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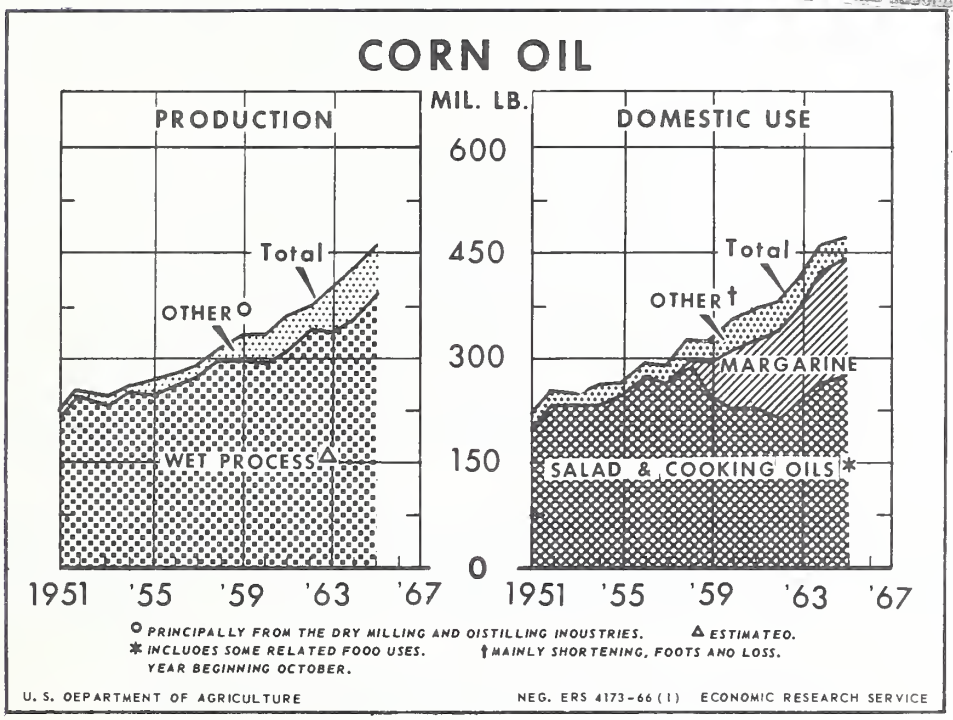

U. S. corn oil production has doubled in the past 15 years, rising from 223 million pounds in 1951-52 to a record 460 million anticipated in 1965-66. The steady growth in wet-process grindings of corn for starch has resulted in increased output of by-product corn oil. Domestic use of corn oil continues mainly as a salad and cooking oil. But since 1958, margarine manufacture as an outlet has expanded sharply and now accounts for over one-third the total domestic use of corn oil. (See page 21).

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Corn oil prices (crude, tank cars, Decatur, Ill.) have doubled within the past 2 years. The monthly average rose from 10 cents per pound in January 1964 to about 20 cents in January 1966. Current prices are highest since November 1961 when they reached 25 cents per pound. Expanding demand for corn oil by margarine manufacturers and limited oil supplies are expected to keep prices at high levels throughout 1966.

Historically, nearly all corn oil has been refined and used mainly as a salad and cooking oil. Since 1957-58, corn oil utilized in the manufacture of margarine has jumped from 1 million pounds to 170 million forecast for the 1965-66 marketing year ending next September 30. The margarine industry now accounts for about 36 percent of the total domestic use of corn oil. Refined corn oil is among the oils relatively high in the poly-unsaturated fatty acid, linoleic, an essential dietary substance. However, the debate over the significance of poly-unsaturation as opposed to saturated oils is still unsettled. The introduction of many new brands of corn oil margarine along with a vigorous merchandising and promotional compaign by industry has boosted the demand for these products.

Corn oil is produced as a byproduct of 3 of the corn-using industries: "Dry" millers make breakfast foods, corn meal, hominy, grits, flour, feed, and oil; "wet" millers, or corn refiners, manufacture starch, syrup, sugar, feed, and oil; and distillers make whiskey, industrial alcohol, feed, and oil.

