



# Current Report

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## The Economic Impact of the 2011 Drought

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### Introduction

According to the U.S. Drought Monitor as of August 23, 2011, 95 percent of Texas, 85 percent of Oklahoma, 56 percent of Louisiana and 16 percent of Arkansas were experiencing extreme or exceptional drought. Some compared the severity of the drought to the "Dust Bowl" of the 1930s. The lack of water made it difficult to cultivate and sustain crops, and pasture land was unable to regenerate and sustain livestock. The result was crop failure for farmers, increased feed costs, reduced weight gain, and herd liquidation for ranchers.

This report presents estimates of the losses to Oklahoma farmers and ranchers caused by drought conditions during 2011. Such information is necessary to inform policy leaders of the losses sustained by their constituents and help them identify the magnitude of assistance to provide, if any. Such information, when systematically collected and analyzed, can be used to identify and evaluate drought management techniques for farmers and ranchers.

In addition to providing estimates of the drought's impact, this report provides details on the data and methods used to generate the estimates. It is organized into two broad categories, crop and livestock impacts, to reflect the common methodology used for each impact. A third section describes additional impacts of the drought that have been identified and present preliminary estimates of the impact. A fourth section lists other drought impacts for which loss estimates cannot be easily estimated. The final section concludes with a summary of the monetary impacts, drought management recommendations for agricultural producers, and policy suggestions to mitigate the drought risk agricultural producers face.

### Crop Loss Estimates

Initial estimates of Oklahoma crop losses from the drought of 2011 amounted to more than \$1 billion. These estimates were released in September 2011. These values were based upon an estimation method that compares estimated yields based upon five-year average yields in Oklahoma to the actual

yields; any positive difference indicated lost crop production. Acres planted and harvested, prices and yields were available from the National Agricultural Statistical Service (NASS) for most major crops grown in Oklahoma. For those not covered by NASS, losses were estimated using data collected directly from growers and producers. In this section, the methodology will be thoroughly documented and the Oklahoma loss estimates presented first for crops with data available from NASS, followed by crops not included in NASS reports.

### NASS-reported Crops

Following guidelines described in Southern Extension Public Affairs, Marketing and Farm Management Committees (2007), Oklahoma loss estimates from the 2011 drought involved a two-step process. First, crop production for 2011 was estimated using a five-year average of yield and harvested acreage; estimated production was planted acres times the average percentage of acres harvested multiplied by the average yield per acre. This number represented the expected crop production in the absence of the drought. Expected crop production less actual crop production provided an estimate of drought-related crop loss. Table 1 contains the estimated losses across NASS-reported crops for Oklahoma. Percentages of estimated production are also provided to illustrate the extent of loss for each crop.

As seen in Table 1 corn, soybeans, grain sorghum, cotton lint, other hay, alfalfa, and rye all lost significant amounts of production in conjunction with the drought. Relative to estimated production, sorghum, cotton lint, other hay, and alfalfa suffered losses in excess of 50 percent of expected production.

A normal metric of loss is to consider the value of production lost, which provides the ability to compare across commodities in a common unit. The estimates reported in September 2011 were based upon the market year average price, or current prices at the time of release (if market year average prices were not available). Table 2 provides the value of lost production by commodity.

**Table 1: Estimated 2011 Drought Crop Loss in Oklahoma.**

	<i>Estimated Loss (in 1,000s)</i>	<i>Units</i>	<i>Percent of Estimated Production</i>
Wheat	25,843	bushels	25.7%
Corn	19,673	bushels	48.1%
Soybeans	4,962	bushels	48.8%
Grain Sorghum	6,787	bushels	64.3%
Peanuts	8,050	pounds	10.8%
Cotton Lint	106,825	bales	55.7%
Oats	101	bushels	33.4%
Other Hay	2,422	tons	52.9%
Alfalfa	486	tons	51.9%
Canola	32,327	pounds	24.8%
Rye	219	bushels	46.4%

Source: Computed using values from USDA NASS, Oklahoma Crop Report, January 12, 2012.

