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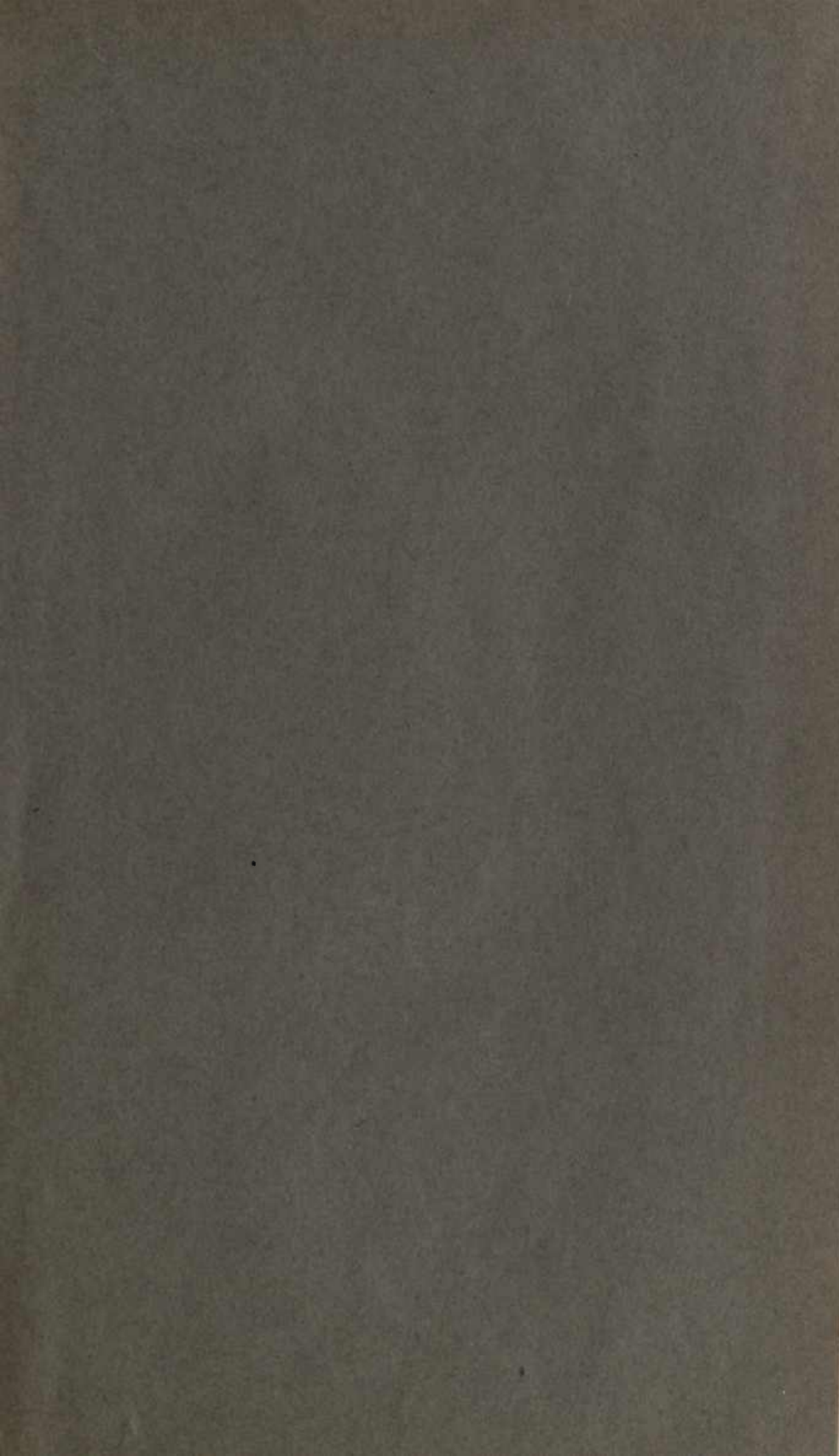
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Supply and Marketing of
SOYBEANS
—and—
**SOYBEAN
PRODUCTS**

By C. L. STEWART
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L. J. NORTON *and*
O. L. WHALIN



UNIVERSITY OF ILLINOIS
AGRICULTURAL EXPERIMENT STATION

Bulletin 386

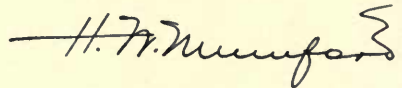
FOREWORD

FEW PRODUCTS of the farm have increased in economic importance so rapidly in recent years as have soybeans. This growing interest has been reflected in the attention that has been given to the various aspects of the crop by the Agricultural Experiment Station of the University of Illinois. Its place in cropping plans, its use as a feed for livestock, and the cost of producing the crop have all been under investigation for some years.

The purpose of the present study has been to examine the supply situation with respect to both soybeans and soybean products, the present and potential markets for soybeans, the means and methods by which they are marketed, their economic characteristics in relation to improvements in marketing, and the influence of various factors on the prices paid for them.

Various state and federal agencies, as well as private enterprises and individuals, have given helpful information and assistance: namely, the Illinois Crop Reporting Service (a cooperative enterprise of the Illinois State Department of Agriculture and the U. S. Department of Agriculture), the Bureau of Agricultural Economics of the U. S. Department of Agriculture, the Bureau of the Census and the Bureau of Foreign and Domestic Commerce of the U. S. Department of Commerce, the U. S. Tariff Commission, practically all crushers of soybeans in the United States, and many handlers, manufacturers, producers, and consumers.

The information herein presented it is believed will be useful, not only as a basis for understanding the economic developments affecting soybeans in recent years, but also as a means of determining the tendencies which will count heavily in the future in establishing the place of this crop in the agriculture of the state.



Director

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Supply and Marketing of Soybeans and Soybean Products

By C. L. STEWART, W. L. BURLISON, L. J. NORTON, and O. L. WHALIN*

SOYBEAN PRODUCTION in the United States has become centered largely in Illinois, tho the degree of concentration is not so marked as in certain regions of foreign production. In several districts in Manchuria, the most important foreign center of production, soybeans occupy between 40 and 65 percent of the cultivated area (Fig. 1). In Illinois, even including the acreage of soybeans grown with other crops, the latest United States Census showed only one county, Christian, in which the proportion of harvested crop land in soybeans was as high as 11 percent. In eight Illinois counties,^b however, over 40 percent of the farms reported some soybeans produced in 1929; in Macoupin county over 55 percent reported soybean production.

Thus the soybean has become a major crop on many Illinois farms, and tho it cannot yet be recognized as a major crop in the state, it is of outstanding importance among the secondary crops of Illinois and may be expected to attain major rank in some districts soon.

Estimating the soybean hay crop at the average December value per ton for tame hay, the total Illinois crop had an average value in the 1928-1931 period of nearly \$8,400,000 annually (Table 1). This average annual value of soybeans for the four years was surpassed by corn, which was valued at \$181,962,000; by oats, \$48,209,000; by all hay, exclusive of soybean hay, \$39,390,000; and by wheat, \$27,643,000 (Fig. 2). During this period the value of the soybean crop in Illinois was practically equal to the entire fruit crop and was greater than any other noncereal crop.

The value of gathered beans in 1931 was nearly 40 percent of the estimated value of the total soybean crop in Illinois; while the value of gathered beans in 1930 equaled 65 percent of the total estimated

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^bThe percentages in these eight counties were as follows: Bond, 42.8; Champaign, 42.5; Christian, 50.7; Cumberland, 40.4; Fayette, 40.6; Macoupin, 55.2; Montgomery, 42.8; and Piatt, 43.4. The number of counties in other states having more than 40 percent of the farms reporting soybeans was as follows: Indiana, 1; Louisiana, 4; Missouri, 1; North Carolina, 12; and Virginia, 11. Of the 37 counties all but 10 were in southern states.

TABLE 1.—VALUE OF THE SOYBEAN CROP IN ILLINOIS, 1928-1931

Year	Total value	Value of hay	Value of beans
1928.....	\$ 7 487 170	\$3 745 170	\$3 742 000
1929.....	8 426 350	3 556 350	4 870 000
1930.....	10 888 800	4 034 800	6 854 000
1931.....	6 700 500	4 581 500	2 119 000
Average.....	\$ 8 375 705	\$3 979 455	\$4 396 250

mand for seed. Lower prices have increased the supplies available to more distant seed users, to crushers, and others, but the demand has not become sufficiently strong to maintain prices at levels that prevailed when the local seed demand absorbed all available supplies.

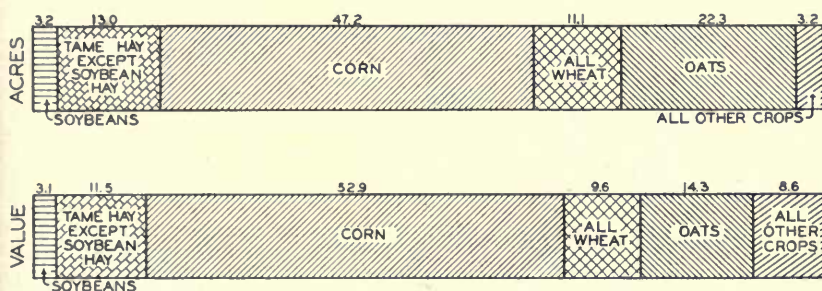


FIG. 2.—AVERAGE ACREAGE AND VALUE OF SOYBEANS COMPARED ON A PERCENTAGE BASIS WITH SELECTED HARVESTED CROPS, ILLINOIS, 1929-1931

The acreage devoted to soybeans in Illinois averaged 3.2 percent of the total land in crops in the three-year period 1929-1931 and was surpassed by corn, oats, tame hay except soybean hay, and all wheat in the order named. During the same period the aggregate value of the soybean crop of the state represented 3.1 percent of all crops and was surpassed by corn, oats, tame hay, and wheat. The average gross value of \$15.13 an acre for soybeans was surpassed only by corn at \$17.41 an acre and was followed by tame hay at \$13.84, all wheat at \$13.46, and oats at \$9.98 an acre.

In response to the need for an outlet for the increased supply of soybeans in Illinois, oil-extracting mills have been developed at various points. Soybean cake or its pulverized product, meal, resulting from the crushing process, has been utilized recently as a protein ingredient of mixed feeds. Manufacturers of such feeds have become important users of these products. More than 45 percent of the 1928-1931 crops of gathered soybeans produced in Illinois have been utilized by the crushing and feed manufacturing industries.

Soybean products have become the objects of considerable domestic and international trade, entering into competition with many oil-bear-

ing and high-protein products from the corn, cotton, and flaxseed belts of the United States as well as from other countries. To the trade in vegetable oils and animal fats soybeans are of special importance.

THE SUPPLY OF SOYBEANS AND SOYBEAN PRODUCTS

Soybeans are now grown principally in Manchuria and eastern central China, in Japan, Korea, and the United States, and to some extent in northern India, Indo-China, and the Malayan Islands. The

crop is grown to a limited extent in Italy, France, southern Russia, Hungary, Hawaii, Egypt, South Africa, and in a few countries of South America.^{14*} Table 2 shows the production of soybeans for the more important countries of the world.



FIG. 3.—SOYBEAN PLANT AT TWO STAGES OF GROWTH

The soybean (*Soja max*), a summer leguminous annual, is shown at the left as the plant appears when the beans are ready for harvest. The pods are from 1 to 2½ inches long and contain from 2 to 4 seeds. The stems, leaves, and seed pods are covered with short reddish-brown or gray hairs. The root tubercles are large and abundant. The picture at the right shows the plant at the time of active growth, or at about the flowering stage. The flowers are small and inconspicuous, either white or purple, and are clustered in the axils of the leaves. The stems are branched, rather woody, and grow from 2 to 3½ feet or more in height.

*These numbers refer to literature citations on pages 541 and 542.

Previous to 1908 the trade in soybeans was confined almost altogether to oriental countries, particularly to China and Japan. Since then the usefulness of the soybean has been more generally appreciated in other countries and an important international trade has developed.

TABLE 2.—SOYBEAN PRODUCTION IN SELECTED COUNTRIES,
AVERAGE 1909-1913, ANNUAL 1920-1931

(Tons of 2,000 pounds)

Year	Manchuria	Korea	Dutch East Indies ^a	Japan	United States ^b	Total for five reporting countries
1909-1913.....	.....	499 119 ^c	.....	533 239	.....	.....
1920.....	3 862 000	735 784	112 193	655 785	68 340	5 434 102
1921.....	1 950 000	718 590	108 930	636 000	84 450	3 497 970
1922.....	3 272 000	693 510	115 740	558 720	129 870	4 769 840
1923.....	2 666 000	712 800	107 220	527 340	196 230	4 209 590
1924.....	2 780 000	561 690	106 080	412 740	170 400	4 030 910
1925.....	3 500 000	708 270	117 990	554 190	153 060	5 033 510
1926.....	4 050 000	668 280	110 160	375 360	195 510	5 399 310
1927.....	4 900 000	729 000	119 130	501 120	223 770	6 473 020
1928.....	5 334 000	585 210	129 079	457 161	260 640	6 766 090
1929.....	5 351 000	613 012	117 505	407 745	260 100	6 749 362
1930.....	5 807 000	689 671	134 040	465 944	359 250	7 455 905
1931.....	6 349 000	634 644	.....	.....	447 510	7 431 154

^aNative crop. ^bFigures for 1924 and later are for production from acreage actually harvested for beans rather than for potential production. ^cFour-year average 1910-1913.

It is interesting to note that the soybean is one of the oldest crops grown by man. It was described in a Chinese book on *materia medica*, "Ben Tsao Gang Mu," written by Emperor Shen-Nung about 4,800 years ago.^{18*} In China and Japan the soybean has been of prime importance since ancient times, and in value and variety of uses is the most outstanding legume grown in these countries.^{18*}

Domestic Production of Soybeans

Introduced into the United States in 1804,^{14*} the soybean has become a crop of importance only within the last fifteen years. Certain well-defined characteristics seem to account for its rapid development in the United States in this time and particularly in the southeastern and corn-belt states during the last ten years. Some of the more important reasons cited for this popularity are the following:^{7*}

1. The soybean is rich in protein.
2. It is the richest nitrogenous roughage adapted to most farms.
3. It is suited to many uses and relished by most livestock.
4. If properly handled, it furnishes a satisfactory substitute for oats in the cropping system, and is a good emergency hay crop.
5. It is adapted to a wide range of soil types.
6. Being a legume, it has merit as a soil builder if used properly.
7. It ranks well as a cash crop.
8. It fits well into rotations.

Before 1917 fewer than 500,000 acres of soybeans were grown in this country, including acreages on which soybeans were grown alone as well as acreages on which they were grown interplanted with other crops. For the period 1917 to 1924 records of soybean production in the United States are somewhat scattered and fragmentary, but from 1924 to the present date statistics seem to be reasonably trustworthy.

Soybeans have been grown on between 4 and 5 percent of the farms of the United States, according to the Census returns for 1924 and 1929.

Census year	Farms reporting soybeans		Acres of soybeans grown alone		Gathered beans, bushels
	Total	Percent of all farms	Total	Acres per farm	
1929.....	302 842	4.8	1 962 000	10	8 661 188
1924.....	283 284	4.4	1 376 000	8	5 190 000

The East North-Central group of states was the leading group in soybean production in 1929 (Table 3). About 28 percent of the soybean-producing farms of the country were located in that area, and 57 percent of the gathered beans of the country were reported from the farms of this area.

According to the 1930 Census, the three states showing the largest proportion of farms reporting soybeans in 1929 were Delaware, 22.3 percent; Indiana, 17.1 percent; and Illinois, 16.9 percent. California, Nevada, and Washington reported practically no soybean production.

TABLE 3.—SOYBEAN PRODUCTION IN THE UNITED STATES, BY GEOGRAPHIC DIVISIONS, 1929

Geographic division	Farms reporting soybeans		Acres planted with soybeans				Beans gathered (bushels)
	Total	Percent of all farms in area	Total	Per reporting farm	Grown alone	With other crops ^a	
State groups							
New England.....	556	.4	5 335	10	5 051	284	704
Middle Atlantic.....	3 476	1.0	17 925	5	15 484	2 441	14 805
East North-Central.....	85 390	8.8	939 451	11	793 285	146 166	4 977 439
West North-Central.....	44 398	4.0	544 868	12	370 004	174 864	1 334 510
South Atlantic.....	73 350	6.9	648 009	9	326 456	321 553	1 702 709
East South-Central.....	68 562	6.5	456 420	7	368 383	88 037	292 383
West South-Central.....	26 804	2.4	296 849	11	80 863	215 986	323 327
Mountain.....	244	.1	1 821	7	1 753	68	15 223
Pacific.....	62	(b)	301	5	270	31	88
Total U. S.....	302 842	4.8	2 910 979	10	1 961 549	949 430	8 661 188

^aFor method of reducing interplanted crop acreages to solid equivalent acreages, see Table 5, footnote. ^bLess than .05 percent.

Of the seventeen western states there were only two, Colorado and New Mexico, in which there was even one county where as many as 2 to 3 percent of the farms reported soybeans. Probably not all the soybeans produced in the western areas, particularly in areas of orchard production in California, were completely enumerated.

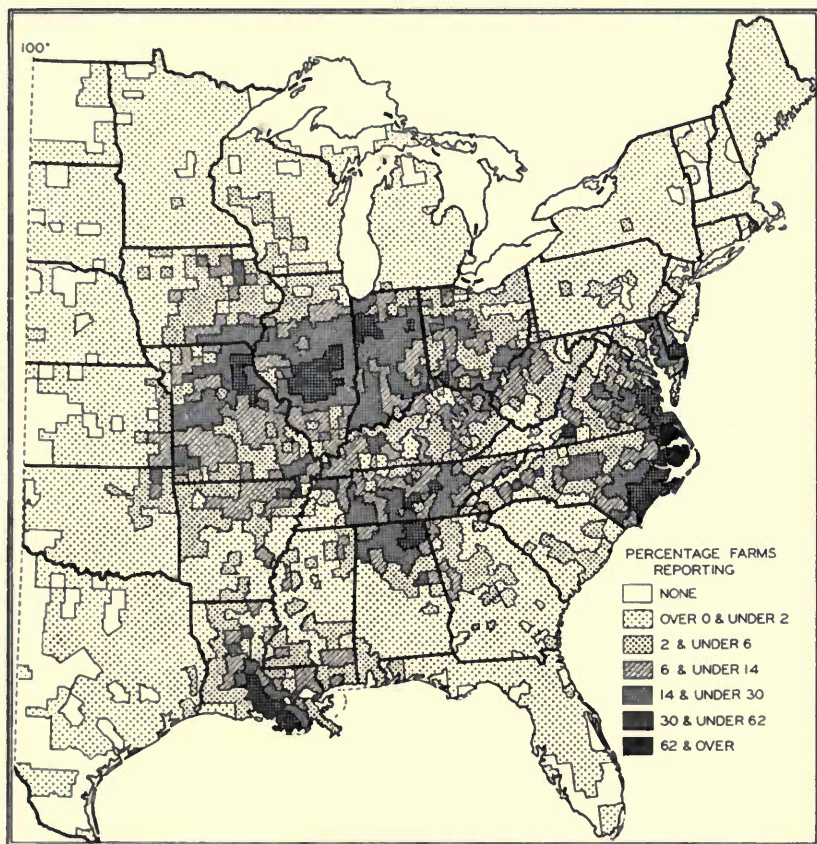


FIG. 4.—PERCENTAGE OF FARMS IN THE PRINCIPAL SOYBEAN PRODUCING AREAS IN THE UNITED STATES GROWING SOYBEANS, BY COUNTIES, 1929

Nearly all the soybeans grown in the United States in 1909 were found in the southern states. By 1919 there had been a fairly uniform development in the area east of the Mississippi river and in the first tier of states west of it, as measured by the percentage of farms growing the crop. At that time soybeans had considerable prominence in New England and in Texas, Oklahoma, New Mexico, Arizona, Colorado, Utah, Idaho, and Montana. By 1924 the soybean acreage had decreased in the New England states, in New York, and in the area west of Meridian 97. The most important change between 1924 and 1929 was the increased concentration in the areas already developed by 1924.

Analysis by counties of that part of the United States east of Meridian 100, which runs thru the North Dakota-Texas tier of states, shows that the proportion of farms reporting the growing of soybeans in 1929 was comparatively large in three major areas and very small in many areas, even in the humid eastern half of the country (Fig. 4). In the coastal plains of North Carolina and Virginia, where soybeans are raised for seed and crushing purposes, over half the farms in

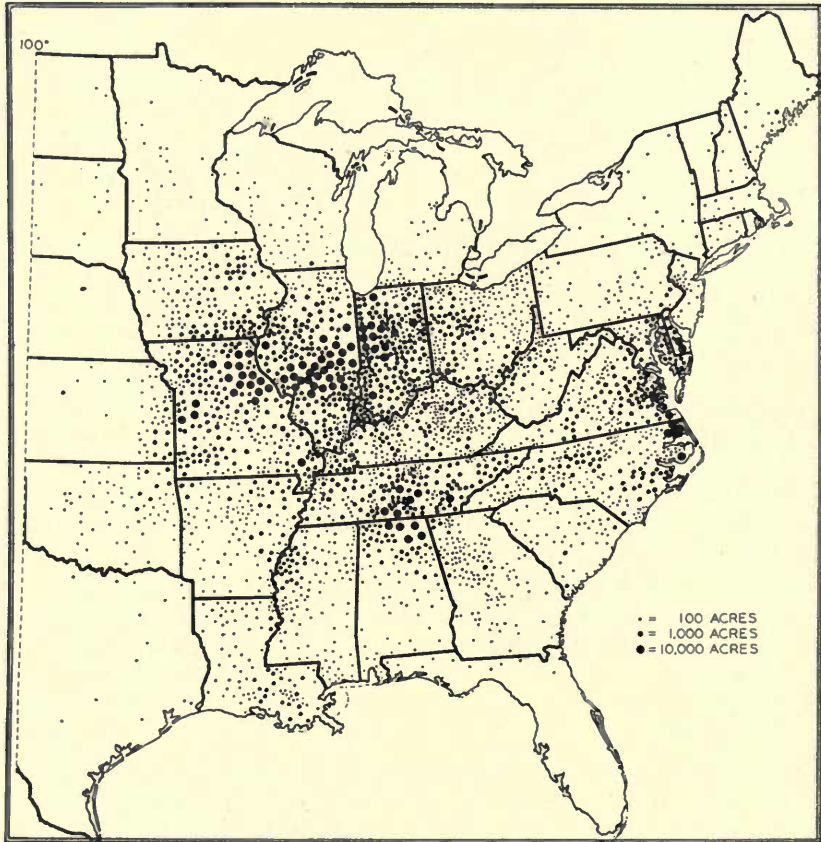


FIG. 5.—ACREAGE OF SOYBEANS GROWN ALONE IN PRINCIPAL SOYBEAN PRODUCING AREAS IN THE UNITED STATES, BY COUNTIES, 1929

A map showing the acreage of soybeans grown alone does not give a representative impression for the southern states in that the main part of the crop grown in the South is planted with a row of beans alternating with a row of some other crop. The crop is seldom interplanted in this manner in the corn-belt states. The extreme concentration of acreage of soybeans grown alone in local areas in Missouri, Illinois, and Indiana in 1929 is to be especially noted.

several counties were reported as growing soybeans and in two counties the proportion of farms reporting soybean production was between 80 and 90 percent. In a crescent area crossing Iowa, Missouri, Illinois,

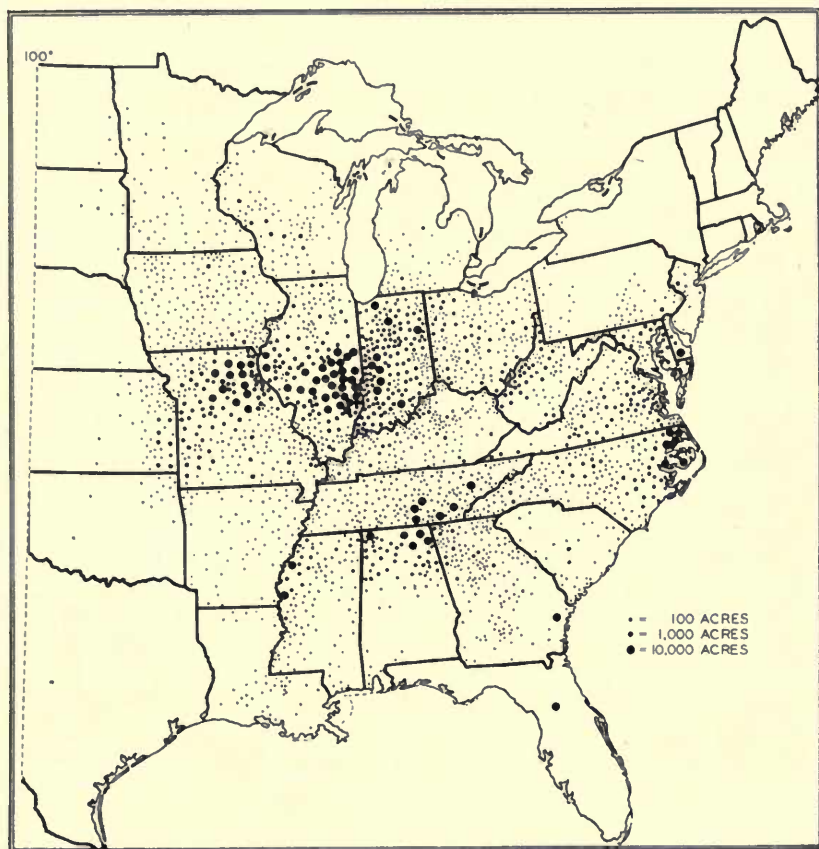


FIG. 6.—ACREAGE OF SOYBEANS GROWN ALONE IN PRINCIPAL SOYBEAN PRODUCING AREAS IN THE UNITED STATES, by COUNTIES, 1924

The acreage of soybeans grown alone in 1924 did not differ greatly from the acreage of 1929 except that in 1924 there was less acreage in the important regions of soybean production and the concentrated area did not extend quite so far to the south and southwest as in 1929.

and Indiana—where soybeans are produced for crushing, for seed, and for hay—three counties, one in Missouri and two in Illinois, reported between 50 and 60 percent of the farms growing this crop. In the Tennessee river valley in Tennessee, Alabama, and Georgia soybean hay has been produced on a considerable proportion of the farms, the

highest percentages of reporting farms, between 30 and 40, being found in three counties in Tennessee and three in Alabama.

Between 1924 and 1929 there was an increase in the proportion of farms reporting soybeans in the Ozark highlands of southern Missouri and northern Arkansas, in northeastern Oklahoma, and in Louisiana.

Regional differences similar to those described above are shown also in the acreage planted to soybeans, particularly to soybeans grown

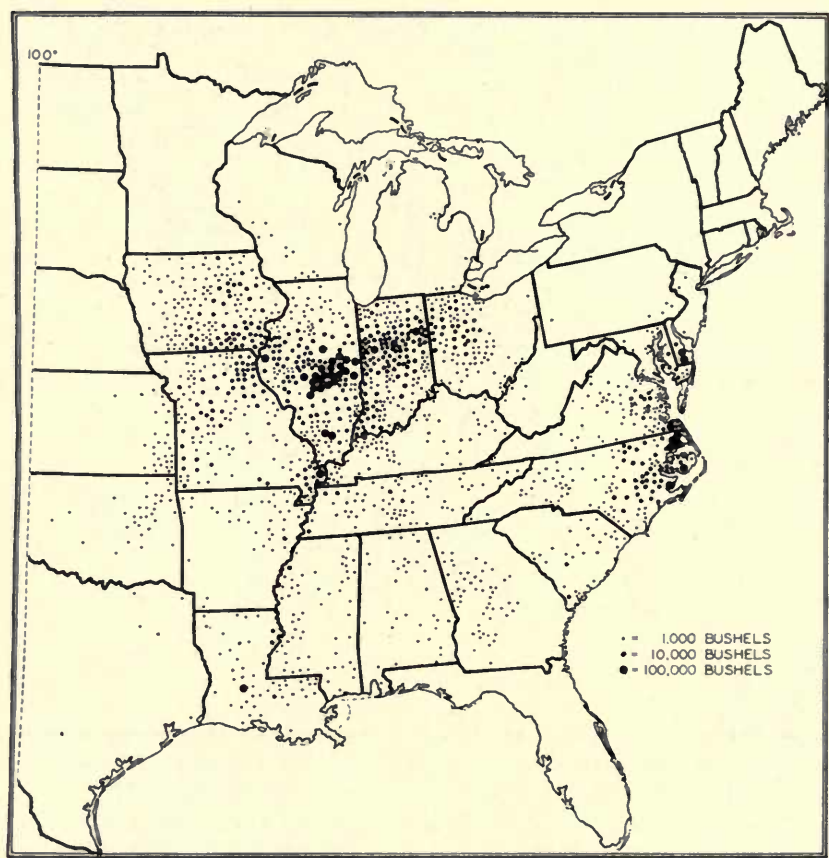


FIG. 7.—PRODUCTION OF GATHERED SOYBEANS IN PRINCIPAL SOYBEAN PRODUCING AREAS IN THE UNITED STATES, BY COUNTIES, 1929

No state gathered as much as 50,000 bushels of soybeans in 1909. Two states, Virginia and North Carolina, produced more than 100,000 bushels in 1919, and the latter approached 500,000 bushels. By 1924 four states, Illinois, North Carolina, Missouri, and Indiana, produced more than 500,000 bushels and two states, Illinois and North Carolina, more than 1,000,000 bushels each. By 1929 Iowa had reached a production of 500,000 bushels, Indiana 1,000,000 bushels, and Illinois, 3,250,000 bushels.

alone (Figs. 5 and 6). Between 1924 and 1929 the acreage of soybeans per farm showed a marked increase in nearly all parts of the country.

The production of soybeans gathered as beans in 1929 is shown by Fig. 7 to have been concentrated in the heart of the Iowa-Missouri-Illinois-Indiana area and in the coastal-plain counties of North Carolina and Virginia to a much greater degree than was the acreage.

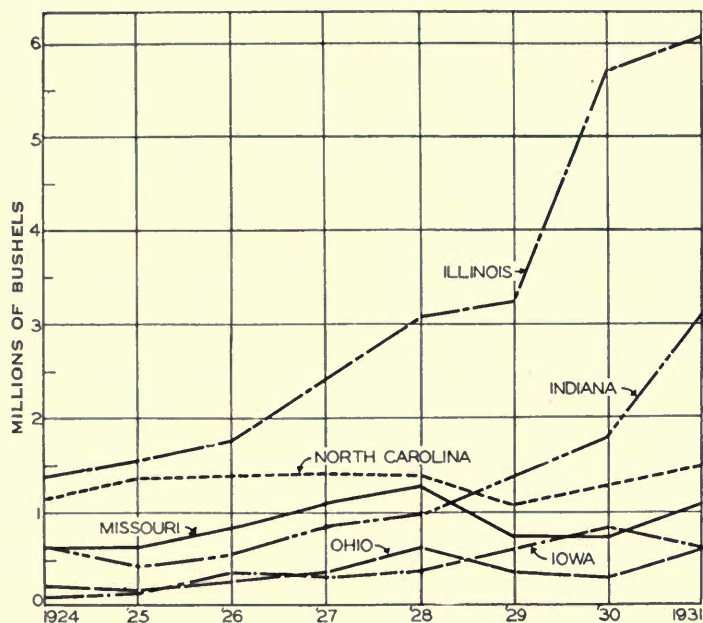


FIG. 8.—PRODUCTION OF GATHERED SOYBEANS IN SIX LEADING STATES, 1924-1931 CROPS

Illinois and Indiana are rapidly becoming the leading source of commercial soybeans, while the soybean producers of Missouri and Ohio are turning more definitely to hay as the major product. North Carolina has produced hay and seed for a long time, and production has remained rather stable compared with most states. Production in Iowa has reached a point where commercial supplies of soybeans are becoming more plentiful.

In 1924 twenty-two states produced the bulk of soybeans in the United States. The total production of gathered beans was slightly above 5 million bushels. From 1924 to 1931 inclusive production trebled, figures for 1931 indicating a total of nearly 15 million bushels of gathered beans.

In 1924 Illinois ranked first in soybean production, with North Carolina second, Missouri third, and Indiana fourth. The 1931 rating was as follows: Illinois, Indiana, North Carolina, and Missouri.

TABLE 4.—PRODUCTION OF GATHERED SOYBEANS IN SELECTED STATES AND IN THE UNITED STATES, 1922-1931

(Thousands of bushels)

State	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931
Ohio.....	465	800	195	165	247	350	555	317	294	560
Ind.....	240	644	653	400	529	884	1 000	1 380	1 806	3 062
Ill.....	812	1 288	1 380	1 431	1 750	2 392	3 069	3 247	5 712	6 055
Mich.....	41	66	19	20	22	16	30	18	20	24
Wis.....	77	32	72	18	11	10	25	22	23	20
Iowa.....	132	119	120	140	300	276	357	578	858	578
Mo.....	165	840	656	672	830	1 092	1 288	737	741	1 080
Kans.....	29	154	46	77	80	72	82	36	60	108
Del.....	80	122	110	105	140	224	270	216	156	364
Md.....	208	285	69	75	50	36	44	60	32	94
Va.....	15	15	180	143	195	196	182	262	135	280
W. Va.....	15	42	38	38	52	48	29	11	7	12
N. C.....	1 600	2 125	1 160	1 348	1 378	1 410	1 380	1 053	1 261	1 498
S. C.....	33	60	60	90	80	80	50	47	84	95
Ga.....	37	77	126	60	84	42	30	69	110	142
Ky.....	78	84	40	42	32	24	23	78	60	94
Tenn.....	54	63	80	60	100	72	145	104	144	165
Ala.....	155	225	28	35	20	16	18	41	84	115
Miss.....	96	116	56	90	63	78	120	78	60	225
Ark.....	12	16	30	30	25	24	17	70	52	116
La.....	12	16	40	60	51	72	53	190	220	170
Okla.....	4	13	28	32	24	45	52	56	56	60
Other states.....	4	13	28	32	24	45	52	56	56	60
U. S.....	4 333	7 144	5 190	5 131	6 063	7 459	8 819	8 670	11 975	14 917

TABLE 5.—TOTAL EQUIVALENT SOLID ACREAGE* OF SOYBEANS GROWN IN SELECTED STATES AND IN THE UNITED STATES, 1922-1930

(Thousands of acres)

State	1922	1923	1924	1925	1926	1927	1928	1929	1930
Ohio.....	90	128	89	69	105	142	166	180	179
Indiana.....	113	172	217	157	195	218	294	331	402
Illinois.....	169	272	358	330	388	465	497	544	719
Michigan.....	12	14	11	12	12	10	12	10	8
Wisconsin.....	48	48	25	16	12	11	18	11	10
Iowa.....	22	29	60	53	56	75	65	86	103
Missouri.....	53	149	208	192	296	369	407	436	463
Kansas.....	6	14	10	12	12	9	13	18	30
Delaware.....	18	24	17	14	17	24	25	27	28
Maryland.....	63	73	39	38	43	42	41	38	41
Virginia.....	7	1	107	116	122	128	121	115	117
West Virginia.....	225	260	37	33	54	40	32	31	19
North Carolina.....	10	21	215	246	295	304	326	370	478
South Carolina.....	12	31	29	60	67	60	44	45	76
Georgia.....	12	32	71	90	72	83	59	76	106
Kentucky.....	65	65	50	57	60	48	85	94	86
Tennessee.....	154	157	200	170	261	335	305	329	339
Alabama.....	113	106	112	134	105	113	58	69	82
Mississippi.....	43	45	80	103	110	186	123	140	134
Arkansas.....	3	8	28	37	43	65	64	90	83
Louisiana.....	3	8	30	36	37	50	62	134	158
Oklahoma.....	10	12	13	13	25	35	61	84	84
New York.....	3	3	3	3	3	3	3	3	3
New Jersey.....	1	1	1	1	1	1	1	1	1
Pennsylvania.....	9	8	9	8	9	8	9	8	9
United States.....	1 226	1 618	2 003	1 987	2 375	2 802	2 865	3 247	3 758

*Total equivalent solid acreage is derived by adding (1) the acreage cut for hay, (2) the acreage harvested for beans, and (3) a computed portion of the acreage in which soybeans have been interplanted with other crops.

