

Potential yield loss in grain sorghum due to weeds

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Introduction

- Weeds are one of the most significant threats to crop production in North America. Crop losses in yield and quality due to weed interference, as well as costs of controlling weeds, have a significant economic impact on crop production.
- United States ranks 1st in the world in grain sorghum production, followed by Nigeria, Mexico, and India. In 2016, US produced 480,261,000 bushels with an average yield of 77.9 bu / acre.
- The WSSA Weed Loss Committee report by Chandler et al. (1984) estimated 11 to 18% grain sorghum yield loss across the US due to weeds. The report by Bridges (1992) estimated 5 to 15% grain sorghum yield loss due to weeds across the US even when Best Management Practices with herbicides were used and ranged from 5 to 60% grain sorghum yield loss with BMPs but no herbicidal weed control.
- These data highlight the continued need for weed science research.

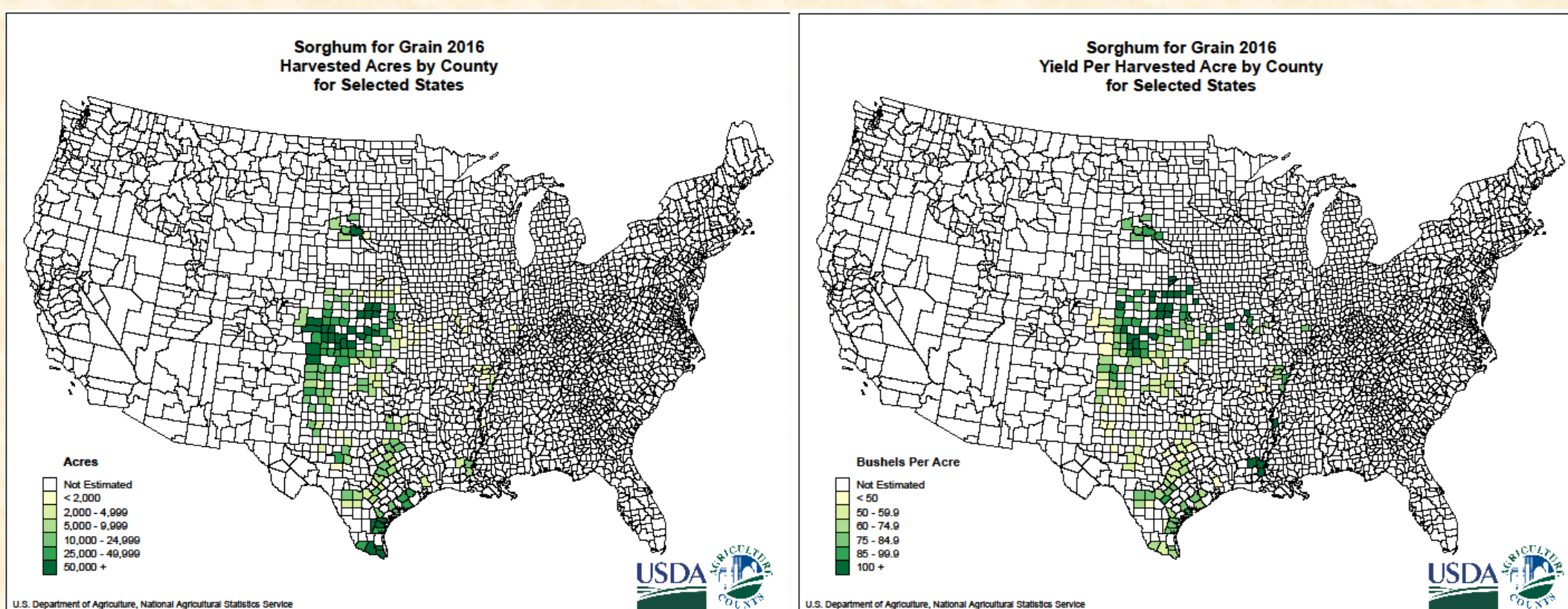


Figure 1. Distribution of grain sorghum acres harvested by county in 2016 in the United States (left) and yield per harvested acre (bu/acre) for each county in 2016 in the United States (right). Images and data from USDA-NASS.

Objective

- To report on potential grain sorghum yield and economic losses due to weeds across the US over nine years (2007-2015).

Methods

- Requests for data were sent to research and/or extension weed science specialists known to conduct weed control research in grain sorghum. Each specialist was asked to provide results of up to 10 individual studies conducted within a year during the period of 2007 to 2015 on weed control in grain sorghum. Data were also obtained from weed control research reports published online or received from specialists for several states.

- Information requested:

- **Weedy yield** = average yield from the non-treated weedy plot (yield using Best Management Practices (BMP) but no weed control), and
- **Weed-free yield** = average yield from a herbicide control plot with > 95% control for each weed species (yield with BMP and excellent weed control)

- Yield loss (%) was determined for each individual study, then averaged within a year, and averaged across years for each state:

$$YL\% = \frac{\text{weed-free yield} - \text{weedy yield}}{\text{weed-free yield}} * 100$$

- State-level data for total grain sorghum acres harvested, average grain sorghum yield (bushels/acre), as well as total production (bushels) and yearly average commodity prices (US \$/cwt) were obtained from USDA-NASS reports.