**Table 2: Value of Lost Production Estimates by Commodity and Release Date for Oklahoma.**

	<i>Sept. 2011</i>
Wheat	\$194,404,547
Corn	\$131,812,246
Soybeans	\$66,986,623
Grain Sorghum	\$44,117,171
Peanuts	\$2,656,500
Cotton*	\$53,583,254
Oats	\$372,960
Other Hay	\$302,750,000
Alfalfa	\$97,200,000
Canola	\$7,758,571
Rye	\$1,312,283
Total	\$904,954,156

\* Cotton losses includes an estimated loss in cottonseeds equal to 10% of gross lint value.

The estimates suggested that Oklahoma's total crop production losses were nearly \$1 billion; hay (other hay plus alfalfa) losses accounted for nearly half of total crop production losses at \$400 million. Wheat accounted for an additional 21 percent of losses, corn represented 15 percent of losses, and cotton/cottonseed accounted for 6 percent of losses.

### Other Crop Estimates

In addition to the NASS reported crops presented in Tables 1 and 2, estimates were constructed for more specialized crop producers in Oklahoma. Specifically, estimates were generated for peaches, pecans, watermelons, horticulture, and organic vegetables (Table 3). Given that different data were available for each type of commodity, the method of

**Table 3: Value of Sales of Oklahoma Fruits, Nuts and Vegetables Drought-Related Losses, 2011**

<i>Commodity</i>	<i>Estimated Sales Lost</i>
Peaches	\$330,220
Pecans	\$7,938,000
Watermelons	\$2,572,000
Organic Vegetables	\$315,797
Total	\$11,156,017

estimating the loss in production from the drought will be discussed for each commodity.

Data for peach production, utilized production, market year price, and value of utilized production were obtained from the Oklahoma Field Office of USDA-NASS. An average value of production for Oklahoma over the five most recent years available (2003-2008) was calculated; this became the estimate of expected production (in absence of the drought). Based upon information collected from peach growers via phone and email, about 20 percent of Oklahoma's peach crop was determined to have failed from drought causes. Therefore, the estimated losses to peaches from drought are estimated to be 20 percent of the expected production, or \$330,220.

The USDA-NASS Oklahoma Field Office provides pecan production data in its "Annual Pecan Review" publication. Based upon the values contained in this publication, the researchers estimated the average value of Oklahoma's pecan production by native and improved varieties for 2006 through 2010. The average value of production for native and improved pecans was \$13,960,000, and \$6,250,000, respectively. Oklahoma growers suggested that they had lost 60 percent of their improved crop; because native pecan varieties are thought to be twice as resilient and resistant to drought stress as the improved varieties, it was assumed that a 30 percent reduction in the native crop production occurred. Therefore, estimated pecans loss in was calculated by multiplying 30 percent by \$13.96 million to yield a loss of native pecans in the amount of \$4,188,000. Using a similar method, improved pecan loss was estimated at \$3,750,000.

Watermelon production data were provided by USDA-NASS in its annual Vegetables summary report. To estimate the loss of Oklahoma watermelon production, however, shipment data was used from the "National Watermelon Report" dated September 6, 2011 to compare the level of watermelons shipped from Oklahoma on that date compared to the year prior; shipments up to September 6, 2011 were 59.7 percent of those one year prior. This value was used as the percent of lost production, so multiplying 59.7 percent by the average value of production between 2006 and 2010 yielded an estimate of \$2,572,000 for Oklahoma.

Organic produce is an additional category of crops affected by the drought in 2011. This category of production represents a small portion of Oklahoma's commodity production in 2011. USDA-NASS reported approximately \$632,000 in sales of organic produce from Oklahoma in its Organic

Census Factoids. Assuming a 50 percent drought-related loss of produce sales, organic produce contributed \$315,797 toward Oklahoma's total losses.

