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Economic Issues with Sunflowers

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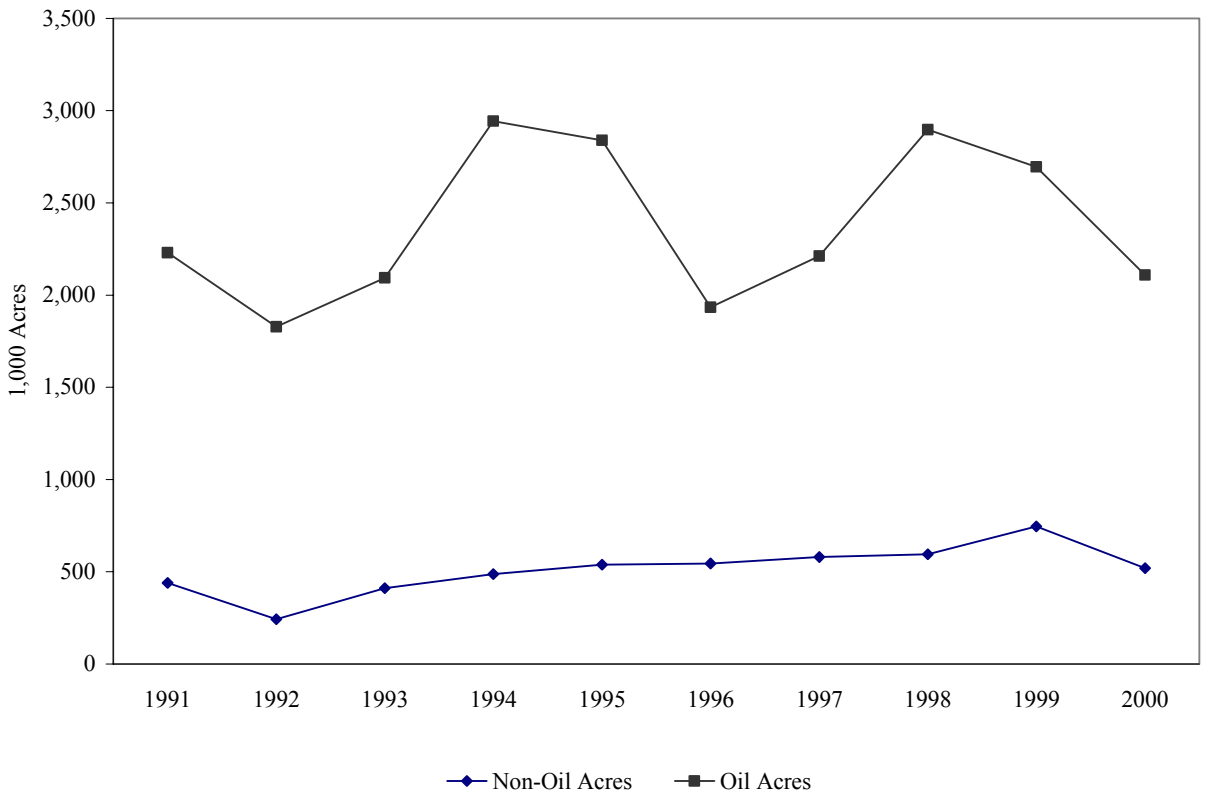
In recent years, the production of sunflowers for cooking oil, confectionary (e.g., food), and birdseed has increased throughout the United States. Sunflowers are primarily grown in North Dakota, South Dakota, Minnesota, Kansas, Colorado, Nebraska, and Texas. North Dakota produces about 5 percent of the U.S. sunflower crop. This publication describes trends in sunflower production and discusses the implications for producers.

Many hybrids and varieties of sunflowers are available in the United States. One popular type of sunflower is NuSun, which has been trademarked by National Sunflower Association (NSA). NuSun sunflowers are mid-oleic hybrids, which have an oleic level between 50 percent and 70 percent with an average of 65 percent. In 1999, the NSA tested 36 NuSun hybrids and five traditional hybrids at field trials in Casselton, North Dakota; Brookings, South Dakota; and Colby, Kansas. The Kansas field-trial results showed that NuSun hybrids were comparable with traditional hybrids in yield and oil percentage.

Trends in Sunflower Production

Sunflower acreage for non-oil purposes in the United States increased 68 percent from 1992 to 1999 before declining in 2000 (Figure 1). Meanwhile, sunflower acreage for oil purposes increased 33 percent from 1996 to 1998 before declining the past 2 years due to demand conditions.

Figure 1. U.S. Sunflower Acres Harvested for Oil and Non-Oil Purposes, 1991 to 2000 (USDA NASS)



In Kansas, acreage for non-oil uses decreased 73 percent from 1995 until 1998 and has varied from 20,000 to 30,000 acres per year since then (Figure 2). The decline in acres from 1995 to 1998 occurred largely due to relatively high prices and expected profitability for alternative crops, particularly feedgrains and wheat. Disease problems and relatively low yields during 1996 and 1997 also discouraged Kansas farmers from planting confectionary sunflowers. The majority of confectionary sunflowers grown for non-oil uses are sold to confection sunflower processing plants in Goodland and Colby in northwest Kansas. Acreage for oil purposes steadily increased from 1991 to 1995, and then decreased until 1998. Acreage increased 35 percent in 1999 and then decreased 23 percent in 2000. USDA NASS reports that there were 290,000 and 28,000 acres of oil and non-oil sunflowers harvested in Kansas in 2001. The same competitive crop price and sunflower disease factors that affected confectionary sunflower acreage since 1995 influenced oil-type sunflowers. Nearly all of the oil-type sunflowers produced in Kansas and adjacent central Great Plains states are sold to an oil-type sunflower crushing plant near Goodland. The northwestern and north central counties are where sunflowers are traditionally grown in Kansas.

