Crop Choice, Non-Target Pest Levels, Yield Loss and Their Effect on Insecticide Use in South Dakota

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Introduction

The rapid adoption of genetically modified (GM) crops in South Dakota, prompted us to examine changes in pest management practices over time. GM adoption has been linked to decreased need for pesticides (Catangui 2005, Vialon 2006). Surprisingly, as Figure 1 indicates, South Dakota has experienced an increase in the proportion of acres treated with insecticide over the past two decades leading to an investigation of why this has occurred. Figure 2 is an extension of this information, showing the location of the outliers visible in Figure 1. The outliers represent counties that are experiencing unusually high percentages of their acres treated with insecticide. These counties tend to be clustered, especially in 2007 and 2013. Interestingly, counties with widespread insecticide use remain in the south-east portion of the state. Our outlier, Shannon county in 2007, represents a county that still very few acres planted with corn. Easiest achieving high proportion of planted acre treated with insecticide.

Due to data limitations the answers to many of our questions could not be addressed directly. There is limited information about GM adoption and pest management in South Dakota so the following research uses the proportion of different crops planted as a way to identify general trends in insecticide use.

Objectives

1) Investigate the main causes of the increase in acres treated with insecticide.
2) Establish whether there is a link between the type of crop planted and acres treated with insecticide.
3) Determine whether there is a relationship between yield loss and acres treated with insecticide.

Results

The following display highlights some unexpected results from the regression analysis. Initially the model included yield and yield loss variables, but because of lack of significance the variables were dropped. This will be an avenue for future research.

Overall, the regression results indicate that the type of crop matters when looking at acres treated with insecticide. Corn and hay were positive and significant, meaning the larger the proportion of those crop planted within a county the larger the proportion of acres treated with insecticide. The soybean variable was negative, but when the aphid is considered there may be a positive affect on acres treated when soybeans and aphids are both present in a county. There is a statistical difference between 2005 and 2007. Because of this, a second regression was completed that included interaction terms.

Conclusions

Because of data limitations the full extent of the relationship between the type of crop planted and its impact on insecticide use is not fully known. The results of this analysis lend themselves to a series of stylized facts, which taken together tell the story of insecticide use in South Dakota.

The number of acres treated with corn has increased

Several factors have contributed to the increase in acres of corn planted in South Dakota. Over time, the development of corn varieties that were better suited to South Dakota’s shorter growing season led to a gradual increase in corn production. This, though, was compounded by the ethanol boom, which might account for much of the increase in corn production shown in 2002 and 2007.

The number of acres planted with soybeans has decreased in 2007

By 2007 this number was down to all soybean-producing counties in South Dakota (Catangui). This combined with a high demand for corn may have contributed to the decrease in soybean acres planted in 2007.

Acknowledgments

Funding for this project was provided by the South Dakota Corn Utilization Council.