

## **Economic Impact of the Sugarcane Aphid on Lower Rio Grande Valley Sorghum Production**

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Sorghum is a multibillion-dollar crop with over 7 million acres planted each year in the U.S. (USDA-NASS, 2015). Texas is the second largest producer of grain sorghum in the country. In 2015, about 2.7 million acres were planted in the state with an estimated economic value of \$742.7 million (USDA-NASS, 2015; Salinas and Robinson, 2015). However, the sorghum industry is threatened by a new invasive pest, the sugarcane aphid (SCA), capable of causing substantial damage to crop production (Villanueva et al., 2014; Knutson et al., 2015). In fact, due to its rapid population growth, great dispersion capacity, and reduced availability of effective insecticides the SCA has become the most important pest in sorghum since its detection in 2013.

Infestations of seedling grain sorghum can kill young plants and later infestations can prevent the formation of grain. While feeding on sorghum the aphid leaves behind waste also known as honeydew, which has been known to cause multiple problems for growers. The honeydew produced not only can clog a combine harvester due to its stickiness, but it also can cause growers yield to be significantly reduced. The honeydew left behind also support the growth of fungus which can inhibit plant growth (Villanueva et al., 2014).

Despite the importance of sorghum production to both national and state economies, very little work has been done to assess the economic impact caused by the SCA infestation. The main objective of this study was to estimate the economic impact of the SCA at both the farm and industry levels. Specifically, we focused on assessing the economic impact associated to the SCA outbreak in the Lower Rio Grande Valley (LRGV), Texas. Given its geographical location just north of the Mexico-U.S. border, the LRGV is a key region to timely understand and identify the economic impact of new invasive pests. In 2015, about 310,000 acres of sorghum were planted in the region with an estimated economic value of 92.3 million (USDA-NASS, 2015; Salinas and

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Robinson, 2015). This study also estimates the monetary value of the control efforts aimed to mitigate the burden caused by this new invasive pest.

## **Research Methodology**

In order to get the best representation on sorghum production in the LRGV we surveyed 41 growers altogether in Starr, Willacy, Cameron, and Hidalgo counties by telephone. Participants were randomly selected from a list of growers who signed up to receive the Pest Cast Newsletter that is distributed every week to alert local growers of new pest developments during the growing season. Farmers were asked a series of questions first for the year 2014 and then for their 2015 crop. The questionnaire gathers detailed information about yearly crop yields, crop acreage, insecticide application decisions, and management and production practices. As a result of this survey we were able to obtain data for a sum of 46,578 acres in 2014 and 49,761 acres in 2015.

Collected data were used to estimate the reduction in growers' profit associated to the SCA infestation, as well as the monetary value of the prevented loss attributed to control efforts. A functional form for the sorghum growers' profit was defined and estimated for each farmer based on reported yields and farming management practices. The SCA outbreak affects farmers' profit by increasing the production cost due to additional insecticide application expenses and by reducing the revenues due to lower yields. On the other hand, protected profit is equal to the monetary value of the prevented yield loss minus the additional pesticide application expenses caused by the SCA infestation. Farm level economic loss estimates were then used to calculate the total economic impacts of the SCA in the LRGV's sorghum industry.

## **Results and Discussion**

Estimation results suggest that on average the SCA caused a loss of \$61.88/acre between 2014 and 2015 (Table 1). The major share of the loss was due to the decrease in yields, which reduced revenues by \$52.14/acre. The total cost to control the aphids was estimated at \$15.54/acre, including insecticide, surfactant and application costs. The SCA also caused a reduction on the variable harvesting cost of \$5.80/acre. In terms of annual losses, it was estimated that the SCA reduced profit by \$68.96/acre in 2014 and by \$55.25/acre in 2015. The main difference between years is due to the fact that a lower infestation rate was observed in 2015, which resulted in less applications to control the SCA.

Table 1. Sugarcane aphid estimated and prevented economic impacts.

	2014	2015	Average
<b>Economic Loss (\$/acre)</b>			
Revenue Loss	51.76	52.50	52.14
Additional Insecticide Application Cost	22.57	8.96	15.54
<i>Insecticide</i>	9.33	3.83	6.49
<i>Surfactant</i>	3.33	0.96	2.11
<i>Application</i>	9.92	4.16	6.95
Reduced Variable Harvesting Cost	5.37	6.21	5.80
Total Profit Loss	68.96	55.25	61.88
Total Profit Loss for LRGV	21,874,897	17,127,788	19,528,590
<b>Prevented Economic Loss (\$/acre)</b>			
Revenue Saving	115.12	28.92	70.60
Additional Insecticide Application Cost	22.57	8.96	15.54
Increased Variable Harvesting Cost	11.94	3.42	7.54
Total Profit Saving	80.61	16.54	47.52
Total Profit Saving for LRGV	25,568,578	5,128,646	15,465,933

Note: Each value represents the estimated mean over sprayed and non-sprayed fields.

At the industry level, results indicate that the SCA outbreak caused a total economic loss to farmers in the LRGV of about \$21.87 million and \$17.13 million in 2014 and 2015, respectively. Therefore, since its appearance in 2013 the overall reduction in profits due to the SCA infestation in the LRGV is estimated at \$39.00 million.

In terms of prevented profit losses, control efforts aimed to mitigate the negative effects of the pest contributed significantly to reduce the economic impact caused by the SCA infestation. Particularly, empirical results suggest that for every dollar expended controlling the SCA, farmers were able to protect \$4.53. Results also indicate that the profit loss was reduced in \$80.61/acre and \$16.54/acre in 2014 and 2015, respectively. Overall, LRGV's sorghum producers were able to protect \$25.57 million in 2014 and \$5.13 million in 2015.

## Ongoing and Future Work

Direct effects of the SCA outbreak on the sorghum industry alone fail to capture the full economic impact of losses. Particularly, local industries, institution and private households are indirectly affected by the reduction in sorghum growers' profits caused by the SCA. In the next phase of the project, sorghum industry losses will be used to assess the overall economic impact of the SCA outbreak in the LRGV economy in terms of output, value-added, labor income and employment effects. Also, the economic impact study conducted at the LRGV will be replicated statewide.

## References

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