USDA-NASS conducted a survey of horticultural products as part of the 2007 Census of Agriculture. Using these values, 2009 values of sales by horticultural product were determined for Oklahoma. Little growth is thought to have occurred in these sectors, as confirmed by anecdotal evidence from producers. Most Oklahoma producers who were asked about their production responded that about 50 percent of production was lost because of the drought. Thus, a total of \$81,836,500 in sales of horticulture was estimated as lost in Oklahoma; more than half of these losses were in nursery stock. Table 4 provides a breakdown by product.

Table 5 presents a summary of the total drought losses estimated from Oklahoma crop production in 2011. In total, more than \$1 billion in crops and horticultural products were lost.

**Table 4: 2011 Drought Lost Value of Sales of Oklahoma Horticultural Products.**

<i>Horticultural Product</i>	<i>Estimated Sales Lost</i>
Nursery Stock	\$49,068,000
Annual Bedding/Garden Plants	\$5,260,000
Sod, Sprigs or Plugs	\$14,018,500
Potted Flowering Plants	\$794,000
Herbaceous Perennial Plants	\$9,496,000
Propagative Materials	\$2,469,500
Food Crops Grown Under Protection	\$27,500
Foliage Plants	\$264,500
Cut Flowers	\$155,000
Transplants for Commercial	
Vegetable Production	\$25,000
Cut Christmas Trees	\$159,500
Other Horticultural Products	\$99,000
<b>Total</b>	<b>\$81,836,500</b>

**Table 5: Summary of Oklahoma 2011 Drought Loss Estimates for Crops.**

<i>Commodity</i>	<i>Loss Estimate</i>
Crops (E.g., Grains, Hay, Soybeans, Cotton)	\$904,954,156
Specialty Crops (E.g., Fruits, Vegetables and Nuts)	\$11,156,017
Horticulture Crops (E.g., greenhouse production, nursery products, sod)	\$81,836,500
<b>Total Crop Loss</b>	<b>\$997,946,673</b>

## Livestock Loss Estimates

While Oklahoma ranchers raise a variety of livestock, many are capable of tolerating drought (e.g., goats), and are in facilities which can accommodate drought conditions (e.g., feedlots), or are otherwise minimally affected by drought. This report focuses on cattle. Because the dominant system of cattle production in Oklahoma involves grazing, and cows need access to water for survival, it was determined that the drought impacts would be predominantly associated with cattle ranching.

Measuring the impact of drought on beef cattle is difficult for several reasons. First, many of the impacts of drought on cattle production are not financially obvious at the time of the drought but occur later. Secondly, drought does not usually cause a direct loss of cattle, though in extreme cases cattle may die from heat stress or drinking water containing toxic algae. Instead, drought impacts the ability to produce cattle and results in lowered production of existing animals or reduced future production ability. Thus, it is conceivable that, depending on the timing of the drought, a cattle producer could sell calves at more or less the normal time, and sell the breeding herd due lack of feed, thereby incurring no additional expense for feed. In the absence of significant market price declines, the outward appearance of this situation is that the drought had no impact on the producer; in fact, the only impact was increased income from additional animal sales. This ignores the loss of forage that precipitated the dramatic liquidation of the herd and lost future productivity. More typically, in the year of the drought, cattle producers will incur losses of forage, losses from early sales of animals and additional feed costs to maintain animals. The following sections will explain how estimates of the immediate (2011) drought impacted Oklahoma beef cattle producers. The estimates do not account for losses in the future attributable to the 2011 drought, such as losses of calves from breeding animals which were liquidated or failed to breed due to high temperatures (causing a future loss of income), or pasture damage from overgrazing under extreme conditions (resulting in reduced stocking rates and increased costs maintaining the pasture).

By January, 2012, the USDA Cattle inventory reports showed that Oklahoma had a beef cow herd of 1.728 million head, down 288,000 head from one year earlier. The inventory of beef replacement heifers was 300,000 head, down 55,000 head from the previous year and the inventory of bulls weighing 500 pounds or more was 120,000 head, down 15,000 head from the year before. Typically, summer stockers are produced in Oklahoma. These animals arrive in April or May and leave in summer or fall. No data is available on how many summer stockers are normally produced in Oklahoma, not to mention how many were not produced in 2011 because of the drought.