Figure 2. Kansas Sunflowers Harvested for Oil and Non-Oil Purposes, 1991 to 2000 (USDA NASS)

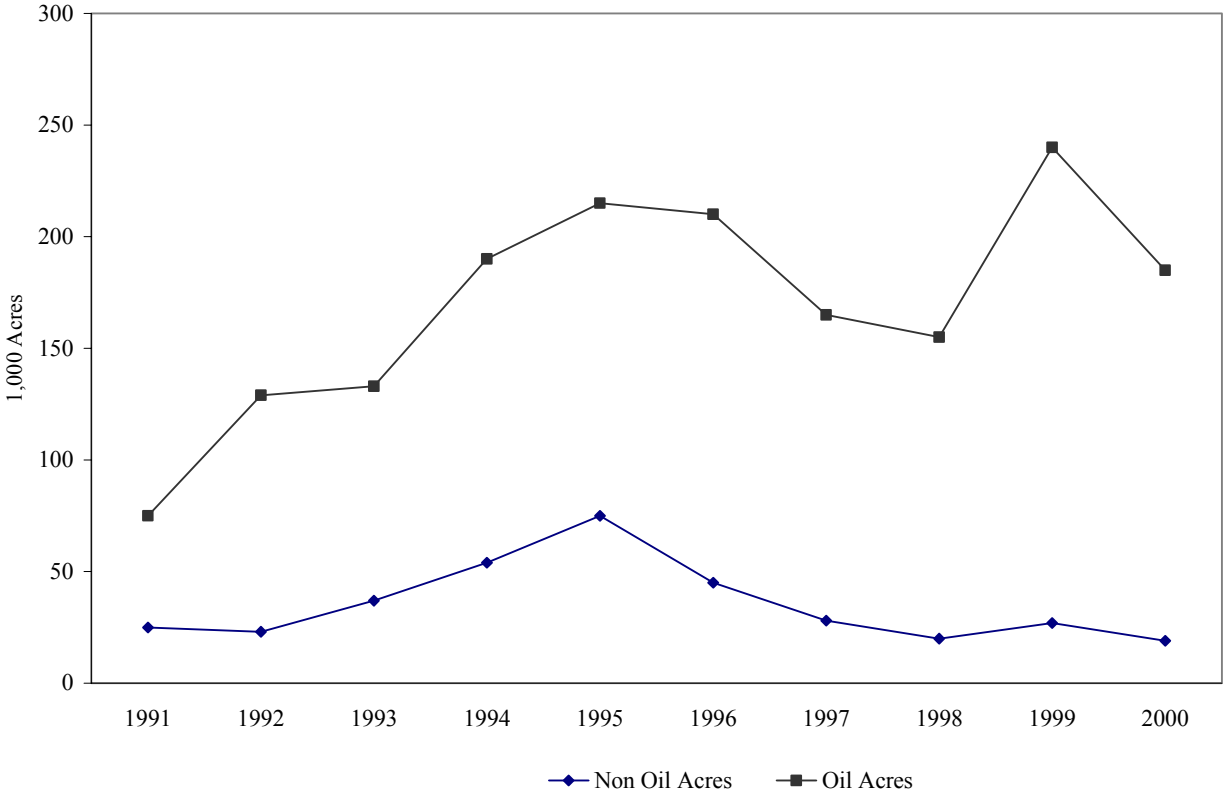
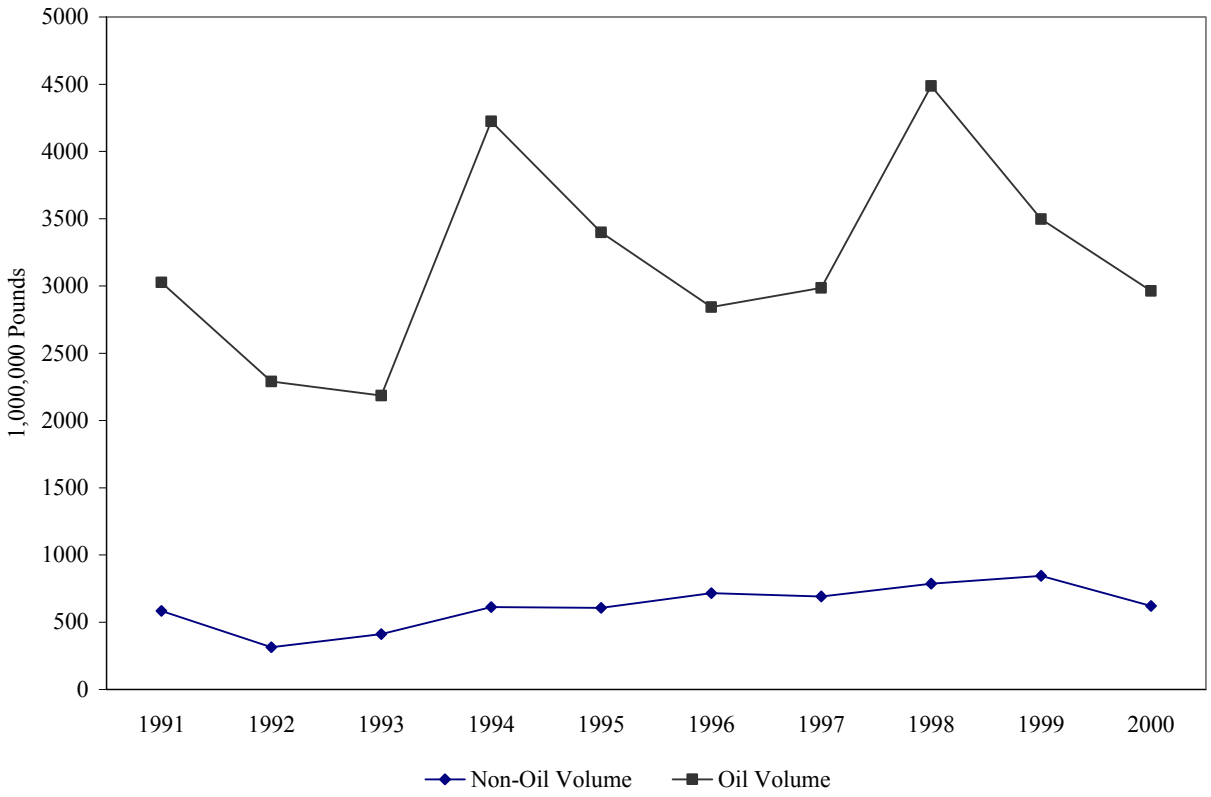