In Missouri 20 acres of soybeans interplanted with other crops are computed as equivalent to 1 acre of solid planting; in Illinois, Indiana, Iowa, Michigan, and Wisconsin, the proportion is 10 to 1; in Maryland and Virginia the proportion is 5 to 1; in Delaware 4 to 1; in Virginia 3 to 1; in Arkansas, Georgia, Kentucky, Louisiana, North Carolina, Oklahoma, South Carolina, and Tennessee 2 to 1; in Alabama and Mississippi 3 to 5.

Potential production represents the product of acreage and estimated yield of matured beans.

Table 4 shows the production of gathered beans in 22 selected states and in the United States from 1922 to 1931. Fig. 8 represents production of gathered beans in the six leading states from 1924 to 1931. Remarkable increases are to be noted.

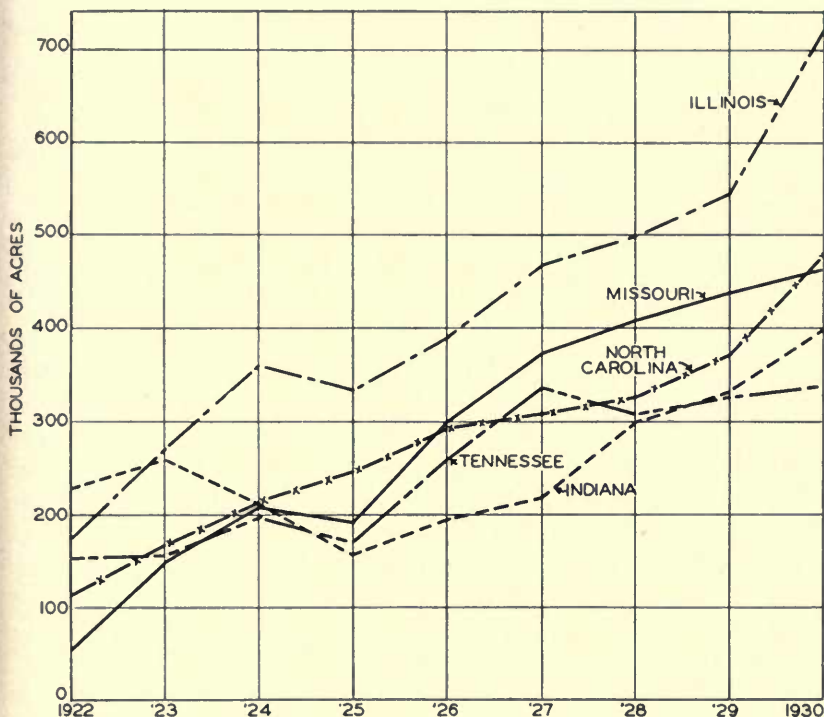


FIG. 9.—TOTAL EQUIVALENT SOLID ACREAGE OF SOYBEANS IN FIVE LEADING STATES, 1922-1930 CROPS

Illinois, Indiana, North Carolina, and Missouri have been the four leading states in total soybean acreage as well as in production of gathered beans since 1922. Tennessee grows a large acreage but the volume of beans gathered is not so large. The prominent position of Missouri and North Carolina in soybean acreage is partly the result of increase in hay acreage in these states since 1925.

Previous to 1925 the total acreage* of soybeans in the United States fluctuated rather noticeably, but from that year to 1931 the variation has been less marked. Since 1922 the acreage has trebled, reaching 3,758,000 acres in 1930, with an approximate increase of 10 percent for 1931. The more rapid increase has occurred in the corn-belt states, particularly in Illinois, Missouri, and Indiana (Table 5 and Fig. 9).

*"Total acreage" as used here means total acreage expressed as the equivalent of solid acreage. See footnote to Table 5 for further explanation.

The acre-yield of gathered soybeans in the United States has fluctuated considerably from season to season, but apparently less than the yield of most other standard crops. Available statistics indicate that the fluctuation is somewhat less than formerly, as a result of the use of superior varieties and the employment of better cultural practices. In North Carolina, Virginia, and Maryland, the trend in acre-yield has been downward in the last decade and a half, while in Illinois and Indiana it has been distinctly upward (Table 6).

TABLE 6.—YIELD PER ACRE OF GATHERED SOYBEANS IN SELECTED STATES AND IN THE UNITED STATES, 1922-1931

(Bushels per acre)

State	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	Average 1922-26	Average 1927-31
Ohio.....	15	16	13	15	13	10	15	15.1	14	20	14.4	14.8
Ind.....	12	14	9.9	10	12.6	13	14.5	15	14	17.8	11.7	14.9
Ill.....	12.5	14	12	13.5	12.5	13	16.5	17	17	17.5	12.9	16.2
Mich.....	10.2	11	9.7	10	11	8	15	9	10	12	10.4	10.8
Wis.....	11	8	9	9	11	10	12.5	11	11.5	10	9.6	11
Iowa.....	22	17	12	14	15	12	17	17	16.5	17	16	15.9
Mo.....	11	12	9.5	10.5	10	10.5	12.5	11	9.5	12	10.6	11.1
Kans.....	.....	.....	11.5	9.6	10	12	10.2	9	7.5	9	10.4	9.5
Del.....	14.3	15.4	11	15	14	16	18	9	6	14	13.9	12.6
Md.....	16	17.5	11.5	12.5	12.5	12	14.8	12	6.5	13.5	14	11.8
Va.....	16	19	12	11	13	14	13	12.5	7.5	14	14.2	12.2
W. Va.....	15	15	14	12.5	13	16	14.5	11	7	12	13.9	12.1
N. C.....	16	17	14.5	14.5	13	15	11.5	13.5	13	14	15	13.4
S. C.....	11	12	5	4.5	4	5	5.5	11.8	10.5	9.5	7.3	8.5
Ga.....	12.2	11	7	5	6	6	6	9.8	10	9.5	8.2	8.3
Ky.....	13	14	8	7	8	8	7.8	13	10	13.5	10	10.5
Tenn.....	9	9	8	7.5	8.3	8	6.3	6.5	8	7.5	8.4	7.3
Ala.....	8.6	9	7	7.5	5	5.2	6	13.8	12	11.5	7.4	9.7
Miss.....	12	14.5	7	10	7	6.5	10	13	10	15	10.1	10.9
Ark.....	.....	.....	6	5	5	4	8.4	14	10.5	14.5	5.3	10.3
La.....	12.1	16	8	10	8.5	9	5.3	10	10.5	10.6	10.9	9.1
Okla.....	.....	.....	7	8	6	7.5	7.5	8	8	10	7	8.2
U. S.....	13.8	14.5	10.9	11.6	11.4	12	13.4	14.1	13.9	15.6	12.4	13.8

The acreage of gathered soybeans in the United States has more than doubled since 1925, the most rapid development occurring since 1928. The latter period was one of increasing use of soybeans in industries.

The soybean acreage cut for hay increased from 1,181,000 acres in 1925 to 2,100,000 in 1930. The largest hay sections are located in Illinois, Missouri, Tennessee, and Indiana. Expansion of the hay acreage appears to precede the marked development of bean production in most areas, and reaches an approximate maximum earlier.

The practice of seeding soybeans with other crops is largely confined to the southern states, notably North Carolina, Tennessee, Louisiana, Mississippi, South Carolina, and Arkansas. The corn-belt states

have increased their acreage grown for hay and beans in a greater ratio than the acreage seeded with corn. In the more important hog-producing sections, however, there is a considerable area devoted to soybeans in corn. In the United States as a whole the acreage of soybeans grown with other crops and harvested with livestock has shown little increase during the last four years.

Production of Soybeans in Illinois

Few soybeans were grown in Illinois previous to 1890, when J. C. Utter of Mt. Carmel, Wabash county, began the production of this crop. Frank Hurrelbrink of Taylorville, Christian county, known because of his work with the Hurrelbrink variety of soybean, started his work in 1897. He has grown soybeans continuously since that time, experimenting with many varieties.

C. A. Rowe and his father, of Jacksonville, Morgan county, grew soybeans about 1899. Somewhat earlier than this the late Ralph Allen of Delavan, Tazewell county, became interested in soybeans and furnished seed beans to Illinois farmers as well as to interested persons in other states, in Hawaii, and in Alaska. C. L. Meharry of Attica, Indiana, who owns a large tract of land near Tolono, Champaign county, Illinois, has been an active soybean grower since 1909. The year following the Meharry venture, John T. Smith, also near Tolono, began to grow soybeans on a very limited scale, and in 1921 undertook active production. During the last decade soybeans have become an increasingly popular crop on Illinois farms.

Illinois farmers produce and market more soybeans* than do farmers of any other state (Tables 4 and 5). Acreage may be given first consideration as an index of production. In acreage devoted to soybeans for all purposes Illinois has stood first among the states beginning with 1923 and continuing to date. The acreage of soybeans gathered for beans and that cut for hay* have both been important in Illinois since 1922 (Table 7). In soybean acreage devoted to hay during the five-year period 1926-1930 Illinois averaged highest, altho surpassed by Missouri in 1927 and 1928. Indiana, North Carolina, and

*By "soybeans harvested for hay" is meant soybeans cut with leaves and pods on, with no intention of separating them for seed. In harvesting for beans the crop may be harvested without cutting, as when picked by hand or when row harvesters are used, these machines being common in the southern states, or harvested by cutting and threshing, as is more prevalent in the corn belt. Some methods of cutting and harvesting result in the removal of the threshed straw from the field for possible use in feeding or otherwise. When the combine is used, the threshed straw is frequently returned to the field as the combine operates.

Missouri, the states coming nearest to Illinois in acreage gathered for beans during 1930 and 1931, fell below Illinois by 46, 70, and 75 percent respectively.

Of the total acreage of soybeans cut for hay in the United States in 1929 and 1930, Illinois had 16 percent. The corresponding figure for gathered beans was 36 percent.* In production from acreage gathered for beans, as well as in the amount of such acreage, Illinois has stood first among the states since 1924. Of the entire amount of beans gathered in the United States in 1930 and 1931, nearly 44 percent was in Illinois (Table 4, page 440).

TABLE 7.—PROPORTION OF SOYBEAN ACREAGE GATHERED FOR BEANS, CUT FOR HAY, AND INTERPLANTED WITH OTHER CROPS, ILLINOIS, 1922-1931

Year	Gathered for beans	Cut for hay	Interplanted with other crops
	<i>percl.</i>	<i>percl.</i>	<i>percl.</i>
1922.....	38.5	41.4	20.1
1923.....	33.8	50.4	15.8
1924.....	32.1	55.9	12.0
1925.....	32.1	55.8	12.1
1926.....	36.1	54.1	9.8
1927.....	39.6	52.7	7.7
1928.....	37.4	55.7	6.9
1929.....	43.5	55.0	1.5
1930.....	55.7	42.6	1.7
1931.....	44.3	54.4	1.3

In 1931 the proportion of crop land in Illinois that was planted in soybeans (expressing the acreage of soybeans in terms of equivalent of solidly planted acreage) was 3.7 percent, or more than four times the proportion for the country as a whole. Other important legume crops in Illinois included the clovers, alfalfa, and cowpeas. In the use of land the leading rival to soybeans among the legumes in 1931 was sweet clover, which occupied 4 percent of the total crop area.

The relative prominence of soybeans among the other legume crops on an acreage basis has increased in Illinois since 1922, the first year for which the statistics needed for comparison are available. Over this period all legume crops have increased in importance. Roughly, sweet clover occupied six times as much of the crop land in Illinois in 1931 as in 1922, while the corresponding increase for soybeans was five. Comparable figures for the United States as a whole are not available for sweet clover, which has been of much less importance in most states than in Illinois. As for soybeans, it is certain that the nation as a whole has shown a less marked interest in this crop than has been shown in Illinois.

*See source of data for Table 4, page 543.

Soybeans are grown to some extent in every county in Illinois. In order to visualize the variations in the production of different counties, it is suggested that the reader examine not only the Illinois section of Fig. 4 (p. 435) but also Fig. 10, showing both acreage and production in the nine crop reporting districts of Illinois. While the production of gathered beans is somewhat more concentrated than that of beans cut for hay, it will be observed that every district shows the production of this crop for both purposes.

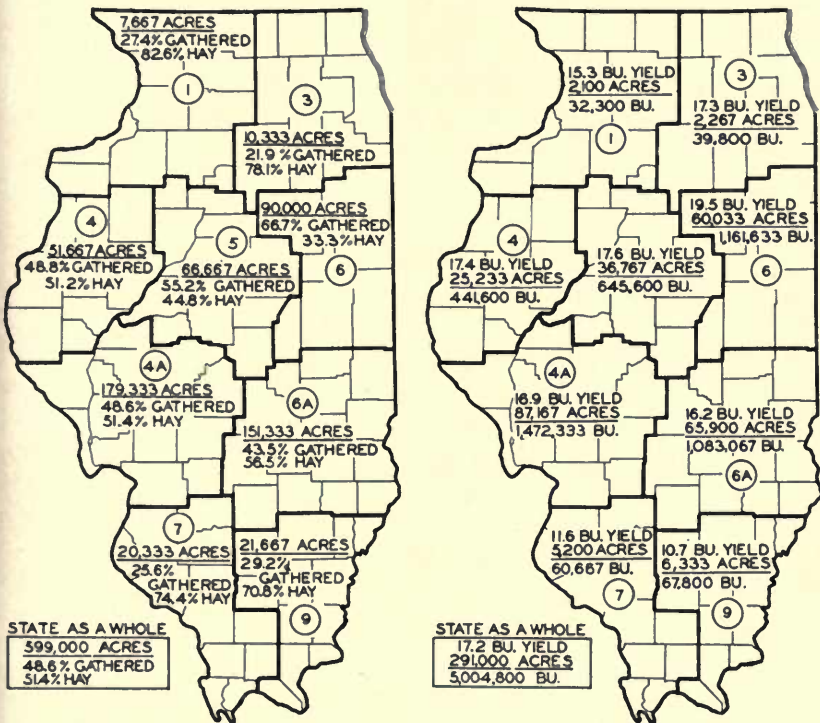


FIG. 10.—ACREAGE, YIELD, AND PRODUCTION OF SOYBEANS IN ILLINOIS, BY CROP REPORTING DISTRICTS, AVERAGE OF 1929-1931 CROPS

The proportion of the soybean acreage that was cut for hay for the three-year period 1929-1931 ranged from 82.6 percent in the Dixon district (1) to 33.3 percent in the Champaign district (6). Hay production has been much more important in the northern and southern thirds of the state than in the central third. Average production of gathered beans was greatest in the Springfield district (4a), followed by the Champaign and Mattoon districts (6 and 6a), each producing more than a million bushels of beans. In the Champaign district acreage was less than in the Mattoon district, but the high average yield of 19.5 bushels an acre, compared with 16.2 bushels for the Mattoon district, accounted for the greater production.

TABLE 8.—PRODUCTION OF SOYBEANS IN TWELVE LEADING PRODUCING COUNTIES OF ILLINOIS, WITH RANK BY YEARS, 1929-1931

Name	Average production	Rank		
		1931	1930	1929
	<i>bu.</i>			
Christian.....	692 200	1	1	1
Champaign.....	534 700	2	2	2
Piatt.....	333 300	3	4	3
Moultrie.....	317 500	4	3	4
Douglas.....	253 600	6	5	6
Macoupin.....	250 600	5	6	9
Macon.....	237 000	7	7	5
Shelby.....	194 100	9	8	8
Sangamon.....	189 500	8	9	10
Hancock.....	172 000	10	11	7
Vermilion.....	160 700	11	10	12
Edgar.....	145 500	12	12	14

Certain counties in Illinois which have been notable for bean production thru the last decade are shown in Table 8.

Soybean Varieties in Illinois

Since the soybean is a relatively new crop in the corn belt, considerable experimentation with a number of varieties has been carried on both by farmers and by the agricultural experiment stations. It is not surprising, therefore, that rather frequent changes have occurred in the varieties grown in different districts in the state (Table 9). Because of the wide variation in soil and climatic conditions within the state, a large number of varieties of soybeans will probably continue to be planted.

Varieties of outstanding promise recommended by the Illinois Station in 1923^{6*} were Manchu and Virginia, and in 1929 Illini, Dunfield, and Mansoy. With the increasing amount of soybeans available for industrial use, more attention is being given to color because of the preference of crushers for yellow beans.

The trend in use of varieties in Illinois in 1931 may be summarized as follows:

Varieties gaining favor	Varieties holding own	Varieties losing favor
Illini	Ebony	Haberlandt
Manchu	Virginia	Mammoth Yellow
Dunfield	Ilsoy	Hamilton (Ohio 9035)
Mansoy	Peking	Ito San
Laredo	Black Eyebrow	A. K.
	Wilson V	Midwest
	Hurrelbrink	

TABLE 9.—VARIETIES OF SOYBEAN SEED OFFERED FOR SALE BY GROWERS, IN ORDER OF FREQUENCY OF OFFERS PRINTED IN FARM-BUREAU PUBLICATIONS, ILLINOIS, 1921, 1925, AND 1931

Year	Crop reporting districts										Entire state
	Dixon (1)	Chicago (3)	Galesburg (4)	Springfield (4a)	Bloomington (5)	Champaign (6)	Mattoon (6a)	Jacksonville (7)	Harrisburg (9)		
1921	Midwest	Midwest	Ebony Midwest Ohio A. K.	Ebony Midwest A. K.	Midwest A. K.	Ito San	Ebony Midwest A. K. Ohio	Peking Midwest Ebony	None	Midwest Ebony A. K. Peking Ohio Ito San	
1925	Manchu Midwest Black Eyebrow A. K.	Manchu Midwest A. K. Black Eyebrow	Manchu Black Eyebrow Midwest Peking Ebony A. K. Virginia Ito San Wilson Ohio Haberlandt Ilsoy Black Eyebrow Ohio	Midwest Manchu Peking Ebony A. K. Virginia Ito San Wilson Haberlandt Ilsoy Black Eyebrow Ohio	Manchu A. K. Midwest Ebony Ito San Ilsoy	Manchu A. K. Midwest Ebony	Midwest Ebony Virginia Peking Ilsoy Manchu A. K. Ohio Wilson Manchu	Virginia Ilsoy Haberlandt A. K. Ohio	Midwest Ilsoy Ebony Haberlandt Virginia Ohio Wilson Manchu	Manchu Midwest A. K. Ebony Virginia Ilsoy Ohio Black Eyebrow Haberlandt Peking Wilson Ito San	
1931	Manchu Illini Midwest	Manchu Illini	Illini Manchu Peking Black Eyebrow Dunfield Virginia Wilson Ito San	Illini Virginia Manchu Ilsoy Manoy Midwest Wilson A. K. Haberlandt Hurrebrink Peking	Illini Manchu Ebony A. K. Wilson Black Eyebrow Midwest Ilsoy Virginia	Illini Manchu Dunfield A. K. Ebony Peking	Virginia Illini Ilsoy Manchu Ebony Laredo Haberlandt Mammoth Yellow Peking Wilson	Virginia Ilsoy Manchu	Virginia Illini Ebony Peking	Illini Manchu Virginia Ilsoy Ebony A. K. Mansoy Dunfield Peking Wilson Midwest Black Eyebrow Haberlandt	

Costs and Returns in Producing Soybeans*

In accounting for the expansion of soybean production, the indirect returns as well as direct money income must be considered.

In the decade 1921-1930 soybeans were less profitable on the better land of the corn belt than were corn, wheat, alfalfa, or red clover, but they were more profitable than oats or timothy. While the labor and power requirements for soybeans are much higher than those for oats or timothy, the larger gross returns have been sufficient to pay relatively better for the use of time, equipment, and land. The expansion in soybean acreage has occurred largely at the expense of these less profitable crops except where soybeans have been used to replace winterkilled crops. Soybeans have made possible a cash crop during the year in which they were planted and have not required the enlargement of livestock enterprises. Many tenant farmers who, because of lack of equipment or capital, are definitely limited in their livestock enterprises, have found this crop well fitted to the farm plan.

The financial returns from the soybean crop in any area must be considered in relation to the stage of the economic development of the crop. Prior to 1928 the rapid expansion in soybean acreage provided a seed outlet which absorbed a considerable proportion of the crop at remunerative prices. During this time there was no established mill outlet for the beans. The inauguration of the contract-price plan in 1928, favorable yields, increased acreage, and the smaller proportion of beans used for seed purposes put the crop largely on a commercial or crushing basis. The development of higher yielding varieties and the improvement in cultural methods have been important factors in increasing both the acre-yields and gross returns.

Champaign and Piatt Counties, Illinois.—Annual cost records from farms in Champaign and Piatt counties, Illinois, for the years 1921-1927 reveal an average acre-yield of 15.6 bushels, with only one year in which the yield exceeded 20 bushels. For each of the three years 1928-1930 acre-yields in the same area exceeded 20 bushels and averaged 22.4 bushels. As a result of the increased yield the computed net cost per bushel was \$1.10 in 1928-1930 compared with \$1.43 for 1921-1927.

During the ten-year period 1921-1930 acre-costs for soybeans harvested with binder (Fig. 11) and thresher were remarkably constant and uniform in the Champaign-Piatt area (Table 10). The cost per acre at rates then current for labor and other items averaged \$26.74

*Based on information collected and prepared by R. C. Ross, Assistant Chief in Farm Organization and Management.

TABLE 10.—AVERAGE COST OF PRODUCING SOYBEANS IN ILLINOIS AND INDIANA FOR SPECIFIED PERIODS,^a 1921-1930

Area	Kind of study	Crop years	Number of acres	Yield per acre	Cost per acre ^b	Net cost ^b	Return above computed cost per acre ^b
<i>Soybeans gathered</i>							
<i>Illinois</i>				<i>bu.</i>		<i>per bu.</i>	
Champaign and Piatt counties.....	Complete cost	1921-1930	1 568	17.6	\$26.74	\$1.30	\$ -.17
Central Illinois, threshed.....	Enterprise cost	1928-1929	2 380	22.0	26.05	1.06	9.01
Central Illinois, combined.....	Enterprise cost	1928-1929	5 326	23.5	24.46	1.05	9.56
Montgomery county, threshed.....	Enterprise cost	1928-1929	451	12.0	19.14	1.34	2.99
Montgomery county, combined.....	Enterprise cost	1928-1929	816	19.9	20.83	1.05	9.55
<i>Indiana</i>							
Central Indiana.....	Survey	1923-1924	4 861	14.0	20.51	1.46	2.01
<i>Soybeans cut for hay</i>							
<i>Illinois</i>				<i>tons</i>		<i>per ton</i>	
Champaign and Piatt counties.....	Complete cost	1928-1930	216	2.06	\$28.91	\$13.91	\$ -.26
Central Illinois.....	Enterprise cost	1928-1929	837	2.16	25.68	11.89	.75
Montgomery county.....	Enterprise cost	1928-1929	475	1.43	16.96	12.12	-2.62
Clinton county.....	Complete cost	1926-1928	91	1.29	20.45	15.85	-1.49
<i>Indiana</i>							
Central Indiana.....	Survey	1923-1924	832	1.71	20.60	12.05	-2.24

^aThis table should be read with careful reference to the periods covered. For the first seven years, 1921-1927, the annual returns averaged \$1.28 an acre less than the computed costs, while the annual returns exceeded the costs by an average of \$2.43 an acre during the three years 1928-1930. For a more complete explanation of this contrast see pages 448 to 453.

^bFive percent on the land value is included as a land charge. The land value an acre used for the Champaign and Piatt area was \$176; for the central Illinois area, \$171 to 179; for Montgomery county, \$78 for threshed beans, \$112 for combined beans, and \$82 for hay beans. The land charge for central Indiana was shown as a rental figure, \$7.09 an acre for gathered beans, and \$5.60 for beans cut for hay. For other items of cost, current rates were used; these varied somewhat from year to year. The enterprise studies for 1928 and 1929 man labor was figured at 30 cents an hour, horse labor at 14 cents, tractor use at 75 cents for a two-pow tractor and \$1.25 for a three-pow tractor. Other machinery costs were figured at a flat rate of 70 cents an acre. In computing net cost, allowance was made for by-products, such as pasture and, more importantly, straw, when used for feeding.

when the land charge was figured at 5 percent on a valuation of \$176 an acre, and ranged from \$25.25 in 1922 to \$28.91 in 1928. The acre-return varied with yields, prices secured, and uses made of roughage.

The average return was \$26.57 an acre, of which \$22.77 represented income from sales and inventories of grain, and \$3.80, the value of straw and pasture. Total returns from beans and straw varied from \$19.27 in 1926, when the yield was 13.5 bushels an acre, to \$37.40 in 1929, when the yield was 24.6 bushels.



FIG. 11.—A FIELD OF SOYBEANS HARVESTED WITH A BINDER

On some farms in the corn-belt states soybeans are cut with a binder and threshed with a regular grain thresher. This method makes the straw available for feeding.

For the ten-year period 1921-1930 the returns from soybeans, including seed and mill beans and straw, lacked 17 cents an acre of being sufficient to pay growing and harvesting costs and taxes and interest on the land. During five of these years returns were less than the computed costs, the largest loss being \$6.58 an acre in 1926. Of the five remaining years in which returns exceeded the computed costs, 1929 showed the largest difference, \$9.86 an acre. For the first seven years, 1921-1927, of this period the annual returns fell short of the computed costs by an average of \$1.28 an acre, but during the last three years they exceeded computed costs by an average of \$2.43 an acre. Except for 1930, when the soybeans were sold at a dollar a bushel, returns in excess of computed costs were realized in each year when the yield exceeded 16 bushels an acre. With the very favorable prices frequently realized for seed beans in the earlier years of the period and the better established commercial outlets in the later years, the monetary returns were apparently sufficient to lead to a marked expansion in production even tho returns in excess of computed costs were not consistently realized.

The years 1928 and 1929 merit particular mention in this respect. With favorable seasons both years the yields exceeded those of any previous year. Under the contract price inaugurated in 1928 mill beans averaged about \$1.20 a bushel to the grower. Seed prices averaged about \$1.75. Under such conditions the crop was very profitable. In 1929, a year in which high yields continued, the price of mill beans ranged from \$1.40 to \$1.50 a bushel, and seed beans from \$1.50 to \$2. The net returns in these two years were significant factors in the expansion of acreage.

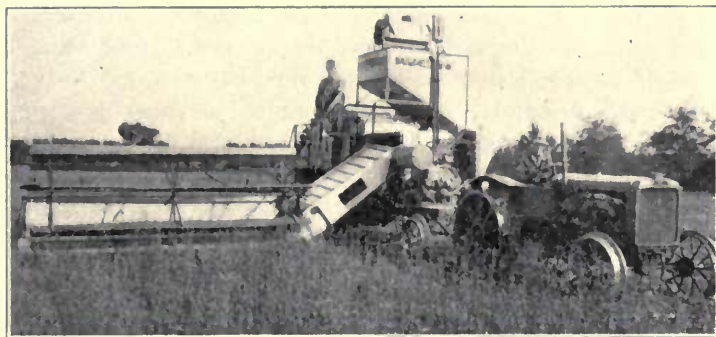


FIG. 12.—HARVESTING SOYBEANS WITH A COMBINE

The combined harvester and thresher, or combine, has made great headway since 1927 as a means of harvesting the soybean crop, especially in Illinois. This method of harvesting has usually been less expensive than the use of both binders and threshing machines.

Central Illinois.—A more exhaustive study of enterprise costs made on a larger number of farms in 1928 and 1929 showed acre-costs and acre-yields for a large area of central Illinois to be similar to the costs and yields cited for Champaign and Piatt counties. The returns were greater for these years because a larger proportion of the beans were disposed of for seed purposes at higher than milling prices. Beans harvested with a combine (Fig. 12) during these two years were produced at somewhat lower acre-cost, but no feed value was realized from the straw; hence the net cost per bushel and the net returns per acre were about the same as for the threshed beans.

Soybeans cut for hay in central Illinois during these years returned only 75 cents an acre in excess of computed costs. This small excess, even with yields averaging as much as 2.16 tons an acre, shows the effect of unusually heavy costs for ground preparation and cultivation for an annual crop that is cut for hay. The average cost per ton, costs

being computed on the basis indicated on page 450, was \$11.89 for the two years.

A similar study for the same years, 1928 and 1929, in the Montgomery county area gave costs and returns on poorer soils belonging to the brownish gray and grayish brown groups. The threshed beans, with an average yield of 12 bushels an acre, were produced at a computed net cost of \$1.34 a bushel, while the combined beans, with a yield of 19.9 bushels, had a computed net cost of \$1.05. The difference in yield was due principally to differences in soil fertility, the combined beans having been grown on the more productive land. In this area the beans, whether threshed or combined, returned an excess over computed costs, but the soybean hay, averaging 1.43 tons an acre, returned \$2.62 an acre less than the computed costs.

Cost records prior to 1926 covering limited acreages in other parts of southern Illinois show that with the low yields the returns in most cases failed to equal computed costs.

Indiana Survey.—A survey made in central Indiana in 1923 and 1924 indicated an average cost of \$1.39 a bushel for growing the crop and \$1.46 for growing and marketing (Table 10). The average yield was 14 bushels an acre. Sixty-two percent of the farms had a profit on gathered beans. Eleven percent of these farms showing a profit produced their beans at a cost of less than a dollar a bushel; nearly 28 percent produced them for less than \$1.25; 50 percent for less than \$1.50, and nearly 66 percent for less than \$1.75. For soybean hay, of which the average yield was 1.71 tons an acre, the computed cost per ton was \$12.05, which was \$2.24 an acre, or \$1.31 a ton more than the returns. On 34 percent of these farms returns exceeded computed costs.

Summary for Illinois Areas.—In the Champaign-Piatt area, the returns on gathered soybeans above operating expenses and taxes, disregarding land values, averaged \$8.63 an acre for the years 1921-1930. For certain shorter periods, however, the corresponding returns for gathered soybeans in the various Illinois areas were as follows: central Illinois, threshed \$17.58 and combined \$18.51; Montgomery county, threshed \$6.91 and combined \$15.14. For soybeans cut for hay, the two- and three-year averages were \$8.54 and \$9.36 an acre respectively for central Illinois and \$1.49 and \$2.18 for Montgomery county.

For the year 1931 production costs declined considerably as the result of lower seed prices, lower rates for man and horse labor, and lower charges for machinery used in harvesting. This was particularly true for beans harvested with combines. Using the land charges indi-

cated on page 449, the 1931 acre-cost of producing the crop on a group of Champaign and Piatt county farms was \$24.31 for beans harvested with binder and thresher and \$19.19 when the crop was combined, the yield in each case approximating 25 bushels an acre. Valuing the crop at 29 cents a bushel, the prevailing price at harvest time, the loss on the combined beans was \$11.49 an acre and on the beans harvested with binder and thresher, \$15.72. Disregarding the land charge, and figuring only operating costs and taxes, the combined beans were produced at a loss of \$2.69 an acre and the beans harvested with binder and thresher at a loss of \$6.92 an acre. With the exception of land charges, the acre-costs for soybeans in 1932 are likely to parallel rather closely those for 1931.

The land values used in calculating the costs of producing soybeans during the period 1921-1931 were those prevailing in 1928 and 1929. In calculating costs of production for 1932, adjustments in land charges should be made corresponding to the decline in land values since 1929. When costs and prices shall again become stabilized, the profitableness of the crop will again be determined largely by the ability of the individual farmer to keep production costs at a minimum, to obtain high yields, and to sell at the best current prices.

Imports of Soybeans and Soybean Products

Imports of soybeans and soybean products into the United States have not been extensive, with the exception of imports of oil during the World War. Nevertheless the amounts imported have represented sufficiently large proportions of the total supply to have an effect on the market.

Soybeans.—The amount of soybeans imported into the United States has been fairly constant from year to year, but at no time significant. The range for the ten years 1922-1931 was from about 59,000 bushels in 1922 to over 72,000 bushels in 1929 (Table 11). In 1931 the amount of beans imported returned to the 1922 figure.

Soybean Oil Meal and Cake.—For a considerable period beginning in 1915, imports of soybean oil meal and cake were somewhat irregular (Table 11). Upward trends seemed apparent, however, from 1925 until 1930, when tariff duties were levied on these two products for the first time. Imports reached approximately 86,000 tons in 1929; while for 1931 they represented only about 20,000 tons, which is the amount of meal obtainable from about 825,000 bushels of beans.

Soybean Oil.—Imports of soybean oil into the United States were greatly stimulated during the World War, when there was a shortage

of all vegetable oils and when some of the normal outlets in Europe were closed. Imports in 1918 reached a total of nearly 336 million pounds (Table 11). Since that time they have declined irregularly but continually. The first marked drop occurred in 1921, when the emergency tariff measure of that year took effect. Yearly variations from

TABLE 11.—IMPORTS OF SOYBEAN OIL, SOYBEAN OIL MEAL AND CAKE, AND SOYBEANS, UNITED STATES, 1915-1931

Calendar year	Soybean oil	Soybean oil meal and cake	Soybeans
	<i>lbs.</i>	<i>tons</i>	<i>bu.</i>
1915.....	21 335 000	2 988	63 964
1916.....	145 409 000	5 234	50 067
1917.....	264 926 000	2 880	89 067
1918.....	335 984 000	39	23 883
1919.....	195 808 000	8 494	72 813
1920.....	112 214 000	12 236	52 281
1921.....	17 283 000	5 318	65 770
1922.....	17 294 000	2 142	58 947
1923.....	41 679 000	15 612	60 804
1924.....	9 125 000	23 542	69 735
1925.....	19 493 000	13 901	63 532
1926.....	30 712 000	21 434	62 127
1927.....	14 915 000	26 976	69 819
1928.....	13 116 000	48 405	70 929
1929.....	19 489 000	85 928	72 286
1930.....	8 348 000	56 813	64 198
1931.....	4 416 000	19 810	59 000

1921 to 1930 have been influenced most markedly by variations in production. As the increased tariff duties of 1930 became effective, further reduction in imports became apparent. Imports for 1931 dropped to 4,416,000 pounds, or to less than 1.3 percent of the 1918 figure. The 1931 imports were equivalent to an amount obtainable from about 570,000 bushels of beans.

Import Duties Levied on Soybeans and Soybean Products

Prior to the tariff act of 1909, United States tariff duties affected neither imported soybeans nor soybean products except in so far as the schedule on chemicals, oils, and paints was applicable to the oil. The first mention of soybean oil as such was made in the 1909 tariff measure, which placed it on the free list. Soybean oil continued on the free list under the act of 1913. The emergency tariff act of 1921 was the first to place a duty on any soybean product. A duty of 2.67 cents a pound (20 cents a gallon) was placed on the oil, which immediately shut out the greater portion of the soybean oil imports (Table 11). The tariff bill enacted the following year reduced the duty on soybean oil to 2.5 cents a pound (18.75 cents a gallon) and levied a duty of 30 cents a bushel on soybeans.