Wet-process Grindings of Corn Continue Upward

Wet milling of corn refers to the manufacturing process which accomplishes the separation of the germ, hull, gluten, and starch from the corn kernel by the use of water as a suspension medium. The main product, corn-starch, is a basic raw material for modified starches and refinery products such as syrup and sugar.

The corn germ separated by the wet process contains much less of the other parts of the corn than that obtained by the dry process, with the result that about half of it is oil. A 56-pound bushel of hybrid yellow dent corn degermed by the wet process yields around 1.8 pounds of oil on the average (table 16). In dry milling, less than half as much oil is extracted from the germ stock.

The volume of corn ground by wet millers has shown a gradual uptrend, rising from a postwar low of 110 million bushels in calendar 1948 to a record 205 million bushels in 1965. The rate of grind was influenced by the increased demand for corn products during the Korean conflict along with the development of new and improved uses of corn products in recent years. The demand for corn starch is fairly stable and tends to rise with the population growth. At present, there are 11 companies in the wet-milling industry.

The growth in wet-process grindings of corn has naturally resulted in increased output of corn oil. Based on calendar year shipments of oil by the wet-process industry, corn refiners have doubled their output since 1948, increasing it from 178 million pounds that year to 370 million pounds (estimated) for 1965. These data indicate that corn refiners in recent years have accounted for around 85 percent of the total U. S. corn oil output (table 16). Data are not available on the quantity of corn oil produced by dry millers and distillers but the volume apparently is relatively small. Production of corn oil may be expected to expand or contract in direct proportion to general activity in the corn refining industries.

Crude corn oil is usually refined to produce a food oil. Refined corn oil closely resembles cottonseed and soybean oils. Techniques used for refining, blending, and deodorizing are in general similar to those employed for other vegetable oils. However, a cooking and filtering step is necessary in the processing to free the oil of natural waxes, which, if allowed to remain, would separate gradually and make the oil cloudy. In refining corn oil, the crude oil is treated with alkali to neutralize the fatty acids and also improve the color. The refining process separates corn oil "foots"; these are used by the soap industry.

Refined corn oil, pale yellow and crystal-clear, has special qualities that make it excellent as a cooking and salad oil. It is used either directly as such or as a base for mayonnaise, salad dressing, margarine, shortening, and other products containing oil. The low cloud point and melting point of corn oil and its good keeping quality favor its use for these purposes. Other food uses for corn oil include deep-fat frying of doughnuts and potatoes, where its relatively high smoke point is noteworthy, and in the production of potato chips, bakery products, and so on.

Nonfood uses of corn oil are small but include the manufacture of soap, insecticides, and the products of the leather and textile industries.

Corn Oil Supplies and Use at Record Levels in 1965-66

As indicated in table 17, corn oil supplies have increased from 217 million pounds in 1947-48 to a record 500 million pounds estimated for 1965-66. Consumption of corn oil has shown a similar uptrend and this year probably will reach a new high of about 475 million pounds. Corn oil imports, from Europe, are relatively small during most years. The postwar high of 26 million pounds was reached in 1961-62 but nothing was imported in the 1964-65 marketing year ended September 30.

October 1 carryover stocks of corn oil (crude and refined) in recent years (1960-64) have varied between 10 and 15 percent of total annual domestic requirements. The carryover on October 1, 1965, was 35 million pounds or only about 7 percent of 1965-66 projected requirements. Stocks of corn oil on December 1, 1965, (the latest Census data available) totaled 29 million pounds compared with 43 million the same date in 1964 (table 19). Corn oil stocks are expected to remain relatively low all this year.