Figure 3. U.S. Sunflower Production for Oil and Non-Oil Purposes, 1991 to 2000 (USDA NASS)



Production, which is measured in pounds, tends to follow acreage. U.S. oil production increased 37 percent from 1996 to 1998 before declining 19 percent by 2000 (Figure 3). Non-oil production of sunflowers increased 62 percent from 1992 to 1999. In Kansas, production of sunflowers for oil uses increased 40 percent from 1997 to 1999 and then decreased 37 percent in 2000 for the same reasons that acreage declined. Production of non-oil sunflowers in Kansas decreased 27 percent from 1995 to 1999 (Figure 4).

Figure 4. Kansas Sunflower Production Harvested for Oil and Non-Oil Purposes, 1991 to 2000 (USDA NASS)

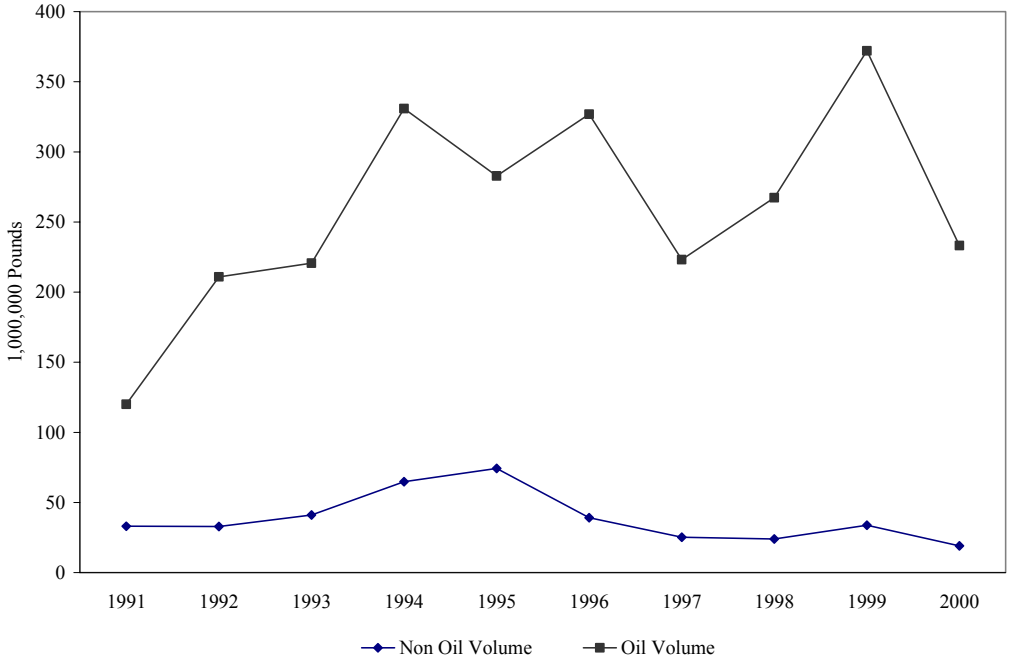
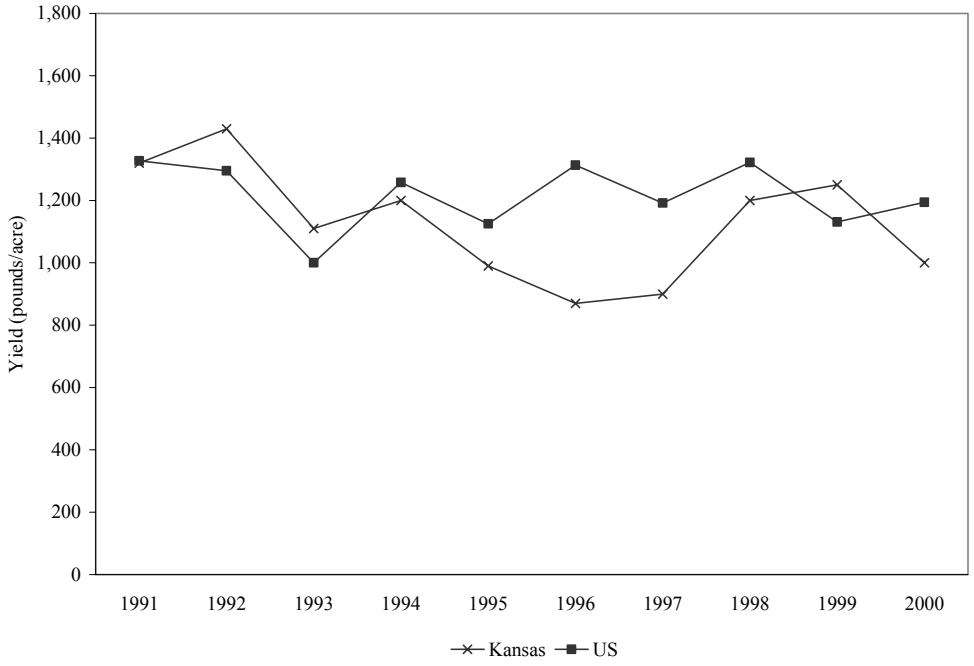


