

# Enterprise Budget:

# Sorghum

SORGHUM IS A GRASS WITH BROAD, corn-like leaves and tall, pithy stems. This crop is grown in dry areas of the plains from South Dakota to Texas because it uses one-third less water than other grain crops. It is very popular in Kansas and Nebraska. Today grain sorghum varieties are raised for cattle feed as a forage or silage. Sweet sorghum varieties are used to produce syrup and also can be made into ethanol. Sorghum is drought- and heat-tolerant, making it a good crop to grow in dry areas where corn is not profitable.

According to the U.S. Census of Agriculture, there are 26,242 sorghum farms in the United States. In 2007 U.S. farmers raised 6.7 million acres of sorghum producing 482 million bushels. They also planted 450,000 acres for greenchop, producing 5.7 million tons. Sorghum is grown on less than 1 percent of Iowa's farms and represents less than 1 percent of its harvested acreage.



## Agronomic Characteristics

Sorghum is an annual plant that grows to be six feet tall. It is normally planted in 30-inch rows but can be planted wider. The narrower rows shade faster reducing weeds and helping reduce soil erosion. Seeding dates vary but sorghum is usually planted in May to avoid having the plants bloom in the heat of summer. Seed depth is around 1 inch for heavy soils and up to 2 inches for sandy soils. Sorghum should be planted at 4 to 5 pounds per acre in dry areas.

Seed varieties are produced by several companies including Pioneer, Dekalb, Fontanelle, Mycogen Seeds, NC+ Hybrids, and Triumph. Each year the National Sorghum Producers have a yield and management contest. To check results and see which varieties performed well, visit <http://www.sorghumgrowers.com>. The four different types of sorghum that can be produced are as follows:

### Sweet

Sweet sorghum is a cane-like plant that is grown for forage, silage, and sugar production. Sorghum is believed to have been introduced to North America by African slaves and was used to make sorghum syrup. After World War II there was a decrease in farm labor, and so the production of sorghum syrup fell drastically. Today less than 1 million gallons are produced in the United States. The syrup is made by pressing the stems with rollers and then boiling them to the consistency that is desired.

## Enterprise Assessment

Capital needed for startup



Importance of experience with grain crops



Managerial input needed



Labor input required



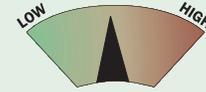
Years needed to develop production expertise



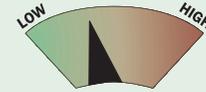
Years needed to develop marketing expertise



Years to financial break-even point



Return on investment (%)



### Grain

Grain sorghum is grown for livestock feed. The seeds can be fed to animals or the whole plant made into silage.

### Grass

This variety is grown for green feed and hay. Sudan, a popular variety, grows to be 10 feet tall.

# Sorghum

## Broomcorn

Broomcorn is grown to make brooms and actually makes sounds like sweeping. The brush and branches of the seed cluster can be used as fibers for brooms.

