COSTS OF HORN FLY CONTROL FOR COW-CALF PRODUCERS IN TENNESSEE AND TEXAS

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INTRODUCTION

Horn flies (*Haematobia irritans (L.)*) are a common livestock pest. They feed 20-40 times per day, resulting in blood loss, pathogen introduction, production inefficiencies, and hide damage, which could reduce profitability in livestock production. Horn fly management strategies can reduce the severity of these problems. Several studies have found greater weight gains in cattle with fewer flies compared with cattle with heavy infestations. Kunz et al. (1991) estimated the monetary damages of horn flies to the United States (US) livestock industry to be $876 million, which is $1.75 billion in 2021 dollars.

Since horn flies can cause monetary losses, it is important to evaluate the economic impact of using different control methods in cattle production. One measurable aspect is how much producers spend managing horn flies, which may include chemical delivery methods (e.g. ear tags, pour-ons, sprays, feedthroughs) and non-chemical methods (e.g., walk through traps, BT technology, and pasture management). We surveyed Tennessee and Texas cow-calf producers regarding their horn fly management costs and approaches and estimated the factors influencing their horn fly management costs. This information is important because horn fly management costs are likely to differ based on location, demographics, perceptions, and traditional practices. Additionally, producers and researchers may be interested in the factors affecting producer decision making and horn fly management expenditures.

SURVEY

Survey Design

To determine cow-calf producers' management practices of horn flies, we emailed a Qualtrics survey to Tennessee cattle producers participating in the Tennessee Agriculture Enhancement Program and members of the Texas and Southwestern Cattle Raisers Association (TSCRA) in 2017. These producers were surveyed because we had access to email addresses of producers from these groups. Response rates to the survey were 11 percent for Tennessee producers (464 responded out of 4,028 who were emailed) and 8 percent for the TSCRA producers (317 responded of the 3,882 who were emailed). Producers were asked to estimate their total spending in 2016 for horn fly management, control and treatment, including labor. Cattle producer demographics, farm characteristics, and methods used to manage horn flies within their cattle herds were also collected.

RESULTS

Producer Demographics

Table 1 contains the variables analyzed and their description while Table 2 presents the average responses for Tennessee and Texas cow-calf producers. Of the producers who responded to the survey, 246 Tennessee producers and 121 Texas producers answered all the questions used in analysis of this paper. The average Tennessee respondent was 57 years old, reported total household income of $50,000 to $99,000 per year, was male (92 percent), and earned a college degree or higher (59 percent).

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They had an average farm size (Total Acres) of 330 acres and 112 head of primarily Angus cattle (88 percent). On average Tennessee producers spent $9.50 per head for horn fly management. Producers indicated fly problems typically occurred in summer months.

Table 1. Names and definitions of dependent and independent variables

Variable	Description
Dependent Variable	
HF Treatment Cost/Head	Total horn fly management costs/head
Producer Demographics	
College	1 if college degree or higher
Age	Producer age
Income	Total household income[a]
Male	1 if producer is male
Farm Demographics	
Angus	1 if producer has Angus cattle
Tennessee	1 if producer was in Tennessee
Total Acres	Size of farm in acres
Herd Size	Total number of bulls, cows, and calves
Spring Calves	Percent of calves in spring calving season
Seasonality of Horn Flies	
Spring	1 if flies abundant in March, April, or May
Summer	1 if flies abundant in June, July, or August
Fall	1 if flies abundant in September, October, or November
Winter	1 if flies abundant in December, January, or February
Horn Fly Perceptions	
Horn Fly Intensity	Intensity of flies on backs of the animals[b]
Disease	Average severity within herd (pinkeye and mastitis)[c]
Horn Fly Problem	Number of flies before considered a problem[d]
Insecticide Effectiveness	Horn fly insecticides effectiveness today versus 5 years ago[e]
Financial Impact	Agreement that horn flies impose financial impact[f]
Consumer Concerns	Agreement consumer pesticides concern is considered when selecting horn fly management options[f]
Horn Fly Management Practices	
Use of Insecticides	1 if uses insecticides (e.g., pour-on)
Use of Ear Tag	1 if uses ear tags
Use of Feedthrough	1 if feeds insecticide to animal
Extension	1 if uses extension services for information
Popular Press Articles	1 if uses popular press articles for information
Information Treatment	1 if the Information Treatment was seen, 0 otherwise

[a] 1=less than $10,000 to 9=$500,000 or greater
[b] 1=no problem to 5=very intense problem
[c] 1=occurs infrequently or mildly to 3=occurs frequently or intensely
[d] 1=low intensity (75), 2=medium intensity (100-150), 3=high intensity (200-350)
[e] 1=much less to 7=much more
[f] 1=strongly disagree to 4=strongly agree
NA means not applicable. Hyp means hypothesized.