Figure 5. U.S. and Kansas Non-Oil Sunflower Yields Per Acre, 1991 to 2000 (USDA NASS)



Sunflowers grown for non-oil uses have had variable yields. Since 1991, yields for the United States have averaged 1,216 pounds per acre, while yields in Kansas have averaged 1,127 pounds per acre (Figure 5). For Kansas, yields declined by 39 percent from 1992 to 1996. However, U.S. yields for sunflowers grown for oil uses averaged 1,336 pounds per acre from 1991 to 2000 and 1,321 pounds per acre in Kansas (Figure 6). Kansas yields increased by 60 percent from 1995 to 1999 and then decreased 19 percent in 2000.

Sunflower production in Kansas has lower yields than the national average, which is heavily weighted toward production in the Northern Great Plains states of North Dakota, South Dakota, and Minnesota. In addition, Kansas yields have a greater standard deviation. Non-oil and oil sunflowers have a standard deviation of 108 and 145 bushels per acre for the United States compared to 185 and 181 pounds per acre in Kansas. These averages and standard deviations can be used to calculate a coefficient of variation, which is the standard deviation divided by the average and then multiplied by 100 to convert to a percentage. This is a measure of risk. The coefficient of variation for U.S. non-oil and oil sunflowers is 8.88 percent and 10.85 percent while the coefficient of variation for Kansas non-oil and oil sunflowers is 16.42 percent and 13.7 percent. Sunflowers grown for non-oil use in Kansas have yields that are twice as variable or risky as that of non-Kansas sunflower producers.

Figure 6. U.S. and Kansas Oil Sunflower Yields Per Acre, 1991 to 2000 (USDA NASS)

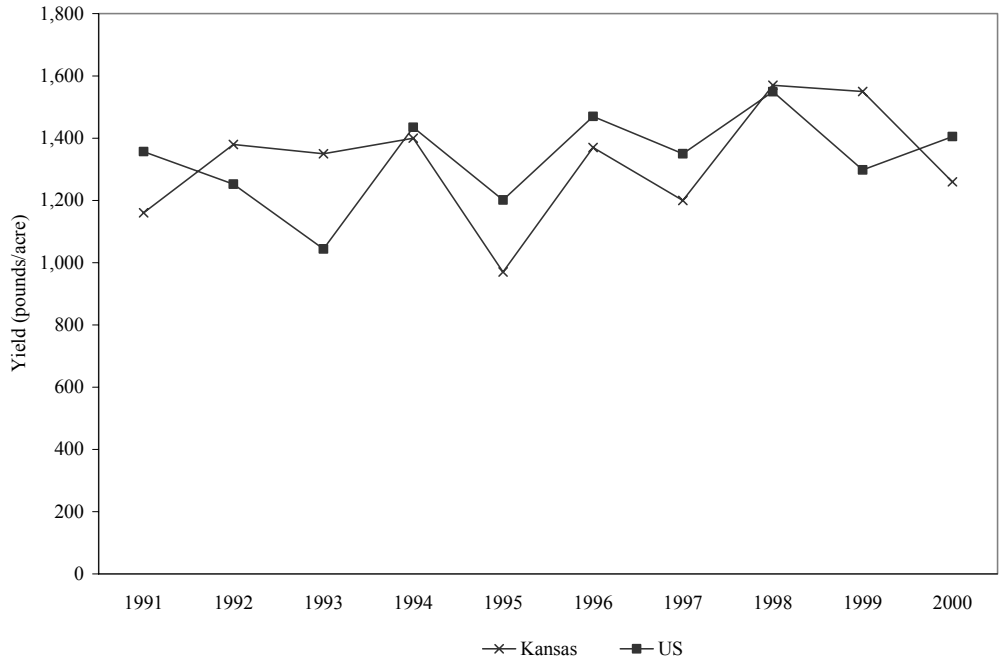
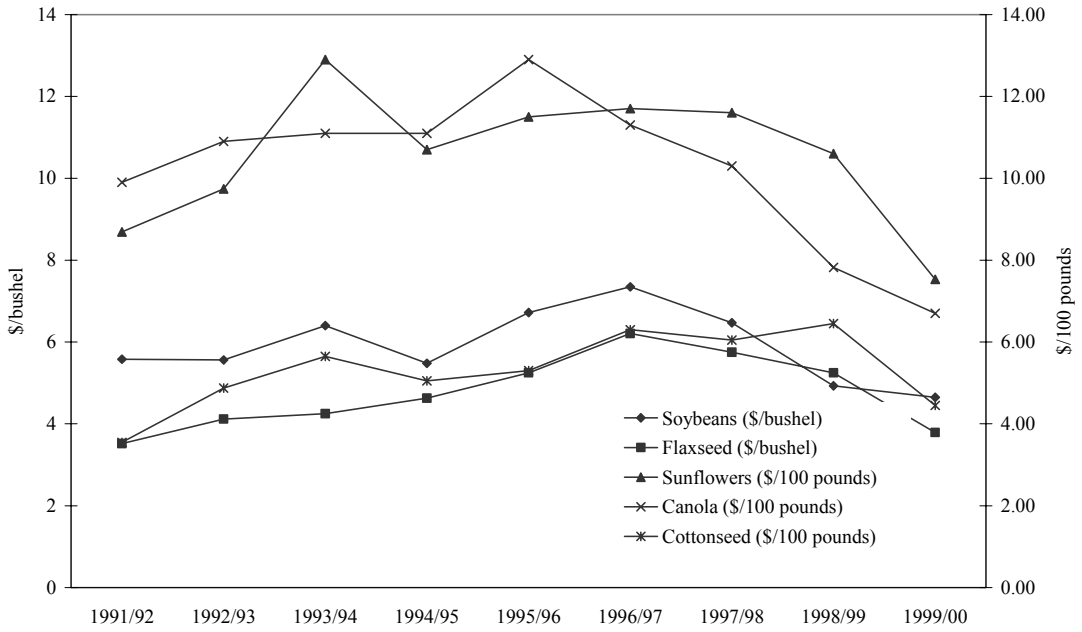