## Lost pasture value

Oklahoma has a total pasture area (including permanent pasture, cropland used for pasture, and pastured woodland) of 23,202,106 acres based on the 2007 Census of Ag. If one assumes a statewide average of \$11.50/acre for dryland pas-

ture (USDA-NASS 2011), the total pasture value in Oklahoma is \$266.824 million per year. Pasture forage production was estimated at 40 percent of normal because of drought, resulting in a loss of Oklahoma's pasture value of \$160.095 million. In September, 2011, NASS published estimates for Other Hay production, which serve as a proxy for pasture production. The estimated 2011 Other Hay production in Oklahoma was 49 percent of the 2001-2010 average. Also, per acre yields in 2011 were estimated at 0.9 tons per acre compared to the 2001-2010 average of 1.59 tons per acre (56.6 percent reduction in per acre yields). The estimated 60 percent loss for Oklahoma appears reasonable compared to these hay losses.

The loss can also be expressed on an animal unit basis. The January 1 cattle inventory for Oklahoma results in an estimated 2.43 million animal units (AU), which includes beef cows; beef and dairy heifers; and bulls, all adjusted for animal unit equivalents. This is an average of 9.55 acres/AU. At \$11/acre value, the 60 percent loss is \$63.03/AU.

### Lost calf value

Another impact of the 2011 drought on Oklahoma herds was the need to market calves early due to lack of forage. Auction data showed unusually large runs of lightweight calves in July and August. It is estimated that roughly 50 percent of Oklahoma's annual calf crop was marketed 150 pounds lighter than normal sales weight at weaning. The 2011 Oklahoma beef calf crop was estimated at 1.8 million head, calculated as 88.4 percent of the January 1, 2011 beef cow herd of 2.036 million head. 50 percent of this value is an estimated 900,000 head of calves sold early because of the drought. Assuming that calves were sold at 375 pounds for \$165/hundredweight, rather than 525 pounds for \$146/hundredweight, at normal weaning time is \$147.75/head loss in value. This loss of \$147.75/head multiplied by 900,000 head is a total estimated loss in calf value of \$132.98 million. The prices used for this estimate are very close to observed prices in July and October, respectively. This is drought-related lost income to the Oklahoma cattle rancher.

### Lost winter stockers and winter grazing 2010/2011

The drought, which began in the fall of 2010, restricted the number of wheat pasture stockers and limited weight gain of those animals in Oklahoma. The animal numbers and prices were a matter of record by the summer of 2011, resulting in the following estimates of lost winter wheat grazing in 2010-2011. The estimated January 1, 2011 feeder supply in Oklahoma was 2.14 million head, down 217,000 head from the five-year average of 2.357 million head. It is assumed that this reduction in feeder cattle outside of feedlots is from a lack of wheat pasture or other winter pasture as a result of the drought. Livestock Marketing Information Center (LMIC) monthly average prices for Oklahoma City show an October purchase price \$124.64/hundredweight at 475 pounds (\$592/head) and a March selling price of \$133.42/hundredweight at 725 pounds (\$967/head) for a gross value of production of \$375/head. This value lost more than 217,000 head is total lost winter stocker value of \$81.375 million for Oklahoma.

### Additional feed costs

NASS estimates showed a remaining beef cow herd of 1.728 million cows plus 300,000 head of beef replacement heifers at the end of 2011 in Oklahoma. It is estimated that half of these animals needed additional feed for 164 days at a cost of \$2/day. This is an additional feed cost of \$328/head for 864,000 head of cows plus 150,000 head of replacement heifers for a total additional feed cost of \$332.6 million.

