

# Utah Fresh Produce Grower Preferred Drought Management Strategies

*Kynda Curtis*, Professor and Extension Specialist, Department of Applied Economics

*Tatiana Drugova*, Postdoctoral Fellow, Department of Applied Economics

*Ruby Ward*, Professor and Extension Specialist, Department of Applied Economics

## Introduction

Fresh produce production plays a vital role in Utah's economy as fresh produce sales generate \$56 million annually in Utah (USDA NASS, 2017). However, agricultural production puts large demands on water resources as agriculture consumes 80% of all water in the United States (USDA ERS, 2019). Thus, climate change impacts and drought, especially in drought-prone areas of the southwest U.S., pose a threat to productivity in the agricultural sector, as well as the economies of rural and tribal communities.

Utah is currently the third driest state in the United States, as 65% of the state experienced abnormally dry conditions from 2000 to 2019 (NIDIS, 2019a). In 2018 and 2019, 38% of the state experienced severe drought (NIDIS, 2019b). Severe drought is connected to heavy pasture and crop losses as well as water shortages requiring restrictions on use, especially in the late summer months. Hence, persistent drought often leads to severe economic consequences in rural communities (Lal et al., 2012; Howitt et al., 2017).

Considering the large contribution agricultural production makes to Utah's economy, approx. 2% of GDP (BEA, 2019), agricultural adaption to drought in order to maintain food and feed production is critical. This fact sheet examines the preferred drought management strategies of fresh produce growers and how their preferences change depending on drought severity and expected crop yields.

## Study Overview and Data

The aim of the study conducted by Utah State University described here was to determine agricultural producer preferences for drought management strategies and how their preferences shift in response to varying levels of drought conditions and expected crop yields. Data was collected at producer meetings and online in 2019 for three groups of producers: hay and forage growers, fresh produce growers, and livestock producers. This fact sheet provides an overview of the results for the fresh produce growers.

## Grower Characteristics

Among fresh produce growers who participated in the study, 20 respondents answered important study questions and were included in the final sample. The majority of these participants farm on 10 acres of land or less (84%), grow vegetables as their primary crop (85%), sell their produce directly to consumers (70%), and use drip irrigation systems (75%). Also, 80% of respondents have used mulch applications and 55% have used wind breaks and cover crops, which are water saving technologies. Finally, half of the sample considered crop losses of 40-59% large, while 40% of the respondents were more sensitive to crop losses, considering losses under 40% large. Table 1 provides an overview of grower characteristics.

**Table 1.** Characteristics of Fresh Produce Growers

Characteristic	Category	Count	% share
Primary operator gender	Male	10	53%
	Female	9	47%
Primary sales outlet	Direct	14	70%
	Direct & wholesale	5	25%
	Other	1	5%
Acres farmed	<=10	16	84%
	11-25	1	5%
	26-100	0	0%
	>100	2	11%
Primary crop	Vegetables	17	85%
	Tree fruit	2	10%
	Other	1	5%
Primary irrigation system	Flood	2	10%
	Pivot	1	5%
	Drip	15	75%
	Other	2	10%
Mulch applications used previously	Yes	16	80%
	No	4	20%
Wind breaks used previously	Yes	11	55%
	No	9	45%
Cover crops used previously	Yes	11	55%
	No	9	45%
What is a large % of crop loss to you?	60-79%	2	10%
	40-59%	10	50%
	20-39%	6	30%
	<20%	2	10%
Number of respondents	-	20	100%

*Note:* Sum of responses per characteristic may not add up to 20 (some answers missing).

### Preferred Strategies

First, fresh produce growers were asked to select their most preferred drought management strategy from a list of options, assuming a drought that could cause large crop losses but not specifying a specific yield or amount of crop loss for each strategy. The results in Table 2 (panel A) show that most fresh produce growers (40%) preferred to adopt a water saving technology, such as cover crops, wind breaks, and mulch applications. Transitioning to a more efficient irrigation system and sacrificing lower value crops were most preferred by 25% of the fresh produce growers, while changing to a drought resistant crop was most preferred by 10%. None of the sampled fresh produce growers selected moving out of farming as their most preferred strategy.