Figure 7. Soybean, Flaxseed, Sunflower, Canola, and Cottonseed Prices Received by U.S. Producers, 1991/92 to 1999/00 Marketing Years (USDA ERS)



There are several reasons for this cyclical acreage trend in sunflower production. Crop rotations, such as the wheat-sunflower-fallow rotation in western Kansas and eastern Colorado, may be responsible for some of the cycles in acreage (Parker). Higher precipitation in states such as North Dakota may produce sunflowers and wheat without fallow, unlike drier states, such as Kansas and Colorado.

Trends in production are driven by yields and acreage. Variation in yields is attributable to disease, weeds, insects, drought, and blackbirds. Sunflowers are highly susceptible to disease and insects (see MF-2384 *High Plains Sunflower Production Handbook* for more detailed information on agronomy and entomology factors linked to sunflower production).

Many factors influence producers' decisions to plant sunflowers. Location determines whether or not sunflowers will be successful. Sunflowers are a short-season crop that allows them to be grown over a wide range of latitudes compared to other oilseed crops. The U.S. growing season for sunflowers is from June through September, around 90 days. Sunflowers thrive in northern areas and in southern double-cropping systems. High-production states, such as North Dakota, South Dakota and Minnesota, have cooler temperatures and harsh winters that make sunflowers less susceptible to insects and disease.

Crop rotations also influence growers' decisions to plant sunflowers. In Kansas dryland production systems, sunflowers are typically rotated with wheat, corn, or grain sorghum, with a fallow period usually included in the rotation. Sunflowers have a deep root system that allows them to flourish in rotations that maximize water use from the soil. A fallow period is often recommended following sunflowers to replenish depleted soil water reserves. Moisture-conserving crop production techniques such as no-till and minimum till allow farmers to be more flexible, have increased dryland cropping intensity overall, and the viability of summer crops such as sunflowers in particular. Under irrigation, sunflowers compete with corn, silage crops, dry-edible beans, and wheat for acreage.

Premiums are offered for certain types of sunflowers, such as NuSun, for oil content and other characteristics. Premiums are dependent on market conditions and the individual characteristics that buyers are looking for in sunflowers. Buyers and processors usually offer the premiums to producers to offer an incentive for producing certain types of sunflowers.

Governmental programs are also creating an incentive to produce sunflowers. Prior to the Freedom to Farm program in 1996, government farm program regulations periodically allowed Kansas farmers to plant sunflowers on program acres and still collect a relatively high proportion of their target price deficiency payments. In these cases, the target price deficiency payments were based on previous feed grain or wheat program crop base acreage. Depending on costs of production and price prospects, these flexible program regulations were of great financial benefit for sunflower producers in the central Great Plains.

With the passage of the Freedom to Farm program in 1996, sunflower producers have benefited from the availability of marketing loans for sunflowers. Crop cost and profitability budgets from K-State Research and Extension indicate that current levels of sunflower production costs relative to their marketing loan rate generally place sunflowers in a strong competitive position with alternative dryland and irrigated crops in the Central Great Plains (O'Brien and Dumler).

Processing Plants
There are four major oil-type sunflower crushing plants located in the Great Plains. Cargill operates a plant in West Fargo, North Dakota, while ADM operates plants in Goodland, Kansas; Enderlin, North Dakota; and Red Wing, Minnesota. The availability of handling and processing facilities is directly related to transportation cost advantages associated with marketing sunflowers.

The location of the end-users influences production decisions. End users are defined as snack-food companies, restaurants, fast-food chains, salad-oil makers, and any other firm that uses sunflower products. Sunflowers are mainly shipped by truck to minimize transportation costs. Cost advantages are greater when the plant also processes the seeds, rather than extracting the oil or processing the seeds, and then shipping the products.

Marketing Options for Sunflowers
The relatively small size of the sunflower industry compared to other grain crops has led to greater marketing options for producers. Sunflowers are priced on a per 100 pounds basis. Cash sales are used for marketing sunflowers in spot markets and local elevators. Elevators or cooperatives offer cash prices to the producers based on current market conditions. In turn, the elevators or cooperatives then sell the sunflowers to oilseed crushing plants, confectionary plants, or birdseed packers depending on seed quality. Cash sales are used with both oil and confectionary sunflowers.

Contracts also are used to market sunflowers. One of the most common contracts is the forward-cash contract. In return for a guaranteed price, a producer and buyer agree upon a quantity and specific date to deliver sunflowers. The forward-cash contract price is determined, but it is subject to premiums or discounts associated with sunflower seed quality and oil content. This contract method is very successful in the sunflower oilseed industry.