Table 6 provides a summary of the estimated drought losses of cattle in 2011. In total, the drought created a loss of more than \$707 million in production to Oklahoma ranchers. Because the drought was limited to Oklahoma, Texas and Arkansas, herd liquidation did not cause beef prices to decline significantly, so those ranchers who sold part or all of their herds received relatively good prices and had significant cash flow going into 2012. However, these ranchers will likely face higher prices for cattle when rebuilding their herds, if they choose to do so. It is anticipated that ranchers will see significant difficulties during the next several years, as they rebuild herds and climate projections suggest ongoing drought conditions for at least the next year.

**Table 6: Summary of Cattle-related Loss Estimates in 2011 for Oklahoma**

<i>Commodity</i>	<i>Loss Estimate</i>
Lost Pasture Production	\$160,094,531
Reduced Calf Value	\$132,975,000
Reduced Winter Stocker and Forage Value	\$81,375,000
Additional Feed Costs	\$332,600,000
<b>Total Cattle Loss</b>	<b>\$707,044,531</b>

### Crop Insurance and Government Payments

Some of these losses were offset by crop and livestock insurance payments. Other farmers received federal disaster assistance payments to replace lost income from failed crops. USDA-Risk Management Agency's (RMA) Summary of Business Application reports that farmers and ranchers received over \$400 million in crop indemnity payments for drought-related losses<sup>1</sup> in the 2011 crop year. Table 7 provides the breakdown of crop insurance payments by crop for 2011.

In addition to crop insurance indemnity payments, farmers and ranchers received disaster assistance payments from USDA-Farm Service Agency. Three specific programs made payments to Oklahoma farmers and ranchers because of the drought: Non-insured Crop Disaster Assistance Program,

<sup>1</sup> Drought-related losses were calculated by summing the following "Cause of Loss" categories, as reported by USDA-RMA: drought, failure of irrigation supply, heat, fire, hot wind, and wind/excess wind.

**Table 7: 2011 Drought-Related Indemnity Payments to Oklahoma Farmers.**

<i>Crop</i>	<i>Payment Amount</i>
Barley	\$54,789
Canola	\$5,149,890
Corn	\$60,983,894
Cotton	\$121,314,397
Grain Sorghum	\$31,356,721
Oats	\$15,824
Peanuts	\$1,360,307
Pecans	\$184,940
Potatoes	\$37,474
Rye	\$47,598
Sesame	\$228,621
Soybeans	\$26,867,076
Sunflowers	\$359,299
Wheat	\$152,831,533
Grand Total	\$400,792,363

Source: USDA-RMA, Summary of Business Application, v. 3.71

**Table 8: 2011 Disaster Assistance Payments by Program to Oklahoma Farmers/Ranchers.**

<i>Program</i>	<i>Payment Amount</i>
Non-Insured Crop Disaster Assistance Program	\$4,998,112
Livestock Indemnity Program	1,097,546
Livestock Forage Disaster Program	\$57,394,201
Total	\$63,489,859

Source: Oklahoma Farm Service Agency Special Report, "FSA at Work Across Oklahoma – FY 2011"

Livestock Indemnity Program, and Livestock Forage Disaster Program. Combined, these programs provided more than \$63 million of assistance. Table 8 presents the breakdown of payments by program.

Farmers and ranchers may have also received ACRE (Average Crop Revenue Election) and/or Supplemental Revenue Assistance Payments (SURE) payments related to the drought. However, these amounts were not available at the time of publication.

### Other Measured Impacts

The direct agricultural impacts of the 2011 drought were significant to Oklahoma's economy. However, the \$1.7 billion

in agricultural losses do not tell the whole story. A reduction in agricultural production indirectly affects input suppliers, as the farmers and ranchers demand fewer inputs to produce their crops and maintain their livestock. While additional losses resulting from impacts further up the value chain were possible, the drought only impacted a limited region so commodity shortages did not occur. As an attempt to measure the indirect impacts of the drought on farm and ranch suppliers, a poll of cooperatives was conducted to understand how their businesses had been impacted by the drought.

Figure 1 presents the distribution of responses from the cooperatives regarding fertilizer, herbicide and other input sales. As one can see, the majority of cooperatives reported that the drought had decreased input sales.