TABLE 12.—DUTIES LEVIED ON SOYBEAN OIL, SOYBEAN OIL MEAL AND CAKE, AND SOYBEANS UNDER RECENT TARIFF ACTS, UNITED STATES, 1909-1930

Year of tariff	Oil	Oil meal and cake	Beans
1909.....	Free list	Free list	Free list
1913.....	Free list	Free list	Free list
1921.....	20c per gal. (2.67c per lb.)	Free list	Free list
1922.....	2.5c per lb. (18.75c per gal.)	Free list	Free list
1930.....	3.5c per lb. (26.25c per gal.) ^a	\$6 per ton	½c per lb. (30c per bu.) \$1.20 per bu.

^aNot less than 45 percent *ad valorem*.

The change in duties in the 1922 act was not reflected in any noticeable change in importations. The tariff act passed in 1930 increased the duty on soybean oil to 3.5 cents a pound and on soybeans to \$1.20 a bushel. Soybean oil meal and cake were taken from the free list and given a duty of \$6 a ton (Table 12). After the act became effective, importation of all soybean products, including oil meal, cake, and oil, declined.

Supply of Soybean Oil and Competing Oils and Fats

Production.—The total production of all vegetable oils and animal fats in the United States showed relatively little annual fluctuation from 1912 to 1930. Following the close of the World War and until 1927 production increased gradually, but since 1927 the trend has been downward. In 1931 the total production exclusive of butter

TABLE 13.—DOMESTIC PRODUCTION OF SOYBEAN OIL AND OTHER VEGETABLE OILS FROM DOMESTIC MATERIALS, UNITED STATES, 1912-1931

(Thousands of pounds)

Calendar year	Cottonseed oil ^a	Peanut oil ^a	Olive oil	Corn oil ^a	Linseed oil ^b	Soybean oil	Total vegetable oil
1912.....	1 435 401	456	966	72 832	510 097	.....	2 019 752
1914.....	1 789 777	11 006	1 128	91 810	296 905	.....	2 190 626
1916.....	1 492 430	28 534	1 462	109 963	251 746	.....	1 884 135
1917.....	1 343 849	50 499	963	118 021	154 921	.....	1 668 253
1918.....	1 283 823	95 934	618	111 065	238 487	.....	1 729 927
1919.....	1 429 948	87 607	439	97 400	119 971	.....	1 735 365
1920.....	1 142 671	13 085	643	98 619	193 322	.....	1 448 340
1921.....	1 277 300	33 234	974	87 481	141 421	.....	1 540 410
.....	934 627	22 644	585	111 508	176 477	751	1 246 592
1923.....	973 753	5 359	574	111 343	297 401	1 404	1 389 834
1924.....	1 154 434	6 691	1 509	117 065	549 648	950	1 830 297
1925.....	1 510 802	15 156	532	104 153	411 908	2 520	2 045 071
1926.....	1 764 318	10 644	1 383	120 041	354 743	2 646	2 253 775
1927.....	1 806 757	10 590	1 858	117 441	448 728	3 088	2 387 462
1928.....	1 460 407	12 439	1 438	124 327	366 304	4 716	1 969 631
1929.....	1 581 631	16 131	1 003	133 680	312 858	11 009	2 056 312
1930.....	1 616 102	25 495	2 184	120 747	393 307	14 387	2 172 222
1931.....	1 417 226	13 730	1 509	113 145	203 613	39 129	1 788 352

^aCrude oil only. ^bOil equivalent of domestic seed production less exports.

TABLE 14.—NET IMPORTS OF FOREIGN VEGETABLE OILS, OIL EQUIVALENT BEING USED FOR OIL-BEARING MATERIALS, UNITED STATES, 1910-1931

(Thousands of pounds)

Calendar year	Soybean oil	Coconut oil and copra	Peanut oil	Olive oil edible	Olive oil including inedible including olive oil foots	Palm oil including palm kernel	Linseed oil and flaxseed	All other vegetable oils and materials	Total vegetable oils and materials
1910.....	.....	66 478	.....	33 459	6 140	87 234	170 630	76 471	440 412
1911.....	.....	76 262	.....	31 028	3 611	45 567	139 629	50 902	352 999
1912.....	24 784	83 663	7 670	43 408	21 498	52 658	147 034	85 107	466 762
1913.....	14 185	90 125	11 256	38 788	14 677	54 025	174 041	80 435	427 532
1914.....	12 551	93 526	7 258	50 806	18 643	48 959	176 957	79 615	488 325
1915.....	21 260	127 444	6 159	47 665	15 686	34 296	273 809	54 225	580 544
1916.....	143 347	159 081	15 503	55 043	20 508	39 214	245 206	94 463	996 721
1917.....	260 949	378 906	27 259	50 619	20 227	30 227	175 978	60 005	1 377 043
1918.....	335 439	613 266	68 392	1 128	20 993	41 563	242 383	95 281	1 078 356
1919.....	178 075	297 378	153 095	67 195	8 659	41 563	278 098	53 428	1 144 925
1920.....	108 985	316 132	95 095	30 144	0 124	41 563	495 169	48 464	1 725 386
1921.....	16 771	291 571	2 592	49 514	20 139	22 770	290 179	31 850	1 052 621
1922.....	16 875	371 240	2 392	91 120	26 937	56 796	422 515	93 700	1 296 052
1923.....	41 507	375 615	7 925	77 120	40 605	126 800	497 299	129 181	1 452 225
1924.....	8 848	371 646	5 194	76 074	31 918	100 133	352 906	228 306	1 294 023
1925.....	18 973	444 418	2 687	90 084	50 050	188 217	353 207	146 387	1 507 397
1926.....	23 145	526 616	26 660	80 777	50 703	205 727	479 710	108 059	1 461 782
1927.....	13 732	556 097	19 394	75 025	49 126	199 180	404 198	145 040	1 481 492
1928.....	12 264	592 277	31 295	82 944	48 271	219 652	324 032	170 757	1 481 492
1929.....	19 358	753 689	14 489	96 798	56 206	329 072	457 971	303 581	2 031 164
1930.....	7 830	703 094	11 024	92 694	69 986	269 116	236 118	216 576	1 652 940
1931.....	4 018	621 762	13 744	(*)	(*)	269 116	267 835	229 381	1 525 114

*Olive oil (edible and inedible, including olive oil foots), 119, 258,000 pounds.

fat was slightly above 4.5 billion pounds, approximately three-fifths of this amount representing animal fats and fish oils and two-fifths vegetable oils.

Production of cottonseed oil, which has averaged about 1.5 billion pounds annually, has been more important than that of any other vegetable oil (Table 13). Next in order have been linseed oil and corn oil. The production of soybean oil, tho of minor importance, has increased rapidly since 1928. In 1930 production was more than 14 million pounds, and in 1931 almost treble that amount. Production of the other important oils has been fairly stable during the last five years.

Net Imports.—Since 1917 there has been a gradual increase in net imports of oils and fats into the United States. This increase has been due largely to the increased imports of coconut oil and copra. (Copra is the dried meat of the coconut and contains from 60 to 65 percent of its weight in oil, depending on the method used in drying it.) Coconut oil and copra represented slightly more than two-fifths of the total net imports of vegetable oils in 1930 (Table 14). Net imports of all these oils in that year amounted to over 1 billion 650 million pounds; coconut oil and copra over 703 million pounds; palm oil, including palm kernel oil, approximately 316 million pounds; and linseed oil, including linseed oil equivalent of flax seed, over 236 million pounds. Net imports of soybean oil dropped to 4 million pounds in 1931. Total net imports of all oils and fats have been slightly more than one-third of the United States production.

Exports.—Exports of vegetable oils, including reexports, have been small since the readjustments which followed the World War (Table 15). In 1930 exports of leading vegetable oils represented less than

TABLE 15.—EXPORTS OF SOYBEAN OIL AND FIVE OTHER LEADING VEGETABLE OILS UNITED STATES, 1919-1931

(Thousands of pounds)

Year	Soybean	Cottonseed	Coconut	Linseed	Corn	Peanut
1919.....	27 715*	193 133	118 612	11 266	6 452	4 342
1920.....	43 512	184 754	25 695	5 366	12 059	1 425
1921.....	1 944	252 549	7 498	3 512	4 400	1 708
1922.....	2 458	75 303	12 972	2 703	5 733	963
1923.....	1 356	49 608	16 562	3 013	4 361	203
1924.....	2 264	43 343	17 961	2 387	3 679	39
1925.....	520	62 415	17 901	2 487	3 847	.....
1926.....	1 567	40 901	15 952	2 567	1 324	.....
1927.....	6 629	67 982	26 275	2 525	310	898
1928.....	7 994	51 702	31 184	1 965	337	42
1929.....	8 098	26 075	30 871	2 208	315	103
1930.....	5 479	29 193	26 904	1 592	613	7 702
1931.....	5 448	23 539	19 201	1 094	776	13 299

*Second six months of 1919 only.

one-twentieth of the net imports of all vegetable oils. Soybean oil exported in 1930 amounted to over half as much as was imported. During 1931, however, soybean oil exports were more than equal to imports.

Export-Import Balance.—Statistics for 1912 and 1914 indicate that the total amount of vegetable oils, animal fats exclusive of butterfat, and fish oils exported from the United States exceeded the amount imported (Table 16). From 1916 to 1931, however, imports have

TABLE 16.—TOTAL PRODUCTION, IMPORTS, EXPORTS, AND NET BALANCE OF VEGETABLE OILS AND ANIMAL FATS, EXCLUSIVE OF BUTTERFAT BUT INCLUSIVE OF FISH OILS, UNITED STATES, 1912-1931

(Thousands of pounds)

Year.	Domestic vegetable oil production	Domestic animal fat production*	Total oil and fat production*	Importation of fats and oils	Exportation of fats and oils	Net import or export balance of all fats and oils
1912.....	2 019 750	2 178 750	4 198 500	512 645	1 163 792	Ex. 651 147
1914.....	2 130 626	2 280 484	4 411 110	535 206	867 578	Ex. 332 372
1916.....	1 884 135	2 728 125	4 612 260	807 244	849 849	Ex. 42 605
1917.....	1 668 253	2 252 161	3 920 414	1 056 144	624 769	Im. 431 375
1918.....	1 729 927	2 755 886	4 485 813	1 444 782	843 777	Im. 601 005
1919.....	1 735 365	2 822 314	4 557 679	1 151 314	1 269 836	Ex. 118 522
1920.....	1 448 340	2 868 285	4 316 625	1 235 300	1 016 733	Im. 218 567
1921.....	1 540 410	3 010 888	4 551 298	788 030	1 387 101	Ex. 599 071
1922.....	1 246 592	3 371 085	4 617 677	1 122 550	1 167 457	Ex. 44 907
1923.....	1 389 834	3 969 423	5 359 257	1 389 605	1 365 071	Im. 24 534
1924.....	1 830 297	3 833 056	5 663 353	1 235 191	1 286 456	Ex. 51 265
1925.....	2 045 071	3 247 580	5 292 651	1 385 724	1 032 258	Im. 353 466
1926.....	2 253 775	3 413 032	5 666 807	1 648 780	1 009 680	Im. 639 100
1927.....	2 427 462	3 416 378	5 843 840	1 605 931	1 015 904	Im. 590 027
1928.....	1 910 910	3 613 603	5 524 513	1 639 860	1 063 128	Im. 576 732
1929.....	2 056 312	3 343 510	5 399 822	2 202 066	1 112 058	Im. 1 090 008
1930.....	2 172 222	3 052 894	5 225 116	1 848 868	928 438	Im. 920 430
1931.....	1 788 352	3 075 926	4 864 278	1 741 428	859 462	Im. 881 966

*Exclusive of butterfat, which represents about 2.1 billion pounds annually.

shown a marked tendency to exceed exports, even the readjustments incident to the ending of the World War and to the imposition of import duties on oils in 1921 cut down the use of imported oils. Following the 1930 tariff act there was a further decline in the importation of vegetable oils, but imports still remained higher than exports.

From 1916 to 1920 inclusive the imports of soybean oil averaged 205 million pounds, or one-fifth of the combined net imports of all vegetable oils. For the five-year period ending with 1931 this amount declined to 14.5 million pounds. The net import balance of all fats and oils increased from more than 350 million pounds in 1925 to nearly 1.1 billion pounds in 1929. A decrease was shown for 1930 and 1931, when the import balance stood at about 900 million pounds.

CONSUMPTION OF SOYBEANS AND SOYBEAN PRODUCTS

Disposition of the Domestic Crop

The demand for soybeans is determined by three main uses: seed, livestock feed, and crushing. At all times the demand for these purposes in the United States as a whole is distinct from the demand for farm uses, which do not relate primarily to the gathered beans.

The disposal of the 1915 soybean crop indicates the typical disposition when the crop was of distinctly minor importance (Table 17). In that year more than half the soybean acreage in the United States

TABLE 17.—USE OF SOYBEANS, BY ACREAGE, UNITED STATES,
1915, 1929, AND 1930 CROPS

Use	Percentage of entire crop acreage
1915 crop (equivalent solid acreage unknown)	
Hay.....	52
Grazed.....	15
Plowed under.....	4
Beans (bushels gathered unknown)	
Seed.....	18.2
Human food.....	.9
Feed.....	9.9
1929 crop (equivalent to 3,245,000 solid acres)	
Hay.....	56
Grazed.....	16
Beans (8,670,000 bushels)	
Seed.....	12
Crushed or ground.....	9
Feed.....	7
1930 crop (equivalent to 3,758,000 solid acres)	
Hay.....	56
Grazed.....	14
Beans (11,975,000 bushels)	
Seed.....	10.5
Crushed or ground.....	11.5
Feed.....	8.0

was cut for hay, 15 percent more was fed without being threshed or shelled, and only 29 percent was harvested for beans. About one-third of the gathered beans was fed to livestock and two-thirds was utilized for seed purposes.

Previous to 1929 the production of soybeans in the United States was influenced largely by the ever-increasing acreage and consequent active demand for seed. Beginning with 1929 the absorption of soybeans by the mills has been a potent factor influencing production. The 1929 and 1930 soybean crops averaged the equivalent of 3,500,000 solid acres. This acreage was disposed of in the following ways: cut for

hay, 56 percent; grazed, 15 percent; harvested for beans, 29 percent.

Products derived from soybeans grown in the United States are many. The following list of such products actually being placed on the market in the United States and Canada at the present time was compiled from letters received during the latter part of 1931 by the Department of Agronomy of the Illinois Station from more than a hundred manufacturing consumers of soybeans and soybean products. This list has grown rapidly during the past year, and does not pretend to be complete.

COMMODITIES IN WHICH SOYBEANS OR SOYBEAN PRODUCTS ARE USED*

<i>Food Products</i>		
Soybean flour	Vegetable shortening	Lektizoy
Soybean meal flour	Infant foods	Zoy Soup
Refined edible soybean oil	Diabetic foods	Zoybeans (cooked beans)
Soybean salad oil	Oleomargarine	Bacon and Zoy Beans
Chocolate bars (30% soybean flour)	Lard substitutes	Zoy Bouillon
Cocoa (up to 60% soybean flour)	Filled sweets	Soy Bean Biscuit
Sausages (up to 50% soybean flour)	Soybean sprouts	Casein Gluten Flour
Bread (7½% soybean flour)	Soybean cheese	No-fat Mayonnaise
Rolls (10% soybean flour)	Soybean milk	Fatless Spread
Macaroni (20% soybean flour)	Soybean buns	Fluffo
Soybean muffins	Soybean ice cream	<i>Canadian Products</i>
Soybean cookies	Soya Cream Biscuits	Milqo (soy milk)
Soybean doughnuts	La Choy—Soy Sauce	Vi-tone (chocolate)
	Soyolk (flour)	Soya Flour
	Soy Biscuits	Soyex-Malt-Cocoa Drink
	Soy Flour	Soyex
	Vi-Zoy	Macaroni
<i>Feed Products</i>		
Cake or meal	Dog chow	34% protein chow chow
Commercial feed	Chicken chowder	24% protein chow chow
Dairy feed	Steer fatena	Chick startena
Dairy chow	Calf chow	Chicken fatena
Hog chow	Lay chow	Olelene
Poultry chow	Rabbit chow	Grainola
<i>Industrial Products</i>		
Paint	Printer's ink	Lauxein emulsifier
Varnish	Glycerine	Soap
Enamels	Celluloid	Core binders
Oilcloth	Lautext plastic wall coat	Rubber substitutes
Linoleum	Lauxein waterproof soybean glue	

Utilization as Beans

The portion of the 1930 soybean crop harvested for beans in the United States represented approximately 30 percent of the total crop

*This list includes a number of products for which only trade names are available.

and yielded 11,975,000 bushels of beans. These beans were utilized for crushing purposes, for seed, for feed, and for human food. About 42 percent of the total was crushed; 34 percent was used for seed; 23 percent was fed to livestock without having the oil removed, and less than 2 percent was used for human food (see Table 22, page 473).

Seed.—The amount as well as the proportion of all beans used for seed has always been important. Since the total acreage of soybeans has been expanding rapidly during the last decade, and since seed for the entire acreage grown must come from the 30 percent harvested for beans, this requirement has accounted for approximately one-third of the gathered beans.

Feed.—The soybean crop is first of all a feed crop. An average of about 56 percent of the 1929 and 1930 crop acreages was cut for hay; about 15 percent was grazed or harvested by livestock, and about 30 percent of the amount gathered for beans was fed to livestock. Thus about 80 percent of the crop was utilized for feed.

The hay serves as a satisfactory roughage for most classes of livestock, comparing favorably with other legumes per pound consumed.^{21*} There is a greater waste of soybeans, however, because a considerable amount of the woody stems is left uneaten.

The area of soybeans pastured or hogged down has been on the decline since 1920. Except for emergency purposes other crops are more suitable for this purpose, at least in the corn belt.

The amount of harvested soybeans fed to livestock has not shown much increase in the last five years. Reasons generally cited have been the danger of soft pork and too oily lard from hogs and lack of sufficient relish by most other classes of livestock to give maximum gains. The feeding of a small portion of beans to breeding animals for the purpose of balancing rations has been satisfactory and has helped to provide cheap and economical rations.

Food.—The soybean has long been considered an essential part of the diet of the people of Manchuria, and other parts of China, Japan, and the East Indies. With the recently developing importance of the crop in the commerce of both Europe and the United States and the very recent expansion of production in the important soybean-producing areas of the United States, more attention is being given to soybeans and soybean products as human foods.

As a food the soybean is unique. It is recognized as the most nearly perfect vegetable substitute for meat grown.^{9*} It contains about 40 percent protein, 20 percent fat, and the important vitamins A, B, and D. The yield of protein from soybeans, weight for weight, is ap-

proximately twice that of meat; four times that of eggs, wheat and other cereals; five or six times that of bread; twice that of lima and navy beans, walnuts, filberts, and most other nuts; and twelve times that of milk.

The consumption of soybeans in the form of such products as soybean milk, soy chocolate, and soy sauce has increased appreciably since 1930. The use of soybeans for confectionery products is growing rapidly. Cooked beans are utilized for table use in various forms. Little use as a green bean for seasonal consumption or for canning has developed in the United States altho this use is important in the orient.

Utilization of Soybean Oil Meal

Soybean oil meal is now being more generally recognized as a protein supplement than it was formerly, with the high quality of the protein it furnishes becoming more widely established. When the production of oil meal was greater than local consumption, the surplus was absorbed for a time by a few large manufacturers of mixed feeds. The large crushings from the 1930 soybean crop caused soybean oil meal stocks to accumulate. This accumulation was finally liquidated thru the activities of the manufacturers of mixed feeds, and thru decided reduction in price. The farmers of the corn belt, where most of the crushing took place, did not, before 1931, use a large amount of the meal because of the high price in comparison with cottonseed meal. The situation in regard to the 1931 crop developed somewhat differently in that more effort was made to sell soybean oil meal to feeders adjacent to the mills thru pricing it on a competitive basis with cottonseed meal.

The actual amounts of soybean oil meal consumed in the United States have not been large compared with the total amount of protein concentrates used. The average consumption for the 1928, 1929, and 1930 crops was about 90,000 tons, compared with approximately 4 million tons of cottonseed meal and linseed meal. The domestic production of soybean oil meal since 1930 has increased sufficiently to offset the decrease in imports (Table 18).

The domestic utilization of soybean oil meal has been largely in mixed feeds, the bulk of it going into dairy rations. Since 1930 more attention has been given to its use in special feeds such as poultry chows, dog chows, and rabbit feeds. Crushers have also begun to cultivate the local feeding trade, where the product is used largely to balance rations in dairy and beef-cattle feeding, and to a less extent for hogs, sheep, and poultry feeding. Most of the recent importations

of cake have been received on the Pacific coast, where soybean cake is used for feeding dairy and beef cattle, a practice of long standing in that region.

The amount of soybean oil meal used for human consumption has been less than that of ground meal. Total human consumption has been small, altho a considerable amount of soybean oil meal has gone into flour for infant and diabetic foods. More recently a number of

TABLE 18.—SOYBEAN OIL MEAL PRODUCED AND IMPORTED INTO THE UNITED STATES, 1922-1930

(Tons of 2,000 pounds)

Crop	Domestic production	Imported during calendar year following crop	Total
1922.....	3 811	15 612	19 423
1923.....	2 451	23 542	25 993
1924.....	7 361	13 901	21 262
1925.....	8 416	21 434	29 850
1926.....	8 029	26 976	35 005
1927.....	13 405	48 405	61 810
1928.....	21 159	85 928	107 087
1929.....	38 270	56 813	95 083
1930.....	110 000	55 107	165 107

baking companies have substituted a portion of soybean flour for wheat flour in the making of bread, with excellent results. The amount of soybean flour used by these companies in this way has been about 15 percent of all flour used in such baking.^{5*}

Recent developments in the use of soybean meal in glue have made this an important and promising outlet for the meal.^{10*}

Altho a large portion of the meal or cake is used for fertilizer in Asiatic countries, there has been no such utilization in this country owing to its greater value for other purposes.^{15*}

The use of soybean oil meal promises to expand as its feeding qualities are better understood and as balanced rations for feeding livestock are more widely adopted. With prices in line with competing protein concentrates, there would appear to be ample opportunity for increasing the consumption of this product.

Utilization of Soybean Oil

There is a demand for soybean oil in edible products, in paint, varnish, and linoleum, in soaps, and for a variety of miscellaneous uses. Altho soybean oil has a wide range of possibilities for utilization, the more desirable outlets have been somewhat restricted (Table 19).

The quality of soybean oil has varied so widely in the past that

many users are prejudiced against it. However, developments in processing and refining have been rapid in recent years and today the product obtained is fairly uniform in quality and is on a par with and frequently superior to imported oil. Trouble experienced with rancidity and with the peculiar taste and odor, due to lecithin, coming from soybean oil when it is used as in cooking is now being overcome.

TABLE 19.—ADAPTABILITY OF SOYBEAN OIL TO USE IN VARIOUS PRODUCTS

Use	Probable adaptation	Inferior adaptation	Satisfactory adaptation	Superior adaptation
<i>Drying products</i>				
Paint.....	To 50 percent	.....	To 25 percent	To prevent yellowing
Varnish.....	To 20 percent	.....	To add luster	.....
Linoleum and oil cloth...	To 20 percent	.....	To give elasticity	.....
Waterproof goods.....	To 25 percent	.....	To prevent cracking	.....
<i>Soap products</i>				
<i>Hard soaps</i>				
Toilet.....	If hydrogenated, to 25 percent	In any amount	.....	.....
Household.....	If hydrogenated, to 20 percent	In any amount	.....	.....
Laundry.....	Depends on price	.....	In considerable amounts	.....
<i>Soft soaps</i>				
Shampoos, etc.....	Limited	In any amount	.....	.....
Automobile soaps, etc..	Depends on price	.....	.....	Very good
<i>Edible products</i>				
Lard compounds.....	Depends on elimination of odor and rancidity	.....	If properly refined	.....
Cooking oils.....	If odor permanently eliminated	.....	To some extent	.....
Salad oils.....	In small amounts	In any amount	.....	.....
Fountain drinks.....	Excellent	.....	In increasing amounts	.....
Candy.....	Fair	In large amounts	.....	.....
Mayonnaise.....	In small amounts	In any amount	.....	.....
Margarin.....	In small amounts if properly treated	.....	In small amounts	.....
<i>Miscellaneous</i>				
Core oil.....	In large amounts	.....	If properly treated	.....
Printers' ink.....	Little change from present use	.....	In small amounts	.....

About 6 million pounds of soybean oil, or one-sixth of the oil from the 1930 domestic crop, was used in edible products. Hydrogenated* soybean oil is being used rather successfully in margarin, in salad oils, and in lard substitutes.

The margarin industry was one of the first to use considerable amounts of soybean oil and at present it absorbs in the United States approximately 750,000 pounds annually. Industries producing lard

*Hydrogenation is a process of applying hydrogen to an oil, thereby causing it to harden.

substitutes have been slower than the margarin industry in according domestic soybean oil a place in their products. Lower prices, however, have been conducive to healthy growth in the use of the oil for these purposes. Consumption in 1931 amounted to 500,000 pounds. As elimination of the bean flavor has been accomplished, the demand for soybean oil for use as a salad oil has been increasing.

A recent development of importance has been the use of soybean oil in certain confectionary and drinking fountain products.



FIG. 13.—FARM BUILDINGS COVERED WITH PAINT CONTAINING SOYBEAN OIL

A paint containing 25-percent soybean oil was applied to the farm buildings shown above. The paint was not tacky, and was holding up well one year after application when the picture was taken.

Soybean oil has probably been given most publicity in connection with the use in paints and varnishes. It is usually classed as a semi-drying oil. The iodine number of soybean oil, about 140 compared with approximately 185 for linseed oil, indicates its comparatively high rating for paint purposes. The iodine numbers of nondrying oils vary from 8 to 110. Increasing recognition is being given to the fact that soybean oil may be utilized in paint up to 25 percent with excellent results (Fig. 13). When the vehicle, or body, of the paint has been adjusted to favor soybean oil of proved quality, as much as 50 percent may be used and a satisfactory paint obtained.* In white paints and enamels soybean oil prevents yellowing (Fig. 14). Much of the earlier discrimination against soybean oil was traceable to inferiority and variability of the product.

*A study of soybean oil in paints is being made by the Illinois Agricultural Experiment Station. Special attention is being given to amounts and kinds of driers and to different amounts of oils in combination that can be used satisfactorily. The reaction to various kinds of woods is under consideration also. These studies include both inside and outside exposures.

Inclusion of some soybean oil in place of linseed oil in enamels gives them a better film and luster.^{4*} In use for waterproofing goods, such as oilcloth and linoleum, soybean oil is decidedly superior to linseed oil in that it has a softer, more elastic film and does not crack easily.

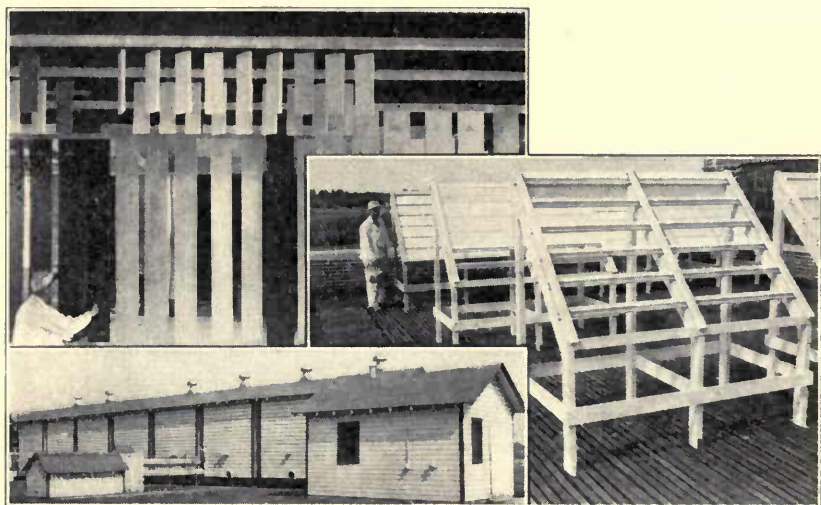


FIG. 14.—EQUIPMENT AND SUPPLIES IN SOYBEAN PAINT TESTS

Approved methods of testing out paint mixtures used at the University of Illinois are shown above. The racks are used for outside exposures and the hooks for inside tests. The small cribs show application of paints containing from none to 50-percent soybean oil in terms of the oil used.

All vegetable oils may be used for soap-making purposes. The amounts of the various oils thus consumed has depended on price. Soybean oil has a fairly high saponification number—193 compared with about 195 for linseed oil, 195 for cottonseed oil, and 260 for coconut oil. The oils with high saponification numbers are most suitable for soap-making purposes. Soybean oil may be substituted almost entirely for linseed oil in soft soaps, but is not entirely satisfactory for hard soaps.^{15*}

There are numerous other industrial uses for soybean oil. The practicability of the use of soybean oil in foundries for core-binding purposes has been demonstrated by the University of Illinois Engineering Experiment Station.^{3*}

The extensive consumption of soybean oil in soap and in certain edible products which took place in this country during the World War period is shown in Table 20. The more recent expansion of the

soybean industry is based mainly on the use of the domestic product and will probably be more permanent because it is being developed under competitive conditions rather than as a result of temporary con-

TABLE 20.—TOTAL INDUSTRIAL UTILIZATION OF SOYBEAN OIL AND PERCENTAGES USED IN SPECIFIED INDUSTRIES, UNITED STATES, 1916-1931

Calendar year	Total pounds	Percent of all oils used in soap industry	Percent of all oils used in lard-substitute industry	Percent of all oils used in margarin industry
1916.....	143 347 000	5.4	1.4	1.3
1917.....	260 949 000	10.3	2.8	2.6
1918.....	335 439 000	...	4.6	2.1
1919.....	150 360 000	6.4	...	...
1920.....	65 473 000	...	2.3	...
1921.....	14 827 000	1.1	1.0	.2
1922.....	15 168 000	.2	...	...
1923.....	41 555 000	.3	.1	...
1924.....	7 534 000	.2	...	(*)
1925.....	22 513 000	.2	...	...
1926.....	25 980 000	.2	...	.3
1927.....	11 366 000	.2	...	.1
1928.....	15 457 000	.2	...	(*)
1929.....	20 793 000	.4	(*)	(*)
1930.....	17 599 000	.3	...	.1
1931.....	35 501 000	.3	.9	.2

*Less than .05 percent.

ditions such as existed during the war period. If the widespread use of the oil in the orient is any indication, consumption may be expected to increase as large dependable supplies become established. The increase in industrial consumption in the United States in 1931 is important, particularly in the part that the domestic supply represented.

Methods of Processing Soybeans for Consumption

The amount and quality of the products obtained from crushed soybeans are influenced by the method used in extracting the oil. Three different methods are now in use including, first, expellers; second, hydraulic presses; and third, solvents.^{26*}

Expeller Method.—The most widely adopted method of oil extraction is a continuous-pressure process in which use is made of expellers (Figs. 15 and 16). The beans are crushed, dried to a moisture content of about 3 percent and passed thru a steam-jacketed trough which heats the beans to about 150° F. before they reach the pressing cage of the expeller. This treatment renders the product more mobile without injuring the resulting oil for use in the manufacture of varnishes or impairing the digestibility of the nutrients in the meal. The expeller operates on the same principle as a household meat grinder. The ordinary working pressure is about six tons a square inch. The

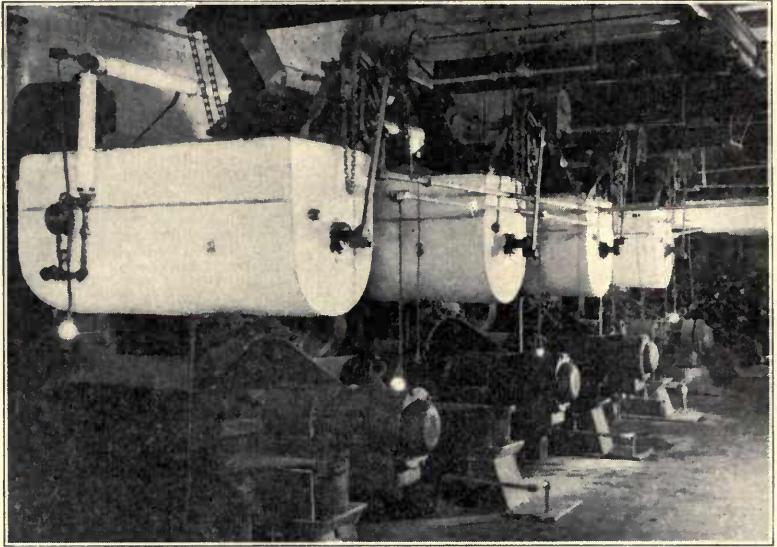


FIG. 15.—SOYBEAN CRUSHERS OF THE EXPELLER TYPE

The oil is removed by pressure under very high heat, resulting in thoroly cooked, roasted, and toasted soybean oil cake, which is reduced to oil meal.

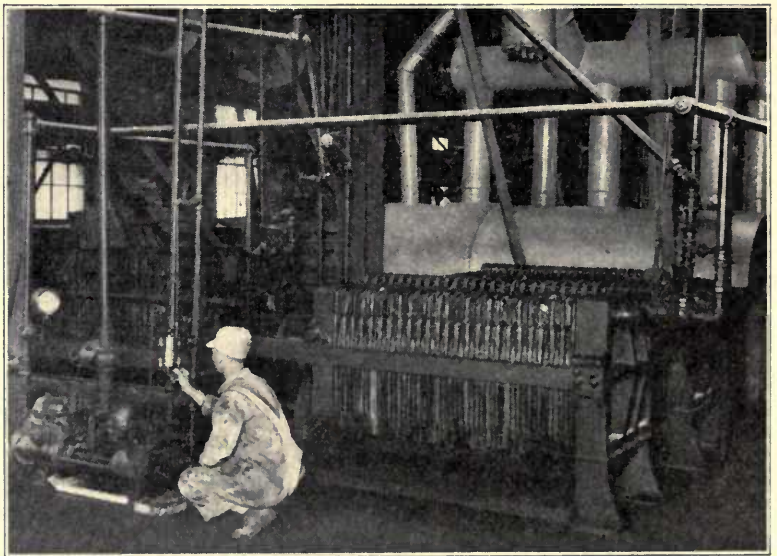


FIG. 16.—FILTER PRESSES OF EXPELLER-TYPE CRUSHER

After the soybean oil is pressed out of the soybean, the oil goes thru a filtration process to clarify it.

oil is pumped thru a rotary strainer on its way to storage, while the cake emerges in thin sheets that are broken up on a revolving cake breaker at the discharge end.

Hydraulic-Press Method.—The most ancient method of extracting oil is the hydraulic-press method, having been used in Manchuria for centuries.^{15*} The beans are prepared in practically the same way as for the expellers just described except that the beans have to be heated to a higher temperature before being pressed. This process is not continuous and requires considerable hand labor for loading and unloading the presses.

Solvent-Extraction Process.—In this method the oil from the flaked or ground beans is dissolved with benzol or a special high-test gasoline usually after the beans have been thoroly cleaned. The oil is then separated from the solvent by distilling off the latter. The solvent is used over and over. Objection has been made that some of the solvent remains in the meal. While efficiently operated modern plants can remove the last trace of the solvent, mills in the United States have not yet pushed the process to that stage of perfection. Oil obtained by this method possesses superior bleaching qualities and shows less refining loss. Likewise the meal is less susceptible to rancidity and shows better adhesive properties for utilization in the glue industry.

Solvent-extraction plants would probably be the most costly of the three types of plants to install, but where loss of solvent is economically minimized such plants would probably have the lowest cost of operation.^{19, 26*} Whatever the type of plant used, efficient operation requires an annual minimum volume of about 100,000 bushels of soybeans. Estimates of the initial cost of plants of this capacity vary from \$30,000 to \$50,000. A plant of this size can use labor efficiently and ship the oil and meal products in carload lots with a fair degree of regularity.