Table 16.--Corn oil: Wet-process grindings of corn, oil production, and prices 1939-65

Calendar year	Corn	Corn oil production				Corn oil prices	
			Wet-process 2/				
	Wet-process grindings 1/	Total	Total	Percent of total output	Yield per bushel of corn ground	Crude, tank cars, Decatur, Ill.	Refined, tanks, N. Y. 3/
	Mil. bu.	Mil. lb.	Mil. lb.	Pct.	Lb.	Cts.	Cts.
1939	77	151	135	89	1.8	5.9	8.6
1940	82	158	158	100	1.9	5.7	8.2
1941	110	203	167	82	1.5	10.0	13.0
1942	130	248	241	97	1.9	12.7	16.1
1943	128	239	222	93	1.7	12.8	16.2
1944	120	211	187	89	1.6	12.8	16.4
1945	119	205	174	85	1.5	12.8	16.6
1946	121	198	167	84	1.4	15.6	20.1
1947	139	247	222	90	1.6	25.7	32.4
1948	110	203	178	88	1.6	25.7	33.4
1949	116	224	209	93	1.8	12.2	18.1
1950	131	248	235	95	1.8	16.0	21.4
1951	129	232	221	95	1.7	19.0	25.0
1952	126	232	216	93	1.7	13.3	18.8
1953	130	259	242	93	1.9	14.1	20.0
1954	131	255	230	90	1.8	14.0	20.9
1955	138	268	244	91	1.8	13.0	20.2
1956	141	272	252	93	1.8	14.1	20.8
1957	139	288	271	94	1.9	13.8	20.1
1958	144	296	266	90	1.8	13.4	16.7
1959	153	321	283	88	1.8	11.8	15.4
1960	153	330	281	85	1.8	13.1	16.8
1961	157	336	310	92	2.0	18.3	22.1
1962	171	365	303	83	1.8	14.6	18.2
1963	185	390	320	82	1.7	12.1	15.3
1964 4/	194	414	367	89	1.9	11.1	13.7
1965 5/	205	446	370	83	1.8	14.1	16.7

1/ Used in the production of starch, syrups, sugar, feed and oil from corn grain. 2/ Based on shipments of oil by wet-process industry. Prior to 1955 reported as sales of products by processors. 3/ Prior to April 1958 reported as drums. 4/ Preliminary. 5/ Partly estimated.

In recent years, 91-94 percent of U. S. corn oil has been utilized in food products and the balance has gone into nonfood uses, primarily as foots. (See cover chart). This consumption pattern is likely to continue, since the special inherent qualities of corn oil are highly desirable in cooking and salad oil and in margarine. Most refined corn oil is still marketed directly in packaged goods for the retail trade but margarine manufacture is becoming an increasingly important outlet for this commodity. During the 1964-65 marketing year, 462 million pounds of corn oil were utilized in the United States as follows: Salad and cooking oil (including some related food uses), 57 percent; margarine, 34 percent; shortening, 2 percent; foots and refining loss, 6 percent.

The use of corn oil in margarine increased from a mere 1 million pounds in 1957-58 to 158 million in 1964-65. Data so far for 1965-66 indicate that the proportion of corn oil used in margarine will be even greater than last year and is projected at 170 million pounds or 36 percent of total domestic use (table 18). The upsurge in the demand for corn oil in margarine coupled with the inability to adjust the output of this byproduct to meet upward shifts in the demand schedule has resulted in a reduction in the quantities available for use in cooking and salad oils and shortening.

As may be seen in the chart below, corn oil used in margarine manufacture represented about 10 percent of the 1.5 billion pounds of all fats and oils used in margarine during 1965.