The poll also sought to identify the level commodity marketing occurring at the cooperatives in light of the drought. Figure 2 presents the responses, and it indicates that all responding cooperatives realized much smaller quantities of grain and/or cotton than the previous year because of the drought.

### Other Identified Impacts

Other impacts in Oklahoma were also attributed to the severe drought. For example, the drought, in conjunction with record high temperatures, caused lake levels to fall, such that Altus-Lugert Lake became dry, Lake Texoma prevented entry for recreational use, and Lakes Keystone, Fort Gibson, and Grand all experienced blue algae blooms. In the case of Altus-Lugert Lake, one immediate impact as the the Altus-Lugert Irrigation District ran out of water to maintain the cotton crop. The decreased depth and flow of other lakes and rivers reduced their utility for recreational purposes. OU researcher Caryn Vaughn has documented the impact of the drought on mussel populations in the Kiamichi and Little River systems. In addition to grossly impacting the ecosystems of these river systems, Vaughn also notes that without the biosystem services of the mussels, public water systems in southeastern Oklahoma face higher costs of filtration. While no formal estimates of the value of recreation and ecosystem losses have been made, the figure would likely be in the millions of dollars (personal communication with L. Sanders and T. Boyer).

### Conclusions

Estimates of the direct agricultural losses caused by the 2011 drought were presented in this report. Crop losses were estimated at more than \$1 billion, while cattle losses were estimated to be \$707 million. In total, Oklahoma's agricultural sector suffered direct drought-related losses of \$1.7 billion in 2011.

In addition to the direct agricultural losses, this report documented drought-related impacts to farm and ranch input suppliers, recreational users of Oklahoma's rivers and lakes, and ecosystems. These impacts were not quantified, but they are no less important to consider.

