yield per acre of soybeans has increased from 11 bushels in 1924 to 25.4 bushels in 1966 and to 27.9 bushels in 1972. The highest yields tend to be found in the Corn Belt and upper Mississippi Delta region (Table 3). These regions have in common hot summer weather and fertile soils. As previously noted, the states in the Southeast have lower yields but still have yields that generally surpass those of the northern and wheat belt states.

Table 3.

SOYBEAN YIELDS
1969-1970-1971-1972

State	Bushels Average Yield			
	1969	1970	1971	1972
Indiana	32.5	31.0	33.0	28.0
Illinois	33.5	31.0	33.0	35.0
Iowa	33.0	32.5	32.5	36.0
Ohio	29.0	28.5	30.5	27.0
Maryland	33.0	24.0	30.0	27.0
Kentucky	28.0	27.0	29.5	28.0
Pennsylvania	30.0	32.0	29.0	25.0
New Jersey	28.0	25.0	28.0	17.0
Delaware	29.0	21.0	28.0	25.0
Florida	27.0	28.0	28.0	21.0
Missouri	26.0	25.5	27.0	28.0
Texas	29.0	28.0	27.0	26.0
Alabama	23.0	23.0	26.0	20.0
Tennessee	24.0	23.0	26.0	23.0
Georgia	24.0	23.0	25.5	15.0
Nebraska	33.5	22.0	25.0	33.0
Mississippi	22.0	22.5	21.5	21.0
New York	21.0	20.0	22.0	21.0

Trends in Production

Economic and climatic conditions have combined to affect the location of the production of soybeans in the United States.

As previously noted, the Corn Belt and Southeast are the major areas of production of soybeans. The yields in these states tend to be higher and these are states that have increased their production.

Since 1966 the United States production of soybeans has increased from 928 to 1,276 million bushels. The increase in the five Corn Belt states of Ohio, Indiana, Illinois, Iowa and Missouri in this period, has been 253 million bushels or 73 percent of the total increase. The southeastern states had an increase of 65 million bushels. Together the change in production in the two areas accounted for about 91 percent of the total increase.

New York has more than doubled its acreage but the total grown is so insignificant as to be hardly worth counting.

Climate

Although soybeans can be grown under a variety of climatic conditions, climate is probably the most important factor influencing the yield and, consequently, the profits. Summer temperature, rainfall and length of growing season are particularly important. To study the relationship of temperature to yield of soybeans, in 1966 24 counties were selected in eight soybean producing states in central and northern United States. These were chosen to give a range in summer temperature. The average July temperature at stations in each county was obtained from Weather Bureau Data. This was related to the average yield of soybeans in the county. The importance of summer temperature is emphasized by the fact that in the counties studied, no county having an average July temperature below 71.5°F had an average yield greater than 22 bushels per acre. However, high temperature is no guarantee of high yields as is evidenced by many of the Southern states which have high temperatures but only moderate yields. Obviously, factors other than temperature are involved in obtaining high soybean yields.

Source?

When yields for the three largest soybean producing counties in each of the eight states are plotted against average July temperature, the relationship between the two can be seen (Figure 3).