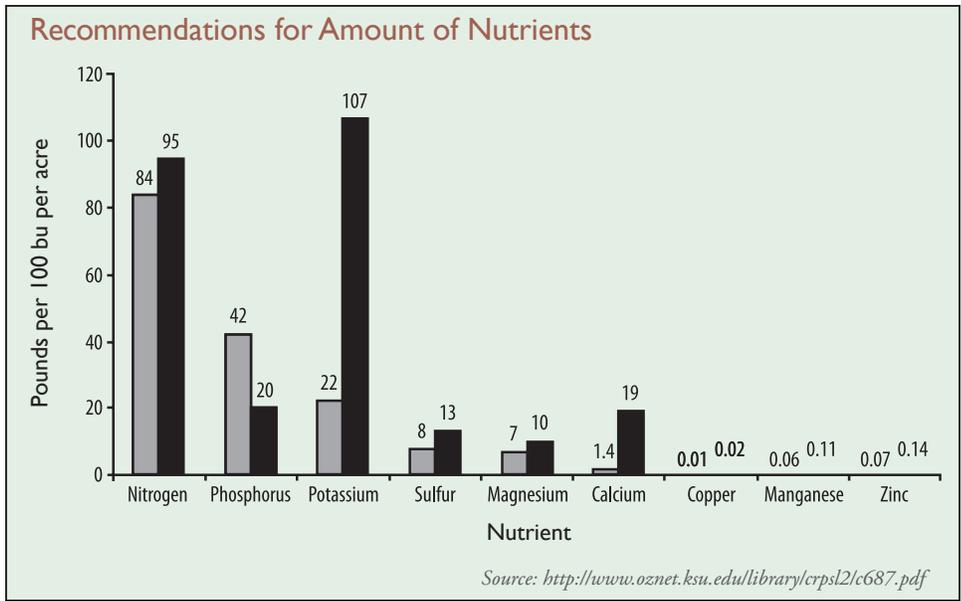
Sorghum can be no-tilled, but requires well-drained soil. Cool and wet soil at planting time can lead to slow germination, delayed maturity, and longer periods exposed to pests. A first time no-tiller with sorghum should plant it after soybean, which has fewer residues than corn, grain sorghum, and wheat.

Sorghum is good at using nutrients from the soil but needs some fertilizer for optimal production. See Chart 1 for recommendations for amount of nutrients.

The plants will turn red and white when they are ripe, but are dried after harvest so they last longer. The sorghum seeds retain moisture for long periods of time and normally have to be artificially dried instead of waiting in the fields. The sorghum can be harvested with 30 percent moisture content. Harvesting sorghum is a careful and time-consuming process that takes an experienced combine operator. Sorghum often ripens unevenly creating opportunities for harvest loss.

Harvest loss can occur due to:

- Header loss causes dropped heads and shattered kernels, so the reel should be run at a middle speed to reduce both from happening.
- Un-threshed grain also is a concern with different speeds cracking kernels.
- Grain also can be carried and lost in the shoe, which can be caused by the operator pushing the combine and cylinder as fast as it will go.



- Walkers can be overloaded causing some loss. An experienced combine driver is key to reducing harvest losses.

After harvesting sorghum, high temperature drying systems are needed to maintain accurate temperatures and moisture levels. There are many resources online to help in starting a sorghum enterprise. Kansas State University has a grain sorghum production book at <http://www.oznet.ksu.edu/library/crpsl2/c687.pdf>. Another is at the University of Missouri, [http://www.psu.missouri.edu/cropsys/Grain\\_Sorghum](http://www.psu.missouri.edu/cropsys/Grain_Sorghum).

## Potential Return

**Yields:** Even though the production costs are similar to corn, the yields are much lower. The U.S. Census reported the following average yields per acre:

- Irrigated: 86.9 bu.
- Part Irrigated: 74.7 bu.
- Not Irrigated: 69.2 bu

These are averages for the whole United States. Iowa has higher rainfall and can expect higher yields. The 2007 Census reported an Iowa average yield of 82.7

bushels per acre. Sorghum was grown on 2,113 acres in 2007. This was a decrease from acres reported in the 2002 Census that showed 2,355 acres. The average yield in 2002 was 60.6 bushels per acre. Greenchop or sorghum silage yield averaged 10.4 tons on 837 acres in 2007.

**Price:** The marketing year for sorghum is from September 1 to August 31 for most of the country. In the south there are shorter marketing years starting June 1 or August 1, depending upon the state. The U.S. average price for grain sorghum in March 2009 was \$5.34 per bushel. In Nebraska the March average price was \$5.37 per bushel; there was no price reported for Iowa. In marketing year 2006 the U.S. average price was \$5.88 and in



# Sorghum

2007 the U.S. average price was \$7.28. The crop is marketed throughout the year in a pattern similar to corn.

## Labor

The labor requirements are similar to corn with the spring and fall requiring the most hours. It takes approximately 4½ hours per acre to produce and harvest sorghum. For sweet sorghum some additional harvesting hours include: 60 hours hand cutting, 25 hours corn binder, and 10 hours mechanical harvesting.