- Average commodity price for the period of 2007 to 2016 was US \$7.83/cwt (\$4.70/bu) and used to determine potential loss in value due to weeds.

Results

Table 1. Potential average grain sorghum production and value losses due to weeds for each state that provided data for the period of 2007 to 2015. Harvested acres and yield data obtained from USDA-NASS.

State	Acres harvested	Average yield	Yield loss	Potential loss in production	Potential loss in value (\$7.83 / cwt)
	acres	bu / ac	%	cwt x 1000	US \$
South Dakota	150,000	63.6	50.1	3,559	27,859,000
Nebraska	151,111	85.3	56.2	4,060	31,783,000
Kansas	2,457,143	67.6	32.8	30,456	238,434,000
Arkansas	150,890	88.1	39.5	2,941	23,027,000
Texas	2,144,444	57.8	60.3	117,786	220,024,000
Average			47.8%		



Figure 2. Field of grain sorghum infested with Palmer amaranth near Manhattan, KS.

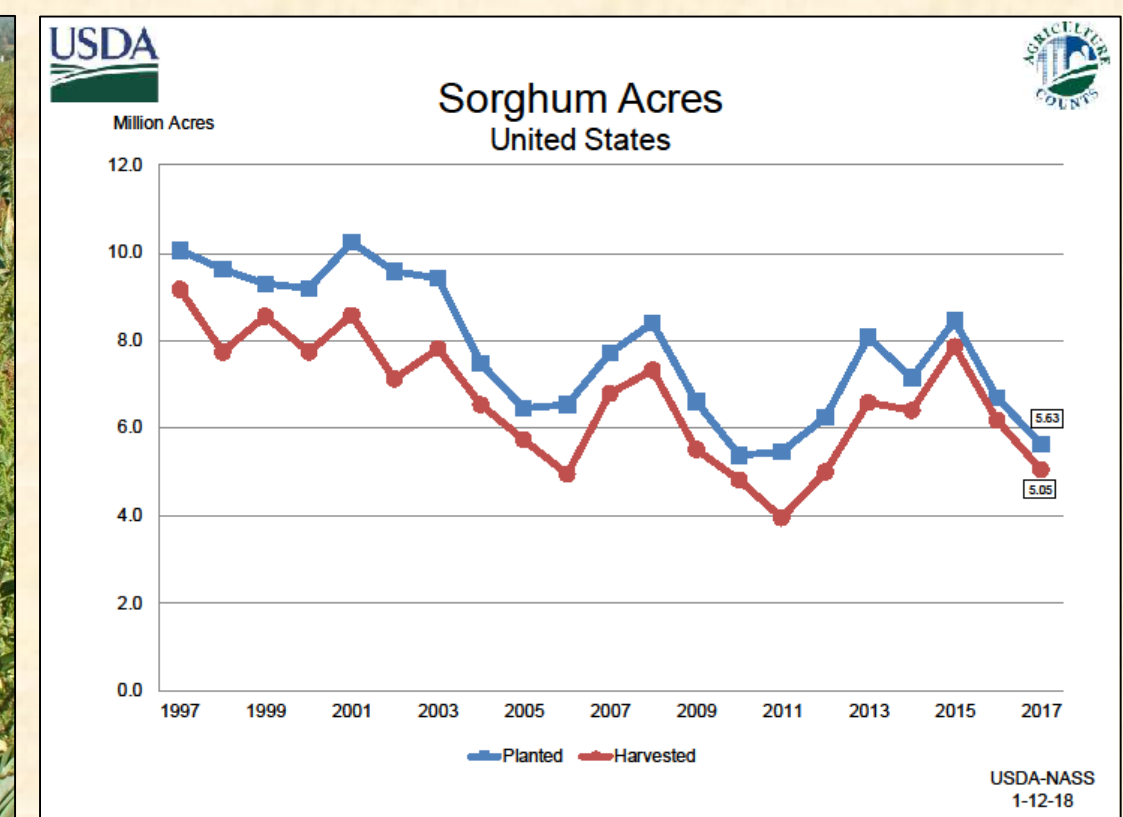


Figure 3. Summary of grain sorghum acres planted and harvested in the United States from 1997 to 2017. Image from USDA-NASS.

Table 2. Potential total grain sorghum losses in production (bushels) and value (US \$) due to weeds for the United States based on 2017 survey from USDA-NASS.

Harvested Acres in grain sorghum	Total production	Value (\$4.70 / bu)	Potential loss in production (47.8% YL)	Potential loss in value
acres	bu	US \$	bu	US \$
5,045,000	363,832,000	1,710,010,000	173,912,000	817,386,400

Summary

- Grain sorghum is grown on more than 90 million acres in North America with a value of more than \$ 52 billion US using current BMPs.
- On average, weeds cause 47.8% grain sorghum yield loss when using BMPs but no herbicidal weed control. Nearly ½ of grain sorghum production and value across the United States would potentially be lost with weeds left uncontrolled.

References

- Bridges DC (1992) Crop losses due to weeds in the United States – 1992. WSSA special publication, Champaign, IL.
- Chandler JM, Hamill AS, Thomas AG (1984) Crop losses due to weeds in Canada and the United States. WSSA special publication, Champaign, IL.
- [USDA-NASS] National Agricultural Statistics Survey (2017) www.nass.usda.gov