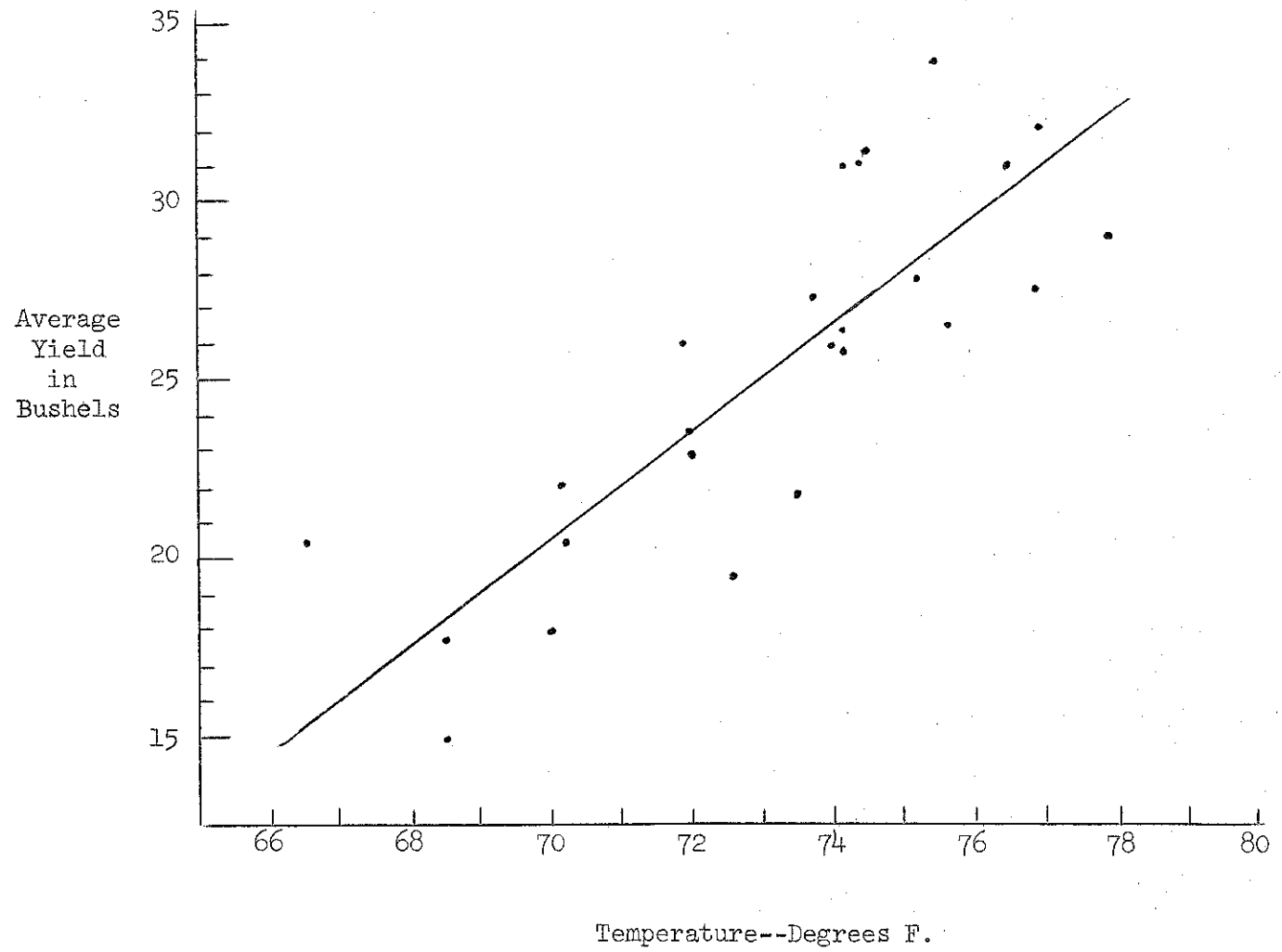


Figure 3. Relationship Between Yield and Average July Temperature

Yet another element that effects yields is the length of the growing season (Figure 4).