Competition From Other Oils

The most important vegetable oils, fish oils, and animal fats possess a certain amount of interchangeability. This is especially true after a given amount of treatment has been applied. Many of the vegetable oils, including soybean oil, require hydrogenation before they can be used in making edible products or the harder soaps.

Soybean oil, as stated above, is usable in edible products, in paint and other drying materials, and in soap products. Most oils and fats are limited to two of these uses. The various oils have their special qualities and consequently their superior uses and adaptations. Thru

processing they may serve in other forms of utilization. The following discussion considers the interchangeability of the various oils from the standpoint of their quality and indicates the importance of each in actual practice.

Drying Uses.—The use of soybean oil in paint and other drying products has usually been recognized as the highest-priced demand outlet. Linseed oil is considered the best drying oil known, and paint in which linseed oil is used has generally been considered as the highest quality paint. Recent developments, however, have shown that some replacement of linseed oil by other oils, including soybean oil, may actually improve the product.^{16*}

During times of relatively high linseed oil prices, other oils in considerable amounts have been substituted for linseed oil in paint products, usually with no adjustment of the vehicle or body to meet the change. Corn oil and cottonseed oil^{33, 34*} may even be used in some of these products, tho they are much less satisfactory than soybean oil, as indicated by their iodine number. Certain fish oils are also used. Tung oil is another oil of good drying qualities that may be used to some extent for replacing linseed oil, particularly in varnishes.^{34*} Considerable substitution of other oils for linseed oil in paint products was made during a part of the World War period. The important fact from the standpoint of the paint is not how much of the other oils is used, but what adjustments are made in the paint constituents to suit the character of the new oil.

Edible Uses.—In the field of edible products the most important vegetable oils used in this country are cottonseed oil, coconut oil, corn oil, and olive oil. Cottonseed oil is the most important from the standpoint of supply, and serves in the regulation of the price of oils for edible uses. Cottonseed oil finds its chief demand in lard substitutes, about 70 percent being used in this way. Tho a considerable amount of the remaining 30 percent goes into butter substitutes and salad oils, the greater part is utilized by the soap trade.

Corn oil, on the other hand, is utilized largely in salad oils, approximately 80 percent of the total production being consumed in this way. Both peanut and coconut oil used for edible purposes find their way largely into a butter substitute known as "nut" margarin. Until recently comparatively little soybean oil has been used for edible purposes in the United States. When properly treated, however, it may serve in any one of the three important food uses—either in lard substitutes, in margarin, or in cooking oils. Most of the fish oils have been used widely as soap oils, but with the improved methods of treat-

TABLE 21.—IODIN NUMBERS,^a SAPONIFICATION NUMBERS,^b ACID NUMBERS,^c AND USES OF THE LEADING OILS AND FATS

Product	Iodin number	Saponification number	Acid number	Uses
Chinese tung or wood oil	160-170	189-195	0-12	Substituted for linseed oil, especially in varnishes and for putty, lacquer, and ink.
Coconut oil	8-10	251-260	3-18	Important food use in nut margarin, used to some extent as lard substitute, in confectionery trade, and as filler for commercial cakes and wafers. Excellent for making cold-process soap, especially shaving and marine soaps.
Corn oil	116-130	188-193	2-20	Refined oil used particularly in salad oil but also in margarins and lard substitutes. Crude oil used in soap making and in dressing leather.
Cottonseed oil	100-115	192-200	2-10	Refined oil used in lard substitutes and to a lesser extent in making margarins and salad oils; foots and inferior grades of oil used in soap making. Used also in manufacture of washing powder, glycerin, and waterproofing preparations.
Fish oil	139-173	191	4-12	Used in paints as partial substitute for linseed oil, especially in paints for smokestacks and in oilcloth and linoleum industries. Used in soap. Used recently in butter substitutes.
Linseed oil	179-204	189-196	1-8	Used chiefly in paints and varnishes. Also used in putty, oilcloth, leather cloth, linoleum, printer's ink, and rubber substitutes. Used in soaps.
Palm oil	48-58	196-206	10-60	Used mainly in soaps, candles, and in tin plate industry. Used to some extent in margarin and lard substitutes.
Palm kernel oil	16-23	240-250	15-30	Used in manufacture of butter and lard substitutes. Chief use is in manufacture of cold-process soaps.
Peanut oil	83-95	185-192	1-14	Used in manufacture of nut margarin and salad dressing. Used in soaps, as a burning oil, in silk manufacture, and in artificial leather industry.
Soybean oil	124-148	189-194	2-7	Considerable quantities go into paint, varnish, enamel, linoleum, and waterproofing products. Used in soaps. Utilized in large variety of food products. Used in core oils.
Tallow	35-46	192-200	1-50	Used in lard substitutes and margarins. Inedible grades go into soaps, illuminating oils, and are used for lubricants.
Whale oil	121-147	188-194	1-35	Used chiefly in soaps, in tanning leather, and as an illuminating oil. Used to minor extent for edible purposes.

^aA high iodine number indicates a good drying oil and consequently a good paint or varnish oil.

^bThe saponification number indicates the number of milligrams of potassium hydroxide used in the saponification of the oil; a high number indicates satisfactory adaptation for use in soap.

^cThe acid value or number indicates the number of milligrams of potassium hydroxide required to neutralize the free fatty acids in one gram of substance.

ment that have been developed, they may substitute for some of the above oils for edible purposes.^{34*}

Soap Uses.—The major soap field is sharply divided between household or hard soaps—such as the better-known kinds of toilet and laundry soaps, including those extremely hard-water soaps often described as salt-water soaps—and two general varieties of soft soaps; namely, (1) shampoo and liquid hand soaps and (2) hospital and auto-

mobile soaps. Sodium serves as the salt base in hard soaps and potassium in soft soaps. Manufacturers of household soaps seldom produce soft soaps, and the important manufacturers of soft soaps produce no hard soaps on a commercial scale.

Thus far soybean oil has taken only a minor place as a constituent of hard soaps. Coconut oil has been considered by some to be almost indispensable in the making of salt-water soaps, the present practice of manufacturers being to use it exclusively. In a country in which so large a part of the population is found in territories where much of the water is hard and where the availability of cisterns and water softeners is not universal, a great deal of hard-water soap is used. The amount of hard soaps used in the United States is probably twenty times that of soft soap.

In the production of shampoos and liquid soft soaps, soybean oil is little used, coconut oil being employed almost exclusively, but it serves well in the other group of soft soaps; namely, the hospital and the automobile soaps, in which lines it is replacing linseed oil.

The hard soaps differ not only from soft soaps but also from one another. In white laundry soaps, where coconut oil constitutes between one-third and two-fifths of the fat base, hydrogenated soybean oil may replace a portion of the hard fat now largely supplied from various inedible animal fats. In chips, flakes, and beads used for laundry purposes, where coconut oil makes up about one-fourth of the fat content, and in high-grade toilet soaps, where coconut oil constitutes about one-fifth of the fat content, practically no utilization of soybean oil has been developed.

The difficulty of displacing coconut oil in many of its soap uses is recognized. To a limited extent palm kernel oil has become a possible substitute for coconut oil in the oil base of the hard soaps. The difficulties of using soybean oil in place of coconut oil are to be differentiated from the possibilities of using it in place of the hard fats of animal and vegetable origin which make up the remainder of the fats used in soaps. These hard fats afford the more significant field for enlarging the use of soybean oil, because by the process of hydrogenation the unsaturated fatty glycerids in soybean oil can be converted to saturated fatty glycerids, the principal components of the hard fats.

With the exception of coconut and palm kernel oil the saponification numbers of all the important oils and fats used in either hard or soft soaps differ but little, and with special treatment these oils and fats may be utilized to meet any of the demands made on a soap

oil with the exceptions indicated. Several forms of oils and fats may be used at one time or may be varied from time to time to produce a given grade of soap.^{31, 33*}

Soybean oil comes nearest to constituting an exception to the rule of special adaptation, its intermediate position and its inherent qualities suggesting that it may serve in widely diversified uses. A summary of the qualities and uses of the more important oils and fats is shown in Table 21.

Distribution of Gathered Soybeans by Uses

Some of the uses made of the 12 million bushels of soybeans gathered in the United States in 1930 are shown in Table 22. The portion used for seed was slightly larger than the portion crushed.

TABLE 22.—UTILIZATION OF SOYBEANS AND SOYBEAN PRODUCTS BY AMOUNTS, UNITED STATES, 1930 CROP^a

Use	Amount
<i>Beans</i>	<i>bu.</i>
Feed.....	2 750 000
Seed.....	4 025 000
Ground	
Food.....	200 000
Feed.....	200 000
Crushed.....	4 800 000
Total.....	11 975 000
<i>Oil</i>	<i>lbs.</i>
Edible purposes	
Oleomargarine.....	750 000
Lard substitutes.....	500 000
Other food products.....	4 750 000
Paint and other industries	
Paint and varnish.....	9 000 000
Linoleum and oil cloth.....	4 000 000
Other uses.....	3 500 000
Soap kettle.....	8 500 000
Increased stocks including oil equivalent.....	6 200 000
Total.....	37 200 000
<i>Meal</i>	<i>tons</i>
Feed	
Commercial feeds.....	84 100
Other feeds.....	15 000
Food	
Flour.....	850
Infant and diabetic foods.....	50
Other uses, including glue.....	10 000
Total.....	110 000

*Imports of soybean oil and beans practically balanced exports of soybean oil for the year October 1, 1930, to September 30, 1931.

One-fourth of the 37.2 million pounds of oil produced from crushing 4.8 million bushels of beans was utilized in paints and varnishes, about one-tenth in linoleum and oilcloth, nearly one-fourth in soap, and about one-sixth for edible purposes.

Domestic production of oil meal of all kinds was approximately 4.2 million tons in 1930. Of this amount, soybean meal represented slightly more than 2½ percent.

Beans gathered in Illinois have found their way into the three major channels of consumption; namely, feed, seed, and crushing. Of the beans gathered from the 1930 Illinois crop, the proportion used

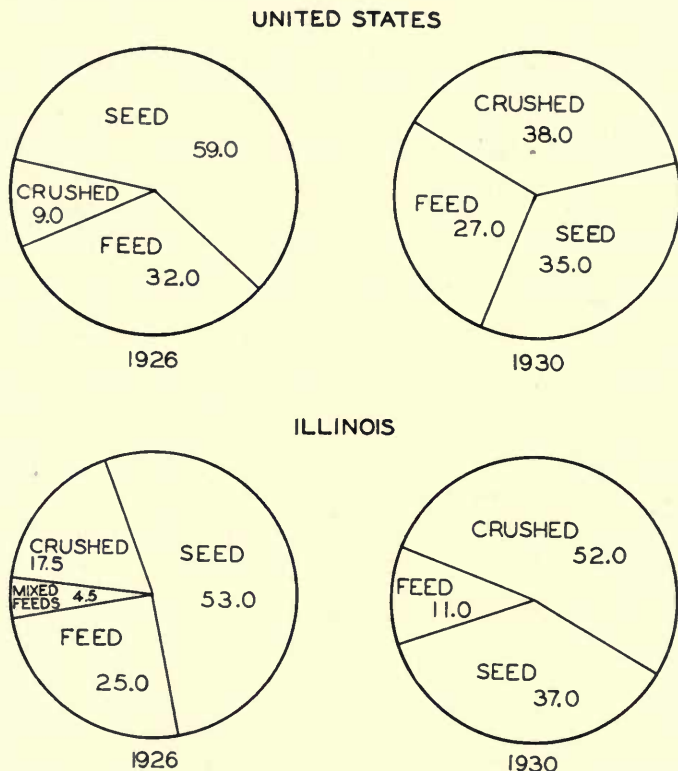


FIG. 17.—PROPORTION OF GATHERED SOYBEANS UTILIZED FOR SEED, FEED, AND CRUSHING IN THE UNITED STATES AND ILLINOIS, 1926 AND 1930 CROPS

The crushing of soybeans had not only increased to a point of prominence by 1930, but was concentrated to a decided degree in Illinois. Feeding of whole soybeans has been more important in the United States as a whole than in Illinois.

for feed was smaller than the proportion of the United States gathered beans used for feed, but a larger proportion of the Illinois crop was used for crushing (Fig. 17). Illinois has contributed the bulk of the domestic beans used for crushing in the United States (Table 23).

TABLE 23.—ESTIMATED DISTRIBUTION OF GATHERED SOYBEANS ACCORDING TO USE, ILLINOIS, 1926-1931 CROPS

(Based on total estimated amounts used for all purposes)

Crop	Used by oil mills and feed manufacturers	Used for seed in state	Used for seed outside of state	Used for feed on farm
	<i>percl.</i>	<i>percl.</i>	<i>percl.</i>	<i>percl.</i>
1926.....	22	29	24	25
1927.....	24	24	22	30
1928.....	43	19	18	20
1929.....	40	27	18	15
1930.....	52	22	15	11
1931.....	50	22	13	15

PRACTICES IN MARKETING SOYBEANS AND SOYBEAN PRODUCTS

Production of soybeans in commercial quantities is more or less concentrated in the corn-belt states. The bulk of the commercial soybeans grown in Illinois come from a relatively few counties (Table 8). Of these counties, three—Christian, Champaign, and Piatt—have been the chief producers for the entire period 1924-1932.

In 1927 and again in 1931, in order to obtain information concerning the handling of the 1926 and 1930 crops, questionnaires were sent to establishments handling soybeans in Illinois. Replies were received from 151 active handlers, or dealers, who reported their operations for both crops.* These establishments handled approximately five times as many beans from the 1930 crop as from that of 1926 (Table 24). Of the supply bought by these dealers from the 1926 crop grown in Illinois about 75 percent was shipped out of the locality to seed dealers and oil mills and about 25 percent was later sold back to farmers in the same locality.

The only district in which the local handlers reported more beans shipped in from outside the locality in 1930-31 than in 1926-27 was

*The 1927 questionnaires were distributed by the Illinois Agricultural Experiment Station and the Illinois Crop Reporting Service (a cooperative enterprise of the Illinois Department of Agriculture and U. S. Department of Agriculture) to country elevators and local seed dealers in Illinois. Usable replies were received from 747 establishments, but only 210 indicated that soybeans were handled. The 1931 questionnaire was sent by the Illinois Agricultural Experiment Station to those establishments reporting in 1927 and to enough other names to make a representative sample. Of the 360 establishments that replied, 169 reported the handling of soybeans. A summary of results, published in mimeograph form by the Illinois Station in September, 1932 ("Some Recent Changes in Marketing Illinois Soybeans," by C. L. Stewart, W. L. Burlison, and O. L. Whalin) includes fairly complete information on the market movements of Illinois soybeans of the 1926 and 1930 crops.

the Carbondale district (7). The greatest gain in supplying local needs was shown in the Bloomington, Mattoon, and Dixon districts (5, 6a, and 1). By 1930 the reporting handlers in all areas were shipping out

TABLE 24.—EXTENT TO WHICH PURCHASED SOYBEANS CAME FROM LOCAL SOURCES OR WERE SHIPPED IN FROM OUTSIDE THE LOCALITY, AND EXTENT TO WHICH BEANS SOLD WENT TO LOCAL PURCHASERS OR WERE SHIPPED OUT OF THE LOCALITY, 151 IDENTICAL COUNTRY ELEVATORS AND LOCAL SEED DEALERS, ILLINOIS, 1930 AND 1926 CROPS

Crop reporting district	Number of reports	Total bought	Bought locally	Shipped in	Total sold	Sold locally	Shipped out
1930 crop							
		<i>bu.</i>	<i>perct.</i>	<i>perct.</i>	<i>bu.</i>	<i>perct.</i>	<i>perct.</i>
1 Dixon.....	21	3 947	61.9	38.1	2 787	44.8	55.2
3 Chicago.....	17	7 981	18.9	81.1	7 981	19.8	80.2
4 Galesburg.....	9	16 121	95.1	4.9	15 966	36.4	63.6
4a Springfield.....	21	249 709	99.8	.2	249 709	1.5	98.5
5 Bloomington.....	19	87 942	89.6	10.4	86 654	10.8	89.2
6 Champaign.....	33	177 775	99.5	.5	177 537	3.8	96.2
6a Mattoon.....	15	26 037	96.1	3.9	26 037	21.2	78.8
7 Carbondale.....	7	414	36.2	63.8	414	100.0	0
9 Harrisburg.....	9	11 810	91.5	8.5	11 810	13.2	86.8
State.....	151	581 736	96.3	3.7	578 925	6.2	93.8
1926 crop							
1 Dixon.....	21	2 070	22.1	77.9	2 030	97.2	2.8
3 Chicago.....	17	4 854	1.2	98.8	312	100.0	0
4 Galesburg.....	9	3 010	83.0	17.0	3 011	76.8	23.2
4a Springfield.....	21	34 320	98.7	1.3	30 895	19.8	80.2
5 Bloomington.....	19	16 217	13.8	86.2	16 152	19.4	80.6
6 Champaign.....	33	47 055	92.6	7.4	38 909	22.0	78.0
6a Mattoon.....	15	18 185	55.7	44.3	17 735	45.8	54.2
7 Carbondale.....	7	349	63.3	36.7	349	98.8	1.2
9 Harrisburg.....	9	495	93.9	6.1	420	52.4	47.6
State.....	151	126 556	73.9	26.1	109 813	28.3	71.7

TABLE 25.—SOYBEANS PURCHASED BY 151 COUNTRY ELEVATORS AND LOCAL SEED DEALERS, ILLINOIS, 1931 CROP

Crop reporting district	Establishment reporting		Total beans bought	Beans bought locally	Beans shipped in
	Total	Handling soybeans			
			<i>bu.</i>	<i>perct.</i>	<i>perct.</i>
1 Dixon.....	58	18	750	13.3	86.7
3 Chicago.....	54	12	5 515	44.2	55.8
4 Galesburg.....	19	12	25 992	100.0	0
4a Springfield.....	35	21	305 114	99.3	.7
5 Bloomington.....	45	16	226 920	97.4	2.6
6 Champaign.....	64	34	203 673	98.1	1.9
6a Mattoon.....	34	23	77 748	100.0	0
7 Carbondale.....	30	5	200	50.0	50.0
9 Harrisburg.....	17	10	4 100	100.0	0
State.....	356	151	870 012	98.2	1.8

of their localities the bulk of the soybeans they handled, or an average of 93.4 percent. The Springfield district (4a) showed the most increase as a source of market beans.

Corresponding figures reported as of December, 1931, show that 356 handlers up to that time had purchased 870,000 bushels of beans from the 1931 crop (Table 25), which probably indicates that for the year as a whole over twice as large an amount was handled as was handled during the entire previous season. Four of the central districts supplied about 95 percent of the beans, distributed as follows: Springfield (4a), 35 percent; Bloomington (5), 26 percent; Champaign (6), 23 percent; and Mattoon (6a), 11 percent.

Sources of Market Information

The most detailed and authentic information on the soybean crop is published seasonally by the Bureau of Agricultural Economics, U. S. Department of Agriculture. This includes by leading markets wholesale prices offered by seedsmen (by weeks, January to June) and the following by states:

Size of crop (December)

Farm prices offered growers (October-February)

Movement of crop out of growers' hands (November-February)

Retail prices quoted by seedsmen (March-June)

Prospective demand (around March 10)

Retail sales of seed for season in terms of previous year (July)

Prices and other pertinent information are also distributed by oil mills, seed dealers, and grain papers. Price quotations by varieties are sent out by dealers about the first of February.

The leading markets for which regular quotations have been reported are New York, Baltimore, Richmond, Louisville, St. Louis, Kansas City, Chicago, and Minneapolis. Of these markets Louisville, St. Louis, and Chicago are the most important receivers of seed beans from Illinois. Numerous Indiana cities receive some Illinois beans. Shipments are made to Cincinnati and Memphis also. The surveys reveal that Decatur and Bloomington were the most important receiving points for soybeans raised in Illinois in 1926, and Chicago, Decatur, Peoria, Toledo, St. Louis, Bloomington, and Taylorville were the most important receiving points for the 1930 crop. The greater portion of beans was received by oil mills located at these points.

The chief sources of soybeans received for local distribution by the reporting dealers from the 1926 and 1930 crops, aside from soybeans bought locally, were stations in central and southern Illinois and Chicago, Bloomington, and St. Louis. Very few beans were shipped in from points outside the state. About 20 percent of the beans bought

by these Illinois dealers from the 1926 crop and about 12 percent bought from the 1930 crop were sold locally.

Time of Movement

Soybeans usually leave the growers' hands more rapidly in Illinois than in other states. They begin moving in October, and by January 15 an average of 48 percent of the Illinois beans are out of the growers' hands. This is to be compared with 35 percent in North Carolina, 46 percent in Missouri, and 30 percent in Indiana. All these comparisons are based on the ten crops for the years 1923-1932.

Movement of Illinois soybeans in recent years has been unusually rapid during the early part of the season. On the average for the five crop years 1927-1931, 47 percent of the crop leaving the growers' hands was out of their hands by November 15 (Table 26). An addi-

TABLE 26.—PROPORTION OF SOYBEAN CROP LEAVING GROWERS' HANDS THAT WAS OUT OF THEIR HANDS BY MIDDLE OF NOVEMBER, DECEMBER, AND JANUARY, ILLINOIS, 1922-1932

(Based on total crop)

Crop	November 15	December 15	January 15
	<i>percl.</i>	<i>percl.</i>	<i>percl.</i>
1922.....	20	25	60
1923.....	30	40	50
1924.....	30	40	40
1925.....	15	30	30
1926.....	25	25	50
1927.....	35	50	70
1928.....	55	70	70
1929.....	50	55	70
1930.....	65	65	70
1931.....	30	35	45

tional 8 percent moved out in the next thirty days and 10 percent during the following thirty days. The beans moved more rapidly than usual in 1928, 1929, and 1930 as a result of the special purchasing basis used by oil mills and feed manufacturers.*

A survey covering the 1923 Illinois crop showed that most of the sales of soybeans to elevators were made before March. January was the month of heaviest sales. The amount sold by growers direct to oil mills was small, the sales being heaviest in February. Purchases were made by mills from growers consistently from December thru April, while sales were made to farmers all thru the season up to June but were heaviest in April and May. Production and marketing at that time were evidently adjusted to the demand for seed.

*See pages 487 to 490.

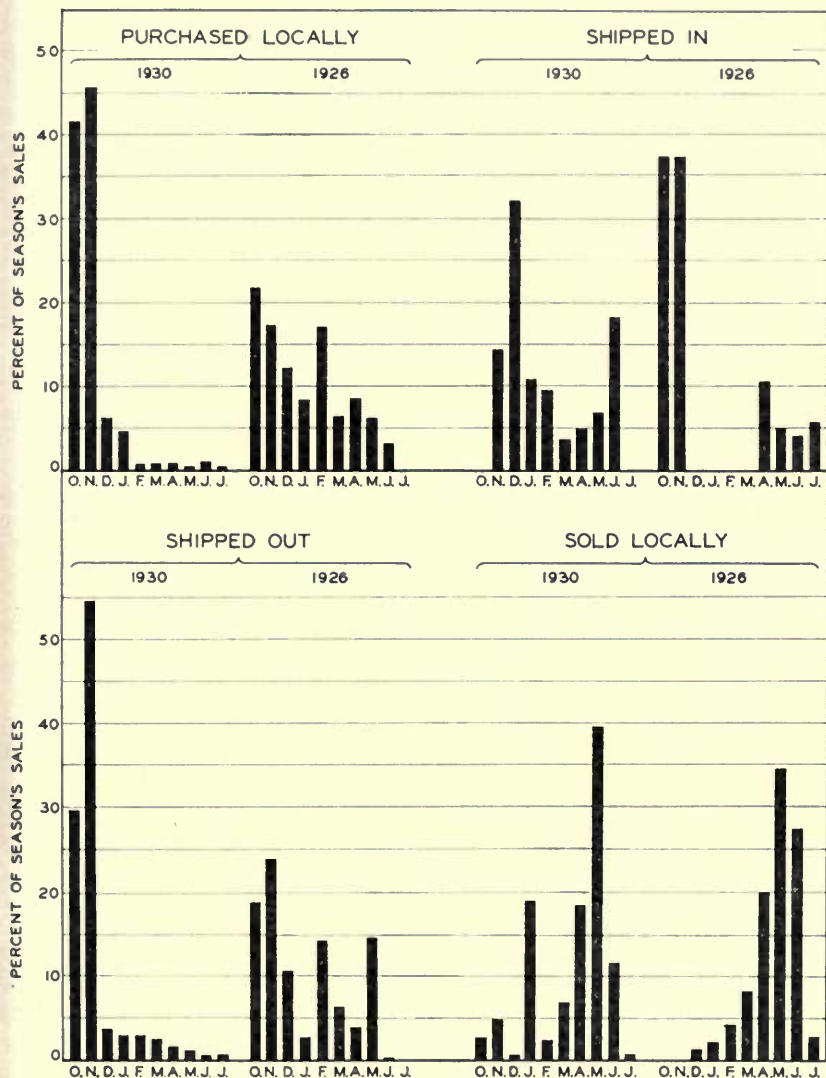


FIG. 18.—MONTHLY MOVEMENT OF SOYBEANS BY LOCAL HANDLERS IN ILLINOIS, 1930 AND 1926 CROPS

Movement of the 1930 soybean crop in Illinois was unusually rapid both because most of it went to crushing mills and because marketing arrangements afforded no incentive for holding back the crop. In-movements were smaller than out-movements and showed some tendency to develop two peaks of movement each year, one in the fall when the bulk of the crop was moving and the other in the spring when growers were making inquiries for seed.

In the case of the 1930 crop the same 151 handlers purchased nearly nine times as many beans locally as in the case of the 1926 crop but shipped in only seven-tenths as many. Local purchases from the 1930 crop were concentrated to a considerably greater extent in the months of October and November than were local purchases from the 1926 crop (Fig. 18). In-shippments were heaviest in April and May during both seasons. There was some tendency for earlier purchasing of in-shippments from the 1930 crop and less purchasing after May.

TABLE 27.—ESTIMATED PROPORTION OF SOYBEAN SEED SHIPPED OUT OF THE LOCALITY BY WHOLESALE DEALERS AND JOBBERS BEFORE SPECIFIED DATES IN JANUARY, SELECTED STATES AND UNITED STATES, 1919-1931 CROPS
(Based on total amounts shipped)

Date	United States	Illinois	Indiana	Missouri	North Carolina
	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>	<i>perct.</i>
Jan. 15, 1920.....	48.4	71.0	0	34.6	47.9
Jan. 15, 1921.....	17.1	.8	36.0	....	21.6
Jan. 28, 1922.....	23.5	38.8	11.6	23.1	26.1
Jan. 28, 1923.....	42.4	38.3	21.2	100.0	43.8
Jan. 26, 1924.....	34.5	42.5	20.0	49.3	28.6
Jan. 26, 1925.....	39.9	33.8	12.1	33.0	50.3
Jan. 25, 1926.....	33.1	42.8	19.5	44.0	27.8
Jan. 31, 1927.....	35.9	49.0	16.3	33.8	30.2
Jan. 30, 1928.....	34.0	40.1	16.9	25.6	33.4
Jan. 28, 1929.....	61.7	74.4	43.1	81.0	47.4
Jan. 27, 1930.....	51.6	68.1	47.1	65.3	33.3
Jan. 28, 1931.....	37.3	68.7	49.5	22.8	24.9
Jan. 25, 1932.....	18.9	21.3	50.0	6.5	30.0
Average, 1923-1932.....	38.9	47.9	29.6	46.1	35.0

Data for the 1926 and 1930 crops show movement out of dealers' hands, both as to the portion shipped out and that sold locally (Fig. 18). In the portion shipped out is included that which went to oil mills as well as to seed dealers. The greater part of the 1930 crop shipped out left local handlers in October and November, nearly 85 percent moving during these two months. Marketing of the 1926 crop was also heaviest during these two months, tho less than 50 percent of the crop moved; the next most important three months were May, February, and December.

Movement of soybeans from the hands of growers is to be distinguished from the subsequent distribution among dealers and from dealers to consumers. Information on the latter type of marketing is meager. As has been indicated, most of the soybeans purchased by seed dealers have been received between December and May. As an average for the ten years 1923-1932 about 48 percent of the soybeans have left the hands of Illinois seed dealers by the latter half of January (Table 27). The average for all states was nearly 39 percent.

Varieties Marketed in Different Sections of Illinois

The leading varieties of soybeans marketed in Illinois are Illini, Manchu, Midwest, A.K., Virginia, and Ebony. Others of considerable importance are Peking, Ilsoy, Wilson V, Ito San, Haberlandt, Black Eyebrow, and Ohio. Three recent varieties, besides Illini, are Dunfield, Laredo, and Mansoy. Manchu and Ito San appear among the varieties in demand in all areas taking Illinois seed. Black Eyebrow, Ebony, Midwest, and Virginia varieties are generally demanded also. From the standpoint of volume, however, Manchu is the outstanding variety, followed by Illini, Midwest, Virginia, and Ebony. In the northern half of the state the marketed varieties have been mainly Illini, Manchu, A.K., Midwest, and Ebony, and in the southern half, Manchu, Midwest, Virginia, and Ebony. Black Eyebrow and Peking varieties have been found mainly in the western part of the state.

In the 1927-1931 surveys made by the Illinois Station information was obtained concerning the varieties of Illinois-grown beans shipped out of the localities where grown and their market destinations. The varieties of the 1926 and 1930 crops shipped to the following markets are listed in the order of their importance (amount).

1926 CROP

<i>Decatur</i>	<i>Bloomington</i>	<i>Chicago</i>	<i>Other points in Illinois</i>	<i>St. Louis</i>		
Manchu A.K.	Manchu A.K. Ebony	Manchu Midwest A.K.	Manchu Midwest	Virginia Manchu Ebony		
<i>Northern Indiana</i> Manchu	<i>Southern Indiana</i> Virginia Wilson Ilsoy	<i>Louisville</i> Manchu Ebony	<i>Cincinnati</i> Manchu Ebony Black Eyebrow	<i>Memphis</i> Virginia	<i>Other southern points</i> Virginia Manchu Ebony	

1930 CROP

<i>Decatur</i>	<i>Bloomington</i>	<i>Chicago</i>	<i>Peoria</i>	<i>Taylorville</i>	<i>Other points in Illinois</i>	<i>St. Louis</i>
Yellow Illini Manchu	Manchu Illini Yellow	Yellow Illini Manchu Dunfield Ebony	Illini Manchu Yellow Dunfield Black Eyebrow	Illini Manchu	Virginia Ebony Illini Yellow Manchu Black Eyebrow	Yellow Illini Manchu Dunfield
<i>Toledo</i> Illini Manchu Yellow	<i>Milwaukee</i> Illini Manchu	<i>Indianapolis</i> Manchu	<i>Other points in Indiana</i> Illini Manchu Dunfield	<i>Other points in Ohio</i> Virginia Ebony Illini Manchu	<i>Other points in states</i> Manchu Virginia Illini Wilson	

The varieties shipped in by 151 identical Illinois handlers during the crop seasons of 1926-27 and 1930-31 and the points from which

they were received are indicated by the following tabulation, the varieties being listed in the order of their importance (amount):

1926 CROP				
<i>Peoria</i>	<i>Chicago</i>	<i>Bloomington</i>	<i>Champaign county</i>	<i>Northern Illinois</i>
Manchu Midwest	Manchu Midwest Ebony	Manchu Ebony Midwest	Manchu Illini	Midwest Manchu
<i>Central Illinois</i> Manchu Midwest	<i>Southern Illinois</i> Ebony Virginia	<i>St. Louis</i> Manchu Virginia	<i>Indiana</i> Manchu	<i>Other states</i> Wilson Manchu
1930 CROP				
<i>Peoria</i>	<i>Chicago</i>	<i>Bloomington</i>	<i>Champaign county</i>	<i>Northern Illinois</i>
Manchu	Manchu Illini Ebony	Manchu Illini	Illini Manchu	Illini Manchu
<i>Central Illinois</i> Illini Ebony Manchu Wilson	<i>Southern Illinois</i> Virginia Ebony	<i>St. Louis</i> Virginia Illini Manchu Ebony	<i>Indiana</i> Manchu	<i>Other states</i> Manchu Midwest

In marketing channels Manchu was found to be more widely distributed in Illinois in both 1926 and 1930 than was any other variety. The widespread demand for this variety has been due to the fact that it is grown in important quantities in all parts of the state except in the two southern crop reporting districts. Until about 1925, Midwest was the leading variety marketed in the state, but it has given way rapidly to Manchu. Midwest is still grown to some extent in the west-central portion of the state, but primarily for silage and pasture. The Illini variety is most important in the Galesburg (4a), Champaign (6), Bloomington (5), and Mattoon (6a) districts. Ebony, mainly a hay bean, is marketed in small amounts in the central districts, but scarcely at all in the two northern and two southern districts. Virginia, a hay and seed bean, is marketed chiefly in the Springfield (4a), Mattoon (6a), Carbondale (7), and Harrisburg (9) districts. Ilsoy, a hay and seed bean, is marketed in the same areas as Virginia.

Selling Soybeans for Seed

The ever-increasing acreage of soybeans in the United States has kept the demand for seed active up to and including 1931. Many of the early Illinois growers specialized in seed production. Oil mills have assumed importance as an outlet for Illinois soybeans only since 1925.

Demand for soybean seed has come mainly (1) from the expanding acreage, chiefly in the corn belt, devoted to the growing of soybeans for beans, and (2) from the need for seed of medium-early varieties for hay and pasture in the feeding and dairy sections of the corn

belt, in territory adjacent to the corn belt, and in certain areas in the southern states. Of these two sources of demand that for seed in the corn belt was the more important thru 1922, but once soybean growing became established in the various parts of the corn belt, the growers became less dependent upon shipped-in seed, and since 1922 the demand for seed of hay and pasture varieties has been the more important. Before 1925 the demand for seed was sufficient to absorb most of the good seed beans on the market.

In the livestock and dairy regions and in those southern states which use soybeans mainly for hay and pasture, the seed demand has continued, especially for the medium-late varieties, which are best grown for seed in the latitude of the southern counties in Illinois.

If livestock feeders and dairymen in the corn belt raise their own soybean seed rather than buy from growers specializing in its production, they will tend to diminish the outlet for seed. Since costs of harvesting and threshing soybeans have been high and since weather conditions are somewhat uncertain during the harvest season, there is likely to be a more or less permanent tendency to concentrate seed production within certain restricted areas and on specialized farms. If this occurs it will greatly facilitate the marketing of high-quality seed.

A survey made by the U. S. Department of Agriculture in 1919 showed that 13 percent of Illinois soybean seed was raised on the farms using it, 9 percent was obtained from neighboring farms, and 78 percent was obtained from seed dealers.^{29*} Replies from Illinois farmers indicated that of the 1923 crop of soybeans harvested by them about 35 percent went directly to farmers, 36 percent to seed companies, 8 percent to country elevators, and 5 percent to oil mills. Of the soybean seed planted in Illinois in 1925, about 54 percent was grown by the farmer planting it, 27 percent was bought from other farmers, 10 percent from local seed dealers, and 9 percent from distant seed dealers.* As the crop has become better established, fewer growers have purchased their seed except in areas where seed frequently fails to mature or where the crop is harvested mainly as hay or forage.