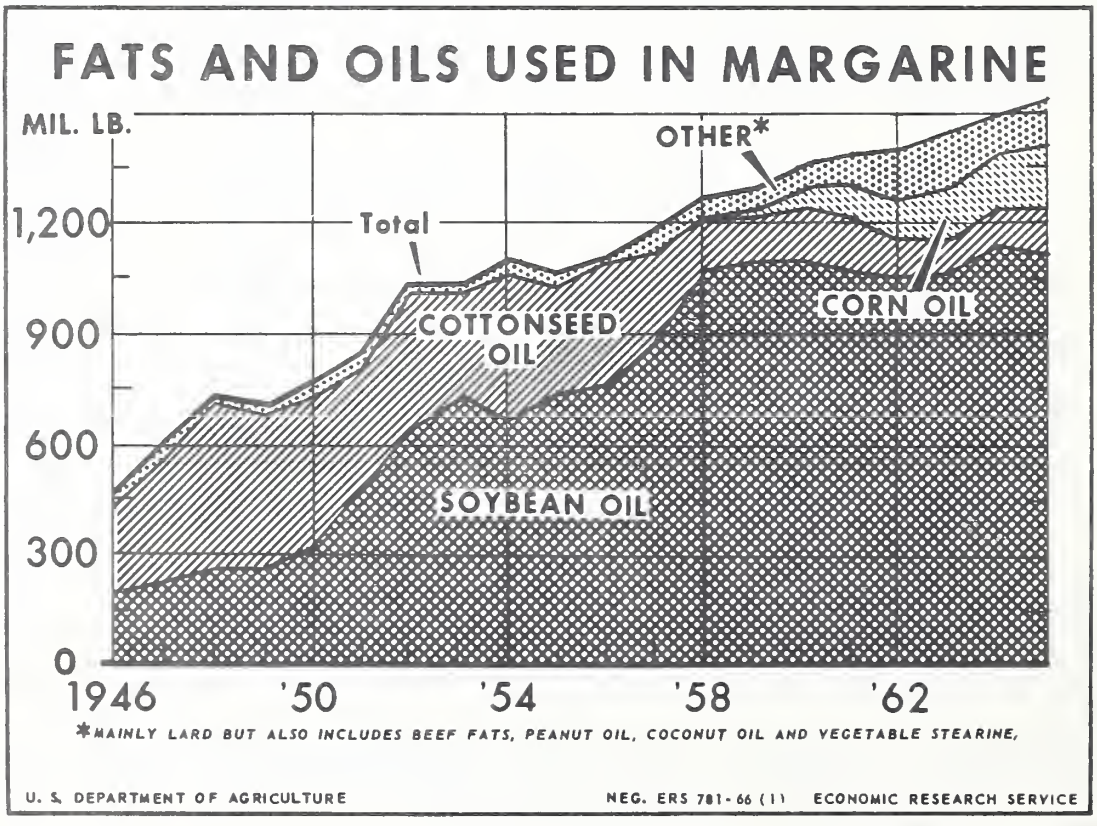

Figure 1

Table 17.--Corn oil: Supply and disposition, 1947-65

Year beginning October	Supply				Disposition	
	Production	Imports	Stocks October 1	Total	Exports and shipments 1/	Domestic disappearance
	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds
1947-48	204	---	13	217	2/	207
1948-49	225	---	10	235	2	222
1949-50	242	2/	11	253	2	233
1950-51	243	2/	18	261	3	247
1951-52	223	2/	12	235	2/	222
1952-53	258	2/	12	270	---	254
1953-54	252	---	16	268	---	253
1954-55	268	1	15	284	---	265
1955-56	270	---	19	289	---	267
1956-57	286	---	23	309	---	293
1957-58	291	6	16	313	---	289
1958-59	315	10	25	350	---	327
1959-60	332	12	24	368	---	329
1960-61	331	22	39	391	---	358
1961-62	361	26	33	420	---	370
1962-63	379	15	50	444	---	381
1963-64	413	3	63	478	---	416
1964-65	435	---	62	497	---	462
1965-66 3/	460	5	35	500	---	475

1/ Includes exports under voluntary relief programs in 1948-49. 2/ Less than 500,000 pounds. 3/ Forecast.
Totals computed from unrounded numbers.