## Risks

Besides harvest losses, the biggest risk will be drying and storing of sorghum. Leaving the grain in the field for field dry-down can be an unpredictable process; there also is risk of increased lodging and molding. Another alternative is post-harvest drying, but it is much slower and has more foreign material. Grain sorghum is mature at 30 percent moisture; however, at 20 percent moisture there is minimal harvest and seed loss. Harvesting is all about timing, and conditions will change each year. Other risk factors include birds that are attracted to sorghum grain and contribute to losses. Grain sorghum also is not widely grown in Iowa so it is important to have a place to market your grain. A forward contract can secure a place for you to sell your grain.

## Marketing

Some common uses of sorghum include:

1. **Waxy sorghums:** adhesives for sizing paper and fabrics
2. **Sweet sorghum:** syrup
3. **Grain and butyl alcohol**
4. **Wallboard:** houses

Sorghum also is a feed ingredient for both cattle and poultry. It has a higher protein content and lower fat content than that of corn. The plant also is high in fiber and iron; however, sorghum has a very hard kernel making it harder to digest and more resistant to diseases and damage. Sorghum can be ground, cracked, steam flaked, and roasted to enhance the nutritional value up to 12 to 14 percent. There is also an increasing popularity in forage and silage sorghum in dry areas because it uses less water than corn silage.

Most grain sorghum is used as a livestock feed, but now it also is being used to make ethanol. In Kansas there are six ethanol plants that use sorghum to produce ethanol. Research at Missouri showed that there was no difference between corn and sweet sorghum ethanol except that sorghum requires less fertilizer and can be grown on less productive land.

Sorghum is the fifth most important cereal crop in the world and feeds over 500 million people in 30 countries. It is used in breads, boiled porridge, malted beverages, beer, and specialty foods like popped grain and syrup. Sorghum also ranks in the top five with

wheat, oats, corn, and barley as the top cereal grains in the world. Only high-quality white sorghum is used to produce food products. One advantage sorghum has is that it is gluten free so people with allergies have an alternative.

A sorghum check off program began July 1, 2008, for 60 percent of grain sorghum value and 35 percent of forage sorghum value. This will aid in marketing and research for the sorghum industry.

### Economic Considerations: Grain Sorghum Budget

	Yield level per acre (bu)		
	70	90	110
Income per acre	70	90	110
Yield per acre	70	90	110
Price per bushel	4.13	4.13	4.13
Net government payment	13.03	14.16	15.29
Indemnity payments			
Miscellaneous			
Return per acre	302.13	385.86	469.59
Cost per acre			
Seed	14.76	14.76	14.76
Herbicide	29.57	38.58	38.58
Insect/fungicide			
Fertilizer/lime	71.75	95.23	116.71
Crop insurance			
Drying	9.10	11.70	14.30
Miscellaneous	6.25	6.25	6.25
Custom hire/machine exp.	76.95	84.09	91.23
Non-machinery labor	8.7	9.5	10.31
Land charge/rent	45.6	57	68.4
Subtotal	262.68	317.11	360.54
Interest on 1/2 non-land cost	7.60	9.10	10.22
Total costs	270.28	326.21	370.76
Returns over costs	31.85	59.65	98.83
Total costs/bushels	3.86	3.62	3.37
Returns to annual costs	15.0%	21.7%	30.2%

Source: <http://www.oznet.ksu.edu/library/agec2/mf2159.pdf>

# Sorghum

## Management

Sorghum and corn are similar but have some differences that could factor into deciding which would be more suitable for your operation. Both work well in a crop rotation system. Sorghum is more drought tolerant and grows on soils that have physical limitations and lower yields. However, there are more herbicide options for corn, and insects do less damage to corn than sorghum. Under favorable conditions sorghum yields are 30 percent less than the potential of corn. Grain sorghum is best suited for drought areas where corn is not as productive.