Sales by Individual Growers.—The selling of soybean seed by individual growers is on the decline. Some of the reasons given are the following: (1) enthusiasm for the soybean seed enterprise has waned as large profits from local sale of seed have disappeared; (2) the price is too low for many growers to be bothered with local selling, most sales being made in April and May when growers cannot afford to stop field work; (3) grower-sellers object to granting credit to grower-

*Unpublished data furnished by the Illinois Crop Reporting Service, Illinois Department of Agriculture and U.S. Department of Agriculture cooperating.

buyers; (4) there is an increasing tendency for growers to dispose of their entire crop to seed dealers, leaving to dealers the trouble and expense of marketing the seed.

Sales by Local Dealers.—When the soybean crop increases to a stage of commercial importance, local dealers handle a large portion of the crop not utilized on the farms where grown. These handlers render two services; they take the crop from surplus areas, reclean it, place it in areas where needed, and hold and store it until there is a demand for it. Local dealers buy for local needs and for resale to wholesale dealers or to distant retail dealers. In surplus areas the local dealer merely redistributes seed within the community and disposes of the surplus. By combining the handling of soybean seed with other seed and perhaps other classes of merchandise, he can sell comparatively small lots of seed to better advantage than can the growers whose business is primarily that of production.

In areas of deficit seed production local dealers have a more clearly defined function. By purchasing in fairly large lots they can buy and ship in more cheaply and with less trouble than individual growers. Dealers can also assure themselves more definitely as to the quality of the product than can individual growers. Dealers in deficit areas have opportunities to encourage the use of good-quality seed of the better adapted varieties.

Sales by Wholesale Dealers.—Wholesale dealers in soybean seed are largely responsible for carrying and storing the crop, for keeping varieties distinct, for furnishing seed having desired qualities, for assembling seed from surplus areas, and for distributing it in deficit areas. The wholesale handling of seed is a specialty business. It requires considerable capital, special management, and a reasonable amount of permanence. Wholesale handling of soybean seed must ordinarily be combined with a general seed business because as a specialty it would not furnish a large enough volume of business.

Wholesale dealers usually arrange to have their supplies of soybean seed well in hand and germination tests completed by March 1. They then send out price lists to jobbers, retail dealers, and selected growers. Most of the seed purchased later in the season is for the purpose of filling in shortage of certain varieties or for taking care of extra demands. Inquiries from jobbers and retail dealers begin to arrive by the first of February, and the greater portion of the sales are made before the first of May. These sales are made on the basis of information included in the price lists. Sales are usually in small lots of bagged beans, altho most price lists give some inducements for shipments

above a specified size. Unless prices change a great deal, no new price lists are sent out but supplementary information may be supplied from time to time. Wholesale sales of soybean seed are nearly always for cash.

Sales by Retail Dealers.—Retail dealers buy seed beans both locally and from more distant dealers. The local beans are usually cleaned at the expense of these dealers unless they are already suitable for planting. In most cases in which no information as to germination tests is supplied to retail dealers, none is made available to purchasers.

In a territory of considerable retail seed movement retail dealers often make early purchases in quantities of those varieties for which there is a dependable demand, and later acquire supplementary supplies if needed. In areas of small demand the retail dealer acts simply as a commission agent, ordering for the few growers who request such service. Retail dealers usually inform growers about the available seed by advertisements in local newspapers and especially by direct contact as growers come in for other seeds and supplies.

In many communities retail dealers buy beans from one farmer and sell to another; in some cases all seed handled is grown in the community. Many of the retail sales are on book account, the settlement being made after the purchaser has a crop of soybeans or other cash crop to sell to the dealer.

Sales by Cooperative Agencies.—In several states there are crop improvement organizations whose chief aim is to promote the use of better seed.

The Illinois Crop Improvement Association, since its establishment in 1921, has exerted considerable influence on the improvement of soybean seed. The association was responsible for the introduction in 1922 of the present strain of Manchu. Altho mainly a seed certification association, it has given encouragement in the disposal of seed in certain localities thru cooperation with the local seed organizations, the first of which, the Tolono Soybean Seed Association, was established in 1924 in Champaign county. Similar organizations have arisen at other points in the county, a county-wide association being first attained in 1928.

The beans of the members of the Tolono association are taken directly from the threshing machine to the warehouse where they are cleaned and stored. No outside beans are handled, except when the pool supply is low and then only when the seed is of known origin and meets certification requirements. The average expense for handling and marketing soybeans by the Tolono association has been about

15 cents a bushel. Sales are made to both retail and wholesale dealers. Prices are established rather early in the season and contacts are made with prospective purchasers. As the season advances, prices are adjusted so as to dispose of the entire crop. The greater portion of the sales are made in bulk in carload lots.

In certain communities in Illinois and in some other states an informal type of cooperative selling of soybeans has arisen. In such groups the advertising is usually carried on in the name of one of the members, who serves also as an informal manager for the group. By far the greater quantity of soybeans handled thru cooperative agencies has been handled by purchasers of seed. Local purchasing organizations affiliated with farm bureaus have developed in certain counties, notably in Sangamon and DeKalb counties, Illinois. Another arrangement has been the disposal of the seed of farm-bureau members in certain counties thru local seed firms on favorable terms.

Some combining of buying and selling functions of cooperative associations has taken place. In general, cooperative marketing of soybeans and other seed is a recent development, most of it having arisen since the World War. A few cooperative associations operate on a fairly large scale and buy and sell much as do wholesale dealers except that they tend to give similar attention to the orders from individual growers and those from dealers.

Sales of Seed by Oil Mills.—Some soybean mills buy and sell seed beans in addition to beans for crushing. One of the earliest crushing plants in Illinois was developed to utilize the surplus beans from the seed trade.

All the above agencies serve to some extent in establishing contacts between buyers and sellers, in performing the ordinary services of marketing, in insuring quality and variety of seed, and in adding more definiteness to price quotations. They aid in establishing a common ground of interest on the part of growers and consumers in the production of high-quality products.

Selling Soybeans for Industrial Uses

Nearly all the soybeans entering marketing channels from the Illinois crops are first handled by country elevators or local dealers, unless they are grown in the vicinity of oil mills and are sold directly to the mills. Soybeans sold to local dealers are stored in bulk by them for shipment in carload lots; yellow beans are handled separately from the others.

Soybeans are bought by oil mills according to federal grades, and

the farmer is usually paid on that basis. The mills buy on the basis of U. S. No. 2 grade, but usually pay premiums for No. 1 and for Extra No. 1 over the No. 2 price. They likewise discount No. 3 and No. 4 beans from the price of No. 2 beans. All poor-quality beans marketed go to oil mills at low prices. Soybeans going to oil mills are seldom cleaned. Most of the beans bought by local dealers are held only a short time. Elevators handle such soybeans in the same manner as other crops.

Guaranteed Minimum Price of 1928 and 1929.—Beginning with the 1928 crop the marketing of soybeans in Illinois has furnished a unique example of marketing practice as applied to the general crops of the corn belt.

Previous to 1928 some of the producers and users of soybeans had been considering ways and means of increasing the acreage devoted to this crop so that a dependable supply of sufficient volume to be attractive to commercial processors would be assured. The extensive winterkilling of wheat during the 1927-28 season left a considerable acreage of land in the soybean-growing districts of the state which would have to be planted to some spring crop.

In April, 1928, meetings were held by representatives of producers and of leading soybean crushers of Illinois which resulted in the crushers offering to contract for the soybean crop from 50,000 acres in Illinois at a price of \$1.35 a bushel for No. 2 beans delivered at Peoria or Bloomington.

The full quota of contracts was obtained in 1928, and the mills extended the price to soybeans which had not been contracted, so that about 1.2 million bushels of beans were received by these mills during the fall and winter of that year. Under the stimulus of an assured market at a guaranteed price, the acreage of soybeans showed considerable increase that year.

The contract was especially liberal in the provision that if a grower were offered a better price than that stated in the contract, he would have the privilege of selling to other buyers, provided that he first gave the contracting crushers the opportunity of purchasing at the advanced price. In other words, the crushers provided an assured market for the beans without limiting the chances of a better market. The contract permitted the grower to anticipate a seed demand and still retain his commercial outlet under the contract.

Under this arrangement the crushing mills received a very large proportion of the commercial soybeans of the state. Since there was little incentive for growers to hold the beans, they were rushed in as

soon as threshed, the Peoria mills receiving 150 cars during a single day. The mills were forced to declare a virtual embargo for a few days until they could obtain storage space. They were out of the market only four days, a change in the weather assisting them in holding back the flood of beans. There was no further serious trouble in this respect.

Practically the entire output of soybean oil meal was turned over to one of the parties to the contract, the Grange-League-Federation Exchange of Ithaca, New York, a cooperative organization furnishing feeds and other supplies to dairy sections in the East. This meal was used in the preparation of mixed dairy feeds. The beans were stored and crushed thruout the year so as to furnish a seasonal supply of both meal and oil.

Under this original contract the mills had practically underwritten the 1928 soybean crop in Illinois and had thereby secured a fairly large volume of beans. Essentially the same contract was again offered to growers in the spring of 1929. The principal difference was that the price was on a sliding scale beginning at \$1.33 for No. 2 beans delivered up to November 15, and increasing one cent each 15 days until a price of \$1.38 was reached for beans delivered after January 15.

Late in the summer of 1929 the price of linseed oil and meal began to advance because of shortage in the crop of flax both in the United States and Argentina, and it was apparent that soybeans would, on the same basis, be worth more than the contract price. The contracting millers therefore voluntarily raised their price to a flat \$1.50 for No. 2 beans delivered at the mills. There was lively bidding by other millers, and quite a few of the beans which had been contracted for were sold elsewhere by producers.

The sliding scale of prices adopted in the 1929 contract was designed to compensate the producer for withholding his beans from shipment. The mills in the meantime had increased their storage facilities, and when the contract price was raised in the fall of 1929, it was again made a flat figure. The assurance which the processors derived from having the beans actually in storage in their own elevators was evidently sufficient to justify them in carrying these costs.

The maximum handling charge of five cents a bushel which was offered to the country elevators in 1928 was far from attractive where beans were handled in small amounts and hence used disproportionate amounts of storage space, where it was necessary for the elevator to hold the beans for some time, or where the elevator had to assume the danger of high-moisture beans going out of condition.

In 1929 many local handlers had no signed agreements with the contracting mills and when the beans came to their elevators, some of them sold considerable quantities to the highest bidders. In this way mills which had not entered into the contract were in some cases able to fill their requirements from beans which presumably were intended for the contracting mills.

The contract with the growers was specified in terms of acres rather than bushels. Under such a contract it was to be expected that the production of the acres under contract would be reported large if the market went down and small if prices in the outside markets rose above the contract price. Since the contract was intended to stimulate production, and since many farmers had not had enough experience with soybeans to have a very good idea as to how large a yield they might reasonably expect, it may be assumed that the mills were willing to enter this arrangement in the hope that the increased amounts of beans made available would justify the risks assumed. The same may be said of the provision in the contract for "giving the rise of the market," which the processors regarded as necessary in order to secure the desired amounts of soybeans.

In 1928 the original intention was to contract for a million bushels of beans. When the crop started to move in the fall, it became obvious that unless the contracting mills extended the same price to the balance of the crop, competitors would obtain at least a part of the desired volume at lower prices. As a result, contracting mills received contract and noncontract beans on the same basis. While this was probably the expedient thing to do, it removed a large part of the incentive to the farmer to sign the contract the following year, and while a larger acreage was planted, a smaller acreage was represented by the contracts.

Altho the contracts provided for delivery at either Peoria or Bloomington, nothing was specified as to how the point of delivery for individual lots of beans was to be decided. Naturally each producer chose to deliver to the point having the lower freight rate from his station. The result was an occasional lack of adjustment to the requirements of the mills. The mills absorbed the difference in freight, however, when it was necessary to reship to the more distant point.

Contracts of a similar nature were made in the winter of 1929-30 for the 1930 crop by another company which, up to that time, had not processed soybeans on an extensive scale. The minimum price specified in these contracts was above the market prices quoted in the fall of 1930, and apparently the results were not profitable to the buyer. Since

1930, contracts which specified minimum prices have not been available to Illinois growers. Falling prices tend to increase the hazards to buyers who contract to pay minimum prices.

The soybean contracts fulfilled a major purpose in directing attention to the economic problems of this new crop, and particularly in contributing toward a systematic market development.

Selling the Pooled Soybeans of 1930 and 1931.—During October, 1929, the Soybean Marketing Association was formed in Illinois for the purpose of representing the interests of growers and stimulating industrial consumption. The Illinois Agricultural Association was largely instrumental in bringing about the soybean organization, and the management contract is vested with its affiliate, the Illinois Agricultural Service Company, Chicago, Illinois.

The members of the Soybean Marketing Association, operating at first under a three-year marketing contract, consigned their crop to the association pool.

Development of marketing machinery for handling the 1930 soybean crop was started in August of 1930. Application was made to the Federal Intermediate Credit Bank of St. Louis and the Federal Farm Board for commodity loans which were granted in the sum of \$650,000 for financing and marketing the crop. Contracts were entered into for storage space in bonded warehouses under federal license which could issue warehouse receipts acceptable as collateral.

Sales contracts were then effected with six important processing companies. Contracts were also made with 192 country elevators for receiving and shipping the beans handled by the association. A dollar a bushel was established by action of the board of directors as the amount to be advanced on No. 2 soybeans. That advance was maintained thruout the season.^{24*}

When time for entering into sales contracts for the 1931 crop arrived, most crushers offered only 25 cents or less a bushel. Agreement was finally reached with one of the largest mills and a second mill cooperating with it, whereby the association would receive an immediate payment of 30 cents a bushel on delivery. On the strength of this, an advance of 20 cents a bushel was made to the growers. While the beans were transferred to the crushers for the initial consideration of 30 cents a bushel, the agreement entitled the association to additional marketing responsibilities and returns. After expenses were deducted, including an agreed fixed charge for processing, the profit from the sale of the oil and oil meal was to be divided between the association and the crushers. Furthermore the association retained a voice in the

sale of the products. Final sales permitted additional payments of $5\frac{3}{4}$ cents a bushel. Thus the final price received by members of the association was $25\frac{3}{4}$ cents a bushel.

As the season advanced, an export demand developed of which the association easily took advantage because of its large volume of beans. This market became so favorable that it was more profitable to sell part of the stored beans for export than to process them. A supplementary agreement was made with the cooperating crushers to aid in meeting this new situation.

The Soybean Marketing Association in pooling the soybean crop of its members over this two-year period was handicapped by falling prices. It is of course impossible for a cooperative association which pools to pay as good prices as can be obtained in the open market early in the season, unless it makes an advance which is above the average price realized. It turned out that the soybean association over-advanced on its initial payment in 1930. Had there been an advancing market, a pool distributing sales more or less over the season or sharing in advances on the products might have paid an average price above the early season open-market price, but below the later season open-market price. Such differences in prices must be expected by members of pools which operate alongside an open market paying prices based on day-to-day developments.

It is significant that the Soybean Marketing Association developed direct dealings with the processors and exporters. It was instrumental in working out arrangements with large-scale processors for selling soybeans in such a way that the prices received were based on the actual value of the products into which the beans were processed, not as prices of a particular date, but over a period of time.

While two years of experience is not enough to judge of the permanence of this method of selling soybeans, cooperation between producers and users of beans, which this method of pooling provides, has made for a mutual understanding of the problems involved in marketing the products and in stimulating the development of the entire industry.

Selling Soybean Oil and Oil Meal

Most of the oil processed from Illinois soybeans is sold on contract thru vegetable oil brokers of Chicago. The National Soybean Oil Manufacturers Association of that city distributed early in 1932 revised trading rules the following excerpts from which are illustrative of the carefulness with which marketing problems are being approached in present-day oil dealings.

The rules as to oil may be summarized as follows:

Quality	Maximum with penalty	Maximum without penalty	Minimum
Specific gravity at 15.5/15.5° Centigrade....	...	...	.9240
Iodin No. (Wijs).....	...	...	131.0
Saponification No.....	...	...	190.0
Unsaponifiable matter, percent.....	...	1.5	.....
Acid No.....	4.0	3.0	.....
—or free fatty acids, percent.....	2.0	1.5	.....
Volatile matter at 105° Centigrade.....	.2%	.1%	.....
Foots.....	.....	2.5%	.....

"Off Quality. Crude Soybean Oil shall not contain in excess of 1½% Free Fatty Acids or ¼¹⁰th of 1% moisture and impurities.

"Shipments up to 2% Free Fatty Acids and ¼¹⁰th of 1% moisture and impurities shall constitute legal deliveries with an allowance to the buyer of ½% of the purchase price for any excess Free Fatty Acids above 1½% and up to a maximum of 2%, fractions in proportions, and with an allowance of ¼¹⁰th of 1% of the purchase price for any moisture and impurities in excess of ¼¹⁰th of 1% and up to ¼¹⁰ths of 1%.

"Quantity. One (1) tank car to be understood as 61,000 pounds with 2% leeway allowed.

"Terms. Unless otherwise specified at time of sale, terms are to be *net cash sight draft with bill-of-lading and other proper documents attached.*

"Time of Shipment. Unless otherwise specified at time of sale, shipment is to be made during the month or months specified in the contract with a tolerance period of fifteen (15) days without charge to the buyer. After the expiration of these 15 days the seller shall have the right to either ship the car to the buyer within five days, after giving written notice by registered mail or telegraph, charging \$2.00 per day for the period of delay after the tolerance period, or may sell the contract, or may sell the oil in the open market for buyer's account or store oil and make a charge for such storage of \$1.50 per tank car per day. In case the contract is a drum or barrel contract, an equivalent storage charge is to be made of 30c per 400* drum or barrel per month, or 1c per 400* drum or barrel per day.

Shipments shall be understood as follows:

- Quick shipment—within two working days
- Immediate shipment—within five working days
- Prompt shipment—within ten working days

Rejection. All oils not constituting legal deliveries shall be subject to rejection. Such rejection to be made by telegraph within seventy-two hours after delivery of the oil to buyer's plant. If rejection is uncontested, seller shall tender replacement shipment within twenty-four (24) hours from time of acceptance of rejection. A telegram offering delivery, followed by a confirming letter on the same day, shall constitute a tender. Actual shipment must follow within forty-eight hours of the sending of the telegram unless otherwise agreed upon between buyer and seller.

"Brokerage. On all sales of Soybean Oil through brokers, the seller shall pay the brokerage, unless otherwise specifically agreed at the time of sale, and the rate is one (1%) per cent of the sale price.

"Brokerage is payable regardless of whether deal is actually consummated or not.

"Brokerage is payable on net weights, and F.O.B. Mill value.

"**Tank Cars.** It is understood that seller's tanks are to be provided unless otherwise specified at time of sale.

"**Unloading.** Buyer agrees to empty seller's tank cars promptly upon arrival and to return as per seller's instructions. Forty-eight (48) hours will be allowed for unloading and \$2.00 per tank for each 24 hours thereafter is to be paid by buyer to seller."

Soybean oil meal has been disposed of mainly thru direct sales by processors to mixed-feeds manufacturers and to a less extent thru brokers. The most common sales are made for bagged oil meal on a basis of tons, in carlots, with settlement by sight draft. In order for soybean oil meal to command the highest price, it must have (1) a bright yellow color, (2) a sweet, nutty flavor (not burnt), and (3) a protein content of 42 to 44 percent, tho a slight premium may be paid for a higher percentage of protein.

ELEMENTS OF COST IN MARKETING SOYBEANS

Marketing Mill Beans

The costs involved in marketing soybeans are different for the two principal outlets, mill and seed. The principal items of cost in handling mill beans are (1) local elevator costs, including costs of temporary storage, (2) freight, (3) selling costs, and (4) storage costs, if the beans do not move directly to the mill.

Local Elevator.—The actual charge put on a particular lot of beans may be established either as a margin earned by purchase and sale or as a service charge for handling without actually taking title. The actual cost to an elevator of handling soybeans should not be very different from the cost of handling wheat. Bushel for bushel, beans and wheat are of the same weight and have about the same value. An analysis of the costs and capital investments in 1927 of 79 farmers' elevator companies located in eastern and central Illinois indicated that an average margin of 4.3 cents a bushel was applicable to wheat.^{17*} Some items of cost have been reduced since 1927, and the generally lower level of crop prices will in the long run make it necessary for crops to be handled on lower margins.

The method whereby local companies handle beans at a fixed charge per bushel has been fairly common since the contract or pooling system of sale has been used. In the contracts made with local elevators by the Soybean Marketing Association in 1930, a maximum charge of 5 cents a bushel was established. In some cases this was reduced by private arrangements between the grower and the local elevator. For this charge the local elevator company advanced cash to growers equal-

ing the value of the beans until repaid by the association; it stood shrinkage, if any, provided temporary storage, and loaded out and shipped the beans. In fact the elevator handled the product as tho it had purchased the beans for its own account, except that it was not responsible for selling or for price fluctuations.

In the handling of the 1931 crop these charges were reduced. The setting of the handling charge was left somewhat to the local advisory councils of the Soybean Marketing Association within their respective counties, it being their duty to obtain agreements with elevators in their counties to handle the pool beans. The board of directors of the association, however, had placed a limit of 4 cents a bushel on the handling charge.*

Information received from 166 identical establishments handling soybeans from the 1930 and 1931 crops in Illinois indicated that 30 and 23 percent respectively were recleaned (Table 28). The cost of re-

TABLE 28.—ESTIMATED COST OF HANDLING SOYBEANS FOR ALL PURPOSES BY 166 IDENTICAL COUNTRY ELEVATORS AND LOCAL SEED DEALERS, ILLINOIS,*1930 AND 1931 CROPS
(Cents per bushel)

Crop reporting district	1930 crop				1931 crop			
	Re-cleaned	Cost of recleaning	Other costs	Total cost	Re-cleaned	Cost of recleaning	Other costs	Total cost
	<i>perct.</i>				<i>perct.</i>			
1 Dixon.....	84	9	32	34	0	..	38	..
3 Chicago.....	0	..	5	5	0	..	3	3
4 Galesburg.....	12	4	7	11	(b)	4	3	7
4a Springfield.....	31	3	4	5	41	3	3	4
5 Bloomington.....	39	5	8	9	10	5	4	5
6 Champaign.....	30	3	4	5	18	1	3	3
6a Mattoon.....	34	4	5	5	39	4	4	4
7 Carbondale.....	0	..	13	13	0	..	..	..
9 Harrisburg.....	2	12	5	19	(b)	5	..	..
State.....	30.3	3.4	4.9	5.9	23.4	3.1	3.4	4.1

*Each district and state is weighted by number of bushels reported for given item. ^bLess than 1 percent.

cleaning given by all handlers reporting on these crops averaged 3.4 cents a bushel for the 1930 crop and 3.1 for the 1931 crop. In 1931 the range varied from one cent in the Champaign district (6) to 5 cents in the Bloomington and Harrisburg districts (5 and 9).

Other handling charges per bushel, besides cleaning, reported for the 1930 crop averaged 4.9 cents and for the 1931 crop 3.4 cents. The

*Information supplied by Wilbur H. Coultas, Manager, Soybean Marketing Association.

total cost per bushel for the local handling of the 1930 crop, as reported, averaged 5.9 cents, and for the 1931 crop 4.1 cents.*

The replies from local handlers in leading soybean-producing counties of Illinois in 1927 and 1931 indicated average handling charges, other than cleaning, to be 12 cents a bushel for the 1926 crop, with a county range from 3 to 20 cents (Table 29). The same handlers reported an average of 4.8 cents for the 1930 crop, with a range of 4 to 6 cents for the counties listed.

TABLE 29.—COST OF HANDLING SOYBEANS OTHER THAN CLEANING BY IDENTICAL COUNTRY ELEVATORS AND LOCAL SEED DEALERS IN LEADING PRODUCING COUNTIES, ILLINOIS,^a 1926, 1930, AND 1931 CROPS

(Cents per bushel)

Counties	52 identical handlers		57 identical handlers	
	1926	1930	1930	1931
LaSalle.....	..	5	5	3
Hancock.....	..	5	5	3
Schuyler.....	10	5	5	3
Cass.....	..	5	5	3.5
Christian.....	14	5	4	3
Morgan.....	..	5	5	4
Sangamon.....	..	4	2	2
DeWitt.....	..	4	5	3
McLean.....	..	..	..	3
Macon.....	8	5	5	3.5
Menard.....	3	4	4	3
Champaign.....	15	4	4	3
Livingston.....	14	5	5	3
Piatt.....	..	..	3	2
Vermilion.....	20	6	6	3
Coles.....	..	5	5	4
Douglas.....	..	..	5	4
Average.....	12	4.8	4.4	3.2

*The 1926 and 1930 comparison represents mainly beans handled for seed, while the 1930 and 1931 comparison includes all beans handled.

Comparison of handling costs other than cleaning for the 1930 and 1931 crops shows an average cost of 4.4 cents for the 1930 crop, with a county range from 2 to 6 cents, and an average charge of 3.2 cents for the 1931 crop, with a range from 2 to 4 cents. The most common figure given for the 1930 crop was 5 cents and for the 1931 crop 3 cents.

*There is no inconsistency in the fact that there are some cases in which the sum of the cleaning cost and other handling charges is not the same as the total cost shown. For the Champaign district (6) in 1931 the sum shown is 4 cents and the total handling cost 3 cents. Only 18 percent of the beans in that district were cleaned, so that at the rate of 1 cent a bushel for cleaning, less than one-fifth cent was added for this item when the charge was spread over the entire 100 percent of beans reported. Furthermore the tendency to disregard fractions of less than a half cent would cause the one-fifth under consideration to be dropped from all but the state total.

The cost or charge for local handling of soybeans was not well established in 1926-27, but by the time the 1930 and 1931 crops were marketed, charges were falling in line with other farm products, so that the handling charges for the 1931 soybean crop were comparable to the charges for other products.

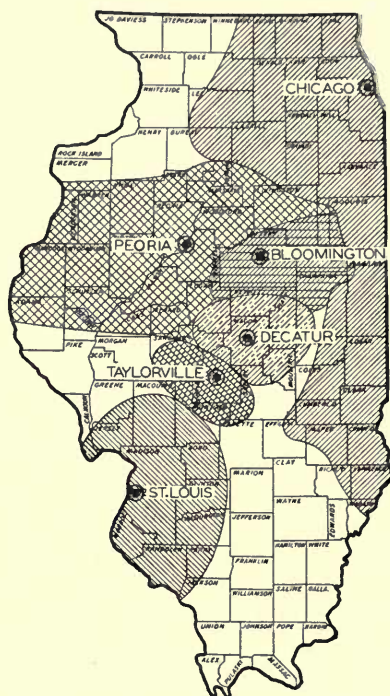


FIG. 19.—AREAS SERVED BY SIX LEADING RECEIVING MARKETS FOR SOYBEANS PRODUCED IN ILLINOIS, DETERMINED MAINLY BY FREIGHT COSTS

Illinois is well supplied with crushing mills. These mills have been located not only near concentrated areas of production but in localities favored by transportation connections for economical distribution of the products.

Transportation.—Most of the soybean crop moves by rail from local points to the milling or storage centers, altho beans from areas around the milling centers have been trucked in in increasing amounts. Soybeans have usually taken the grain rates.

Six important concentration points have developed for soybeans grown in Illinois; namely, Bloomington, Chicago, Decatur, Peoria, St. Louis, and Taylorville. Chicago, Peoria, and St. Louis have considerable advantage from the standpoint of transportation facilities and freight rate arrangements, while Taylorville, Decatur, and Bloomington

ton are much nearer the chief centers of production. The practical limits of the supply area for each market, as determined by freight rates, is shown in Fig. 19. These areas in most instances have equally favorable rates to two markets. Most of the beans in the areas of concentrated production reach terminal markets with freight charges of 4.5 cents to 7 cents a bushel. Truck shipment has been more eco-

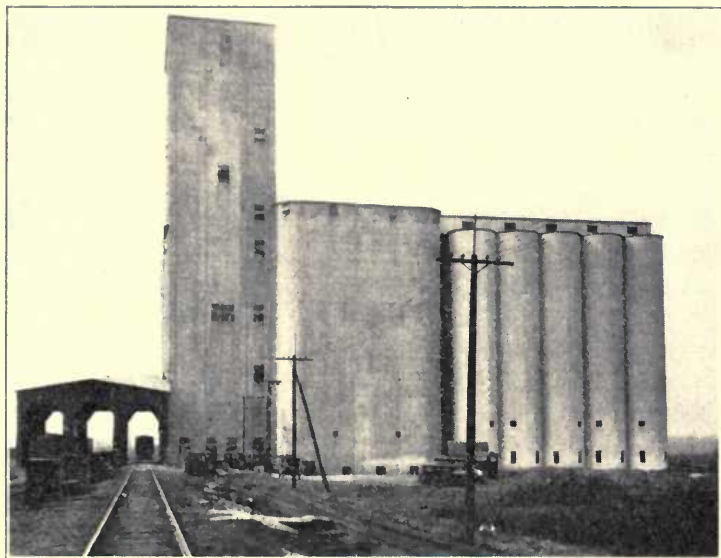


FIG. 20.—TERMINAL STORAGE ELEVATOR

The elevator shown above is located at Peoria, Illinois. It has been used by the Soybean Marketing Association for the storage of soybeans.

nical for many of the beans going to Taylorville, Decatur, Bloomington, and Peoria, as the main part of the tributary area is within 50 miles of these markets, which are served by an unusual network of good roads.

In some cases producers trucking beans to Bloomington and Peoria have received prices no higher than local station prices when allowance is made for local elevator charges. Processors have not made price adjustments to compensate for the elimination of the railroad cost between the local station and the mill that results when beans are trucked. The explanation advanced is that the processor has been losing the benefit of applying reshipping rates in the case of trucked-in beans. This loss has about equaled the freight charge from local station to mill. Trucking charges averaged about 3 cents a bushel for

the 1931 crop. Moreover freight rates have not responded to lower price-levels as have elevator costs. Increasing use of truck transportation can be anticipated under the circumstances.

Selling.—Soybeans are not regularly sold thru organized exchanges, as are many other kinds of crops. Instead, direct contacts have been built up between mills and local elevators. Grain brokers at interior points have been used by some buying agencies. The charge has usually been one cent a bushel.

Soybeans are bought on the basis of grade, and inspection fees must be included in selling costs. These are assessed on the basis of cost and vary at different points. Weighing charge is another small item of cost.

Storage.—The processor takes storage costs into consideration in arriving at the price which he can afford to pay for the beans. If beans are stored by a selling agency, storage costs must also be considered (Fig. 20). There are four elements in storage costs: (1) use of storage space; (2) interest on money invested in product during time stored; (3) shrinkage; (4) any processing that may be needed to make beans a storable product, such as drying, cleaning, and treatment to prevent deterioration in grade or quality, resulting from insect injury or other causes. Over a period of years these items have amounted to about 6 cents a bushel for wheat and should be no greater in the case of soybeans. Storage costs for soybeans from the 1931 crop were reported as 6¼ cents a bushel.^{32*}

Processing Beans

The price received by farmers for Illinois beans has been about 40 cents a bushel less than the gross value of the products obtained by processing. This covers the charges made by the local elevator, transportation agencies, and the processor, including profit.

Cost of processing a bushel of beans was reported by the U. S. Tariff Commission to be 27.1 cents in 1923-24. At Japanese mills costs were 17.8 cents, at the mills of Great Britain 15.3 cents, and at the mills of Dairen, Manchuria, 8.5 cents (Table 30). If from the 40 cents a bushel, which seems to be the approximate figure used in basing bids, there is subtracted 11 cents a bushel for local elevator handling, transportation, inspecting and weighing services, the manufacturing margin, including profit, would be 29 cents a bushel. If beans cost a mill 40 cents a bushel and yield 7.75 pounds of oil and 48 pounds of meal, and the oil is sold at 3 cents a pound and the meal at \$18.50 a ton, 27.5 cents a bushel would remain for manufacturing costs and profit.

As noted above, costs were indicated to be higher in this country than in foreign milling centers during the period for which comparable data are available. Any reduction in the cost or charges made for processing will be reflected in higher prices to growers of beans under existing systems of marketing.

TABLE 30.—COSTS OF RAW MATERIALS AND OTHER ITEMS OF SOYBEAN OIL PRODUCTION, UNITED STATES AND SELECTED FOREIGN COUNTRIES, 1923-1924

(Per bushel of soybeans crushed)

	United States	Manchuria		Japan	Great Britain
		All Manchuria	Dairen only		
Cost of soybeans used for crushing.....	\$1.376	\$1.112	\$1.157	\$1.332	\$1.392
Conversion cost					
Factory expense.....	.171	.052	.053	.128	.102
General expense.....	.100	.031	.032	.050	.051
Total.....	.271	.083	.085	.178	.153
Total manufacturing cost.....	\$1.647	\$1.195	\$1.242	\$1.510	\$1.545
Yield of crude oil.....	<i>lbs.</i> 6.15	<i>lbs.</i> 5.69	<i>lbs.</i> 5.77	<i>lbs.</i> 8.87	<i>lbs.</i> 7.46
Yield of cake.....	44.18	56.74	56.51	47.46	51.37
Cost per pound* of producing oil.....	<i>cts.</i> 10.21	<i>cts.</i> 6.26	<i>cts.</i> 6.41	<i>cts.</i> 6.57	<i>cts.</i> 7.79

*Total cost of crushing allocated to oil and cake on basis of sales return for each product.

Marketing Seed Beans

Unless premiums are paid for quality, the cost to the purchaser of seed beans in carload lots will be practically the same as the cost of beans bought for processing. To these costs must be added the cost of cleaning, storage, advertising, selling, and collection.

Comparison of reports received from identical handlers dealing mostly in seed beans indicate that 73.1 percent of the 1926 crop was cleaned and 67.1 percent of the 1930 crop (Table 31). The seed handlers incurred a recleaning cost of 7.1 cents a bushel for the 1926 crop and 5.3 cents for the 1930 crop. Costs from the various crop reporting districts had become more uniform by 1930, yet they varied at that time from 4 to 9 cents a bushel.

Handling charges aside from cleaning amounted to 15.7 cents a bushel for the 1926 crop and 11.5 cents a bushel for the 1930 crop. The range between averages for the various crop reporting districts was wide for both years, being from 5 to 51 cents for the 1926 crop and from 7 to 32 cents for the 1930 crop. Total handling charges for seed beans were given as 21.0 cents a bushel for the state in 1926-27

and 14.9 cents a bushel in 1930-31. With increased production, handling operations have become better organized and costs have decreased.

Marketing costs for handling soybeans for seed purposes may be summarized as follows for the 1930 crop: cost from producer to wholesale handlers, 11 cents; cleaning, 5 cents; other handling charges, 11 cents. A total of 27 cents in costs is thus added to the producer's price by the time wholesale prices are quoted to the retailer. To this must be added transportation costs from wholesale dealer to retail dealer or final purchaser, and retail selling cost if the beans are passed thru a retail handler, as well as a reasonable profit for each of the various seed handlers.

TABLE 31.—ESTIMATED COST OF HANDLING SOYBEANS USED MAINLY FOR SEED, 151 IDENTICAL COUNTRY ELEVATORS AND LOCAL SEED DEALERS, ILLINOIS,* 1926 AND 1930 CROPS

(Cents per bushel)

Crop reporting district	1926 crop				1930 crop			
	Re-cleaned	Cost of recleaning	Other costs	Total cost	Re-cleaned	Cost of recleaning	Other costs	Total cost
	<i>perct.</i>				<i>perct.</i>			
1 Dixon.....	30	17	51	70	84	9	32	34
3 Chicago.....	72	5	5	9	0	..	..	..
4 Galesburg.....	77	5	10	15	17	4	13	14
4a Springfield.....	64	5	21	23	88	4	7	12
5 Bloomington.....	77	9	10	17	73	5	9	13
6 Champaign.....	58	5	20	23	85	8	18	25
6a Mattoon.....	88	7	19	26	90	5	11	17
7 Carbondale.....	6	3	5	32	0	..	13	13
9 Harrisburg.....	53	12	..	25	5	5	8	11
State.....	73.1	7.1	15.7	21	67.1	5.3	11.5	14.9

*Each district and state is weighted by number of bushels reported for given item.