The average Texas respondent was 61 years old, reported household income of $100,000 to $149,000 per year, was male (85 percent), and earned a college degree or higher (69 percent). They had an average farm size of 2,625 acres and 206 head of primarily Angus cattle (60 percent). Texas producers spent $12.40 per head. Flies were reported active from spring through fall which may explain the increased costs for Texas.

Table 2. Dependent and independent variable descriptive statistics for Tennessee and Texas

Variable	Tennessee Average	Texas Average
Dependent Variable		
HF Treatment $Cost/Head	9.50	12.40
Producer Demographics		
College	0.59	0.69
Age	56.54	60.94
Income	4.82	5.8
Male	0.92	0.85
Farm Demographics		
Angus	0.88	0.6
Total Acres	329.59	2,625.20
Herd Size	111.76	205.55
Spring Calves	53.1	64.38
Seasonality of Horn Flies		
Spring	0.31	0.6
Summer	0.98	0.98
Fall	0.76	0.92
Winter	0	0.03
Horn Fly Perceptions		
Horn Fly Intensity	3.15	3.43
Disease	1.27	1.1
Horn Fly Problem	1.84	2.01
Insecticide Effectiveness	4.03	4.29
Financial Impact	3.24	3.29
Consumer Concerns	2.92	2.74
Horn Fly Management Practices		
Use of Insecticides	0.9	0.9
Use of Ear Tag	0.59	0.34
Use of Feedthrough	0.55	0.55
Extension	0.74	0.65
Popular Press Articles	0.54	0.71
Information Treatment	0.48	0.53

Notes: n = 246 for Tennessee and n = 121 for Texas.

Economic Factors and Management

Two percent of Tennessee producers and seven percent of Texas producers spent more than $40 per head, while 91 percent of Tennessee producers and 85 percent of Texas producers spent less than $15 per head to manage flies (Figure 1).