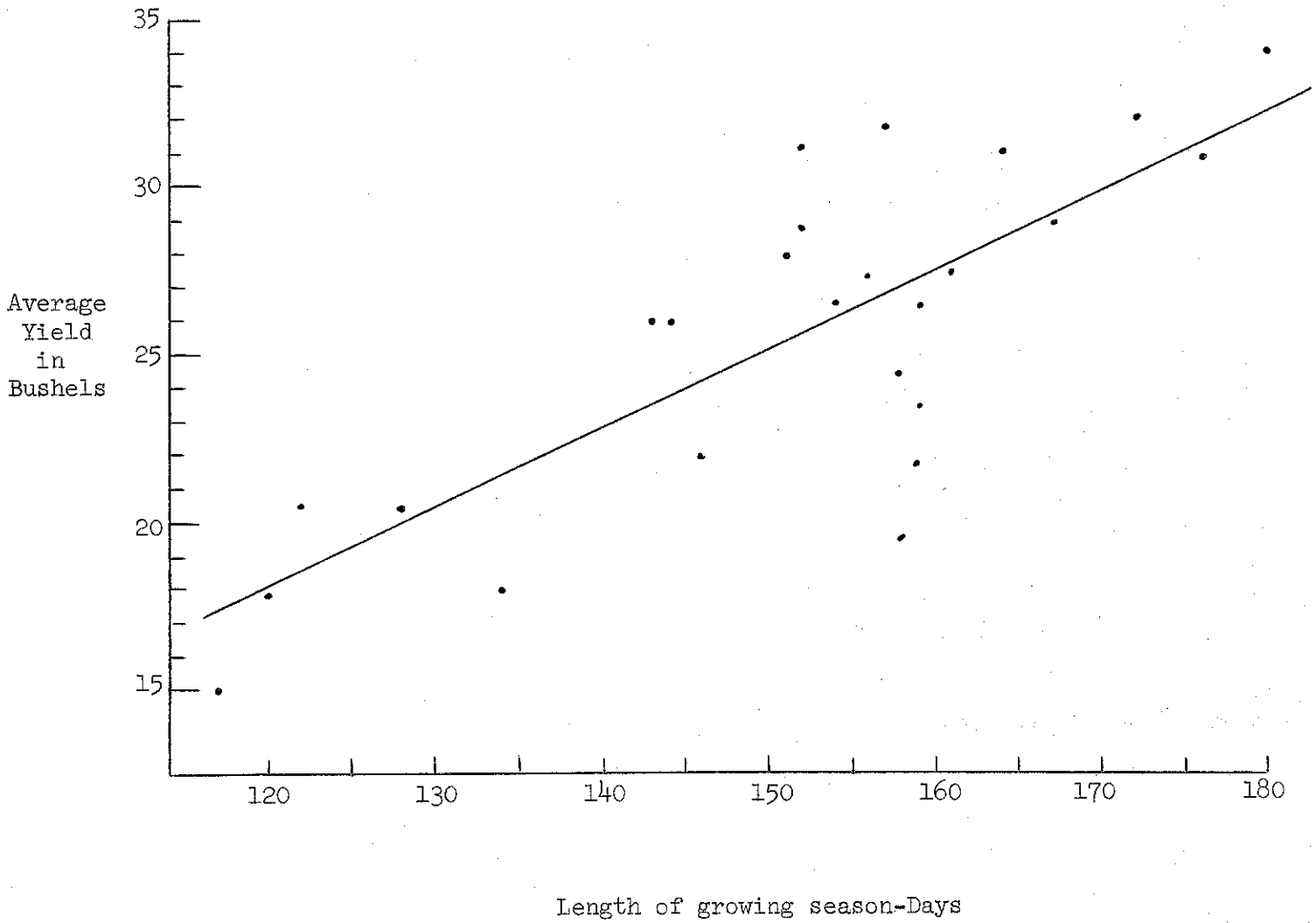


Figure 4. Relationship Between Yield and Length of Growing Season

Although soybeans can be grown under a variety of climatic conditions, and varieties have been developed ranging in time required for maturity from 75 to 200 days, the early maturing beans are not usually as high yielding as the later maturing varieties.

Soybeans are also sensitive to length of day and to altitude. In high altitudes where the nights are colder during the growing season, varieties normally adapted to these same latitudes but for lower elevations produced abundant vegetative growth but may not mature seed. Furthermore, even varieties developed for a short growing season, often do not ripen because at temperatures below 50°F almost all growth activity stops.