Forward-cash grower contracts are also used for specialty crops, such as the high-oleic and confectionary sunflowers. This contract is similar to the cash-forward contract. First of all, a minimum number of acres as stated by the producer and processor is required in order to fill the amount specified in the contract. Processors also require the grower to use specific seed varieties. The processor provides production advice to improve quality and yields. This contract also includes “Act of God” clauses, which protect the growers from production failures due to conditions out of their control. Some contracts require the grower to store the crop until the processor is ready for delivery. In these cases the grower receives a price premium or storage credit to defray a portion of the storage costs.

Processing of Sunflowers
Sunflowers are considered oilseeds, along with cottonseed, soybeans, canola, and various other crops. Sunflowers are used for their oil, meal, and confectionary products. Oil and meal are processed from the same varieties. Confectionary seeds have their own characteristics for their specific purposes. Within the oil varieties, oil is extracted, and meal is a by-product of this process. However, 80 percent of a sunflower’s value comes from oil. The crushing process at two plants removes the hulls from the seeds, and the hulls can be used to create steam to power the plant. For every 100 pounds of seed, about 40 pounds of oil, 35 pounds of high protein meal, and 20 to 25 pounds of by-products are produced.

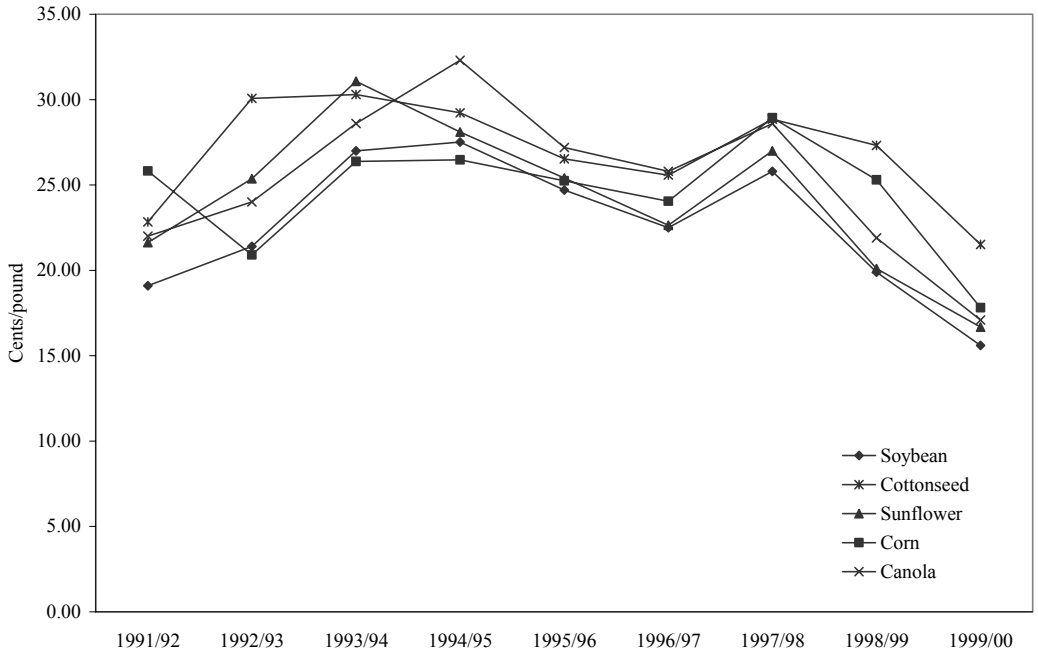
Confectionary sunflowers are divided into three categories. Food grade sunflowers are made up of the highest quality seeds, including the largest and cleanest seeds. Ingredient sunflowers are seeds that are still food grade quality, but they do not possess the characteristics to be in the food grade category. The sunflower seeds that cannot be used for ingredients are used for birdseed. Usually these are smaller, lower quality seeds.

Prices for Various Oilseeds

Soybean, cottonseed, sunflower, flax, and canola are the most popular oilseeds grown by producers. U.S. average prices for each oilseed are shown in Figure 7. In general, prices increased and then decreased since 1991/92 marketing years. For example, prices for canola have declined 93 percent since the 1995/96 marketing year. Soybeans decreased 58 percent since 1996/97 marketing year. Flaxseed prices increased by 76 percent from 1991/92 to 1996/97 and have declined 64 percent since then. On average, cottonseed prices increased 59 percent from 1991/92 to 1998/99 before declining 31 percent in the 1999/00 marketing year.

Sunflowers increased by 33 percent from 1991/92 to 1993/94; decreased by 17 percent in 1994/95; increased by 9 percent until 1996/97 and have decreased 36 percent since then. This decrease parallels the trends in production seen earlier in Figure 1 except that production increased by 33 percent in 1996 to 1998 while prices only increased 10 percent.

Figure 8. Soybean, Cottonseed, Sunflower, Corn, and Canola Oil Prices, 1991/92 to 1999/00 Crop and Marketing Years (USDA ERS)



In general, trends in the prices of the five main vegetable oils (soybean, cottonseed, sunflower, corn, and canola) are similar, suggesting that they are close substitutes for one another (Figure 8). Sunflower oil was greatest in the 1993/94 marketing year and lowest in 1999/00 marketing year. Prices of all five vegetable oils has fallen since 1997/98, suggesting an excess supply.

The other main component of oilseeds is meal, which is used primarily as an ingredient in livestock feed rations. The trend in prices of the five main oilseed meals (soybean, cottonseed, sunflower, linseed, and canola) is similar, which suggests that they are substitutes for one another as seen in Figure 9. However, sunflower meal has the lowest protein percentage, at 28 percent relative to soybean and other meals. Prices trended downward from 1996/97 marketing years until the 1998/99 marketing year and then increased in 1999/00. Sunflowerseed meal increased by 18 percent from 1991/92 to 1993/94 before decreasing by 49 percent in 1994/95. Prices increased by 97 percent in 1995/96 and decreased 91 percent until 1998/99.