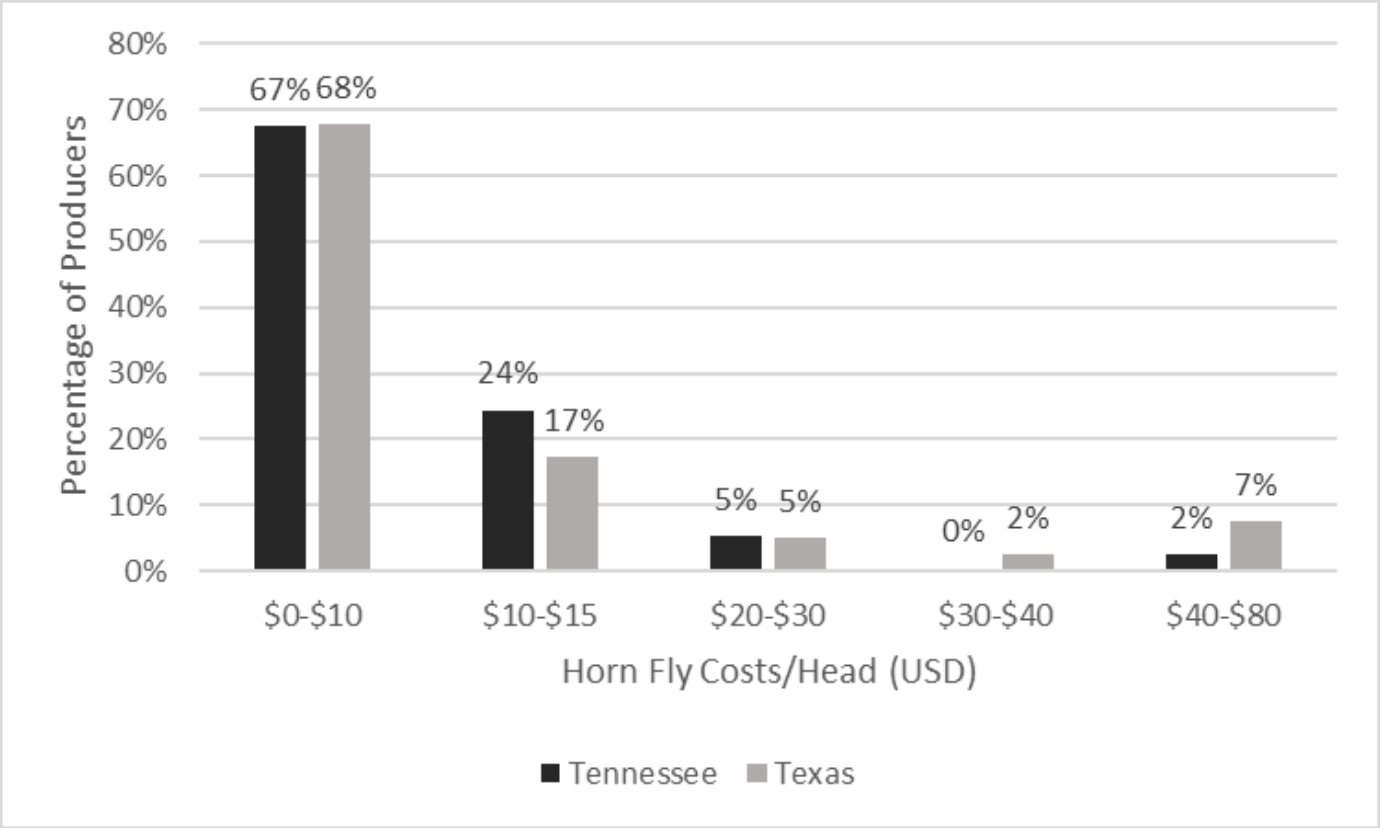

Figure 1. *Percent of Producers with Stated Horn Fly Costs per Head within each Range (USD).*

Notes: Stated horn fly costs were obtained with the following question, "Please estimate your total spending in 2016 for all horn fly management, control, and treatment of your entire herd. (Please include labor costs in your estimate)." Number of observations=367

Producers with a college degree or higher had 23 percent lower horn fly management costs per head than producers without a college degree (Table 3). As income level increased, horn fly management costs per head were 7 percent higher. Producers with Angus cattle spent 28 percent less per head than other producers. A ten head increase in herd size reduced horn fly management costs by 1 percent. A one unit increase in the intensity at which producers consider horn flies to be a problem resulted in a 15 percent decrease in horn fly management costs per head. Horn fly management costs were 24 percent higher for producers using ear tags while those using a feedthrough insecticide had 32 percent higher horn fly management costs compared to those not using the fly management method (Table 3). This increase in costs for these products is consistent with documented average costs of $2.19/head for ear tags and $8.46/head for feedthrough (Benavidez, 2020). Tennessee producers reported lower levels of fly

Table 3. Results of Ordinary Least Squares Regression of Horn Fly Treatment Cost/Head

Variable	Coefficient
Producer Demographics	
College	-0.231**
Age	-0.001
Income	0.067**
Male	-0.218

Notes: *P < 0.1, **P < 0.05, ***P < 0.01. OLS is ordinary least squares. Number of observations=367.

Table 3. Results of Ordinary Least Squares Regression of Horn Fly Treatment Cost/Head (Continued)

Variable	Coefficient
Farm Demographics	
Angus	-0.278**
Tennessee	-0.009
Total Acres	0
Herd Size	-0.001***
Spring Calves	-0.001
Seasonality of Horn Flies	
Spring	0.128
Summer	0.026
Fall	0.183
Horn Fly Perceptions	
Horn Fly Intensity	0.086
Disease	0.106
Horn Fly Problem	-0.147**
Insecticide Effectiveness	0.028
Financial Impact	0.102
Consumer Concerns	0.028
Horn Fly Management Practices	
Use of Insecticides	0.009
Use of Ear Tag	0.237***
Use of Feedthrough	0.324***
Extension	-0.074
Popular Press Articles	-0.077
Information Treatment	-0.042
Constant	1.368**

Notes: *P < 0.1, **P < 0.05, ***P < 0.01. OLS is ordinary least squares. Number of observations=367.

abundance in spring and fall compared to Texas producers, but the abundance of flies in the summer was similar for both states (Figure 2). Figure 3 details survey respondents' methods to prevent and treat cattle for horn flies. Nearly 90 percent of respondents use insecticides to prevent and/or treat horn fly issues. Alternatively, fewer than 8 percent of respondents utilize beneficial insects and manure composting to combat horn fly infestations. Similarly, less than 20 percent of producers use a mechanical control method, such as walk through traps, to reduce horn fly pressure.