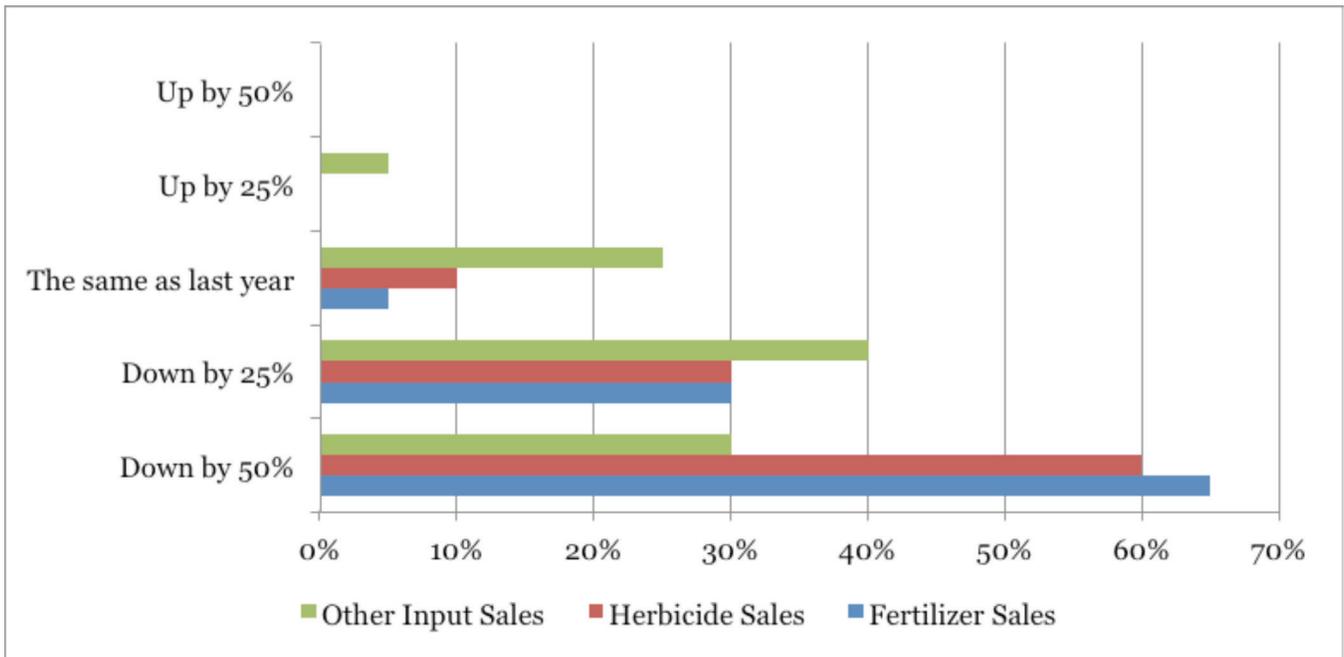


Figure 1: Responses from Oklahoma Cooperatives About Drought Impacts on Input Sales, 2011.

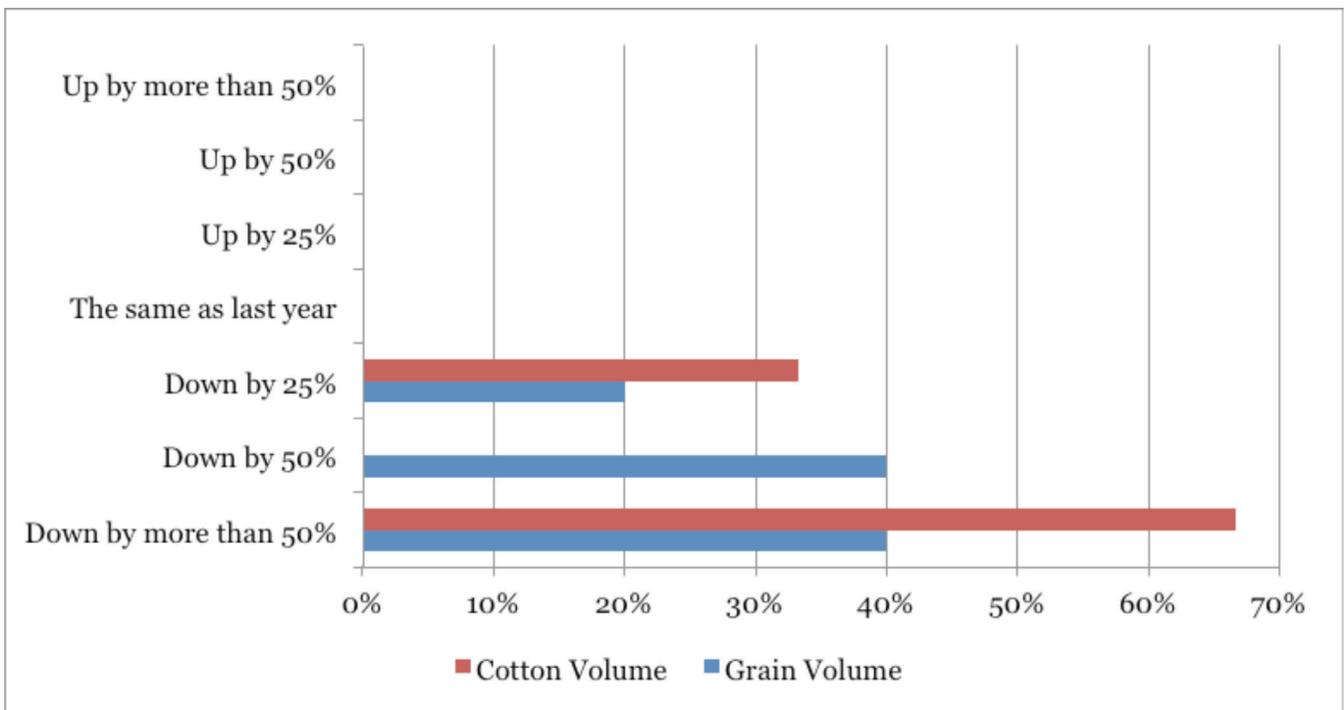


Figure 2: Cotton and Grain Volume Marketed by Oklahoma Cooperatives, 2011.

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Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

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- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
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