U. S. Prices

In spite of increasing production the price of soybeans has remained high and in the last two years has exceeded that for any year since 1953.

Because of varying weather conditions the production and price of soybeans in the United States is quite uncertain. Recently, cash soybeans in Chicago were about \$3.80 per bushel. This, of course, is not typical and the fact should be so recognized by those who are interested in the crop.

In the last ten years the average annual U.S. price has ranged from \$2.34 in 1962 to \$3.01 in 1971 (Table 4).

Table 4.

AVERAGE UNITED STATES PRICE OF SOYBEANS

Year	Price
1962	\$2.34
1963	2.51
1964	2.62
1965	2.54
1966	2.75
1967	2.49
1968	2.43
1969	2.35
1970	2.84
1971	3.01

Soybeans in New York State

During the 1930's there was some interest in growing soybeans in New York. Two black-seeded, early maturing varieties, Seneca and Cayuga, were developed and released from Cornell about 1933. A soybean processing plant was built at Oswego. This processed some New York soybeans and also was used for beans imported from the midwest, largely by water transport. This plant was closed in the late 1940's. Soybeans have never been important in the State. For many years they declined in importance but in the last seven years there has been an increase. In 1940 there were 14,000 acres grown in New York (Table 5). This number decreased to about 3,000 acres in 1960. In 1972 it was reported that 8,000 acres were grown in the State.

Table 5. SOYBEANS PRODUCTION HARVESTED FOR BEANS IN NEW YORK STATE

Year	Acres (000)	Bushels produced per acre	Total bushels produced (000)
1940	14	13.0	182
1950	7	18.0	126
1960	3	17.0	51
1961	4	21.0	84
1962	4	18.0	72
1963	4	16.0	64
1964	4	17.0	68
1965	3	15.0	45
1966	3	20.0	60
1967	4	23.0	92
1968	6	22.0	132
1969	5	21.0	105
1970	6	20.0	120
1971	7	22.0	154
1972	8	21.0	168

Source: Soybean Digest, Blue book issue, March 1965, Vol. 25, Number 6 and Crop Production, Annual Summary, U.S.D.A., Statistical.

COSTS AND RETURNS FOR NEW YORK

In 1966 a survey was made of 30 farmers in central New York who harvested soybeans for processing. These had an average of 29 acres of soybeans. In addition they grew corn, wheat, oats, hay and dry beans. Some of the farmers had fruit and vegetables. About half had some kind of livestock.

Because the methods of growing and harvesting soybeans have changed little since 1966, the information obtained from that study will be used as a basis of up-dating the cost and returns for the crop and making an appraisal of the crop for the present 1972 year.

Physical Quantities Per Acre

Yields on farms visited varied greatly. The range was from 4 to 38 bushels and the average was 18 bushels per acre (Table 6). This was two bushels below the state average as published by the U. S. Department of Agriculture.

Table 6.

PHYSICAL QUANTITIES PER ACRE OF SOYBEANS
30 New York Farms in 1966

Item	Average
Bushels yield	18
Pounds of seed	92
Pounds of fertilizer	238
Pounds of: N	17
P ₂ O ₅	41
K ₂ O	39
Man hours: To grow	2.1
To harvest	0.6

About 92 pounds of seed and 238 pounds of fertilizer were used per acre. A wide variety of fertilizer analysis was used. Since soybeans are not labor intensive only 2.1 hours were required to grow and 0.6 hours to harvest an acre.

For more detail on the study the reader is invited to request a copy of A.E. Res. 217, Costs and Returns in Producing Soybeans for Processing in 1966.

As could be noted in Table 3 the average yield of soybeans in New York in 1966 was 20.0 bushels per acre. This was above the average of 18 bushels yield found on the farms in the study. The reported yield information for New York shows no improvement in yields since 1966. In 1970 the average was 20.0 bushels and in 1971 it was 21.0 bushels.