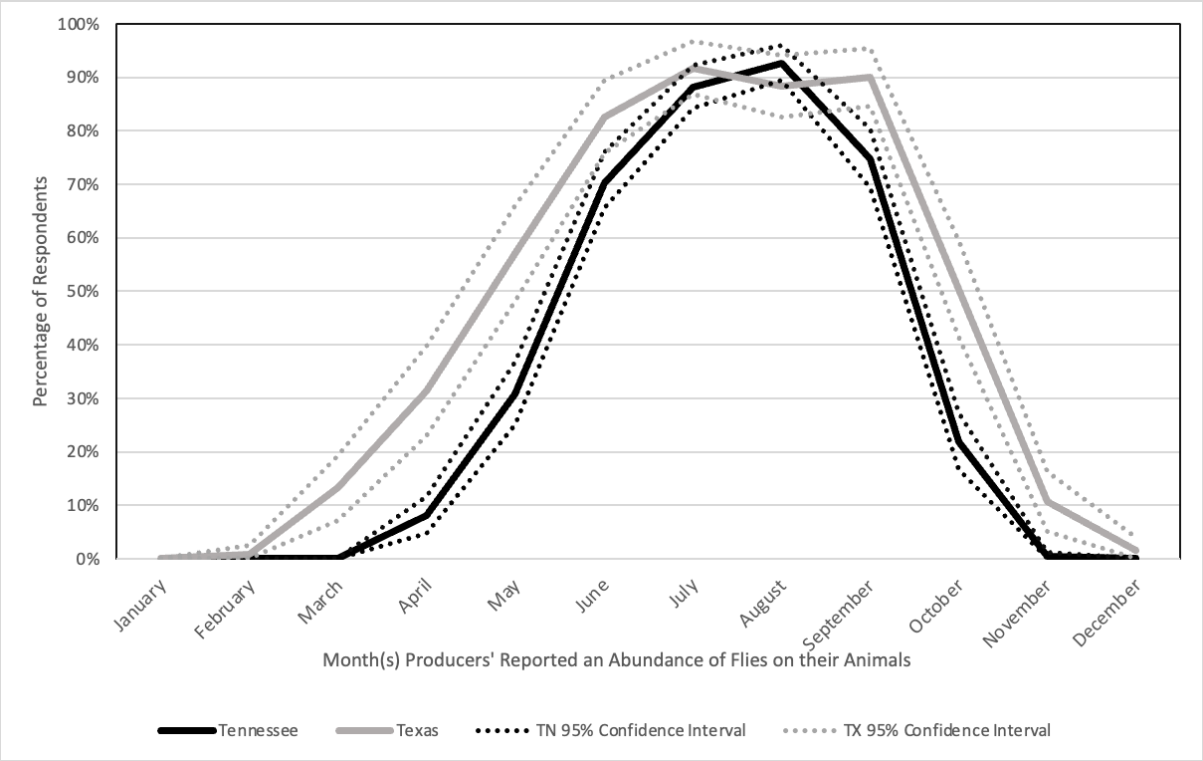

Figure 2. *Percentage of Tennessee and Texas Respondents Selecting Certain Months as having an Abundance of Flies on their Animals and the Associated 95% Confidence Intervals of Estimates.*

Notes: he exact question producers were asked to obtain this information was, "In what months are flies most abundant on your animals? (check all that apply)." Number of observations=367.