Figure 9. Soybean, Cottonseed, Sunflower, Linseed, and Canola Meal Prices, 1991/92 to 1999/00 Marketing Years (USDA ERS)

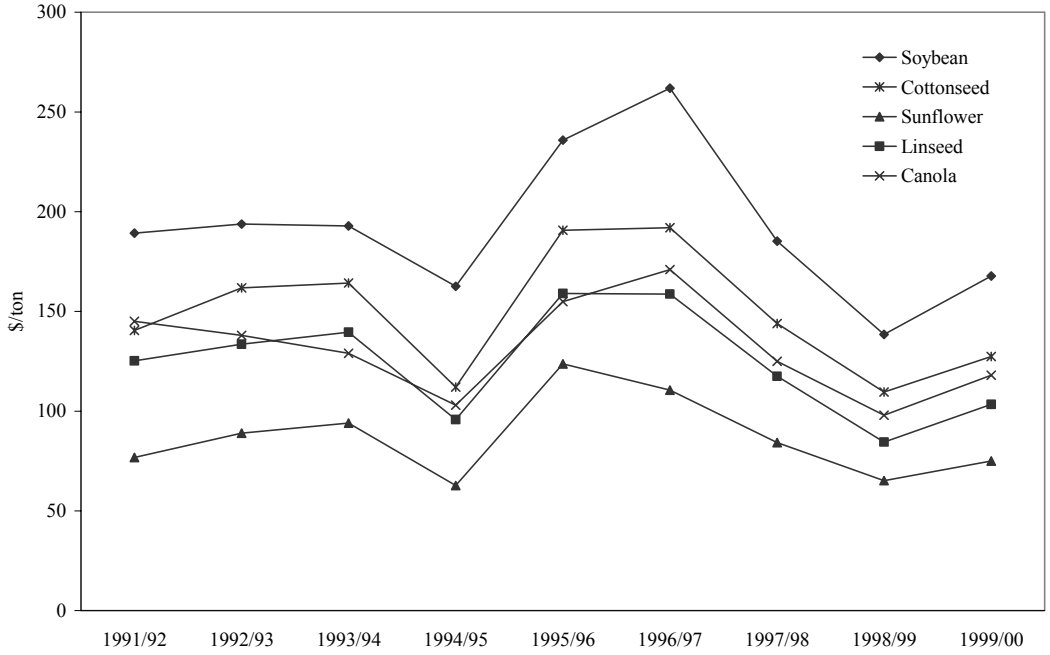


Figure 10. Domestic Disappearance of Different Vegetable Oils, 1988 to 2000 (USDA ERS)

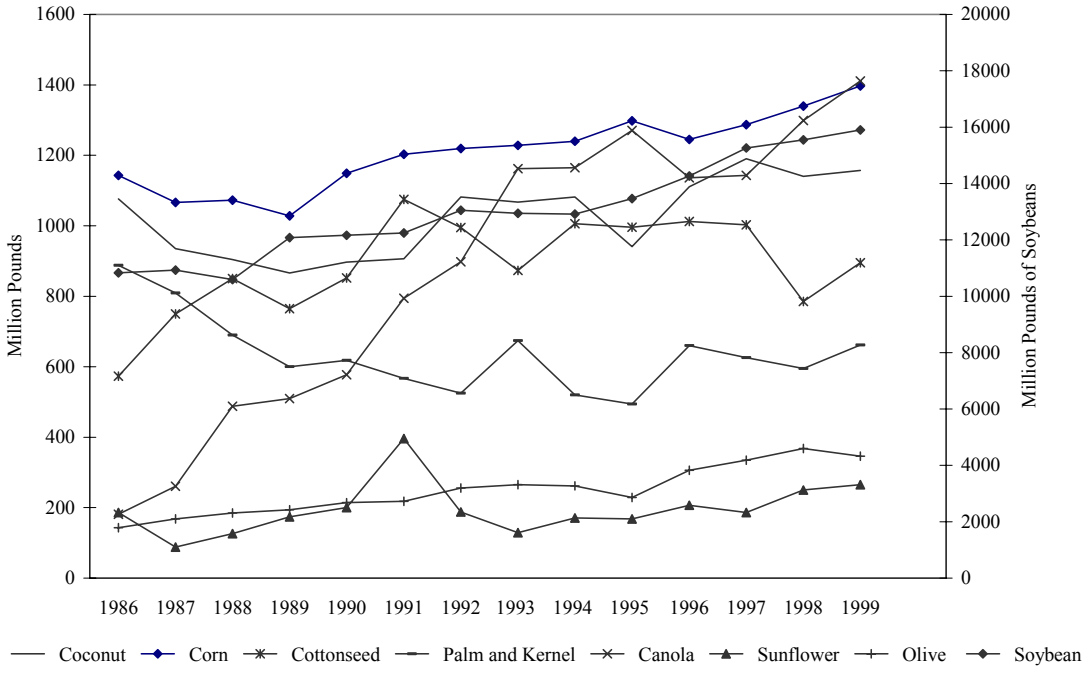


Figure 10 shows domestic disappearance of various vegetable oils from 1986 to 2000. Canola has shown the greatest growth over time and has gone from second lowest use in 1986 (next to olive oil) to second greatest use (next to soybean oil) in 1999. Sunflower oil disappearance has increased by 55 percent since 1993.

Markets for Sunflowers
Harvested sunflowers are used in a variety of ways. Different markets and customers demand sunflower seeds with certain qualities and characteristics for individual uses. About 60 percent of annual confectionary sunflower production is exported from the United States to Spain, Netherlands, Germany, and Canada, where demand is higher for quality sunflower seeds and products. These countries use sunflowers for confectionary and oil.