## Market Outlook

Sorghum and corn are substitutes so the outlook of sorghum relates closely with the corn market. In a study done at Texas Tech University, grain sorghum has shifted somewhat from the feed sector to the food, alcohol, and industrial sector. Even though Mexico, Japan, and Israel have decreased imports of sorghum, exports still have increased. Part of this is increased demand from Spain and Sudan and the European Union ban of GMO corn. Sorghum is an alternative substitute to corn and is not banned by the EU. In November 2007, it was estimated that the average yields of sorghum had increased by 2 bushels per acre, raising production by 14 million bushels. The USDA issues current market reports at <http://www.ksgrains.com/sorghum/USDANews.html> under market news reports.

## Sources

<http://darwin.nmsu.edu/~molbio/plant/sorghum.html>

### *National Sweet Sorghum Producers and Processors Association*

<http://www.ca.uky.edu/nssppa/sorghumfaqs.html>

### *Kansas State University Extension*

<http://www.oznet.ksu.edu/library/crpsl2/c687.pdf>

### *Kansas Grain Sorghum Producers Association*

<http://www.ksgrains.com/sorghum/MiloMania04.pdf>

### *University of Missouri*

[http://www.fapri.missouri.edu/farmers\\_corner/budgets/MiloPrint.pdf](http://www.fapri.missouri.edu/farmers_corner/budgets/MiloPrint.pdf)

[http://www.psu.missouri.edu/cropsys/Grain\\_Sorghum/](http://www.psu.missouri.edu/cropsys/Grain_Sorghum/)

### *National Sorghum Producers*

<http://www.sorghumgrowers.com>

### *Pioneer Hybrid*

<http://www.pioneer.com/web/site/portal/menuitem.8bd903dc0c895618bc0c0a03d10093a0/>

### *Texas Tech Sorghum Research Initiative*

<http://www.depts.ttu.edu/aged/Sorghum/index.php>

### *Mississippi State University Extension*

<http://msucares.com/crops/sorghum/index.html>

### *Gramene-Sorghum*

[http://www.gramene.org/species/sorghum/sorghum\\_intro.html](http://www.gramene.org/species/sorghum/sorghum_intro.html)

### *International Crops Research Institute for the Semi-Arid Tropics*

<http://www.icrisat.org/sorghum/sorghum.htm>

<http://www.agry.purdue.edu/ext/corn/news/timeless/lateplantgrainsorghum.html>

<http://www.ers.usda.gov/Data/FeedGrains/>

Bulletin Sorghum: the other important coarse grain, 1990-2007, Department of Agriculture and Applied Economics Texas Tech University

### *Agricultural Marketing Resource Center*

[http://www.agmrc.org/commodities\\_products/grains\\_oilseeds/sorghum/general\\_sorghum.cfm](http://www.agmrc.org/commodities_products/grains_oilseeds/sorghum/general_sorghum.cfm)

### *University of Kentucky*

[www.uky.edu/Ag/NewCrops/introsheets/grsorghum.pdf](http://www.uky.edu/Ag/NewCrops/introsheets/grsorghum.pdf)

[www.uky.edu/Ag/AnimalSciences/pubs/asc126.pdf](http://www.uky.edu/Ag/AnimalSciences/pubs/asc126.pdf)

Prepared by Mike Duffy and Jodi Calvert, ISU Department of Economics, Extension Economics. Designed by Victoria Watson, ISU graphics design student. Financial support from the Leopold Center for Sustainable Agriculture.



LEOPOLD CENTER



#### **... and justice for all**

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, gender, religion, age, disability, political beliefs, sexual orientation, and marital or family status. (Not all prohibited bases apply to all programs.) Many materials can be made available in alternative formats for ADA clients. To file a complaint of discrimination, write USDA, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington, DC 20250-9410 or call 202-720-5964.

Issued in furtherance of Cooperative Extension work, Acts of May 8 and June 30, 1914 in cooperation with the U.S. Department of Agriculture. Jack M. Payne, director, Cooperative Extension Service, Iowa State University of Science and Technology, Ames, Iowa.