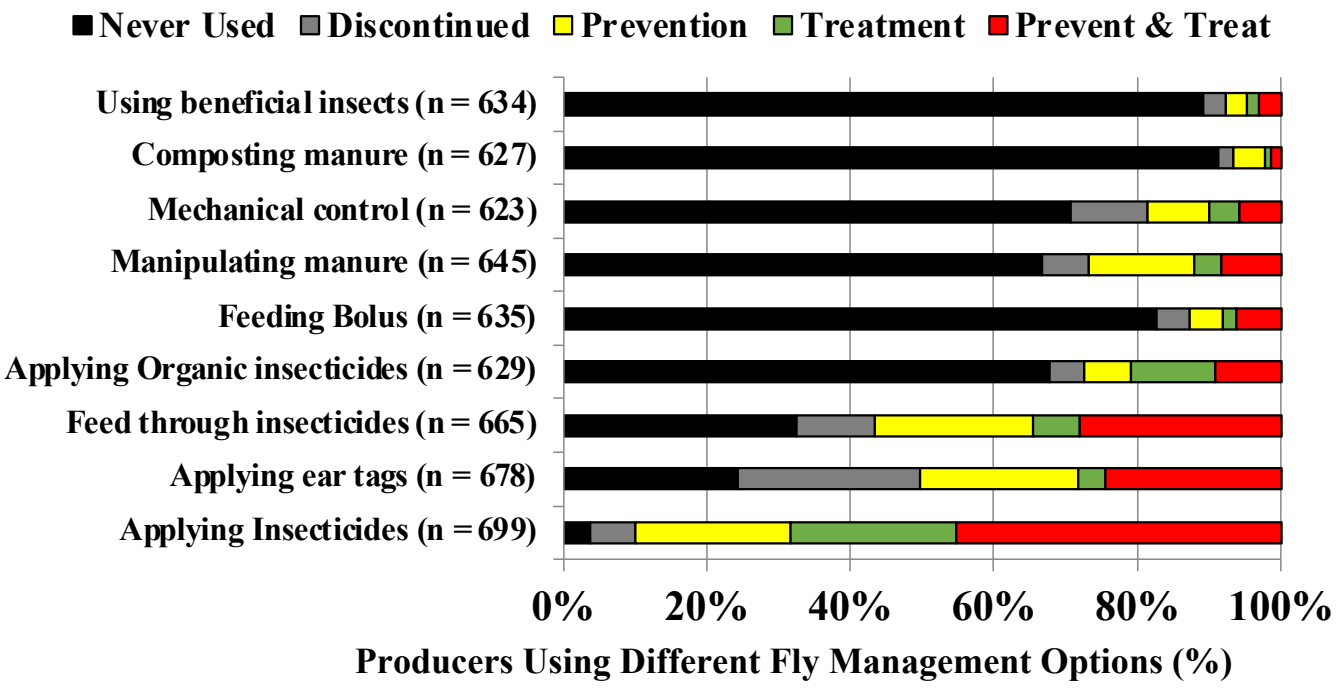

Figure 3. *Percentage of Tennessee and Texas Respondents Use of Methods to Prevent and/or Treat for horn flies.*

Notes: TThe exact question producers were asked to obtain this information was, "What methods do you use to manage horn fly populations and predation on your cattle herds? Please indicate your usage of each method." While only 367 producers answered all questions used in the regression analysis in Table 3, over 600 producers answered the questions in Figure 3.

Respondents also were asked about the effectiveness of insecticides on horn flies compared to five years ago. One-third of respondents state insecticides are less effective on horn flies than five years ago while 30 percent of respondents think they are just as effective today (Figure 4). Alternatively, 37 percent of respondents believe insecticides are more effective today than five years ago.