Table 18.--Corn oil: Utilization, 1947-65

Year beginning October	Food uses					Non-food uses				Total domestic disappearance
	Shortening	Margarine	Salad and cooking oil	Other	Total	Soap	Foots and loss	Other	Total	
	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds	Million pounds
1947-48	3	3	178		183	1/	17	7	24	207
1948-49	1	1	201		203	1/	17	2	19	222
1949-50	1/	1/	215		215	1/	16	2	18	233
1950-51	1/	1/	224		224	1/	20	3	23	247
1951-52	1	1/	197		198	1/	22	2	24	222
1952-53	1	1	229		231	1/	21	3	24	254
1953-54	1	1/	229		231	1/	20	2	22	253
1954-55	3	1/	231		234	1/	30	2	31	265
1955-56	2	1	243		246	0	19	1	20	267
1956-57	2	1/	270		273	0	19	1	20	293
1957-58	4	1	261		265	0	22	1	23	289
1958-59	5	13	208	77	303	0	23	1/	23	327
1959-60	6	39	250	4	299	0	27	3	30	329
1960-61	11	82	224	8	326	0	30	2	32	358
1961-62	10	95	205	27	337	0	32	1	33	370
1962-63	4	128	203	8	349	0	32	1	33	381
1963-64	5	145	227	12	389	0	27	1	28	416
1964-65	9	158	242	22	431	0.	30	1	31	462
1965-66 2/	5	170	270		445	0	30	---	30	475

1/ Less than 500,000 pounds. 2/ Forecast.
Totals computed from unrounded numbers.

Expanding Corn Oil Demand Pushes Prices Above Other Edible Oils

As may be seen in the chart below, corn oil prices (crude, Decatur) were relatively stable during 1952-60, the average annual price varying between 12 and 14 cents per pound. During this period, corn oil was utilized almost exclusively as a salad and cooking oil and in the manufacture of miscellaneous food products. Cottonseed and soybean oils predominate in these fields and the price of corn oil varies in close conformity with changes in prices of cottonseed oil and other competing food oils. Prices of crude corn oil ran 2 percent above prices of crude cottonseed oil. During the postwar years 1946-59, price changes in these 2 oils not only moved together in the same direction each year, but also were nearly identical.

In calendar 1961, corn oil prices soared to an annual average of 18.3 cents per pound--41 percent higher than cottonseed oil--as the aggregate demand for corn oil outstripped available supplies. Prices subsequently declined to 11.1 cents in 1964, but still averaged 8 percent above cotton oil. Corn oil prices in 1965 averaged 14.0 cents per pound compared with 11.6 cents for cottonseed oil (crude, Valley) and 11.2 cents for soybean oil (crude, Decatur).