Exporting Beans

During the period of development of commercial soybean production in Illinois little attention was given to the foreign outlet for soybeans. In fact steps were taken to get duties adopted which would shut out imports of foreign beans or materials made from them. With the collapse of domestic soybean prices in the fall of 1931, opportunity arose for the exportation of soybeans at higher net prices than the domestic users were currently paying. Experimental export shipments were made by the Soybean Marketing Association in the early winter of 1931-32 and also by certain other interests in the corn-belt and Atlantic seaboard trade. Somewhat larger exports were made in the following spring (Fig. 21). One drawback to the use of this market, however, is the large expense involved in moving the commodity from

the interior to some exporting point. What this amounted to in one instance was as follows:

COST PER BUSHEL OF MOVING SOYBEANS FROM CENTRAL ILLINOIS ON
BOARD BOAT AT NEW ORLEANS, 1931 CROP*

	Cents
Local elevator charge.....	3.5
Freight, central Illinois to New Orleans.....	15.3
Elevation and boat loading at New Orleans.....	1.75
Brokerage to exporter.....	1.0
Commission firm at New Orleans for forwarding and checking records at New Orleans.....	.5
Weighing and inspection.....	.2
Total.....	22.25

The value of soybeans per bushel in gold was reported as 55 cents at Dairen, Manchuria, in December, 1931.^{20*} This just about equaled the prevailing buying price at Illinois country points plus the cost of marketing and transporting to New Orleans. This shows the superiority of the world market to the interior domestic market during the 1931-32 season. This point is further indicated by the price quoted on Manchurian soybeans in European ports. Early in December, 1931, the U. S. Department of Commerce^{30*} reported Manchurian soybeans at Dutch and German ports to be worth the equivalent of 63.6 cents a bushel. By February this price had risen to 76.8 cents.

The superior export market was due in part to better prices for soybean products and in part to lower processing costs for soybeans abroad. Late in February, 1932, soybean meal—English extracted in bulk—was quoted at the equivalent of \$24 a ton, and soybean oil—English crude, extracted, spot, naked—at 4.05 cents a pound. Both of these prices were above prevailing American prices at producing points. The lower processing costs have been referred to on page 498.

While it is undoubtedly true that a remunerative soybean-producing enterprise cannot be built up in Illinois without a well-developed domestic processing industry, nevertheless the experience of 1931-32 shows the importance of opening up and developing foreign connections. Inasmuch as soybean production for export is largely in the northern hemisphere, with the season of harvesting in Manchuria similar to that in the United States, it would be expected that the seasonal variation of soybean prices would be such that winter storage costs would normally be offset by a rise in price. The better organized transport facilities in the United States may give United States growers an opportunity to market ahead of the Manchurian soybean growers.

*Information supplied by Wilbur H. Coultas, Soybean Marketing Association, 1932.

The commercial production of soybeans in the United States is still small in comparison with Manchurian exports. Exports of soybeans from Manchuria in the 1930-31 season amounted to the equivalent of about 134 million bushels of beans, cake and oil, 82 million

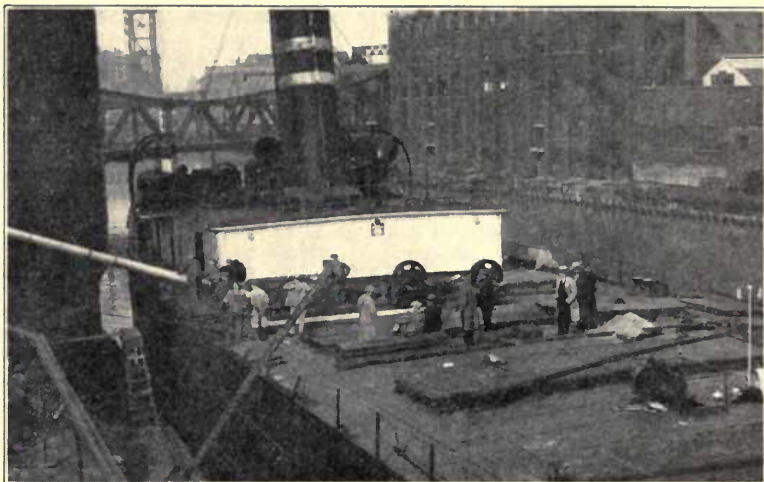


FIG. 21.—A SHIP LOADED WITH ILLINOIS SOYBEANS FOR EXPORT MOVEMENT

The first cargo of soybeans exported from Illinois by way of the Great Lakes is shown in the above picture. This cargo of 205,000 bushels left Chicago during April, 1932.

bushels of which were exported as beans. Exports of domestic beans from the United States began with the 1931 crop on a commercial scale and were as follows for February-August, 1932.^{30*}

Month	Total bushels	Value	Bushels shipped to—				
			France	United Kingdom	Canada	Germany	Other destinations
Feb.....	141 091	\$ 27 227	.....	7 467	2 900	130 667	60 390 ^a
Mar.....	367 796	192 907	56 050	41 277	.....	208 618	1 518
Apr.....	717 077	525 918	121 383	112 000	190 455	293 228	11
May.....	301 564	191 200	33	184 799	77 498	37 333	1 900 ^b
June.....	128 888	75 232	18 750	73 735	36 400	.....	3 ^c
July.....	214 458	125 816	.....	.....	90 671	123 765	22 ^d
Aug.....	109 451	62 531	37 333	39 340	25 128	7 647	3 ^e
Total.....	1 980 325 ^f	1 200 831	233 549	458 617	423 052	801 258	63 847

^aNetherlands, ^bArgentina, ^cJamaica, ^dColumbia, ^eGuatemala, ^fExports from the 1931 crop began in November and amounted to 141,225 bushels for November and December. In November 18,667 bushels were shipped to Germany and 29,792 bushels to Netherlands. In December 26,581 bushels were shipped to Germany and 66,185 bushels to Netherlands.

Soybean exports from the United States were in excess of 100,000 bushels for the first time in February, 1932. About a third of the season's export movement took place in April. About two-fifths of the beans exported during this season were shipped to Germany. New

Orleans was the principal port from which shipments were made, tho Chicago, an inland port, ranked second in bushels of beans exported.

Month	Bushels shipped from—				
	Virginia	New Orleans	Chicago	Mobile	Other destinations
Feb. ....	.....	.....	.....	.....	..
Mar.	111 794	149 337	1 510*	105 118	37
Apr.	107 598	345 332	190 455	73 680	11
May.	37 399	186 667	77 498	.....	..
June.	17 817	74 667	36 400	.....	3
July. ....	.....	123 765	90 671	.....	22
Aug.	28 181	56 142	25 128	.....	..
Total.	302 789	935 910	420 152	178 798	73

(*Michigan.)

Difficulties generally involved in European buying of American products apply to soybeans. Declines in the exchange value of English and Scandinavian currencies have created difficulties in exporting to these countries, but this particular difficulty has not applied to exports to Germany or Holland, both of which are large users of oil seeds.

The development of an export outlet for soybeans from the corn belt emphasizes again the need for developing facilities which will permit more economical systems of transportation to ocean ports.

THE INSPECTION SYSTEM AND SOYBEAN GRADES

After extensive studies of the various phases of the soybean industry, the U. S. Department of Agriculture announced standards for soybeans in September, 1925, and recommended their use in the grading and marketing of this commodity. These standards were used as a basis for federal inspection of the 1925 crop of soybeans at original shipping points in eastern North Carolina.

Based on the application of the standards and on further studies of the industry, slight revisions were made, effective September 1, 1926. One important change was the addition of a supergrade to take care of extra high-grade stock for which there is demand at a premium, especially from the seed trade. Wholesale seedsmen have found it expedient to purchase their supplies on the basis of the two high grades. Shippers and state agencies are cooperating with federal inspectors for the purpose of furnishing buyers with authentic supplementary information as to variety and germination. Oil mills buy soybeans on the basis of U. S. No. 2 grade, with a scale of discounts for lower grades and premiums for higher grades.

Soybean inspection is provided by licensed inspectors operating under a federal inspection system administered by the Hay, Feed and Seed Division of the U. S. Bureau of Agricultural Economics. This is separate from the system of federal supervision of grain inspection

and is operated on a different basis. In many cases, however, licensed grain inspectors also meet the special requirements necessary to secure a license to inspect soybeans.

Soybean inspection service provides for the maintenance of federal soybean inspectors at shipping points and at important terminal markets under cooperative agreements between the Bureau of Agricultural Economics and organizations such as state departments of

TABLE 32.—CARLOADS OF SOYBEANS FEDERALLY INSPECTED IN LEADING SOYBEAN PRODUCING STATES, 1928-1932

(Figures represent full carloads, with few exceptions)

Inspection points	1926-1928	Fiscal years ending June 30				
		1929	1930	1931	1932	1929-1932
<i>Illinois</i>						
Bloomington.....	4	108	135	174	194	611
Cairo.....	..	..	..	..	62	62
Chicago.....	..	..	134	643	507	1 284
Decatur.....	22	..	..	..	..	..
East St. Louis.....	..	..	..	..	604	604
Peoria.....	..	638	289	613	872	2 412
Taylorville.....	..	..	..	13	64	77
Total.....	26	746	558	1 443	2 303	5 050
<i>Missouri</i>						
St. Louis and Sikeston.....	..	..	45	368	260	673
<i>Indiana</i>						
Indianapolis and LaFayette.....	..	..	..	9	429	438
<i>North Carolina</i>						
Elizabeth City, Raleigh, and Washington.....	219	108	207	416	161	892
<i>Ohio</i>						
Cincinnati and Toledo.....	..	..	84	616	415	1 115
<i>Virginia</i>						
Norfolk and Richmond.....	33	5	14	69	534	622
<i>Other points</i>	8	69	76	37	378	560
Grand total.....	286	928	984	2 958	4 480	9 350

agriculture, commercial exchanges, and dealers' or growers' associations. The organization cooperating with the Bureau pays the inspector and the local expenses necessary to the proper conduct of the work. Fees charged for inspection are divided between the local organization and the U. S. Department of Agriculture in such manner that both are reimbursed as completely as possible. Inspectors located at any shipping point or terminal market usually are available for making inspections at neighboring points. Illinois supplied more than half of the beans inspected in three of the four years ended June 30, 1932 (Table 32).

Soybean inspectors in Illinois are located at Bloomington, Chicago, Peoria, Taylorville, East St. Louis, and Cairo, the last two points having been added for the 1931 crop.

Soybeans are divided into five classes: yellow, green, brown, black, and mixed. Soybeans of the yellow and green classes may not contain more than 5 percent of soybeans of other colors, and those of the brown and yellow classes may not contain more than 10 percent of other classes. The Black Eyebrow variety is listed under mixed soybeans.

TABLE 33.—FEDERAL GRADE REQUIREMENTS FOR YELLOW, GREEN, BROWN, BLACK, AND MIXED SOYBEANS^a

U. S. grade	Condition and general appearance	Minimum test weight per bushel	Maximum limit of—			
			Moisture	Splits	Damaged beans	Foreign material
Extra No. 1 ^b	Cool, of natural odor, plump, well screened, and of good color	lbs. 56	perct. 15	perct. .5	perct. 1	perct. .2
No. 1	Cool, of natural odor, and of good color	56	15	1	2	.5
No. 2	Cool, of natural odor, and may be slightly stained or mottled	54	16	10	3	2
No. 3	Cool, of natural odor, and may be stained or mottled	52	17	20	5	5
No. 4	Cool, may be badly stained or mottled, and may be slightly frosted or immature	50	18	30	8	10
Sample grade	Soybeans which do not comply with the requirements of any of the above grades or which have any commercially objectionable foreign odor, or are sour, heating, hot, moldy, infested with live weevils or other insects injurious to stored soybeans, or are of otherwise distinctly low quality					

^aHandbook of United States Standards for Soybeans, Form HFS-899, U. S. Dept. Agr. Bur. Agr. Econ., Sept., 1928.

^bThe grade Extra No. 1 shall apply only to yellow soybeans, green soybeans, brown soybeans, and black soybeans containing not more than one percent (1%) of soybeans of other classes, either singly or in any combination, and shall not apply to the class, mixed soybeans, unless the latter is composed of 98 percent or more of the Black Eyebrow variety.

Each class is divided into six grades with requirements for each grade as indicated in Table 33. The following specifications are from the "Handbook of U. S. Standards for Soybeans."^{28*}

"The grade designations for soybeans shall include successively the letters 'U. S.,' the name or number of the grade or the words 'Sample Grade,' and the name of the class, and in case of 'Mixed Soybeans,' in addition the name and approximate percentage of each of the classes Yellow Soybeans, Green Soybeans, Brown Soybeans, or Black Soybeans which constitutes 5 per cent or more of the mixture. In lots of 'Mixed Soybeans' which contain 5 per cent or more of the Black Eyebrow variety, the percentage of such variety shall be stated in the same manner as that of a class."

An examination of the grade requirements will show that while the provisions for the upper grades are rigid, requirements are much less strict for the lower grades. Since the methods of harvesting and storage now in use produce beans varying in quality, this wide spread in requirements is necessary to prevent too large a proportion of beans going into sample grade.

The structure of the grades, as provided in the United States standards for soybeans, corresponds only roughly to that of grain grades. Foreign material in soybeans is a broad term, including dirt, weed seeds, cereal grains, and small pieces of soybeans which pass thru a sieve with round perforations $\frac{1}{64}$ inch in diameter, as well as all matter other than soybeans which remains on top of the sieve. Pods and broken stems are sometimes present.

The factor of splits is not comparable with any factor employed in the grading of any of the grains.

Split beans are useless for seed and have the further disadvantage of tending to become rancid in storage. There is ample justification, therefore, for discriminating against shipments of soybeans having a high percentage of splits.

Soybeans grown in Illinois are graded largely on these two factors, foreign material and splits.

The amount of soybeans inspected according to grades by licensed federal inspectors was twice as large for the year ended June 30, 1932, as for the preceding year, and for these two years it was more than five times as large as for the two years ended June 30, 1930. The amounts of each year's inspection falling in each of six grades was as follows:

Grade	Carloads inspected during year ended June 30				Total	Percent
	1929	1930	1931	1932		
	(Thousands of bushels)					
Extra No. 1.....	10	24	2	10	46	.3
No. 1.....	38	110	251	192	591	4.0
No. 2.....	382	377	2 082	6 629*	9 470	64.1
No. 3.....	373	378	1 544	1 252	3 547	24.0
No. 4.....	177	123	190	156	646	4.4
Sample.....	180	137	48	106	471	3.2
Total.....	1 160	1 149	4 117	8 345*	14 771	100.0

(*Includes 1,853,477 bushels inspected for export.)

Nearly two-thirds of the inspected soybeans were graded No. 2, taking the total of the four years as a whole; the percentage was less than one-third for the two years ended June 30, 1930 and not quite half during the year ended June 30, 1931. The proportion grading No. 2 during the year ended in 1932 was so large as probably to cause the four-year percentage in that grade to be higher than could be ordinarily expected.

The proportion graded Extra No. 1 and No. 1, as well as the proportion graded Sample and No. 4, became progressively smaller during the four years as the concentration in Grades 2 and 3 became greater.

The question has been raised whether the grading system for soybeans should not recognize that a pound of oil is worth more than a pound of meal and should not determine the oil content of the beans.^{27*} This would, of course, add to the expense of the grading process. Moreover it is questionable whether increased oil content necessarily represents increased commercial value. The oil content and the protein content of soybeans tend to be so related that as the percentage of one is increased, the percentage of the other is decreased.^{25*} The content problem in soybeans thus assumes a double form, emphasizing both protein and oil.

SPECIAL CONSIDERATIONS APPLYING TO THE VALUATION OF SOYBEANS AND SOYBEAN PRODUCTS

Use-Values of Soybeans and Soybean Products in Feeding

Soybeans and soybean products may be considered from the standpoints of value in use as well as value in exchange. Estimated use-values of feed products of soybeans, expressed in terms of digestible protein and total digestible nutrients per 100 pounds and per acre of each product, based on Illinois returns, are shown in Table 34.

TABLE 34.—DIGESTIBLE NUTRIENTS IN FEED PRODUCTS OF SOYBEANS*
(Pounds)

Product	Yield per acre	Digestible protein		Total digestible nutrients	
		Per 100 pounds	Per acre	Per 100 pounds	Per acre
Soybean hay.....	4 176	9.7	405	42	1 754
Soybean seed.....	1 392	32.5	452	89	1 239
Soybean straw.....	2 366	.4	10	24	577
Soybean seed and straw.....	3 758	12.3	462	48	1 816
Soybean oil meal.....	1 114	37.0	412	76	847

*Averages of 59 plots (16 varieties) cut for hay and 59 comparable plots harvested for seed and straw in the South-Central rotation, University South Farm, Urbana, Illinois, 1919-1926.

Assuming digestible protein to be three times as valuable as total digestible nutrients, a ratio that has been fairly constant, soybean hay would show 15 percent greater value an acre for feeding than soybeans alone, while the oil meal would have about 20 percent less value.

A comparison of the feeding value of the digestible protein and total digestible nutrients in 100 pounds of soybean oil meal and soybeans on the basis of the above ratio shows an equal total feeding value for the two. Soybean meal is superior to soybeans for swine feeding, and also for dairy feeding, where the use of legume hay removes the need for additional conditioner.^{2, 21*} This would indicate that sometimes such considerations are sufficient to justify farmers in undertaking the added costs incurred in exchanging beans for meal on a pound for pound basis.

Since soybean oil meal represents the most desirable form of the soybean to use in feeds for livestock, a comparison of its feeding value with that of the leading protein concentrates is shown in Table 35.

TABLE 35.—DIGESTIBLE NUTRIENTS IN SOYBEAN OIL MEAL AND OTHER PROTEIN FEEDS
(Pounds)

Product	Digestible protein per 100 pounds	Total digestible nutrients per 100 pounds	Feeding value in terms of soybean oil meal ^a
			<i>per cent.</i>
Soybean oil meal.....	37	76	100.0
Linseed meal (old process).....	30	77	89.3
Cottonseed meal (41 percent).....	36	76	98.4
Gluten meal.....	34	84	99.5
Wheat middlings.....	13.2	73	60.2
Wheat bran.....	12.5	61	52.7
Tankage.....	56.2	71.4	128.3

^aValue determined by obtaining the sum of the value of the digestible protein and the total digestible nutrients of each product and dividing it by value of soybean oil meal. Digestible protein was given a weight of 3 and total digestible nutrients a weight of 1.

It has been established that soybean oil meal may be fed in connection with most livestock rations. It ranks high both in digestible protein and in total digestible nutrients (Fig. 22). On the basis of the above stated relation of values between digestible protein and total digestible nutrients, cottonseed meal (41 percent protein) and gluten meal have about the same feeding value as soybean oil meal on a pound for pound basis.^{8*} Compared with soybean oil meal, linseed meal may be rated about 90 percent as valuable for feeding, wheat middlings about 60 percent, and wheat bran nearly 53 percent. The results obtained in feeding experiments have not varied widely from these figures. Linseed meal has usually been considered equal to soybean oil meal and to cottonseed meal in the fattening of livestock. As a protein supplement for hogs,^{21*} the efficiency of soybean oil meal varies from two-thirds to three-fourths that of tankage. Soybean oil meal is somewhat short in mineral con-

stituents, but the shortage may be overcome by supplementing the meal with a simple mineral mixture.

The percentage of the digested protein that may be stored in the animal as body tissue determines the quality of a protein, and is re-



FIG. 22.—SOYBEAN MEAL BEING FED TO BEEF CATTLE

Soybean oil meal has proved to be a satisfactory protein supplement in corn-belt cattle feeding rations in experiments at the University of Illinois.

ferred to as its "biological value." Investigations at the University of Illinois have shown that soybean protein has a high biological value as compared with many of the other vegetable proteins.^{11, 12*}

Derivative Products as Factors in the Market Valuation of Soybeans

Prices of mill beans depend on prices of oil and meal. The gross value at different prices of the oil and meal content of a bushel of soybeans is given in Table 36. These values represent the sum of 7.75 pounds of oil and of 48 pounds of meal at their respective stated prices. If meal is worth \$20 a ton and oil 3 cents a pound, the value of the products in a bushel of soybeans would be worth 71 cents; of this, 48 cents would be attributable to the meal and 23 cents to the oil. A price change of 1 cent a pound for oil corresponds to a difference of about 7.75 cents in the value of a bushel of beans. A difference of \$1 a ton in the price of meal corresponds to a difference of about 2.4 cents in the value of a bushel of beans. The value of the oil and meal determines the value of beans to processors.

To get at a net price which a farmer might expect to receive, the following items would have to be deducted; the cost-and-profit margin

TABLE 36.—TOTAL GROSS VALUE OF PRODUCTS OBTAINED FROM A BUSHEL OF SOYBEANS AT DIFFERENT PRICES OF OIL AND MEAL

(Based on 7.75 pounds of oil and 48 pounds of meal per bushel)

Price of oil per pound at—	Gross value of products with price of meal per ton at—									
	\$15	\$16	\$17	\$18	\$19	\$20	\$25	\$30	\$35	\$40
<i>cts.</i>										
2½	\$.55	\$.58	\$.60	\$.63	\$.65	\$.67	\$.79	\$.91	\$1.03	\$1.15
2¾	.56	.59	.61	.64	.66	.68	.80	.92	1.04	1.16
2¾	.57	.60	.62	.65	.67	.69	.81	.93	1.05	1.17
2¾	.58	.61	.63	.65	.68	.70	.82	.94	1.06	1.18
3	.59	.62	.64	.66	.69	.71	.83	.95	1.07	1.19
3¼	.60	.63	.65	.67	.70	.72	.84	.96	1.08	1.20
3¼	.61	.64	.66	.68	.71	.73	.85	.97	1.09	1.21
3½	.62	.65	.67	.69	.72	.74	.86	.98	1.10	1.22
3½	.63	.66	.68	.70	.73	.75	.87	.99	1.11	1.23
3½	.64	.66	.69	.71	.74	.76	.88	1.00	1.12	1.24
3¾	.65	.67	.70	.72	.75	.77	.89	1.01	1.13	1.25
3¾	.66	.68	.71	.73	.76	.78	.90	1.02	1.14	1.26
4	.67	.69	.72	.74	.77	.79	.91	1.03	1.15	1.27
4¼	.68	.70	.73	.75	.78	.80	.92	1.04	1.16	1.28
4¼	.69	.71	.74	.76	.79	.81	.93	1.05	1.17	1.29
4½	.70	.72	.75	.77	.80	.82	.94	1.06	1.18	1.30
4½	.71	.73	.76	.78	.80	.83	.95	1.07	1.19	1.31
4¾	.72	.74	.77	.79	.81	.84	.96	1.08	1.20	1.32
4¾	.73	.75	.78	.80	.82	.85	.97	1.09	1.21	1.33
4¾	.74	.76	.79	.81	.83	.86	.98	1.10	1.22	1.34
5	.75	.77	.80	.82	.84	.87	.99	1.11	1.23	1.35
6	.82	.85	.87	.90	.92	.94	1.06	1.18	1.30	1.42
7	.90	.93	.95	.97	1.00	1.02	1.14	1.26	1.38	1.50
8	.98	1.00	1.03	1.05	1.08	1.10	1.22	1.34	1.46	1.58
9	1.06	1.08	1.11	1.13	1.15	1.18	1.30	1.42	1.54	1.66
10	1.14	1.16	1.18	1.21	1.23	1.26	1.38	1.50	1.62	1.74

of the processor, the freight on the beans, the charge made by local elevators for shipping, and any other marketing or storage costs.

The above analysis assumes that beans were being bought for current delivery on the basis of current prices. Even if beans were being bought for future delivery, prices of products would be taken into consideration in arriving at the offers. The prices used would either be estimated or established by selling products for delivery at a later date. Table 36 and the accompanying discussion are meant to serve as an illustration of a method and indicate only approximate values.

PRICES OF SOYBEANS AND SOYBEAN PRODUCTS

Prices of Seed Beans

The market structure for seed beans is more complicated than for mill beans. The seed trade can be divided into three classes: (1) the regular annual demand from sections or farms where beans are grown chiefly for hay or forage; (2) the demand from new growers in sections producing mill beans and in newly developing soybean areas;

(3) the intermittent demand from commercial growers who are replacing their seed stocks.

The stability of the demand from these three sources differs. From the hay and forage producers it tends to be regular and stable, but from the other two classes rather irregular. Demand for seed from new producers will be important as long as the industry is expanding into new regions or to new farms in regions in which the crop has been grown. Up to the present time this requirement has been quite important because of the tendency for the acreages of the crop to expand. The intermittent demand from commercial growers who are replacing their seed stock will be particularly important when improved varieties are being introduced or in years following seasons when the weather causes quality of farm seed to be low. Otherwise this demand will be a factor only when individual farmers decide to change their seed. Producers of hay varieties may count on a fairly steady market from year to year.

The market for thresher-run seed beans is not usually well established before November, prices having a tendency to increase thruout the season. Prices for the 1930 crop, however, actually declined. Thruout the period 1917-1931 prices varied widely from state to state (Table 37). The corn-belt states and North Carolina produce the bulk of commercial beans and include the low-priced areas. For the 1929, 1930, and 1931 crops, yearly prices averaged approximately a dollar a bushel for the states referred to, with a range from 95 cents in Illinois and Ohio to \$1.20 in Missouri.

The South Atlantic states produced the bulk of the remaining beans entering seed channels, and averaged \$1.75 a bushel for the same period, with a range from \$1.40 in Maryland to \$2.45 in Georgia.

Illinois has had centers of extensive production of commercial beans which are usually of such quality as to be suited for seed and which to a large extent dictate the price of the latter.

Local Prices of Soybeans in Illinois.—A comparison of farm-price figures for different districts in Illinois indicates wide sectional differences in soybean seed prices (Table 38). Prices for the period January to May were used rather than for a period which included the harvest months, in order to arrive at prices for seed rather than for mill beans. The farm prices as reported are a composite of the two, particularly at harvest time in the sections producing mill beans. As in the case of grains, prices were lowest in the Champaign district (6). The Galesburg and Bloomington districts (4 and 5) had about the same price averages, altho for individual years they differed widely.

Prices were highest in the Carbondale and Harrisburg districts (7 and 9). The price differences between these southern districts and the rest of the state reflect to a large extent the relative importance of the mill and hay varieties. The larger the proportion of the acreage in hay-type beans, the greater the relative scarcity of seed and the higher the price.

TABLE 38.—AVERAGE FARM PRICES OF SOYBEANS BY SELECTED CROP REPORTING DISTRICTS, ILLINOIS,* JANUARY-MAY, 1925-1931

(Dollars per bushel)

Year	Galesburg (4)	Springfield (4a)	Bloomington (5)	Champaign (6)	Mattoon (6a)	Carbondale (7)	Harrisburg (9)
1925	\$2.04	\$2.14	\$2.06	\$2.30	\$2.20	\$2.32	\$2.00
1926	1.73	1.92	2.09	1.83	2.07	2.65	2.43
1927	2.23	2.27	1.78	1.69	1.76	1.88	2.07
1928	1.60	1.71	1.58	1.43	1.65	1.74	1.77
1929	1.64	1.74	1.77	1.53	2.00	2.25	2.26
1930	1.58	1.69	1.54	1.49	1.77	2.07	2.15
1931	1.08	1.08	1.00	.97	1.21	1.61	1.56
Average	\$1.70	\$1.79	\$1.69	\$1.61	\$1.81	\$2.07	\$2.03

*The northern districts are omitted because the data are not satisfactory, prices not having been reported regularly.

Farm prices of soybeans in the Springfield, Champaign, and Mattoon districts (4a, 6, and 6a) were reported in a manner which makes month to month comparison satisfactory. All three districts include important producing centers. The monthly prices in these districts from October thru June for the crop years 1925-1931 are shown in Table 39. In the Springfield district (4a) average prices for this seven-year period rose steadily after October; January prices averaged 20 cents higher than October; March, 17 cents over January; and May, 10 cents over March. May, in recent years, has become the final month of active seed purchases. In six years out of the seven soybean prices increased by significant amounts between October and March. A part of this increase reflected the change from the mixed mill and seed prices to strictly seed prices, and reflected the keen demand for soybean seed during this period of expanding acreage. The exceptional years, when prices declined, were 1930-31 and 1931-32, the entire soybean season in both years being characterized by severe price declines in commodities generally.

The rise in price in the Champaign district (6) was less marked than in any other district, altho the price was significantly higher in the spring than in the fall during six of the seven years (1925-1931). The exception occurred again in 1930-31. The average increase from October to May was only 28 cents compared with 47 cents in the

Springfield district (4a), hay beans exercising a larger influence on composite prices in the Springfield district than in the Champaign district.

TABLE 39.—AVERAGE MONTHLY FARM PRICES OF SOYBEANS IN THREE CROP-REPORTING DISTRICTS IMPORTANT IN SOYBEAN PRODUCTION, ILLINOIS, OCTOBER-JUNE, 1925-1930 CROPS
(Dollars per bushel)

Crop year beginning October	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June
Springfield (4a)									
1925.....	\$1.55	\$1.25	\$1.67	\$1.88	\$1.55	\$2.05	\$2.00	\$2.13	\$2.86
1926.....	1.33	1.76	2.02	2.01	2.34	2.26	2.32	2.40	2.37
1927.....	1.58	1.45	1.57	1.54	1.42	1.80	1.84	1.96	1.98
1928.....	1.29	1.29	1.35	1.44	1.50	1.89	1.93	1.92	2.18
1929.....	1.41	1.63	1.47	1.55	1.60	1.66	1.81	1.84	1.84
1930.....	1.13	1.18	1.15	1.08	1.25	1.04	.93	1.12	.83
1931.....	.21	.32	.34	.36	.37	.38	.44	.41	.43
Average...	\$1.21	\$1.27	\$1.37	\$1.41	\$1.43	\$1.58	\$1.61	\$1.68	\$1.78
Champaign (6)									
1925.....	\$1.61	\$1.68	\$1.53	\$1.93	\$1.61	\$1.67	\$1.76	\$2.16	\$2.65
1926.....	1.58	1.41	1.30	1.61	1.66	1.44	1.85	1.88	2.35
1927.....	1.16	1.31	1.00	1.19	1.38	1.53	1.49	1.56	1.71
1928.....	1.11	1.19	1.38	1.24	1.40	1.51	1.65	1.86	2.00
1929.....	1.44	1.44	1.46	1.47	1.40	1.56	1.44	1.58	1.39
1930.....	1.13	1.08	1.12	1.10	1.06	.99	.91	.80	.80
1931.....	.21	.32	.24	.30	.21	.36	.34	.35	.36
Average...	\$1.18	\$1.20	\$1.16	\$1.26	\$1.26	\$1.29	\$1.35	\$1.46	\$1.61
Mattoon (6a)									
1925.....	\$1.20	\$1.44	\$1.46	\$1.56	\$1.69	\$1.65	\$2.13	\$2.17	\$2.71
1926.....	1.62	1.46	1.49	1.63	1.78	1.74	1.88	1.79	2.00
1927.....	1.14	1.37	1.28	1.48	1.57	1.63	1.70	1.85	2.00
1928.....	1.59	1.40	1.55	1.80	1.75	2.12	2.09	2.22	2.11
1929.....	1.70	1.61	1.62	1.70	1.65	1.74	1.89	1.88	1.88
1930.....	1.27	1.24	1.22	1.35	1.23	1.23	1.11	1.07	.95
1931.....	.25	.30	.35	.33	.38	.40	.40	.37	.38
Average...	\$1.25	\$1.26	\$1.28	\$1.41	\$1.44	\$1.50	\$1.60	\$1.62	\$1.72

Seasonal prices in the Mattoon district (6a) usually started at a slightly higher level than did prices in the Springfield district (4a) and considerably higher than prices in the Champaign district (6). Prices in the Mattoon district during 1925-1931 represented more nearly seed prices than did prices in either of the other two districts and by late May reached a midway position between those of the other two districts, representing an adjustment of the demand and supply situation of the three areas. The average seasonal increase in price was 37 cents. The trends were similar in all three districts.

Comparison of records from 151 firms handling soybeans from

both the 1926 and 1930 crops shows that the prices paid to producers for soybeans from the 1926 crop, except for a slight decrease in January, increased gradually up thru June (Table 40). Prices for July are generally not shown. Because of the backwardness of the 1927 planting season, however, a market was maintained for the 1926 crop about a month longer than usual. Prices for the 1930 crop were rather uniform thru May, with a downward trend for the remainder of the crop year. Prices after May were not mainly for seed beans, as the demand for seed had been practically supplied by this time.

TABLE 40.—AVERAGE PRICES PAID TO PRODUCERS FOR SOYBEANS BY 151 IDENTICAL COUNTRY ELEVATORS AND LOCAL SEED DEALERS, ILLINOIS, OCTOBER-JULY, 1930 AND 1926 CROPS

(Dollars per bushel)

Crop reporting district	Number of reports	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Average
1930 crop												
1 Dixon.....	21	\$.95	\$1.55	\$1.00	\$....	\$....	\$....	\$1.25	\$1.25	\$....	\$....	\$1.20
3 Chicago.....	17	1.50	....	....	....	....	1.15	1.00	....	....	....	1.20
4 Galesburg.....	9	1.10	1.00	....	....	....	1.30	....	....	....	....	1.15
4a Springfield.....	21	1.05	1.20	1.10	1.10	1.55	1.15	1.10	1.15	.60	.55	1.05
5 Bloomington.....	19	1.35	1.30	1.25	1.10	1.15	....	1.00	1.00	.95	....	1.15
6 Champaign.....	33	1.10	1.00	1.15	1.05	1.05	.95	1.00	.70	.55	.30	.90
6a Mattoon.....	15	1.40	1.35	1.30	1.65	1.45	1.65	1.50	1.20	1.40	1.50	1.45
7 Carbondale.....	7	....	....	....	....	....	....	1.55	1.50	....	....	1.50
9 Harrisburg.....	9	1.50	1.40	1.50	1.50	1.60	1.45	....	1.50	....	....	1.50
State.....	151	\$1.25	\$1.25	\$1.20	\$1.30	\$1.35	\$1.30	\$1.20	\$1.20	\$.90	\$.80	\$1.20
1926 crop												
1 Dixon.....	21	\$2.75	\$....	\$....	\$....	\$....	\$2.70	\$....	\$3.35	\$2.90	\$....	\$2.90
3 Chicago.....	17	1.00	1.65	1.75	1.85	2.10	....	....	....	....	....	1.65
4 Galesburg.....	9	....	....	....	....	....	....	2.00	2.00	....	....	2.00
4a Springfield.....	21	1.60	1.65	2.00	1.80	2.00	2.15	2.10	2.20	2.35	2.10	2.00
5 Bloomington.....	19	1.55	1.50	1.80	2.00	2.15	2.40	1.60	2.20	2.40	2.00	1.95
6 Champaign.....	33	1.35	1.40	1.60	1.70	1.75	1.85	2.00	1.90	2.50	2.25	1.85
6a Mattoon.....	15	1.70	2.00	2.00	2.00	1.50	1.90	2.00	2.00	2.50	2.50	2.00
7 Carbondale.....	7	....	2.40	2.40	....	....	2.20	....	....	2.00	....	2.25
9 Harrisburg.....	9	1.50	1.50	1.50	1.50	1.50	1.90	1.80	1.50	1.50	1.50	1.55
State.....	151	\$1.70	\$1.75	\$1.85	\$1.80	\$1.85	\$2.15	\$1.90	\$2.15	\$2.30	\$2.05	\$2.00

Wholesale Prices of Soybeans.—The markets of most interest to Illinois handlers are Chicago, St. Louis, Louisville, and Kansas City. Monthly and yearly prices are available for these markets beginning with the 1919 crop, and weekly figures beginning with the 1925 crop. Prices at the various markets differ from year to year and quite often from month to month within the year. Since 1924, Kansas City prices of soybeans have been higher than those of the other three markets, except in 1927 and 1929, when prices at the Kansas City market

dropped below those of the other markets, and in 1931, when prices in that market ranked third, preceded by Chicago and Louisville (Table 41). Wholesale prices for the months of January to May for the five years ended 1931, disregarding Minneapolis, were highest in Chicago at \$2.45 a bushel, and lowest in Baltimore at \$2.10.