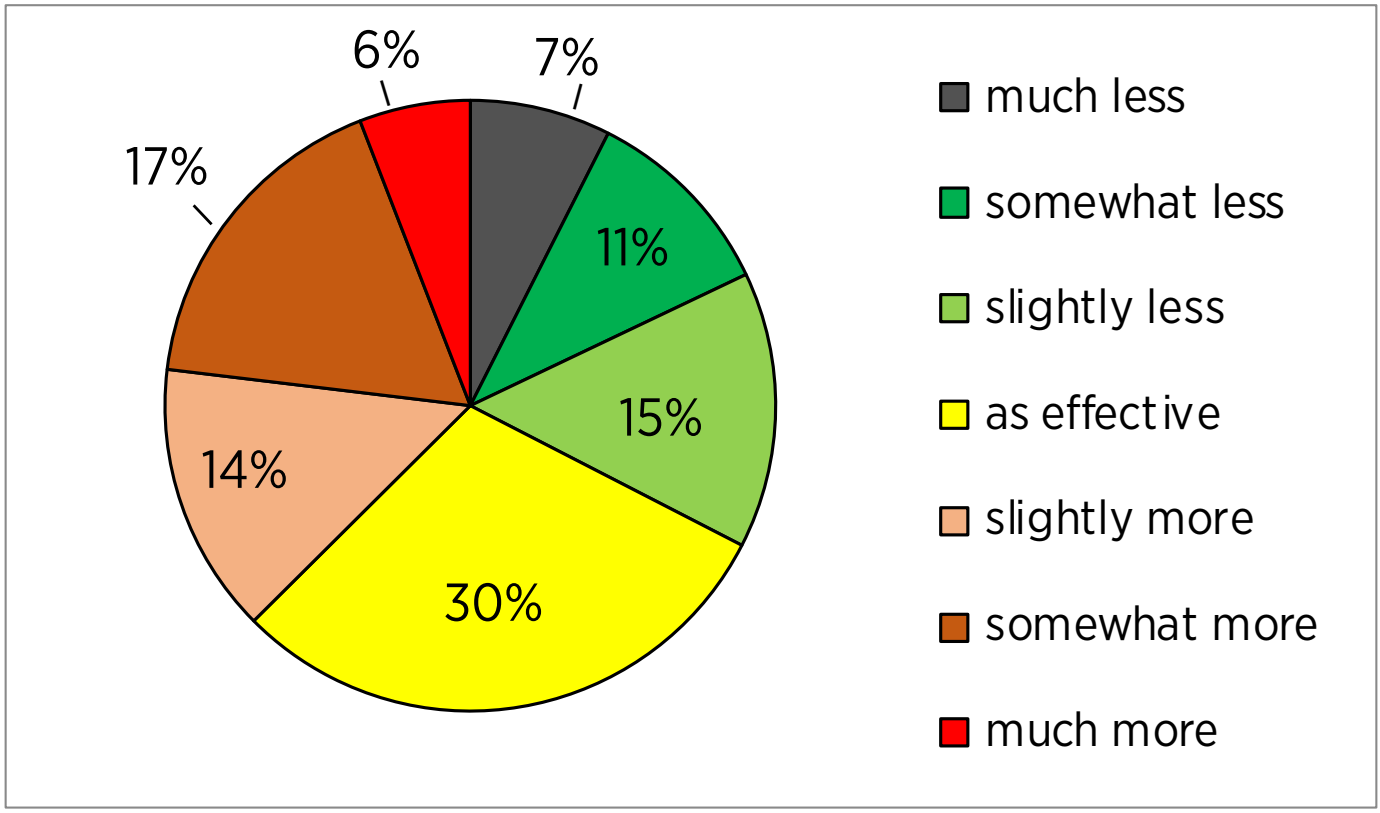

Figure 4.*Producer perceived effectiveness of horn fly insecticides.*

Notes: The exact question producers were asked to obtain this information was, "How would you assess the effectiveness of horn fly insecticides today compared to five years ago?" All survey respondents were asked this question and 692 responded.

DISCUSSION

We surveyed Tennessee and Texas cow-calf producers to determine how much they spend on horn fly management ($9.50 per head and $12.40 per head, respectively) and what factors influence horn fly expenditures. Nearly 90 percent of producers use an insecticide (e.g., ear tag, feed through, bolus, organic insecticide) for horn fly management, which can be expensive and is a limited control option that can lead to insecticide resistance. Several producer and farm demographics were found to influence horn fly management costs. Total household income was associated with increased horn fly management costs. This could be due to producers with higher income levels having more disposable income to spend on horn fly control methods, or producers who spend more on horn fly management produce more profitable cattle which adds to their income.

Having Angus cattle was associated with lower horn fly management costs, which is unexpected given research showing horn flies prefer to feed on cattle with dark hair (Oliveira et al. 2013). One explanation for this finding could be that horn flies on dark haired animals may be difficult to see from a distance and producers may be unaware of flies on their animals unless working with them daily. Additionally, larger herd sizes were associated with lower horn fly management costs on a per head basis.

Producers who did not acknowledge the presence of horn flies until a large quantity of flies were present had lower horn fly management costs per head, which probably means they did not as readily implement horn fly control measures. In essence, if producers did not consider horn flies to be a problem until there were 200-350 flies on an animal, compared to only 75 flies, then they spent less on horn fly control. This type of behavior not only reduces horn fly control costs, but it also helps prevent insecticide resistance. The horn fly management practices of ear tags and feedthroughs increased costs 24 percent and 32 percent, respectively, which was expected given their popularity.

This study lays the foundation of how producer spending on horn fly management contributes to the success of horn fly management strategies. Knowing producer expenditures to prevent and manage horn flies can assist in developing economic thresholds

and injury levels that can promote producer profitability. Thus, horn fly management approaches could potentially save a producer from losses associated with unrealized gains due to reduced feed efficiency and unplanned expenditures (e.g., medical treatments associated with disease occurrence).

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