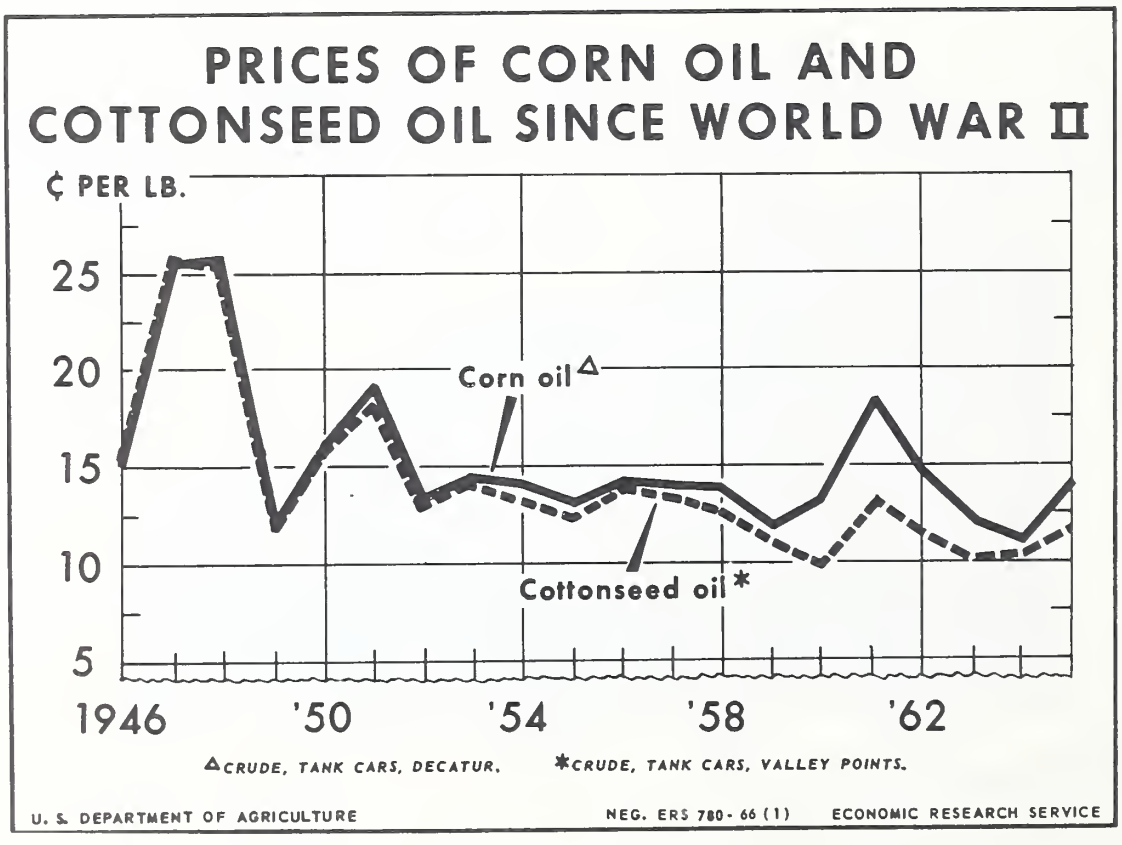

Figure 2

Table 19.--Corn Oil: Supply, disposition and price, by months 1952-65

Year beginning October	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total or average
	Mil.lb.	Mil.lb.	Mil.lb.	Mil.lb.	Mil.lb.	Mil.lb.	Mil.lb.	Mil.lb.	Mil.lb.	Mil.lb.	Mil.lb.	Mil.lb.	Mil.lb.
Production													
1952	23	21	20	21	20	24	22	23	22	19	22	21	258
1953	24	20	20	20	20	22	22	21	21	20	21	21	252
1954	23	22	22	21	21	24	21	23	24	21	24	23	268
1955	23	22	22	22	23	23	21	24	22	22	25	22	270
1956	25	24	21	24	22	24	23	25	24	24	26	24	286
1957	26	23	22	24	22	25	24	25	25	24	25	25	291
1958	28	24	24	24	24	27	27	27	29	26	28	28	315
1959	29	26	27	28	28	29	25	29	28	28	30	27	332
1960	28	27	24	26	25	27	28	30	30	27	31	29	331
1961	28	28	28	28	28	32	31	32	32	30	33	30	361
1962	32	30	26	31	27	33	32	33	34	34	35	32	379
1963	35	35	31	33	35	37	37	36	37	33	34	32	413
1964 1/	36	34	32	35	34	38	36	36	38	36	39	41	435
1965 1/	40	36	36										
Stocks, first of month													
1952	12	15	18	20	22	21	20	20	20	19	15	15	
1953	16	17	17	19	20	19	18	21	20	19	19	17	
1954	15	15	17	19	18	20	21	18	18	18	18	20	
1955	19	22	22	24	23	25	22	22	23	22	25	24	
1956	23	21	23	22	18	20	21	21	21	22	21	19	
1957	16	16	18	17	13	16	21	21	19	16	16	20	
1958	25	27	30	31	30	29	28	32	31	31	30	27	
1959	24	31	30	27	27	29	32	33	39	39	43	38	
1960	39	38	33	33	33	33	36	36	43	40	40	35	
1961	33	25	28	31	37	43	50	54	56	52	52	50	
1962	50	49	51	45	49	46	49	55	56	60	63	62	
1963	63	63	67	65	62	60	60	64	63	64	62	60	
1964 1/	62	52	43	40	39	39	42	42	38	40	39	38	
1965 1/	35	32	29										
Domestic disappearance 2/													
1952	19	17	19	19	21	25	22	23	23	23	21	21	254
1953	22	21	18	19	20	23	19	22	21	20	24	23	253
1954	23	20	20	22	19	23	24	23	24	22	22	23	265
1955	21	22	20	22	21	26	21	23	23	19	26	23	267
1956	26	22	21	28	21	24	22	25	24	25	28	27	293
1957	26	20	23	27	20	20	24	28	30	25	23	21	289
1958	25	22	24	27	26	29	24	29	29	28	31	32	327
1959	23	28	30	28	28	26	25	23	30	25	36	27	329
1960	30	33	28	29	26	26	28	24	35	29	37	33	358
1961	37	28	28	25	24	28	31	33	37	32	38	31	370
1962	35	30	34	30	31	32	28	33	30	31	36	31	381
1963	36	31	34	35	36	37	33	37	36	35	36	29	416
1964 1/	46	42	35	36	34	36	36	39	37	37	40	44	462
1965 1/	44	40											
Price per pound, crude, tank cars f.o.b. Midwest Mills													
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
1952	14.5	14.1	14.4	13.7	13.7	14.8	14.9	14.4	14.1	13.7	14.1	14.0	14.2