Since there has been no change in yields since the 1966 study and with the observation that production methods have not changed, the costs of production for this economic review will be based on the 1966 study as adjusted for changes in prices.

Cost of Growing

In the last seven years all costs have increased but some have gone up more than others. Farm wages have increased almost 60 percent and because they influence the costs of production, directly and indirectly, they have caused a considerable increase in production costs. Other items such as fertilizer have increased less in price. Fertilizer prices have increased only three percent and since the fertilizer input is about 20 percent of the growing cost the overall increase in production costs has been mitigated considerably by this circumstance.

Overall, the cost of growing soybeans in 1972 was approximately \$52.60 per acre (Table 7). This is an increase of about 20 percent in total growing cost. Labor and equipment were important items contributing to this increase.

Table 7. GROWING COSTS PER ACRE FOR SOYBEANS

Item	Index 128		1977
	1966	1972	
Land	\$12.10	\$14.20	
Labor	3.57	5.60	
Equipment	2.42	3.30	
Tractor	4.87	6.40	
Truck	.34	.50	
Custom work	.83	1.10	
Seed	6.29	7.40	
Fertilizer & Lime	8.83	9.10	
Spray materials	2.18	2.50	
All other	2.11	2.50	
Total	\$43.54	\$52.60	78.51

Farmers who grow a field crop such as soybeans tend to think of their costs only in terms of seed, fertilizer, spray materials and, in some cases, labor. The land costs, equipment and general overhead costs tend to be ignored in spite of the need to pay for them in any continuing commercial venture.

Cost of Harvesting

Cost of harvesting an acre of soybeans was approximately \$7.60 in 1972 (Table 8). This was nearly 42 percent higher than the 1966 cost. Labor and equipment are the cost inputs in harvesting and these have increased more in price than have some of the growing inputs.

Table 8. HARVESTING COSTS PER ACRE FOR SOYBEANS

Item	1966	1972
Labor	\$1.11	\$1.80
Equipment	2.77	3.80
Tractor	.21	.30
Truck	.31	.40
Custom harvesting and hauling	<u>.96</u>	<u>1.30</u>
TOTAL	\$5.36	\$7.60

1977 est

11.34

Costs and Returns

The average cost to grow and harvest an acre of soybeans in 1966 was \$48.90 (Table 9). In 1972 the total cost would be approximately \$60.20 per acre. This is an increase of \$11.30 or 23 percent.

At \$2.50 per bushel in 1966 the average loss per acre with almost an 18 bushel yield was \$4.50. If the price averages \$3.50 in 1972 a farmer who obtained 21 bushels per acre (the average New York yield in 1969, 1970 and 1971) would receive a profit of about \$13 per acre.

Table 9. COSTS AND RETURNS PER ACRE OF SOYBEANS

Item	1966	1972 Price	
		High	Normal
Bushels per acre	18	21	21
Price per bushel	\$2.50	\$3.50	\$2.50
<u>Cost</u>			
Growing	\$43.54	\$52.60	\$52.60
Harvesting	5.36	7.60	7.60
TOTAL	\$48.90	\$60.20	\$60.20
<u>Returns</u>	\$44.40	\$73.50	\$52.50
<u>Profit</u>	-\$ 4.50	\$13.30	-\$ 7.70

78.51
11.30
89.85 *incl bank*

In New York the 1972 year was not normal and the average of 21 bushels per acre was not achieved. A farmer who was not able to harvest his crop because of the weather would still have the production costs and even some of the harvesting costs. His harvesting equipment is depreciating whether it is used or not. It also represents an investment on which he may be paying interest or at least on which he has to forego receiving interest. Thus, farmers who planted a crop of soybeans and brought the crop up to maturity but were unable to harvest it would have losses averaging \$60 or more per acre.

If 1972 had been a normal year with a normal yield of 21 bushels of soybeans per acre and a normal price of \$2.50 per bushel, the loss would amount to \$7.70 per acre. At that rate the farmer would be able to cover all of his costs except labor and would be contributing his labor to the enterprise for no return.

