Estimating the Overall Economic Loss to the South Carolina Peach Industry due to the March 2017 Freeze

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Abstract:

South Carolina is the 2nd largest peach producing state in the United States, which in turn makes the peach industry a major contributor to the state's economy ranking 8th in production value in 2016. According to the South Carolina Department of Agriculture (SCDA), the peach industry annually has up to a $300 million impact to the South Carolina economy and has an annual value of nearly $70 million. An unseasonably warm winter at the beginning of 2017 produced an early bloom for the peach crop causing severe damage when record low temperatures occurred in March. Original estimations from the SCDA indicated that about 85-90% of the state's peach crop was destroyed due to the freeze.

The objective of the paper is to determine the economic impact that occurred to the South Carolina peach industry and to the state's economy due to the freeze. The data is obtained from farmers' responses to surveys and from the USDA National Agricultural Statistics Service. Also, the regional economic analysis from the loss is determined using IMPLAN input-output models.

Introduction

The production of peaches in the United States includes about 20 states nationwide, with the top 3 producing states being California, South Carolina, and Georgia. Peach production for the U.S. as a whole has declined every year for the last 10 years, dropping from 1,127,150 tons in 2007 to 735,200 tons in 2016. Also, consumption of peaches per capita has dropped every year since the mid 2000s (USDA NASS, 2012).

In addition to being ranked second in the country, the peach industry is very important to the economy of South Carolina (SC). To illustrate, in 2016 the South Carolina peach industry ranked 8th in production value for the state, with a value of nearly $70 million. Overall, it is estimated by the South Carolina Department of Agriculture that the peach industry has an annual economic impact to the state up to $300 million. There are two main regions in the state that produce peaches typically during the summer months of May-August. The first region being the Ridge area, which is located towards the middle of the state between the Georgia state line and Columbia, SC. The Ridge produces the most peaches in the state by region. The counties that make up this area are Saluda and Edgefield. According to the 2012 U.S. Census of Agriculture, Edgefield and Saluda Counties ranked 1st and 2nd in the state for peach production by county. Next, the Piedmont region in the northwestern part of the state is S.C.'s second leading region of peach production. The main county in the Piedmont that grow peaches is Spartanburg County, which ranks as the 3rd county in the state by peach production (USDA NASS, 2012).

In terms of production, peaches are grown in the warmer months of the summer in South Carolina. Like most fruit, peaches are best grown on higher ground to avoid low spots of cold air. Typically, peaches in the state begin to bloom in the spring months of March and April. A period of dormancy during the winter is required for the crop to grow. More specifically, a

certain number of "chill hours" where temperatures are below 45°F are required for peaches during their dormant stage. The lower the number of chill hours relates to how early the peach crop will bloom once the weather begins to warm. Typically, peach trees in South Carolina require about 800-1,000 chill hours during dormancy (Clemson University).

South Carolina experienced an unseasonably warm winter in the early part of 2017. As a consequence, the majority of peach trees in the state fully bloomed earlier than normal, which was at the end of February and the beginning of March. As a result, much of the state's peach crop was at full bloom when record low temperatures occurred in mid March. Temperatures in the teens for several days caused a freeze, which was detrimental to most peach trees across the state, due to the early bloom. Original estimations from the SCDA estimated that about 85-90% of the peach crop in the state was destroyed due to the freeze. Also, it was estimated that the Ridge area of the state lost the most due to the peach trees there blooming about 10 days earlier than peach trees in the northern part of the state.

The main objective of the paper is to find the overall economic loss that occurred to South Carolina due to the freeze since the peach industry is a major contributor to the state's economy.

Literature Review

Relevant literature reviewed involved a review of methods to estimate the economic impact to the agricultural sector from a drought (Ding, Hayes, Widhalm, 2011). This literature was reviewed due to a drought and a freeze both being weather related and hard to predict the severity of them. The paper talks about how losses can be found, what models to use to analyze

an economic loss, and what type of effects occur to other industries after a loss is observed (Ding, Hayes, Widhalm, 2011).