1953	14.1	14.4	13.8	13.2	13.4	13.7	14.7	14.6	14.9	14.7	14.6	13.8	14.2
1954	13.4	13.5	13.2	13.3	13.4	13.1	13.5	14.1	14.9	13.8	12.6	11.6	13.4
1955	12.1	11.8	11.9	12.9	14.4	15.4	15.6	15.9	14.6	13.3	12.3	12.1	13.5
1956	13.7	14.3	14.5	14.9	14.5	14.0	13.5	13.1	12.8	13.8	13.0	12.8	13.7
1957	13.2	14.6	15.3	15.4	15.3	14.0	14.2	13.8	12.4	13.4	12.7	12.1	13.9
1958	12.4	12.5	12.0	11.6	11.3	11.3	11.8	13.3	12.8	12.0	11.5	11.5	12.0
1959	11.3	11.2	11.7	12.8	13.5	13.6	13.3	12.8	12.2	11.5	11.8	12.2	12.3
1960	14.0	14.3	14.8	15.3	16.0	17.1	17.5	17.6	16.4	16.1	16.7	18.6	16.2
1961	22.1	24.7	21.1	21.0	18.8	16.6	14.4	13.1	12.9	12.3	12.0	12.0	16.8
1962	13.0	14.3	14.8	14.0	14.5	14.3	12.3	12.2	11.8	11.6	11.0	10.8	12.9
1963	11.4	10.8	10.0	9.8	9.9	10.0	10.3	10.2	10.5	10.1	10.5	11.1	10.4
1964 1/	13.0	13.3	14.1	13.1	13.9	14.3	14.7	13.3	12.9	12.8	12.7	13.0	13.4
1965 1/	13.7	15.9	17.9										

1/ Preliminary. 2/ Includes imports.
Totals computed from unrounded numbers.

Corn oil prices in 1966 are expected to average above the 14.1-cent level of 1965. Prices in January 1966 were 20.0 cents per pound, 53 percent above the 13.1 cents in January 1965. Factors resulting in higher prices this year are the expanding demand for corn oil margarines and limited supplies. Apparently sales of the corn oil margarine brands are quite brisk and continue to increase. A wider variety and selection of new improved brands of margarine available to consumers coupled with industry's introductory merchandising and promotional efforts has certainly been a factor in boosting the demand for these products.

The outlook is for a continuation of the steadily growing demand for corn oil at premium prices compared with cottonseed and soybean oils, mainly because of product differentiation in the margarine and salad and cooking oil field. However, safflower oil--a primary product which has even a higher poly-unsaturated fatty acid content than corn oil--is becoming increasingly important in the margarine and liquid oils field. The industry has recently introduced new safflower oil margarine brands also. Increased availability and competition from other food oils will tend to relieve some of the upward pressure on corn oil prices in 1966. While the demand for corn oil is strong and prices relatively high, it is quite unlikely that this favorable situation and outlook will have much influence, if any, on the rate of corn ground by wet-millers.

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