Costs Per Bushel

In 1966 the average cost of growing and harvesting a bushel of soybeans was \$2.72. With a yield of 21 bushels and a cost of \$60.20 the average cost per bushel is \$2.87 (Table 10).

Table 10. COSTS PER BUSHEL OF SOYBEANS

Item	1966	1972
<u>Cost</u>		
Growing	\$2.42	\$2.51
Harvesting	<u>.30</u>	<u>.36</u>
TOTAL	\$2.72	\$2.87

Yield Needed to Break-Even

Obviously the yield of soybeans which is needed to break-even depends on the cost per bushel and the price that the soybeans will bring. In the 1966 study about 5/6 of the farmers had costs per acre that were within \$10 of the average cost.

Using this as a basis some ideas can be gained as to the prices and yields which New York soybean growers must have if they are to break-even or have profitable enterprises (Table 11).

With an average cost per acre of \$60 and an average yield of 21 bushels per acre a price of \$2.86 is needed for a grower to break-even and pay for all costs, including labor (Table 9). This exceeds the prices received in most years (Table 4).

Table 11. PRICE PER BUSHEL OF SOYBEANS TO BREAK-EVEN

Yield Per Acre	Cost Per Acre				
	50	55	60	65	70
16	3.13	3.44	3.75	4.06	4.38
18	2.78	3.06	3.33	3.61	3.89
20	2.50	2.75	3.00	3.25	3.50
21	2.38	2.62	2.86	3.10	3.33
22	2.72	2.50	2.73	2.95	3.18
24	2.08	2.29	2.50	2.71	2.92
26	1.92	2.12	2.31	2.50	2.69

———— Average cost and average yield.

RELATIVE YIELDS AND THE NEW YORK COMPETITIVE POSITION

Labor, fertilizer, supplies and equipment prices vary somewhat from area to area within the United States but generally they are quite similar. Thus, with similar technology the per acre costs of production will vary somewhat from area to area but likewise will tend to be quite similar. The differences in yield per acre then become important in determining the differences in cost per bushel of soybeans and in determining the ability of a crop to compete for resources.

As was noted earlier yields of soybeans tend to be higher in the Corn Belt and somewhat higher in the Southeast than are those of the colder northern states or the dryer western states.

New York is one of the northern states. The average yield in 1966, the year of the survey was 20.0 bushels per acre (Table 12). This was 7 bushels below the yield for Illinois and 9.5 below that for Iowa.

Table 12.

YIELD LEVEL AND CHANGES
1966 to 1971

Year	Illinois	Iowa	Indiana	New York
- Bushels Per Acre -				
1966	27.0	29.5	26.0	20.0
1967	27.5	31.0	24.5	23.0
1968	31.5	32.0	32.0	22.0
1969	33.5	33.0	32.5	21.0
1970	31.0	32.5	31.0	20.0
1971	33.0	32.5	33.0	22.0
1972	35.0	36.0	28.0	21.0

In the last six years the New York yield average has stayed the same or perhaps moved up a bushel. The Illinois yield has gone up 4-6 bushels. Six years ago Illinois farmers had a yield advantage over New York of about seven bushels per acre. Now the yield advantage is 11 to 12 bushels. As would be expected technological improvements of almost any kind help the production of a crop more in the better adapted areas than in those which are less adapted (as New York is for soybeans).

OUTLOOK

Yields are too low and costs are too high in New York State for there to be more than a miniscule quantity of soybeans produced. In 1972 the State had 8,000 acres of soybeans out of 46,000,000 acres for the nation. The State produced 168,000 bushels of beans out of 1,276,290,000 bushels which were produced that year in the United States. However, a few farmers may be able to keep their costs low enough or obtain high enough yields to make a profit. Even these probably could put their resources to better use in competing enterprises if they were so inclined.