Confectionary sunflower seeds are used for packaged, food grade, and ingredients. The largest market for food grade seeds is consumer retail, both domestically and abroad, in countries such as Germany and Spain. Packaged sunflowers are primarily a specialty food product, and are sold to consumers as a healthy snack either in the shell or hulled. Ingredient sunflowers are sold to firms, such as bread companies, that use sunflower seeds in their products.

The birdseed market has been growing in recent years. Lower quality sunflower seeds are used in birdseed. In 1996-1997 (most recent estimate), an estimated 949 million pounds of sunflower seeds were used to make birdseed. This was 25 percent of total U.S. production.

Argentina has been the world's largest producer of sunflowers, with an average of 24 percent of world production over the 1994/95 to 1999/00 time period. The European Union (15 percent), Russia (12 percent), and eastern Europe (11 percent) are also large producers of sunflowers. The United States produces almost as much as Ukraine at 8 percent of worldwide production. The three largest exporters are Russia (25 percent of world exports), European Union (24 percent), and Ukraine (24 percent).

With respect to sunflower oil production, the European Union and Argentina produce 26 percent and 25 percent, respectively, of world production. Argentina has 57 percent of world export market share, followed by the United States at 12 percent and European Union at 9 percent. Mexico is the largest importer of U.S. sunflower oil, with 33 percent of the U.S. export market share. Algeria is second with 23 percent market share, followed by Egypt (9.5 percent), Netherlands (7 percent) and Australia (4.5 percent).

Health Benefits of Sunflower Oil
Studies have shown that sunflower oil is healthier than most other food oils on the market. There are three types or classifications of sunflower oil.

Linoleic (C18:2) sunflower oil contains essential fatty acids that are polyunsaturated. However, the structure of linoleic oil requires light hydrogenation to remain stable for frying. Linoleic sunflower oil usually contains about 20 percent oleic fatty acids, 69 percent linoleic fatty acids, and 11percent saturated fatty acids. Linoleic sunflower oil is excellent for cooking with a neutral taste. This characteristic enhances the taste of food, rather than masking it. Linoleic oil is the preferred oil in much of Europe, Russia, Mexico, the Mediterranean, and South America.

High oleic sunflower oil represents oils that have monounsaturated fat levels of 80 percent or higher. Typically, high oleic sunflower oil would contain 82 percent oleic fat, 9 percent linoleic fat, and 9 percent saturated fat. High oleic sunflower oil is used in food and industrial applications that require higher levels of monounsaturated fats. In 1995, the members of the NSA determined that the existing fatty acid structure of sunflower oil needed to be changed in order to compete more successfully in the domestic market. After visiting with large domestic oil users

and USDA plant breeders, it was determined that a mid-level oleic sunflower oil would be the best product to consider.

NuSun, whose name was trademarked by the NSA, is a mid-oleic sunflower oil with a lower monounsaturated fat level than high oleic sunflower oil, but a lower saturated fat level than linoleic oil. Therefore, NuSun is considered a mid-range oleic sunflower oil. NuSun requires no hydrogenation and has a 9 percent saturated fat level. NuSun works well for frying applications and has a good balance of linoleic acid, an essential fatty acid that enhances the taste of products. NuSun sunflower oil is a close substitute to canola oil; however, canola oil has higher linoleic levels, which requires hydrogenation to stabilize. Sunflower oils, such as NuSun have a longer shelf life due to their chemical makeup when compared to other oils.

Fatty Acids and Vegetable Oils

Lipids or fats are naturally occurring structures in food that play an important role in both nutrition and food preparation. Lipids are a concentrated source of energy for humans, and they are used for energy storage, insulation, and the transportation of fat-soluble vitamins (A, D, E, and K).

Fatty acids are nutritional components found in dietary fats and oils and are usually classified according to their chemical structure. There are four types of fatty acids. Saturated fatty acids are found mostly in animals (meat fat, milk fat, and butter). These remain solid at room temperature and are known to increase LDL cholesterol. Monounsaturated fatty acids are found mostly in vegetable oils and remain liquid at room temperature. These fatty acids are known to lower LDL cholesterol. Polyunsaturated fatty acids are found mostly in vegetable oils. They remain liquid at room temperature, and are known to decrease LDL cholesterol. Finally, polyunsaturated fatty acids such as linoleic and alpha-linolenic acid cannot be produced by the body and must be obtained from other sources. They are known as essential fatty acids, and are necessary for functions like cell structure and hormone production.

Trans fatty acids occur naturally in some animals. They are normally found in some processed foods, and vegetable oils processed into margarines and shortening by hydrogenation. These are known to increase LDL cholesterol levels and lower HDL cholesterol.

Figure 11 presents the percentage of saturated, linolenic, linoleic, and monounsaturated fats found in various vegetable oils. Oils with greater percentages of saturated and fatty acids are less healthy while oils with greater percentages of linoleic and monounsaturated fats are more healthy. Olive, canola, and sunflower seed oil are three of the healthiest vegetable oils available for cooking purposes.

Summary

Non-oil sunflower acreage in Kansas has increased for much of the last decade but confection sunflower yields are more variable and risky than in other states. Consumption of vegetable oils has increased due to changes in consumer's eating habits. Prices of various vegetable oils have trended downward in recent years due to an excess supply of commodities used to make these oils. The closest substitute for sunflower oil is canola oil which had a dramatic increase in domestic use during the last decade. However, sunflowers have a lower price relative to canola. The recent introduction of NuSun sunflower hybrids in Kansas, coupled with premiums based on

oil content and a favorable government policy toward sunflowers, have made sunflowers an attractive crop for some Kansas producers.

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