Growers were then asked whether or not they would adopt a specific drought management strategy, while assuming a drought that could cause large crop losses, but also specifying the expected yield or amount of the crop harvested (40%, 60%, and 80% for each strategy) if they adopt the strategy. The three offered strategies were adopting a water-saving technology, switching to a drought-resistant variety, and sacrificing lower value crops. Grower

responses were used to estimate the minimum level of harvested crop (yield) that growers require in order to adopt a specific strategy and determine the preference among the strategies (see Table 2, panel B). Lower values represent higher willingness to adopt the strategy (and higher preference) and vice versa.

As shown, growers are willing to adopt a water-saving technology if they can harvest at least 36.0% of their crop, which is the lowest among the three strategies, making it the most preferred strategy. Growers prefer this strategy the most, regardless of whether information about the crop yield is provided or not (ranked first in both cases). Growers need to harvest at least 53.3% of their crop in order to change to a drought-resistant crop/variety and 56.6% to sacrifice lower value crops. The rank of these two strategies depends on whether information about crop yields under each strategy were provided (see Table 2). In summary, growers may change their preferences for a drought management strategy depending on the amount of the crop harvested, which in turn depends on drought severity.

**Table 2.** Grower Preferences for Drought Management Strategies

Strategy	A. No crop yield information provided		B. Crop yield information provided	
	Rank	% of respondents <sup>1</sup>	Rank	Crop harvested <sup>2</sup>
Adopt a water-saving technology	1	40%	1	36.0%**
Change to a more water efficient irrigation system	2	25%	-	-
Sacrifice lower value crops	2	25%	3	56.6%***
Change to a drought-resistant crop/variety	3	10%	2	53.3%***
Move out of farming/fallow land	4	0%	-	-

Notes: \*\*\* and \*\* denote significance at 1% and 5% level, respectively.

<sup>1</sup> Percentages represent share of respondents who selected given strategy as most preferred.

<sup>2</sup> Percentages represent required minimum % of crop harvested. Lower value indicates that the strategy is more preferred.

Grower preferences for the drought management strategies also differ across grower subgroups. Table 3 reports minimum crop yields by percentage required within each grower subgroup for a given strategy. Statistically significant differences between the subgroups are highlighted in bold font.

**Table 3.** Preferences for Drought Management Strategies by Grower Subgroups

Characteristic	Category	Adopt a water-saving technology	Switch to a drought-resistant variety	Sacrifice lower value crops
Primary operator gender	Male	39.1%	<b>62.3%</b>	53.6%
	Female	34.8%	<b>39.4%</b>	58.5%
Primary sales outlet	Direct only	40.7%	54.3%	59.9%
	Other	24.7%	51.2%	49.4%
Acres farmed	<=10 acres	37.6%	<b>48.6%</b>	57.1%
	>10 acres	16.2%	<b>81.6%</b>	56.5%
Primary crop	Vegetables	36.9%	<b>48.9%</b>	55.4%
	Other	32.4%	<b>80.9%</b>	63.4%

Primary irrigation system	Drip	<b>41.5%</b>	53.7%	<b>60.6%</b>
	Other	<b>14.5%</b>	52.1%	<b>45.2%</b>
Mulch applications used previously	Yes	38.0%	<b>48.7%</b>	57.1%
	No	28.9%	<b>72.5%</b>	54.8%
Wind breaks used previously	Yes	31.9%	46.7%	<b>51.4%</b>
	No	41.0%	61.4%	<b>63.3%</b>
Cover crops used previously	Yes	40.4%	49.1%	<b>62.8%</b>
	No	30.7%	58.5%	<b>48.8%</b>
Large % of crop loss	<40%	36.1%	46.7%	51.4%
	=>40%	36.1%	57.8%	60.0%

*Notes:* Bold font indicates that the minimum required percentage yield required to adopt is significantly different between the subgroups within a characteristic.