First, the literature about the effects of a drought begins to emphasize the importance of preparedness when weather issues arise. Being prepared is a key to reducing the effects of weather after it occurs. This does not happen often however, due to the unwillingness of governments to allocate resources beforehand. On the other hand, it is difficult for government officials to develop plans before weather disasters happen due to their unpredictability. Also, it is hard to distinguish the cost and benefits of preventative policies due to lack of information. For example, costs of these strategies would mostly be upfront after the weather issue arises, while the benefits at the time would be unclear. The benefits of a preventative strategy would not be known until after the strategy took place and would be hard to predict at the time of implementation (Ding, Hayes, Widhalm, 2011).

Next, as one would expect, weather related issues, such as droughts, freezes, and floods, impact the agricultural sector the most. The direct impact to agriculture is the loss of crops or pastureland. Widespread losses will then cause a negative supply shock to the market. The impacts are then felt by the consumers, who will face higher commodity prices due to the shock. Farmer's losses due to the weather issue could be somewhat mitigated by crop insurance. Governmental aid could also be available to farmers through disaster relief funds. The negative supply shocks can be lessened by producers outside of the area effected. Producers from outside the local area can alleviate the shortage of supply and the price increases by bringing in their goods. This makes estimating the economic impact to an effected area difficult to predict because it allows producers from other areas to become winners in this case (Ding, Hayes, Widhalm, 2011).

An empirical study that is discussed in the literature is a paper by Diersen and Taylor that observes the impact in the South Dakota agricultural sector from a drought that occurred there in 2002. In this study, Input-Output models were used to find the overall economic loss to the state. The losses were divided into three categories: direct effects, indirect effects, and induced effects. Direct effects were described as the initial shocks to income specifically in the agricultural sector. Indirect effects examined shocks in industries related to agriculture. Lastly, induced effects were described as changes that occurred to local consumers due to the drought. Dierson and Taylor initially predicted that the economic loss to South Dakota because of the drought was $1.8 billion. It is important to note that a year later in 2003, Dierson and Taylor revised their estimation to an impact of $1.4 billion. This revision was due to federal aid of $100 million that was provided to South Dakota to help alleviate losses from the drought. The revision is a key factor in trying to predict economic impacts from weather related issues because of new information that becomes available and unforeseen improvements in market conditions (Dierson and Taylor, 2003).

In addition, the literature discusses other empirical studies that predict economic impacts on a state by state basis. Papers mentioned are studies done in Missouri, Georgia, Illinois, and Oklahoma. All the papers reviewed are done on the impacts of droughts in the particular state related to the agricultural industry. However, the selected papers do not provide any estimation models that result from quantitative methods (Ding, Hayes, Widhalm, 2011).

Most of the literature reviewed is devoted to the market impacts of a drought or any other weather related incident, but a section is devoted to the non-market impacts. Essentially, welfare changes to humans should be included in determining economic losses due to weather disasters. For example, health problems can arise from unforeseen weather issues that can cause harm to

human welfare. Another example is wildlife habitats being destroyed due to a natural disasters that may cause psychological harm to humans who are concerned with those wildlife species' wellbeing. These are all problems that arise from weather issues, but they are hard to calculate as a part of economic impacts. Non-market impacts are intangible and considered specific and time-consuming when trying to predict their value (Ding, Hayes, Widhalm, 2011).

Model

An Input-Output (I-O) model was chosen to determine the economic loss to the state. The I-O shows the effect of a change in one industry on other sectors of the regional economy. The model is based on the dependencies of one industry to another, showing losses in total output, employment, labor compensation, and value added. Effects from the model are broken down into three categories to find the total effect. A direct effect is the initial economic loss to the particular industry being studied. Next, an indirect effect is the change in other industries in relation to the direct effect of the initial loss, such as the purchase of inputs. Third, an induced effect is the change in household expenditure to employees based on the direct effect to the studied industry. The total effect calculated by the I-O model is the sum of all the direct effects, indirect effects, and induced effects (McKissick and Kane, 2011).