TABLE 41.—AVERAGE YEARLY WHOLESALE SELLING PRICES OF SOYBEAN SEED, SELECTED MARKETS; QUOTATIONS GIVEN FOR FIRST FIVE MONTHS OF THE FOLLOWING YEAR, 1919-1931 CROPS

(Dollars per bushel)

First five months of—	Chicago	St. Louis	Louisville	Kansas City	Minneapolis	Baltimore
1920.....	\$6.00	\$5.75	\$5.40	\$5.70	\$6.10	\$4.75
1921.....	4.75	3.10	2.65	....	5.70	2.20
1922.....	2.15	2.45	2.25	2.10	3.00	2.05
1923.....	2.70	2.85	2.60	2.45	3.60	2.35
1924.....	2.50	2.80	2.55	2.50	3.45	2.50
1925.....	2.35	2.30	2.30	2.45	2.65	2.90
1926.....	2.50	2.45	2.45	2.55	3.00	2.20
1927.....	2.85	2.60	2.30	2.25	3.05	1.80
1928.....	1.80	1.90	1.95	2.10	2.25	2.00
1929.....	2.55	2.65	2.50	2.35	2.55	2.40
1930.....	2.35	2.20	2.20	2.95	2.55	2.10
1931.....	2.60	1.85	2.30	2.00	2.15	2.25
1932.....	.85	.95	.75	.95	1.05	1.00
Average of 10-year period 1922-1931.....	\$2.45	\$2.40	\$2.35	\$2.35	\$2.80	\$2.25
Average of 5-year period 1927-1931.....	\$2.45	\$2.25	\$2.25	\$2.35	\$2.50	\$2.10

Retail Prices of Soybeans.—Retail selling prices of soybeans have tended to be from 5 to 25 percent higher than wholesale prices. There has been less seasonal variation in retail prices than in wholesale prices, but as wide a range between states (Table 42). As in the case of prices referred to previously, retail prices were lower in the corn-belt states, especially in Illinois and Indiana, than in any of the other states. Kentucky prices have averaged well toward the top, but they have fluctuated widely because of variations in local supplies in that state which in years of shortage have made it necessary to bring in supplementary supplies either from Illinois and Indiana or from these states and North Carolina. Average Illinois prices per bushel for the six years 1925-1930 were as follows: paid producers, \$1.39; wholesale, \$2.39; and retail, \$2.52 (Table 43). The spreads between producers' and wholesale prices in Illinois were somewhat wider than for most other states since producers' prices in Illinois included amounts paid for beans going to oil mills as well as for those sold for seed. The wide spread between producers' prices and wholesale prices in Illinois, in addition to reflecting the influence of prices paid to producers for

beans going to oil mills, reflected costs of marketing services, including profits received by both local and wholesale dealers, part of which was

TABLE 42.—RETAIL SELLING PRICE OF GOOD-QUALITY SOYBEAN SEED IN SELECTED STATES,^a MARCH-MAY, 1926-1932

(Dollars per bushel)

Year and month	Illinois	Indiana	Iowa	Kentucky	Mis-souri	Ohio	Ten-nessee
1926							
March 2.....	\$2.70	\$2.65	\$3.00	\$2.65	\$2.80	\$2.80	\$2.20
March 30.....	2.65	2.65	2.95	2.80	2.80	2.80	2.20
May 1.....	2.80	2.90	2.95	2.90	2.85	3.10	2.20
1927							
March 1.....	2.75	2.75	3.35	2.65	2.85	3.00	2.10
April 1.....	2.80	2.75	3.50	2.70	2.75	3.00	2.50
May 1.....	2.95	2.85	3.50	2.50	2.95	3.10	2.00
1928							
March 1.....	2.30	2.45	3.00	2.60	2.75	2.30	2.30
April 1.....	2.30	2.30	2.90	2.50	2.55	2.50	2.25
May 1.....	2.35	2.45	2.75	2.65	2.65	2.45	2.50
June 1.....	2.45	2.50	2.80	2.65	2.70	2.60	2.50
1929							
March 1.....	2.45	2.35	2.80	3.00	2.70	2.85	3.05
April 1.....	2.80	2.65	2.70	2.95	2.85	2.65	2.85
May 1.....	2.80	2.60	2.90	3.10	3.05	2.90	2.80
June 1.....	2.85	2.65	2.95	3.00	3.25	2.90	3.05
1930							
Feb. 26.....	2.50	2.65	2.90	2.80	2.90	2.80	2.50
March 25.....	2.40	2.65	2.70	2.70	2.85	2.85	2.50
April 30.....	2.95	2.55	2.95	2.90	3.05	2.80	2.65
May 27.....	2.75	2.50	2.95	3.35	2.80	2.95	3.05
1931							
Feb. 25.....	1.80	1.70	2.25	2.50	2.10	2.05	2.15
March 25.....	1.90	1.65	2.15	2.35	2.05	1.80	2.10
April 25.....	1.80	1.55	2.15	2.65	1.90	2.00	2.25
May 26.....	1.65	1.40	2.00	2.25	1.90	1.75	2.25
1932							
Feb. 25.....	.80	.70	1.35	1.10	1.00	.85	1.20
March 25.....	.80	.65	1.15	.95	.90	.80	1.05
April 26.....	.75	.65	1.15	1.30	.95	.85	1.15
May 24.....	.65	.65	1.20	1.00	.85	.80	1.15

^aNorth Carolina is omitted because separate price reports are not available for this state.

TABLE 43.—AVERAGE PRICES PAID TO PRODUCERS FOR THRESHER-RUN SOYBEANS AND AVERAGE WHOLESALE AND RETAIL SELLING PRICES, ILLINOIS, 1925-1931 CROPS

(Dollars per bushel)

	Crop of—						
	1925	1926	1927	1928	1929	1930	1931
Average price paid producers....	\$1.75	\$1.60	\$1.30	\$1.30	\$1.30	\$1.10	\$.40
Average of Chicago and St. Louis wholesale prices.....	2.50	2.75	1.90	2.60	2.30	2.20	.90
Average retail price.....	2.75	2.85	2.30	2.75	2.65	1.80	.75

compensation for the speculative risk involved in disposal of the crop for seed. The spread between wholesale and retail selling prices included only one profit.

Price Differences Among Varieties of Soybeans in Illinois.—Varieties of soybeans differ in price in the various districts of Illinois, much depending upon the use for which they are grown, the supply, and the prospective demand.

Compared with the unweighted average of the prices quoted for all varieties in county farm-bureau publications (Table 44), the prices indicated for selected varieties were as follows for the crops harvested

TABLE 44.—AVERAGE ADVERTISED PRICE OF SOYBEAN SEED OFFERED FOR SALE BY PRODUCERS, BY VARIETIES, ILLINOIS, MARCH-JUNE, 1920-1930
(Dollars per bushel)

Variety	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	Average 1928-30
Illini.....	\$.....	\$.....	\$.....	\$.....	\$.....	\$.....	\$.....	\$.....	\$2.70	\$2.10	\$1.40	\$2.05
Manchu.....	.....	.....	2.65	2.55	2.30	2.25	2.45	1.85	2.05	1.95	1.35	1.80
A. K.....	4.85	2.30	1.95	2.30	2.15	1.90	2.05	1.90	2.05	1.90	1.25	1.75
Midwest.....	5.05	2.30	2.15	2.45	2.35	2.40	2.60	1.85	1.90	2.05	1.55	1.85
Ebony.....	4.50	2.05	2.35	2.65	2.75	2.45	2.40	1.90	2.00	2.25	1.80	2.00
Virginia.....	.....	2.75	2.60	2.75	3.40	2.45	2.45	2.35	2.50	2.30	1.90	2.25
Wilson.....	.....	2.35	.....	2.95	3.30	2.50	2.55	1.90	2.00	2.50	2.75	2.40
Black Eyebrow.....	.....	3.10	2.10	2.70	2.55	1.90	2.30	1.95	2.00	2.15	1.40	1.85
Peking.....	3.95	2.30	2.50	3.00	2.95	2.60	2.40	2.15	2.40	2.00	2.50	2.30
Ito San.....	.....	1.75	1.80	2.55	1.90	.....	.....	.....	2.10	2.50	.....	2.30
Ilsoy.....	.....	2.50	2.25	2.65	2.95	2.50	2.60	2.35	2.35	2.35	1.85	2.20
Haberlandt.....	.....	2.00	2.00	2.35	2.50	2.55	2.60	1.90	2.25	2.25	1.50	2.00
Ohio.....	6.50	2.05	2.35	2.10	2.15	2.00	.....	2.00	2.00	.....	.....	2.00
Dunfield.....	.....	.....	.....	.....	.....	.....	.....	.....	2.00	1.90	1.30	1.75
Mansoy.....	.....	.....	.....	.....	.....	.....	.....	.....	2.00	2.00	1.20	1.75
Miscellaneous.....	3.85	1.95	2.55	2.40	3.00	2.85	2.45	2.00	2.20	2.20	3.25	2.55
Average.....	\$4.80	\$2.30	\$2.25	\$2.55	\$2.65	\$2.35	\$2.45	\$2.00	\$2.15	\$2.15	\$1.80	\$2.05
Wholesale average of Chicago and St. Louis.....	\$3.95	\$2.30	\$2.75	\$2.65	\$2.35	\$2.45	\$2.75	\$1.90	\$2.60	\$2.30	\$2.20	\$2.35

during the five years 1924-1928: *above average*, Virginia, Ilsoy, Peking, Wilson V, Ebony, and Haberlandt; and *below average*, Black Eyebrow, Midwest, Manchu, Ohio, Ito San, and A. K. For the 1929 and 1930 crops Ebony and Haberlandt had moved into the below-average group and the Ito San into the above-average group. The tendency for hay varieties to carry higher prices than commercial varieties is due not only to the fact that hay varieties usually produce less seed per acre than commercial varieties, but also to the fact that supplies are relatively smaller since most of the acreage is cut for hay. These price differences have persisted thruout most of the period for which variety price data are available (Fig. 23).

The average difference in quotations given by country handlers on

the 1926 crop on account of variety was 65 cents, and for the 1930 crop 85 cents.

During the period 1924-1931 the A. K. variety averaged lowest in a majority of the crop reporting districts as well as for the entire state.

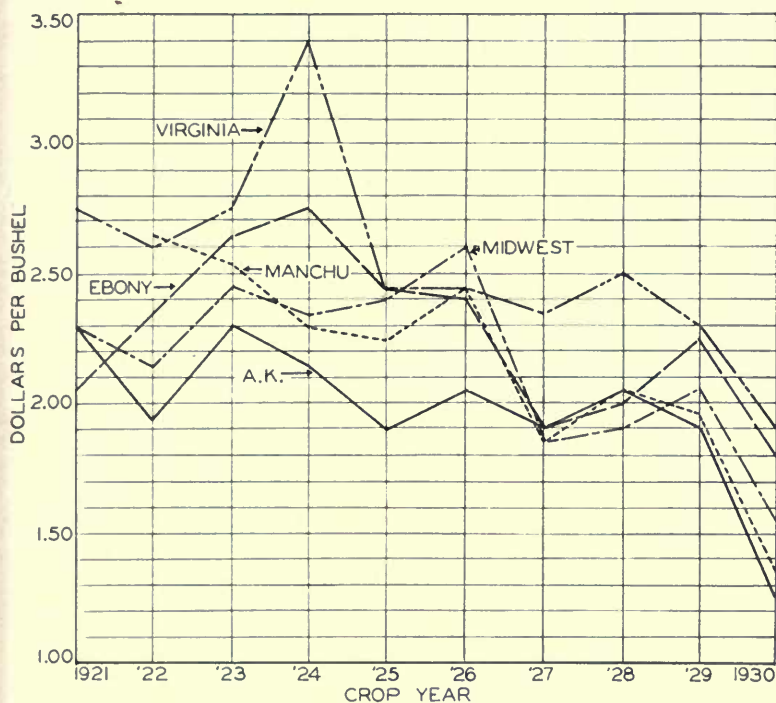


FIG. 23.—AVERAGE PRICES OF SOYBEAN SEED OF SELECTED VARIETIES IN ILLINOIS, 1921-1930 CROPS

New promising varieties of soybeans usually run highest in price until there is an abundance of seed, and then may become the cheapest of all varieties, as in the case of the Manchu. On the other hand, varieties of decreasing importance may at times increase noticeably in price as a result of unusual scarcity. The relative position of hay and seed varieties varies from year to year on account of dissimilar changes in supplies.

Virginia was highest for the entire state and in the Mattoon and Carbondale districts (6a and 7). Black Eyebrow averaged highest in the Springfield district (4a), and Ebony in the Champaign district (6).

Prices of Soybean Oil

Prices of soybeans for other purposes than seed are determined largely by the two major products: oil and meal. Price relationships

between these two products have been such that the oil from a bushel of beans has been worth less than the meal. During considerable periods of time, therefore, soybean oil has been produced when the returns from it alone would not warrant its production.

The demand for soybean oil cannot be studied independently of the demand for other important vegetable oils, such as linseed, cottonseed, corn, and coconut oil.

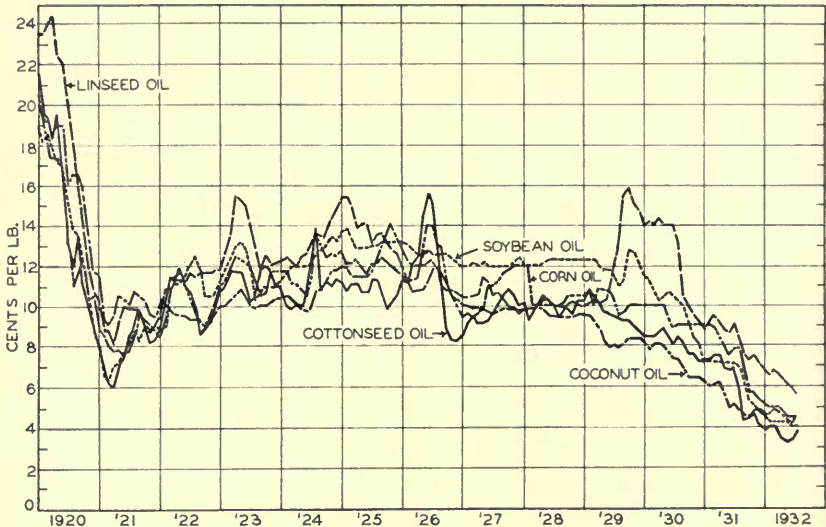


FIG. 24.—PRICES OF SOYBEAN OIL AND FOUR OTHER LEADING VEGETABLE OILS AT NEW YORK, BY MONTHS, 1920-1932

While there was considerable variation in the prices of vegetable oils from the middle of 1922 to the middle of 1929, the trend was practically level. Since then the prices of these oils have gradually moved downward. From 1926 to 1928 soybean oil had a favorable price position compared with other oils. This position has been somewhat reversed since the fall of 1930.

Prices of the drying oils in the United States have usually been higher than those of other vegetable oils. When the available supply of quality soybean oil cannot be used in the paint, varnish, linoleum, and other industries using drying oils, and a part of the existing stock must be sold in competition with lower-priced oils, these lower-priced uses will determine the general level of prices for soybean oil.

There is no distinction between prices of domestic and imported oil, but good domestic oil which ordinarily is from crude to semirefined in quality usually commands a slight premium over imported crude oil.

Comparing soybean oil prices with linseed, cottonseed, coconut, and

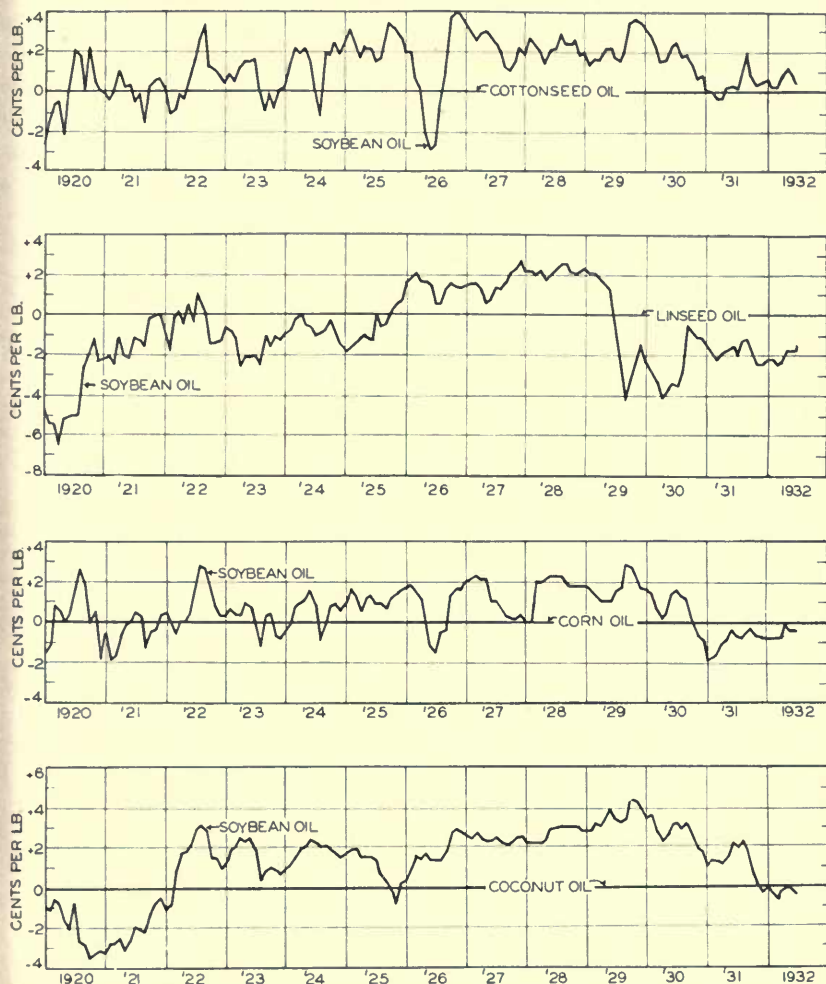


FIG. 25.—PRICES OF SOYBEAN OIL COMPARED WITH PRICES OF FOUR OTHER LEADING VEGETABLE OILS AT NEW YORK, BY MONTHS, 1920-1932

The price of soybean oil was nearest that of linseed oil and farthest from that of coconut oil during most of the period between 1920 and 1930. More recently the price of soybean oil has moved down into direct competition with cottonseed oil. Linseed oil prices have remained above both soybean oil and coconut oil.

corn oil prices, as quoted in the New York market for the period 1920-1931 (Figs. 24 and 25), the following facts are to be noted:

1. Considering price primarily during the period 1921-1931, soybean oil could have profitably replaced only linseed, and for a period

of about three years, 1926-1928, it was higher in price than linseed oil.

2. Compared with linseed oil, the price of soybean oil was slightly lower from 1920 thru 1925, higher from 1926 thru the first half of 1929, and lower for the balance of the period. The most common relationship was from a basis of parity to 2 cents below. There was a tendency for soybean oil to be somewhat more stable in price than linseed oil from 1923 thru 1929. Since the soybean oil was largely imported, it was probably easier for its price to remain fairly constant.

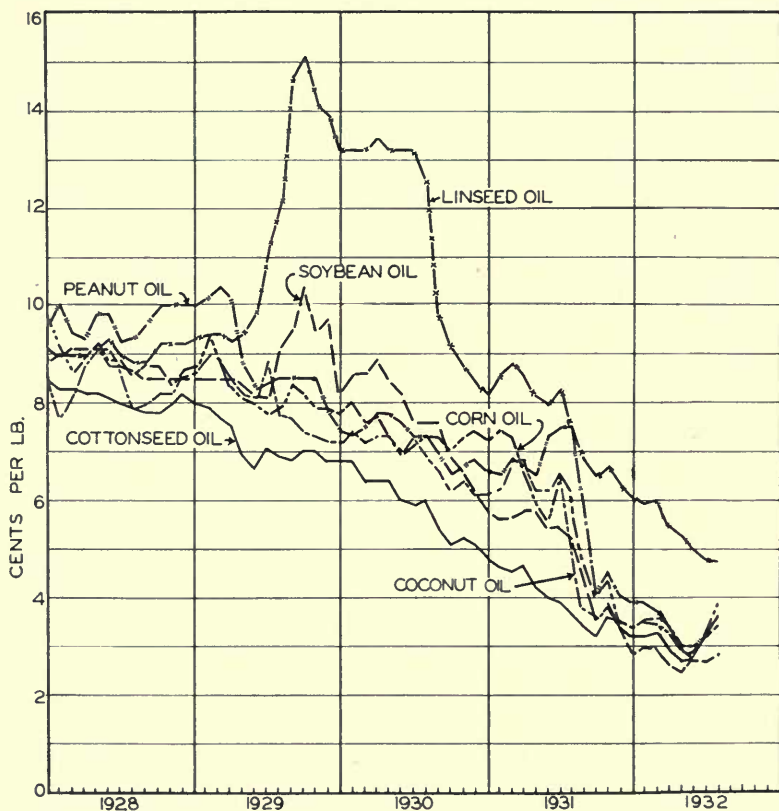


FIG. 26.—PRICES OF SOYBEAN OIL AND FIVE OTHER LEADING VEGETABLE OILS AT IMPORTANT MILLING CENTERS, 1928-1932

Shifts in vegetable oil prices since 1928 have been such that soybean oil has moved from a price position where it was influenced mostly by linseed oil to one where it is influenced by almost all oils. Soybean oil prices of the first quarter of 1932 reflected not only the large stocks of soybean oil on hand but of all other vegetable oils and animal fats as well.

3. Soybean oil showed a distinct premium over cottonseed oil during most of the period 1920-1931 and hence could not compete with cottonseed oil on a price basis. The increased soybean price premium after 1923 was caused partly by decline in cottonseed oil prices and partly by rise in soybean oil prices.

4. The prices of coconut oil represent Manila oil beginning with 1922. Soybean oil showed a price premium over coconut oil from early in 1922 during the remainder of the period except for a few months at the end of 1925 and since December, 1931. Tariffs on vegetable oils effective since 1922, except those on imports from the Philippines, have been an important factor in widening the spread in price between coconut oil and other vegetable oils.

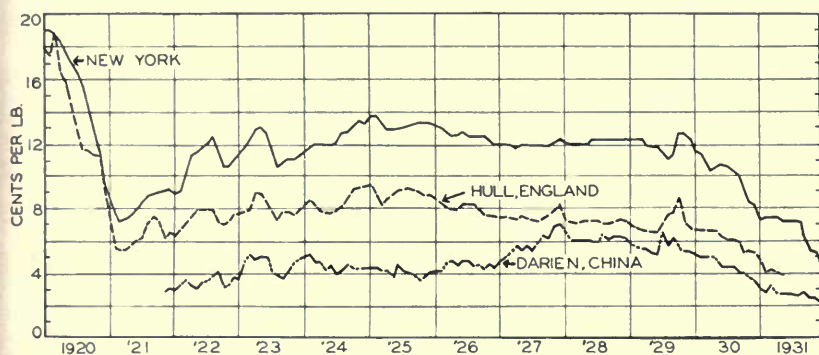


FIG. 27.—PRICES OF SOYBEAN OIL AT DAIREN (MANCHURIA), HULL (ENGLAND), AND NEW YORK, 1919-1932

Prices of crude soybean oil at leading markets in various countries have had a tendency to fluctuate together. Prices have been highest in the markets farthest from the important sources of soybean supply and nearest the centers of consumption. Tariff duties have widened the spread between New York and foreign markets since 1922. All prices are on a gold basis.

5. The production of corn oil has been steady and prices have moved in accord with those of cottonseed oil except that they have fluctuated less, and have usually been at a slightly higher level. The price relation of corn oil to soybean oil has therefore been similar to that of cottonseed oil to soybean oil.

The price decline in all of the vegetable oils, which, except for linseed oil, began in the latter part of 1929 and included linseed oil after the latter part of 1930, has been due to a slump in general prices, depressed demand, and to increased stocks of all vegetable oils (Fig. 26).

Prices of soybean oil for the period 1920-1930 were lower at

Dairen, Manchuria, than at either Hull, England, or New York City (Fig. 27). Dairen is an important exporting point for Manchurian oil, and Hull is an important oil importing and manufacturing center. Prices at New York and Hull were about on a parity until the United States imposed an import duty in 1921, at which time the price at Hull was slightly lower than at New York. Following the imposition of the duty, the margin between New York and Hull has widened until it has become larger than the duty plus the additional freight cost.

Prices of Soybean Oil Meal

Domestic soybean oil meal was on the United States market to only a limited extent before 1928, tho the imported product has been used for a longer period on the Pacific coast because of cheapness of obtaining foreign supplies and because of high costs of obtaining domestic cottonseed and linseed meal.

Current information on soybean oil meal prices has not been readily available until recently. The bulk of this product has been sold on contracts between processors and manufacturers of mixed feeds, open-market sales being uncommon. Not until the spring of 1931 was soybean oil meal included in the weekly *Feed Market Review* of the U.S. Department of Agriculture.

Soybean oil meal sells in direct competition with cottonseed and linseed meal, its price being related to the prices of these two feed-stuffs. During the 1928-1930 period, when soybean oil meal was being used to an increasing extent, linseed meal sold at a higher level than cottonseed meal, with soybean oil meal prices conforming more closely to those of linseed meal, as soybean oil meal was being used extensively as a substitute for the latter. With the lower price-levels that were established toward the end of this period, the prices of the various oil meals have come closer together. Beginning with the 1931 crop soybean oil meal prices have been nearer to those of cottonseed meal than to those of linseed meal (Fig. 28).

In the absence of data concerning soybean oil meal prices extending over a long period, the following tentative statements may be recorded: first, a limited supply of soybean oil meal can be sold on the basis of prevailing prices of linseed meal because it will be used as a direct substitute; second, as the supply is increased, soybean oil meal will have to compete more directly with the lower-priced cottonseed meal and its price will necessarily conform more or less to that of cottonseed meal; third, an increase in the supply of the soybean oil meal should bring linseed meal prices more nearly into line with cottonseed

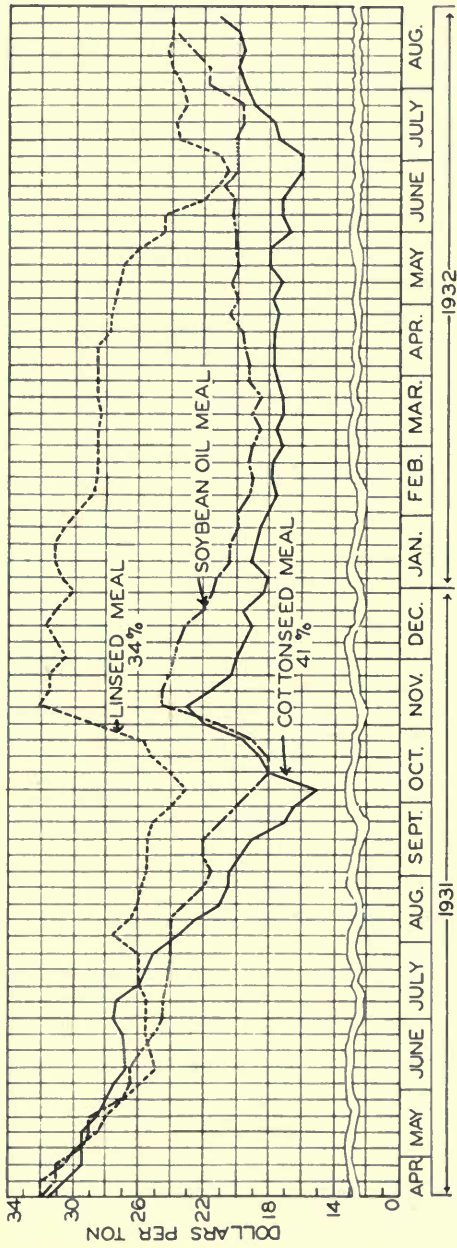


FIG. 28.—PRICES OF SOYBEAN OIL MEAL AND TWO OTHER LEADING VEGETABLE MEALS AT CHICAGO, BY WEEKS, APRIL 15, 1931, TO AUGUST 30, 1932

Prices of the meal made from the 1931 soybean crop were more nearly in line with those of cottonseed meal and fluctuated with them more closely than with linseed oil meal prices.

meal prices, which would lessen the possibility that either linseed or soybean oil meal would sell at a marked premium over cottonseed meal.

The supply of linseed meal in relation to the demand for it was apparently such for a few years before 1930 that it would sell at a premium over cottonseed meal. Soybean oil meal is now being used as a substitute material for linseed meal, as evidenced by changes made in the formulas of certain manufacturers of mixed feeds. The increased production of soybean oil meal has had precisely the same effect as an increase in production of linseed meal on the price of the latter.

Neither the use of soybean oil meal in foods nor its use in fertilizers need be given much consideration from the standpoint of influence on soybean prices at the present time. The demand for soybean meal by firms in the United States using it in the manufacture of food products is not large enough to raise the price of meal above feed prices. As fertilizer, its value would be below its value as a feed, and there is little likelihood that production will be increased to the extent that it will become economically feasible to use soybean oil meal for fertilizer. In the orient where soybean cake is extensively used as a fertilizer, there is now a question about its being able to meet competition from other nitrogenous fertilizer.^{23*}

Prices of soybean oil meal have been lowest in the corn-belt states (Fig. 29). Prices at St. Louis and Chicago have not differed markedly. Prices at Kansas City and Minneapolis have varied by a somewhat wider margin than the Chicago and St. Louis prices, the former markets being farther away from the source of supply.

Use as Affected by Prices

Prices of products whose functions may be largely supplied by substitutes, as in the case of soybeans, are influenced by the total supply of all competing products satisfying the demand for a given type of product rather than by the supply of any single product.

In the case of soybean hay, the price is almost entirely a local matter since very little of it enters commercial channels. This price is largely determined by the price of other hay and feed in the area.

The price of soybeans for crushing purposes is dependent on the supply available for that purpose and on the supply and price of cottonseed and flaxseed in relation to the demand for the resulting products.

Demands effective in determining prices in southern and eastern states are those for seed and for feed; and in the south-central portion of the corn-belt states, for home-grown feed and for crushing

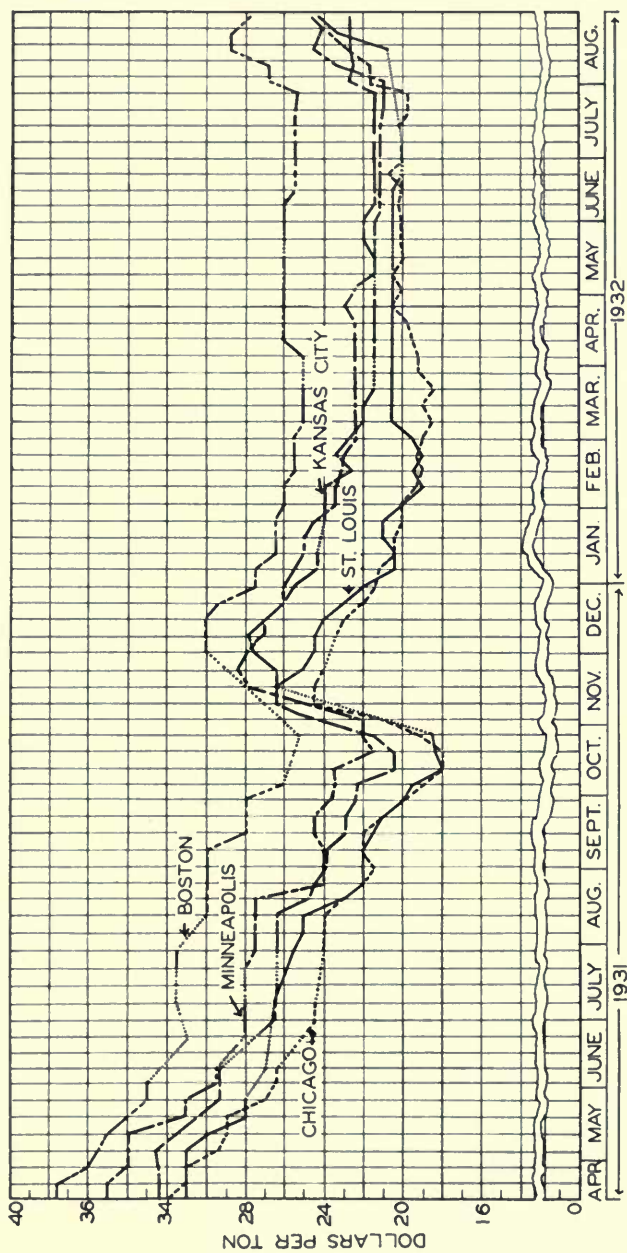


FIG. 29.—PRICES OF SOYBEAN OIL MEAL AT FIVE IMPORTANT MARKETS, BY WEEKS, APRIL 15, 1931, TO AUGUST 30, 1932. Soybean meal prices have been lowest at the markets near production and highest at markets farthest from all protein feed production centers.

products. Toward the northern boundary of the corn-belt states competition centers upon soybeans and other crops in feeding; and in the western part of the corn belt, upon its uses for seed and for feed. In northern Illinois the dominant competition is between soybeans and other crops for feeding; in the central portion of the state, extending well to the south, between feed and mill products; and in the southernmost portion, between seed and feed.

Of the three important demands absorbing soybeans and soybean products—namely, demands for seed, for feed, and for crushing—the seed demand naturally has priority and tends to result in price premiums for such soybeans as meet the requirements. Since the point at which the soybean seed demand is satisfied has already been reached in much of Illinois, it is expected that the demand for feeding or crushing will absorb an even larger amount of beans in the future. The price that is paid for soybeans for the use which absorbs the new surpluses as expansion proceeds determines the price at which most of the beans move. Exceptions to this are premiums for local use arising from local deficit or for seed use associated with higher quality. The tendency for newer uses to set the price of the whole crop in any one area also operates indirectly to set the price in other areas.

In so far as the prices of vegetable oil and oil meal are high enough to cover, in addition to the cost of the raw product, the costs of transportation, processing, and merchandising incident to extracting the oil and getting the meal into the hands of users, crushing mills should be able to absorb a growing surplus. A basic consideration is the difference in net return obtained by using soybeans as a hay crop on the farm and by gathering the beans and selling them to mills. The greatest demand at present is for soybeans for feeding, including both feeding on the farm where raised and inclusion in mixed commercial feeds.

MEETING THE PRICE RISKS IN MARKETING .

Shippers, dealers, and crushers holding large supplies of soybeans are confronted with possibilities of change in prices of beans and bean products. Industrial establishments using beans and bean products as raw materials are confronted with hazards of price change which cannot always be avoided by forward sales of final products. Changes favorable to the one group may be unfavorable to the other.