Those who use primarily use drip irrigation are less willing to adopt a water-saving technology, the most preferred strategy overall. Switching to a drought-resistant variety is preferred more by females, those farming on 10 acres or less, those who primarily grow vegetables, and those who previously used mulch applications. Sacrificing lower-value crops, the least preferred strategy overall when information about crop yields is provided, is preferred more by those who use irrigation systems other than drip, those who have used wind breaks before, and those who have not used cover crops.

Finally, fresh produce growers were asked under what conditions they would stop farming. Of the 16 growers that responded, 44% indicated they would cease if there was no water at all, 38% mentioned high water cost, 19% mentioned a lack of sufficient water, and 13% would not stop farming under any conditions.

## Conclusions

Drought conditions would have to be very serious and long-term for fresh produce growers in Utah to exit farming. They are more likely to adopt water-saving technologies as a drought management strategy than switch to a drought-resistant crop/variety or sacrifice lower-value crops. Also, growers are sensitive to the percentage of expected crop harvested (yield) and associated drought severity since it influenced their willingness to adopt each strategy. In addition, we find some differences in preferences for the strategies across grower subgroups.

Finally, information about expected yields under each drought management strategy and drought scenario is important to the decision-making process, and thus, growers would benefit greatly from such information. Policies to improve uptake of drought management strategies should target grower preferred options as they are more likely to be successful. Policies which provide incentives such as covering a portion of the costs to implement drought management strategies are also recommended.

## References

- Bureau of Economic Analysis [BEA]. 2019. Annual GDP by state – real GDP in chained dollars. Retrieved from <https://apps.bea.gov/iTable/iTable.cfm?reqid=70&step=1&acrnd=1> [Accessed February 2, 2021]
- Howitt, R., MacEwan, D., Medellín-Azuara, J., Lund, J., and Sumner, D. 2017. Economic analysis of the 2015 drought for California agriculture. University of California, Davis, CA: Center for Watershed Sciences.

- Lal, R., Delgado, J.A., Gulliford, J., Nielsen, D., Rice, C.W., and Van Pelt, R.S. 2012. Adapting agriculture to drought and extreme events. *Journal of Soil and Water Conservation* 67(6):162A-166A
- National Integrated Drought Information System [NIDIS]. (2019a). *Drought in Utah*.  
<https://www.drought.gov/drought/states/utah>
- National Integrated Drought Information System [NIDIS]. (2019b). *US drought monitor*.  
<https://www.drought.gov/drought/>
- United States Department of Agriculture Economic Research Service [USDA ERS]. (2019). *Irrigation & water use*. <https://www.ers.usda.gov/topics/farm-practices-management/irrigation-water-use/>
- United States Department of Agriculture National Agricultural Statistics Service [USDA NASS]. (2017). *Census of agriculture, Utah state profile*.  
[https://www.nass.usda.gov/Publications/AgCensus/2017/Online\\_Resources/County\\_Profiles/Utah/cp99049.pdf](https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Utah/cp99049.pdf)

In its programs and activities, including in admissions and employment, Utah State University does not discriminate or tolerate discrimination, including harassment, based on race, color, religion, sex, national origin, age, genetic information, sexual orientation, gender identity or expression, disability, status as a protected veteran, or any other status protected by University policy, Title IX, or any other federal, state, or local law. The following individuals have been designated to handle inquiries regarding the application of Title IX and its implementing regulations and/or USU's non-discrimination policies: Executive Director of the Office of Equity, Alison Adams-Perlac, [alison.adams-perlac@usu.edu](mailto:alison.adams-perlac@usu.edu), Title IX Coordinator, Hilary Renshaw, [hilary.renshaw@usu.edu](mailto:hilary.renshaw@usu.edu), Old Main Rm. 161, 435-797-1266. For further information regarding non-discrimination, please visit [equity.usu.edu](http://equity.usu.edu), or contact: U.S. Department of Education, Office of Assistant Secretary for Civil Rights, 800-421-3481, [ocr@ed.gov](mailto:ocr@ed.gov) or U.S. Department of Education, Denver Regional Office, 303-844-5695 [ocr.denver@ed.gov](mailto:ocr.denver@ed.gov). Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Kenneth L. White, Vice President for Extension and Agriculture, Utah State University.