For this specific paper, the I-O model chosen was the IMPLAN model due to its ability to collect regional data. Models in IMPLAN are able to run for the entire state or can be run on a county by county basis. As mentioned above, IMPLAN separates the total economic effect into direct, indirect, and induced effects. Also, the model predicts multipliers between industries to determine economic losses.

Data

Initial data was found using the USDA National Agricultural Statistics Service and conversations had with peach farmers in the state. Also, crop insurance data from the USDA Risk Management Agency for peaches in 2017 was used. To determine the loss to peach sales from the freeze for the IMPLAN model, two scenarios were used. First, using the crop insurance data, it was estimated that the expected revenue from peach sales before the freeze was $64,673,661.60. This number was determined using the liabilities, coverage levels, and total bearing acres of peached in the state. Next, the estimation of the 85% from the SCDA was used to find that loss to peach sales in scenario 1 was $54,972,612.36. Scenario 2 involved the production value of $70,000,000 from 2016 and again the 85% loss from the SCDA. Using these numbers, loss to peach sales were estimated as $59,500,000 for Scenario 2.

Results

Table 1: Impact Summary from Scenario 1

ImpactType	Employment	LaborIncome	TotalValueAdded	Output
Direct Effect	-1,241.0	-32,507,513.3	-51,625,716.3	-54,972,613.2
Indirect Effect	-57.5	-2,189,553.0	-3,018,809.6	-4,818,937.8
Induced Effect	-191.3	-7,784,415.8	-14,204,494.7	-25,665,700.7
Total Effect	-1,489.8	-42,481,482.1	-68,849,020.6	-85,457,251.7

As shown in table 1 above, using Scenario 1, it was estimated through IMPLAN that loss to South Carolina's economy was $85,457,251.70. In this scenario it can be determined that the multiplier for the peach industry in South Carolina is about 1.55.

Table 2: Impact Summary from Scenario 2

ImpactType	Employment	LaborIncome	TotalValueAdded	Output
Direct Effect	-1,343.2	-35,184,739.5	-55,877,463.1	-59,500,000.9
Indirect Effect	-62.2	-2,369,878.3	-3,267,430.2	-5,215,811.7
Induced Effect	-207.1	-8,425,518.0	-15,374,336.4	-27,779,454.7
Total Effect	-1,612.5	-45,980,135.8	-74,519,229.7	-92,495,267.3

Table 2 shows that using scenario 2, it is estimated that the loss to the South Carolina economy from the freeze was $92,495,267.30. The multiplier in this scenario is also estimated as 1.55.

In both scenarios it was found that indirect effects were highest in Support Activities for Agriculture, Retail, Truck Transportation, Warehouse and Storage, Fertilizer Manufacturing, and Pesticides for Agriculture. Inputs such as fertilizer and pesticides would have been forgone due to peach farmers not having the normal production of peaches. Also, retail, transportation, and warehousing would have been industries that received peaches in a normal year after harvest.

Conclusion and Further Research

This paper attempts to estimate the total economic loss to the state of South Carolina due a freeze that destroyed much of the state's peach crop. Using two scenarios, an IMPLAN model suggests that the state lost anywhere from $85,457,251.70 to $92,495,267.30 because of the freeze. Also, the peach industry is predicted to have lost $54,972,612.36 to $59,500,000. These predictions are based on data obtained from the USDA NASS and peach farmers around the state. Additional information, such as 2017 crop reports from the USDA, that will become

available in the future will be helpful in determining the economic impact to SC. In addition, research can be done finding the loss to not only farm sales, but losses to the packing and processing part of the peach industry.

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