Even in the simplest transaction involving a movement of soybeans there is at least a small risk of adverse price change. As in sales

of grain, whether sold "on track," "to arrive," on consignment, or thru pooling arrangements, these risks must be assumed by someone.*

The soybean crop differs from numerous other crops in that it has been handled with a minimum use of organized exchanges. None of the exchanges have made provision whereby hedging transactions could be undertaken directly in soybeans, in soybean oil, or in oil meal. To only a very limited extent have attempts been made to hedge soybeans or the oil or meal products by future contracts made in terms of flaxseed or in terms of products of cotton more or less analogous to soybean oil and meal. Except for the shortest of periods, the movements of prices of these two types of products have not been sufficiently parallel to justify using one product as the basis for hedging against adverse price movements in the other.

There are a number of conditions that must be met before hedging transactions could be successfully carried on in commodities advancing into commercial prominence, such as soybeans and soybean products. In order that a commodity may be suited to the development of futures transactions it must meet requirements as follows: (1) It must be known and its value understood broadly enough by the general public, as well as by the special trade by which it is used, that it will attract investment and speculative buying and selling in periods of price fluctuation. (2) It must be easily transferred from one marketing position to another. This is essential if cornerings and congestions are to be avoided and if users, especially where they are not numerous, are to be prevented from manipulating the market to their immediate advantage. (3) The commodity must have a fairly large annual commercial volume enjoying the liquid characteristic referred to and should have offerings fairly well spread thruout the marketing year. (4) The commodity should be fairly free of entanglements or surprises where deliveries are made in pursuance of contracts.

In addition to the above characteristics it would be desirable for a central market attempting to create futures facilities for soybeans or soybean products to be so situated that billing thru that point could be used to advantage. A product as complex as soybeans will not likely be made the basis for future trading on an organized exchange so long as the volume handled is not greatly in excess of the amounts which have thus far moved thru any single domestic market center.

Altho hedging is now scarcely possible in connection with soybeans

*Descriptions of the methods referred to are given in many standard treatises on marketing and, with special reference to the problems of price risks, in Hoffman, G. W., "Future Trading and Cash Grain Marketing" Circular 201, U. S. Department of Agriculture, 1932.

or soybean products, processors who distribute the risk on part of their purchases by forward sale of their mill products may attain a result no less satisfactory. Such sales of soybean oil meal to large feed distributing companies have been quite common.

The Soybean Marketing Association developed its policy on rather original lines largely in response to recognized need for handling price risks. The contract used by the association in connection with the sale of the 1931 crop of soybeans was an attempt to distribute the risk between the processors and the producers. The method is described on page 490. The processors carried all of the risk of the price falling below a certain point; from that point on the risk was divided. The association has devoted its efforts not only toward developing larger outlets for its products, but also toward putting supplies into a better marketable position and organizing sales and settlements so as to minimize and mutualize the risks of price changes within the marketing period.

INTERNATIONAL TRADE IN SOYBEANS AND SOYBEAN PRODUCTS

In the foreign trade of the United States imports of soybean oil have appeared since 1910 and of soybeans since 1914. The United States exported domestic beans to Europe in quantity for the first time during the fall of 1931, more than 2 million bushels being shipped from the 1931 crop.

The chief source of world trade in soybeans is Manchuria. From this source soybeans and soybean products have moved principally to other parts of China, particularly the southern part, to Japan, and to countries of northwest Europe. Previous to 1907, when a small lot was shipped to England, the trade was confined largely to oriental regions, particularly to China and Japan. Later expansion has paralleled the economic development of Manchuria which followed (1) the Russo-Japanese war of 1906, (2) the developmental activities of the South Manchurian Railway, which was taken over by Japanese interests at the close of that war, (3) the large migration of Chinese into Manchuria, and (4) the construction in recent years of other railroads by Chinese interests.

Soybeans.—Japan has served as a marketing intermediary for some of the Manchurian soybean crop (Table 45). A small amount of beans has been reexported from the Netherlands also.

For a time the United Kingdom enjoyed a monopoly in the trade outside of the orient, but Germany and France soon adjusted conditions so as to share this trade.

TABLE 45.—EXPORTS OF SOYBEANS FROM SELECTED EXPORTING COUNTRIES, 1923-1930

(Thousands of pounds)

Calendar year	Total	China ^a	Japan including Chosen	Netherlands
1923.....	350 525	349 590	923	11
1924.....	471 136	470 033	876	227
1925.....	405 224	404 090	824	310
1926.....	435 528	434 268	826	435
1927.....	563 986	562 843	1 087	90
1928.....	797 799	796 768	952	77
1929.....	912 521	911 472	949	81
1930.....	917 520	916 685	816	17 ^b

^aThese figures are for yellow soybeans only, but yellow soybeans include nearly all the Chinese soybeans, according to Paul O. Nyhus, Agricultural Commissioner, United States. ^bEight months.

TABLE 46.—IMPORTS OF SOYBEANS INTO SELECTED COUNTRIES, 1913 AND 1919-1931

(Thousands of pounds)

Calendar year	Total of eight countries ^a	Denmark	Japan including Korea	France	Germany	Netherlands	United Kingdom	United States
1913.....	336 262	105 963	.....	99	(b)	60 746	169 454	.....
1919.....	387 547	173 116	.....	.....	.....	72 162	137 901	4 368
1920.....	243 562	170 764	.....	1	45 131	8 279	16 251	3 136
1921.....	387 435	104 155	.....	3	139 600	4 567	135 164	3 946
1922.....	511 901	175 271	.....	23	190 493	11 413	131 165	3 536
1923.....	1 722 732	284 221	950 040	389	195 348	36 557	252 529	3 648
1924.....	1 891 484	345 167	947 697	70	302 761	41 905	249 700	4 184
1925.....	2 392 675	250 149	956 461	18	741 171	80 464	360 600	3 812
1926.....	2 284 384	385 051	936 136	15	815 787	41 693	101 974	3 728
1927.....	2 712 105	348 406	884 710	.....	1 270 062	21 907	182 831	4 189
1928.....	3 872 697	472 469	1 040 128	17 564	1 868 892	40 180	429 208	4 256
1929.....	4 613 330	518 753	1 261 690	3 798	2 257 198	108 304	459 250	4 337
1930.....	3 602 935	388 593	1 002 936	1 208	1 959 417	42 397	204 532	3 852
1931.....	4 317 306	524 788	1 210 628 ^c	23 840	2 236 726	70 950	246 834	3 540

^aImports into Sweden in the years 1928 to 1931 were 200, 221, 108, and 69 thousands of pounds respectively; imports into Italy in the years 1928 to 1930 were 141, 195, and 18 thousands of pounds. ^bLess than 500 pounds. ^cFigures for 1931 not yet available for Korea and Italy.

Importations of beans and oil into countries outside of the orient in 1913 were fairly equal, considering oil as representing 10 percent of the weight of the beans from which extracted. The total importation of beans into these countries showed little increase prior to 1922 (Table 46). Since then the imports have moved steadily upward, reaching seven times the 1922 figure by 1930. The leading importing countries for beans have been Germany, Denmark, and the United Kingdom, most increase having been shown in Germany. Importation into the United States has always been small. Japan, including Korea, has led in the importation of soybeans into the orient.

Soybean Oil.—The importation of soybean oil into countries out-

side of the orient had increased tenfold over 1913 by 1919. Since 1919 there has been considerable variation from year to year, but no appreciable permanent increase. The increase between 1913 and 1919 was largely influenced by war demands. The leading importing countries have been the Netherlands and the United Kingdom. Importations into these countries and into France and Germany have increased somewhat since 1919, while those into the United States and Denmark have decreased (Table 47). Germany, Denmark, and the United King-

TABLE 47.—IMPORTS OF SOYBEAN OIL INTO SELECTED COUNTRIES, 1913 AND 1919-1931

(Thousands of pounds)

Calendar year	Total of seven countries*	Denmark	Japan including Chosen	France	Germany	Netherlands	United Kingdom	United States
1913.....	27 895	.....	.....	416	6 922	6 336	.....	14 221
1919.....	294 514	5 610	.....	8 365	.....	84 733	.....	195 808
1920.....	254 407	11 733	.....	16 761	48 232	80 094	33 607	112 214
1921.....	185 435	7 717	.....	3 955	54 504	73 174	35 802	17 283
1922.....	231 629	5 565	.....	3 918	91 436	68 226	45 190	17 294
1923.....	230 375	7 488	1 048	6 470	58 285	65 838	49 567	41 679
1924.....	200 278	5 975	188	10 586	42 166	67 298	65 740	9 125
1925.....	269 097	9 703	33	16 073	73 793	84 793	65 209	19 493
1926.....	308 055	2 288	128	13 057	44 094	109 709	108 067	30 712
1927.....	353 936	4 394	115	24 759	25 290	166 388	118 075	14 915
1928.....	181 433	1 267	.....	19 064	2 466	91 249	55 196	13 116
1929.....	168 504	699	.....	17 163	4 376	93 739	33 038	19 489
1930.....	241 952	2 084	.....	25 248	28 832	124 768	56 670	4 348
1931.....	160 852	1 908	.....	7 200 ^b	20 442	62 174	64 212	4 916

*Imports into Algeria in 1928, 1929, and 1930 were 3,542, 133, and 11 thousands of pounds respectively; into Austria 8,350, 9,887, and 5,894 thousands of pounds; and into Sweden 10,019, 10,433, and 30 thousands of pounds. ^bEleven months only.

dom have imported raw beans for crushing to a much larger extent than has France. The Netherlands has been more prominent in the importation of oil.

Denmark is the only soybean importing country exporting most of her soybean oil. The United Kingdom and the Netherlands export about half of their soybean oil supply; in the case of the other countries the exports have been negligible except for Germany since 1927 (Table 48). Exports of soybean oil, however, come mainly from Manchuria.

Soybean Oil Cake and Meal.—Trade in soybean cake and meal has been of much less importance for all of the leading importing countries than that in soybeans and soybean oil, but has shown a gradual increase. Importations into these countries for 1927 were: Denmark, 32,100 tons; the United Kingdom, 29,700 tons; and the United States, 27,000 tons. Nearly all exports of cake and meal have originated in Manchuria and have averaged about 1,375,000 tons for the five-year

TABLE 48.—EXPORTS OF SOYBEAN OIL FROM SELECTED COUNTRIES,
1913 AND 1919-1931

(Thousands of pounds)

Calendar year	Total of eight countries ^a	China	Denmark	Japan including Chosen	France	Germany	Netherlands	United Kingdom	United States
1913.....	88 446	65 574	.....	.....	.....	2 130	1 838	21 034	.....^b
1919.....	372 377	314 876	12 614	.....	32	.....	14 813	2 327	27 715 ^b
1920.....	355 809	288 408	32 525	.....	1 021	154	26 766	23 374	43 715
1921.....	237 362	153 110	13 157	.....	403	1 414 ^a	45 187	22 147	1 944
1922.....	263 858	197 310	16 273	.....	.....	1 124	28 556	18 137	2 458
1923.....	353 883	283 590	25 179	5 731	44	1 959	18 714	16 910	1 356
1924.....	384 202	282 863	33 207	9 265	(d)	8 553	18 416	31 497	2 264
1925.....	386 780	265 240	28 327	15 954	63	6 314	27 963	42 399	5 520
1926.....	492 282	355 631	31 391	19 236	67	11 160	37 447	55 019	1 567
1927.....	540 666	329 298	33 837	11 167	85	34 663	75 314	62 025	5 444
1928.....	347 884	125 625	46 466	10 870	213	73 140	35 509	48 919	7 142
1929.....	383 541	148 673	43 690	14 739	375	103 862	23 888	40 347	7 967
1930.....	384 738	251 860	28 610	34 156	24	6 930	22 998	35 198	4 962
1931.....	458 234	328 862	41 070	16 008	(d)	10 190	24 140	32 412	4 552

^aExports from Algeria in 1928 and 1929 were 43 and 23 thousands of pounds respectively; from Sweden 16,796 and 15,911 thousands of pounds; from Austria in the years 1928 and 1929, 35 and 45 thousands of pounds, and in 1931 less than 1,000 pounds; and from Italy in 1931, 666 thousands of pounds. ^bJuly, December only. ^cApril, 1921, to May, 1922. ^dLess than 1,000 pounds.

TABLE 49.—EXPORTS OF SOYBEAN CAKE FROM MANCHURIA AS A WHOLE AND FROM
THE PORT OF DAIREN, WITH DESTINATIONS OF BEAN CAKE
FROM DAIREN, 1926-1931

(Tons of 2,000 pounds)

Location	Exports for year ended October 30				
	1926-27	1927-28	1928-29	1929-30	1930-31
Exported from Manchuria.....	1 783 789	1 283 481	1 017 463	1 362 708	1 436 960
Exported from port of Dairen.....	943 035	900 738
To Japan.....	716 717	673 583
To Korea.....	7 213	5 304
To Europe.....	20 403	38 805
To United States.....	42 018	18 850
To China.....	143 607	161 812
To other destinations.....	13 077	2 384

period 1926-27 to 1930-31 (Table 49). About 70 percent of this exportation for the two years 1929-30 and 1930-31 went thru the port of Dairen and was shipped mainly to Japan and China. Most of the cake and meal going to Europe was shipped to Germany. In 1929 Germany imported 29,400 tons of cake and meal, mostly from China and Italy, and exported 204,800 tons, which went to Denmark, the Netherlands, Finland, Sweden, and the United States.

Soybeans and soybean products in international trade have been influenced greatly by the imposition of tariff duties. Among the leading importing countries only the United Kingdom has admitted these imports duty-free. European countries usually permit beans to come

in duty-free but they levy a rather heavy duty on soybean oil. In some cases this is less when the oil is used for soap or other inedible purposes. The trend has been definitely toward encouraging the soybean crushing industry in these countries.

PLACE OF SOYBEANS IN ILLINOIS FARMING

For the first three years of the decade 1922-1931 the total equivalent solid acreage of soybeans in Illinois had an average yearly rate of increase over the preceding year of between 25 and 30 percent. During the last three years of this period the corresponding increase was slightly over 15 percent. Planting intentions for 1932 indicated a falling off in acreage about equal to the recently prevailing amount of yearly increase. While it is possible that the curve of soybean acreage may be substantially changed, it is doubtful whether it will develop a downward trend. It is possible for soybean acreage to continue to expand by the addition of areas substantially equal to those of recent years. It is likely, however, that a saturation point will be reached in the corn belt with soybeans occupying a much smaller proportion of the cultivated area than they occupy in Manchuria, the center of greatest concentration of soybean production.

The amounts which individual farmers contribute to the market supplies of soybeans and soybean products represent the result of their adjustments to numerous conditions, some internal to their own farms as organized for production and other ends, others external to their farms, their localities, or even the central markets of their country as a whole.

The introduction of the soybean crop was beset with the usual difficulties associated with new crops. Farmers have rather generally found one or more sufficient reasons, however, for giving either a small place or a large one—in some cases, no doubt, too large a place—to this important legume.

Soybeans fit into the farm program in a variety of ways. The more important reasons for the rapid increase in the acreage devoted to this crop in Illinois have been the following:

1. Farmers have desired to substitute some crop that will take the place of oats in the rotation and be more profitable than oats when grown other than for feed or as a nurse crop.
2. The soybean is adaptable as a leguminous catch crop when red clover or another legume in the regular rotation fails to produce a satisfactory stand.

3. The soybean is acid-tolerant and will grow satisfactorily on soil that is too sour for the common clovers.

4. The soybean is able to produce a fair crop on land that is too poor for even poor results with many other crops. It should not be inferred, however, that the soybean is not at its best on fertile land.

5. The crop is valuable as a nitrogenous supplement to other home-grown feeds.

6. The soybean is a dual purpose crop, good either for hay or for seed. Frequently the farmer plants soybeans as hay insurance, realizing that if his regular legume or hay crop is successful, he can cut his beans for seed and if his clover-hay crop is disappointing or is changed to a seed crop, he can use the beans as hay or as a green-manure crop.

7. The soybean crop has a favorable influence upon the crops which follow, particularly upon spring grain and corn, tho where the major portion of the crop is removed from the land, this beneficial effect is less marked than is the case with the clovers.

8. The soybean crop is free from attack by certain insects, such as chinch bugs, that are destructive to many of our crops. Forethought relative to the European corn borer probably stimulated the interest of many Illinois farmers in soybeans, particularly in 1928.

9. Soybeans may be satisfactorily grown in place of late-planted corn when adverse weather conditions cause corn planting to be considerably delayed.

A restraining factor influencing the expansion of soybean acreage should be noted in connection with the recent rapid increase in acreage planted to this crop in the corn belt. Labor requirements for soybeans grown for hay do not fit in well with those for the major crops of the corn-belt region, and for soybeans grown as a cash crop these requirements conflict markedly with those of other crops, especially with corn, on many farms.

Recognition of the adaptabilities and limitations of soybeans with reference to the needs of Illinois agriculture has resulted in giving them a different place in the farming operations in the southern, central, and northern parts of the state. The crop is used in the northern part of the state not only for hay but also to some extent, when interplanted with corn, for grazing and ensilage; in the central division the beans are mainly gathered; and in southern areas of the state the crop is used for hay, with a recent trend toward gathering for commercial purposes.

Altho soybeans are no longer an unfamiliar crop to most corn-belt farmers, they need to be more fully understood, both from the agro-

nomie and economic standpoints. In order to grow soybeans satisfactorily, it is necessary to become familiar with all pertinent facts and not only give the crop timely and proper attention,^a but exercise wise judgment as to how far to push soybeans in systems of farming where their requirements for labor, capital, and management must be viewed in relation to the requirements made by other lines of production. Habits of the soybean plant differ from those of our common corn-belt crops and unsatisfactory results can sometimes be attributed to a lack of understanding of these habits and consequently of the methods of cultivation best suited to the plant, as well as to use of varieties not best adapted to the locality and purpose for which the crop was grown.

In a surprisingly brief period soybeans have become the object of widespread attention among dealers and among leaders in numerous industries. The extent to which soybean oil can be used to advantage is being determined more and more accurately by research specialists in establishments producing paint, soap, and edible products. Peanuts, rather than soybeans, have been responsible for the fact that terminal market prices for hogs are quoted with "soft or oily hogs and roasting pigs excluded." Recently, however, the rising tide of losses encountered by packers^{1, 22*} using hogs from areas in the corn belt where soybeans—not soybean oil meal—are fed, may serve as a warning that discounts for swine from such sections may become a serious factor.

Generally speaking, soybeans have yet a long way to go before they are as widely known for their qualities as are the major farm products of the corn belt. It is probable that a crop which, from the standpoint of the final consumer, serves the purpose of several crops, cannot be expected immediately to occupy the place in the understanding of the layman that almost any one of the major products of corn-belt farms occupies. There is no doubt, however, that workers in many fields are discovering new features in this multi-product crop and are calling it to the attention of more and more people whose natural interest it touches. All of this growth of contact and information tends to fix soybeans more firmly in the national economy.

^aBulletin 310 of this Station, "Soybean Production in Illinois," gives valuable cultural suggestions concerning the soybean crop.

SUMMARY

The principal points emphasized in the present study include the following:

1. In recent years in which five reporting countries have produced over 7 million tons of soybeans, the production in the United States has been between one-third and one-half million tons. (p. 433)

2. There is no county in the United States where the percentage of cultivated acreage devoted to soybeans is more than half as large as the lowest percentage of the three provinces of Manchuria. (pp. 429-430)

3. Altho only a few farms in the United States were growing soybeans twenty years ago, nearly 5 percent reported growing them in 1929. The proportion so reporting in 1929 was nearly 9 percent in the East North-Central division, and nearly 7 percent in the South Atlantic and East South-Central divisions. (p. 434)

4. Illinois and Indiana are rapidly becoming the leading source of commercial soybeans in the United States, while the soybean producers of Missouri and Ohio are turning to hay as their major product. North Carolina has produced hay and seed for a long time and has been an important producer of commercial beans, particularly of seed beans. (p. 439)

5. The acre-yield of gathered soybeans in the United States has fluctuated considerably from season to season, but it has apparently fluctuated less than the yield of most other standard crops. In Illinois and Indiana the acre-yield has been increasing. (p. 442)

6. The acreage of soybeans gathered for beans and that cut for hay have both been important in Illinois since 1922. In soybean acreage devoted to hay during the five-year period 1926-1930 Illinois averaged highest among the states. Of the total acreage of soybeans cut for hay in the United States in 1929 and 1930, Illinois had 16 percent. The corresponding figure for gathered beans was 36 percent. (pp. 443-444)

7. In the decade 1921-1930 soybeans were less profitable on the better land of the corn-belt than were corn, wheat, alfalfa, or red clover, but they were more profitable than oats or timothy. During this period the returns from soybeans, including seed and mill beans and straw, lacked 17 cents an acre of being sufficient to pay growing and harvesting costs and taxes and interest on the land. (p. 450)

8. Imports of soybean oil into the United States, highest in 1918, were cut to less than 3 percent of that record figure in 1924; after increasing from 1925 to 1929, they dropped back in 1930 and 1931 to figures below that of 1924. Imports of soybeans, highest in 1917, 1919,

and 1929, and imports of soybean oil meal and cake, highest in 1929, have declined since those years. (p. 454)

9. Reduction of imports into the United States was influenced by an increase in import duties. The present duty on oil cake and meal is about one-fourth as high as the recent average price of these commodities, the duty on oil is equal to or somewhat greater than the recent average price, and that on soybeans is about three times the recent average price. (p. 455)

10. Soybean oil produced from domestic materials in 1931 was about 2 percent of all vegetable oil so produced, and net imports of soybean oil were not quite one-third of 1 percent of the net imports of all vegetable oils that year. Cottonseed oil, linseed oil, and corn oil were the competing oils produced in largest amounts from domestic materials. Coconut oil (including copra), palm oil (including palm kernel oil), and linseed oil (including flaxseed) were the vegetable oils imported in largest amounts. (pp. 455-458)

11. The average of 3,500,000 acres devoted to soybeans in the United States in 1929 and 1930 was disposed of as follows: cut for hay, 56 percent; grazed, 15 percent; harvested for beans, 29 percent. (p. 459)

12. Soybeans or soybean products were used in 1931 in an extensive list of commodities, including feeds, industrial products, and food products. (p. 460)

13. Soybean oil meal is now being more generally recognized as a protein supplement than it was formerly. (pp. 462, 507-509)

14. The adaptability of soybean oil as a drying oil renders it important in the industries producing paints, varnishes, waterproof goods, linoleums, and oilcloth. About one-tenth of the 37.2 million pounds of oil produced in the United States from crushing 4.8 million bushels of beans from the 1930 crop was utilized in linoleum and oilcloth, about one-sixth in edible products, nearly one-fourth in soap, and one-fourth in paints and varnishes. (pp. 464-473)

15. The use of soybean oil in hard soaps has been increasing, altho coconut oil is not likely to be displaced to a very large extent. Among soft soaps, the shampoo variety makes no bid for soybean oil, while the automobile variety depends upon it very largely. (pp. 471-472)

16. Solvent-extraction plants may be more costly to install than either expeller or hydraulic-press plants, but where loss of solvent is economically minimized such plants would probably have the lowest cost of operation. (pp. 467-469)

17. The proportion of gathered beans that were crushed was 52 percent in Illinois in 1930 compared with 38 percent in the country as a whole. (p. 474)

18. The nine crop reporting districts of Illinois show wide differences in marketing tendencies, but for the state as a whole 96 percent of the 1930 crop reported in a special Station inquiry as purchased was purchased locally. Of the total sold, 94 percent was shipped out of the locality where grown. For the 1926 crop the corresponding proportions were 74 and 72 percent respectively. (p. 476)

19. Soybeans of the 1926 Illinois crop, and more markedly of the 1930 crop, tended to leave the hands of local dealers in October and November. (pp. 478-480)

20. Manchu was the most widely distributed variety in Illinois in both 1926 and 1930. Virginia and Ilsoy, which are hay and seed varieties, are marketed in the four southern districts of the state. (p. 482)

21. As soybeans have become better established in Illinois, fewer growers have purchased their seed except in areas where seed frequently fails to mature or where the crop is harvested mainly as hay or forage. The selling of soybean seed by individual growers is on the decline. (p. 483)

22. Nearly all the soybeans entering marketing channels from the Illinois crops are first handled by country elevators or local dealers, unless they are grown in the vicinity of oil mills and are sold directly to the mills. (p. 486)

23. The guaranteed minimum prices for the 1928 and 1929 Illinois soybean crops stimulated production. Subsequent marketing arrangements fostered by the Soybean Marketing Association have influenced nearly all phases of soybean marketing. (pp. 487-491)

24. Most of the oil processed from Illinois soybeans is sold on contract thru vegetable oil brokers of Chicago. Soybean oil meal has been most commonly disposed of thru direct sales by processors to mixed-feeds manufacturers and to a less extent thru brokers. (pp. 491-493)

25. The average cost of recleaning soybeans, based on figures for one-fourth of the 1931 Illinois crop reported recleaned, was 3 cents a bushel; other local elevator costs were somewhat in excess of this figure. Both recleaning and other costs were lower for the 1931 crop than for the 1926 crop. Beans marketed primarily for seed were handled at higher costs than the above. (pp. 494-496, 499-500)

26. The price received by farmers for Illinois beans has been about 40 cents a bushel less than the gross value of the products obtained by

processing. This covers the charges made by the local elevator, transportation agencies, and the processor, including profit. Freight rates have not responded to lower price-levels as have elevator costs. (p. 498)

27. The superior export market recently developed for soybeans from the United States was a result in part of better prices for soybean products and in part of lower processing costs for soybeans abroad. (p. 501)

28. Oil mills buy soybeans on the basis of a U.S. No. 2 grade, with a scale of premiums for higher grades and discounts for lower grades. Illinois supplied more than half of the beans inspected in the United States during three of the four years ended June 30, 1932. (pp. 503-504)

29. Soybean oil meal ranks high both in digestible protein and in total digestible nutrients. (pp. 508-509)

30. A price change of 1 cent a pound for oil corresponds to a difference of about 7.75 cents in the value of a bushel of beans. A difference of a dollar a ton in the price of meal corresponds to a difference of about 2.4 cents in the value of a bushel of beans. (pp. 509-510)

31. There are wide sectional differences in soybean seed prices in Illinois. (pp. 511-515)

32. Average wholesale prices for the months of January to May for the five years ended 1931, disregarding Minneapolis, were highest in Chicago and lowest in Baltimore. Retail selling prices of soybeans averaged 5 to 25 percent higher than wholesale prices. (pp. 516-518)

33. In Illinois the following varieties have been sold at prices above average: Virginia, Ilsoy, Peking, Wilson V, Ebony, and Haberlandt. (pp. 518-519)

34. Shifts in vegetable oil prices since 1928 have been such that soybean oil has moved from a price position where it was influenced mostly by linseed oil to a lower one where it is influenced by almost all oils. (pp. 522, 524)

35. Prices of soybean oil meal made from the 1931 crop were in line with those of cottonseed meal. (pp. 524-526)

36. Futures contracts for soybeans have not yet been made on organized futures exchanges. (pp. 528-530)

37. The leading importing countries for soybeans have been the Netherlands and the United Kingdom. Importations into these countries and into France and Germany have increased somewhat since 1919. (p. 532)

38. Most of the soybean cake and meal imported by European countries over the five-year period 1926-27 to 1930-31 went to Germany. European countries usually permit beans to come in duty-free but they levy a rather heavy duty on soybean oil. (pp. 533-534)

39. While labor requirements for soybeans grown for hay do not fit in well with those for the major crops of the corn-belt region, there still are many cases in which the crop, whether grown for beans or for hay, is well suited to the program of farming. (pp. 534-536)

Soybeans, important for centuries in certain oriental countries, have recently claimed a position in the national economy of the United States well beyond that which might have been expected even a few years ago by persons not fully familiar with the wide range of uses of this crop and its adaptation to the soils, climates, and farming systems of this country. The crop is full of challenge to consumers, to persons connected with processing and market distribution, and to those engaged in making and administering national and state legislative policies, as well as to operators and owners of farm land in regions where soybeans can be profitably grown.

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SOURCES OF DATA

Data Reproduced in Tables

(Tables for which no sources are here indicated are based on material gathered at the Illinois Agricultural Experiment Station and published here for the first time.)

Table 1. Illinois crop and livestock statistics, Circ. 409, 1931, and Illinois crop and livestock statistics by counties (mimeo.), Dec. 31, 1931, from Illinois Crop and Livestock Reporting Service, Ill. Dept. Agr. and U. S. Dept. Agr. cooperating.

Table 2. Foreign Crops and Markets, May 17, 1926, and Aug. 1, 1932, Bur. Agr. Econ., USDA. Agricultural yearbook, USDA, 1932.

Table 3. Agriculture, general statistics, 1929 and 1930, U.S. Dept. Com. Bur. of the Census, 1932.

Table 4. Report on soybeans and cowpeas (mimeo.), Feb. 1929, and Crops and Markets, Dec. 1928 and Dec. 1931, Bur. Agr. Econ. USDA.

Table 5. Report on soybeans and cowpeas (*supra*). Agricultural yearbook, USDA, 1922, 1923, 1928-1931. Unpublished data (subject to revision) from Illinois Crop Reporting Service, 1930.

Table 6. Report on soybeans and cowpeas (*supra*). Agricultural yearbook, USDA, 1923, 1928, 1930, 1931. Crops and Markets (*supra*), Dec. 1931.

Table 7. Unpublished data from Illinois Crop Reporting Service, 1930.

Table 8. Unpublished data for 1929 and 1930; mimeographed report for 1931 (published 1932) from Illinois Crop and Livestock Reporting Service.

Table 10. Complete cost data revised from Ill. Agr. Exp. Sta. 42nd Ann. Rpt., p. 171, 1929. Yearly mimeographed summaries of Dept. Farm Org. and Mgmt., Univ. of Ill., 1921-1930. Enterprise cost data revised from Table 37, Ill. Agr. Exp. Sta. 43rd Ann. Rpt., p. 170, 1930.

Table 11. Monthly summaries of foreign commerce, 1915-1931, U. S. Dept. Com.

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Tables 13 and 14. Certain vegetable oils, part 2, pp. 93, 96, 97, published by U. S. Tariff Comm. Foreign Crops and Markets (*supra*), May 17, 1926; May 9, 1927; May 14, Dec. 24, 1928; May 20, 1929; June 23, 1930; Aug. 10, 1931; July 25, Aug. 1, 1932. Agricultural yearbook, USDA, 1932.

Table 15. The tariff on animal and vegetable oils, by P. G. Wright, pp. 264-5, Macmillan, 1928. Animal and vegetable fats and oils, 1927-1930, by Harvey J. Zimmerman, supplemented by Statistics of fats and oils, quarterly mimeographed reports for 1931, both from U. S. Dept. Com. Bur. of the Census.

Table 16. Certain vegetable oils (*supra*), part 2, pp. 92-106. Foreign Crops and Markets (see issues cited for Table 13).

Table 17. Monthly Crop Reporter, USDA, Feb. 1916. Unpublished data from Bur. Agr. Econ., USDA. Agricultural yearbook, USDA, 1930, 1931.

Table 18. Monthly summaries of foreign commerce (*supra*) 1922-1930. Agricultural yearbook, USDA, 1931.

Table 20. Certain vegetable oils (*supra*), part 2, pp. 156-171. Foreign Crops and Markets (see issues cited for Table 2). Tariff readjustment 1929. Hearings before Com. on Ways and Means, House of Repr., Vol. 1, schedule 1, p. 653. Animal and vegetable fats and oils, 1927-1930, supplemented by statistics of fats and oils, quarterly mimeographed reports for 1931 (*supra*).

Table 21. Chemical technology and analysis of oils, fats and waxes, by J. Lewkowitsch, revised by George H. Warburton, Vol. 1, 6th ed., pp. 395-

400, 419-442, Macmillan, 1922. The tariff on animal and vegetable oils (*supra*) pp. 20-78. Vegetable fats and oils, by George Jamieson, The Chemical Catalog Co., Inc., New York, 1932.

Table 23. Unpublished material from Illinois Crop and Livestock Reporting Service. Ill. Agr. Exp. Sta. questionnaires sent to operators of local elevators and seed establishments on 1926 and 1930 crops, and unpublished letters from crushers and manufacturing establishments.

Table 26. Seasonal reports on soybeans (mimeographed) 1922-1932, Bur. Agr. Econ., USDA.

Table 27. Market Reporter, Feb. 14, 1920; Feb. 26, 1921; Weather, Crops and Markets, Mar. 11, 1922; Mar. 3, 1923. Supplement to Crops and Markets, Mar. 1924; Mar. 1925. Current reports by Bur. Agr. Econ., Mar. 1, 1926; Mar. 24, 1927; Mar. 26, 1928; Mar. 26, 1929; Mar. 25, 1930; Mar. 31, 1931, Mar. 30, 1932. All from U. S. Dept. Agr.

Table 30. Certain vegetable oils (*supra*) part 1, pp. 60-74.

Table 32. Unpublished material from J. E. Barr, in charge of soybean inspection, Bur. Agr. Econ., USDA, 1932.

Table 34. Ill. Agr. Exp. Sta. Circ. 369, 1931. Ill. Agr. Exp. Sta. Bul. 310, 1928.

Table 35. Based on analyses compiled by Bur. Chem. and Soils, USDA.

Table 37. Seed statistics. Statis. Bul. 2, USDA, 1924. Seasonal reports (mimeographed) issued by Bur. Agr. Econ. Hay, Feed, and Seed Div., USDA, 1925-1931.

Tables 38 and 39. Based on unpublished monthly reports by Bur. Agr. Econ. Crop and Livestock Estimates Div., USDA, 1925-1931.

Tables 41 and 42. Seasonal reports (mimeographed) issued by Bur. Agr. Econ. Hay, Feed, and Seed Div., USDA, 1920-1932.

Table 43. See Tables 37, 41, and 42.

Table 44. County farm-bureau publications, Illinois, Feb.-July, 1921-1931.

Tables 45, 46, 47, and 48. Statistics of fats, oils and oleaginous raw materials, Statis. Bul. 24, USDA, 1928. Foreign Crops and Markets (*supra*) May 27, 1929; June 30, 1930; Aug. 17, 1931; Aug. 1, 1932. Agricultural yearbook, USDA, 1928. Unpublished data from E. L. Thomas, U. S. Dept. Com. Bur. Foreign and Dom. Com., Mar. 18, 1932.

Table 49. Foreign Crops and Markets (*supra*), Feb. 3, 1932.

Data Reproduced in Graphs

Fig. 1 is based on data from The Statistical Monthly, Bureau of Statistics, Legislative Yuan, National Government of China, Vol. 2, No. 12, 1-60, Dec. 1930. Similar information for the provinces of Chahar and Jehol in inner Mongolia is given in Vol. 3, No. 3, 37-63, March, 1931.

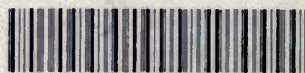
The data for the following graphs were obtained from the sources indicated: **Fig. 2**, Illinois Crop Reporting Service. **Figs. 4, 5, 6, and 7**, U. S. Census. **Figs. 8 and 9**, U. S. Department of Agriculture. **Fig. 10**, Illinois Crop Reporting Service. **Fig. 23**, various county farm bureau publications. **Figs. 24 and 25**, U. S. Department of Labor, Bureau of Labor Statistics; **Fig. 27**, *ibid.* and U. S. Department of Agriculture. **Fig. 26**, National Provisioner and Oil, Paint and Drug Reporter, current issues. **Figs. 28 and 29**, U. S. Department of Agriculture.

Illustrations

For the use of **Fig. 12** the authors are indebted to Avery Harvesting Company; for **Figs. 15, 16, and 20**, to Allied Mills; for **Fig. 21**, to Soya Products, Inc.

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