ANALYSIS OF FACTORS INFLUENCING FARMERS' WILLINGNESS TO PARTICIPATE IN THE TENNESSEE BOLL WEEVIL ERADICATION PROGRAM

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Introduction

Because the boll weevil (*Anthonomus grandis* Boheman) is important in cotton (*Gossypium hirsutum* L.) production, Tennessee farmers are being asked to consider the boll weevil eradication program (BWEP) as a way to control this pest. The eradication program is a cooperative-government-and-grower-sponsored area-wide cotton insect management program designed to eliminate the boll weevil. Several studies have evaluated the costs and benefits of the program (Carlson,et al., 1989; Ahouissoussi et al., 1993; Duffy et al., 1994). However, less research has been done to determine the factors that influence farmers' decisions on participating in the program (Kazmierczak, 1996).

The objective of this study was to identify and evaluate the important socioeconomic, demographic, and source-of-information factors that influence West Tennessee farmers' willingness to participate in a boll weevil eradication program.

Data and Methods

Data for this analysis were from a mail survey of Tennessee cotton producers administered in February and March of 1997. The survey was conducted to provide information for an economic study of the eradication program. In February 1997, a producer referendum was held for the eradication program in several southwestern Tennessee counties bordering Mississippi. Because the survey was administered immediately after the February 1997 eradication program referendum, producers were asked how they voted. A total of 35 out of 44 southwest Tennessee cotton growers who provided information in the survey indicated their yes-no votes in referendum. Of the 35 usable observations, 23 individuals reported that they voted yes and 12 reported that they voted no in the referendum. The 66 percent yes votes in the sample closely paralleled the 68 percent yes votes in the Region I referendum (Robinson, 1997). These producers were also asked to rate the importance of information they may have used to determine their willingness to participate in the eradication program. Other demographic and socioeconomic information was also collected from respondents.

Producers' yes-no decisions in the February 1997 referendum obtained from the survey and a logit procedure were used to fit the following model:

$$\log (P_i / (1-P_i)) = \beta_0 + \beta_1 AGE + \beta_2 BW94 + \beta_3 BW95 + \beta_4 BW96 + \beta_5 PROG + \beta_6 MEDIA + \varepsilon,$$

where P_i is the probability that a farmer will participate in a boll weevil eradication program; β_i are estimated parameters; *AGE* represents the age of the principal operator; *BW94*, *BW95*, and *BW96* are spring-time boll weevil pheremone trap counts for 1994, 1995, and 1996, respectively; *PROG* represents an ordered scale (1=not important to 5=very important) of the importance of boll weevil eradication education presentations; *MEDIA* represents an ordered scale (1 to 5) of the importance of newspaper and magazine articles; and ε is the random error term. The pheremone trap count data for each county of the referendum area were used as a proxy for boll weevil yield damage and control costs experienced by farmers. The number of boll weevils caught in each trap indicates population moving into fields of cotton and causing damage.

The estimated model was used to analyze the probability of producers voting positively for the BWEP. Logistic model parameter estimates cannot be directly used to determine change in probability from a 1 unit change in an independent variable. To calculate changes in probability, each parameter estimate was multiplied by its mean for the corresponding independent variable. Next, a density function was calculated. The change in probability for each independent variable was found by multiplying the density function by the parameter estimate. The change in probability is a function of the probability itself and when multiplied by 100 is the percentage change in the probability of the event occurring given a one unit change in the variable.

Results and Discussion

Due to missing values for one or more of the independent variables, 9 observations were deleted from the model estimated using the PROC LOGISTIC procedure in the SAS computer program (SAS Institute, 1997). Of the 26 observations used, 19 reported they voted yes and 7 voted no in the referendum. The percentage of yes votes for the 26 observations used in the model was 73 percent which is greater than the 66 percent yes votes with all 35 observations.

The estimated logit model coefficients are presented in table 1. The expected sign on *AGE* was uncertain because of its positive correlation with farmer experience growing cotton. The estimated relationship between AGE and willingness to

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participate is positive in the logit model. Farmers with more experience may see the benefit of the program based on their history with boll weevils. *BW94* and *BW95* had the expected positive signs indicating that higher boll weevil populations increased producer willingness to vote for the eradication program. However, *BW96* had a negative sign rather than the hypothesized positive sign and lowered producer willingness to vote for the eradication program. The likely reasons for the population influence in the model were heavy infestations of boll weevils in 1995 compared with 1996. Farmers likely had much smaller yield losses and control costs in 1996 relative to 1994 and 1995. Producers focused on problems in 1995 to make their voting decision which would make the negative sign on *BW96* somewhat spurious. Using the change in probability for *BW95*, a farmer who experienced the maximum boll weevil population was 27 percent more likely to vote yes for the program than a farmer who experienced the minimum population.

The expected positive sign on the coefficient of the *PROG* variable indicates the importance of the BWEP education presentations in influencing producers' support for the program. Change in probability indicates a producer who rated the information with a 5 versus another farmer who rated it with a 4 would be 11 percent more likely to vote for the BWEP. Given the change in probability for *PROG*, a producer who stated that the education presentation information was very important was 45 percent more likely to vote for the BWEP than a farmer who rated the education information as not important.

The sign on the *MEDIA* variable was negative indicating that newspaper and magazine article information about the BWEP tended to reduce producer willingness to vote for the program. A one unit increase in the importance of *MEDIA* reduced the probability of voting yes in the referendum by 9 percent. Producers in the sample who rated the information as very important were 36 percent less likely to vote in favor of the BWEP than individuals who rated the information as not important.

Summary

Data reported by farmers in a 1997 mail survey were used to evaluate farmers' willingness to participate in a boll weevil eradication program. A logit model was used to determine the factors that influence farmers' willingness to participate. Producer age, high boll weevil populations in 1995, and eradication program education meetings were significant and positive in determining participation. The importance of information from newspaper/magazine media had a significant, negative influence on willingness to participate. Boll weevil eradication education presentations had the most significant influence on a farmer's willingness to participate in the program.

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Table 1. Logit model used to evaluate the yes-no vote from the 1997 boll weevil eradication referendum in southwest Tennessee.

Variable name	Coefficient
Decision maker age (AGE)	0.3011*
1994 boll weevil population (BW94)	0.00170
1995 boll weevil population (BW95)	0.00870**
1996 boll weevil population (BW96)	-0.0654*
Newspaper and magazine Information (MEDIA)	-3.9219*
Eradication education Program Information (PROG)	4.9818*
Constant	-44.4404*

*,** Significantly different at the 0.05 or 0.10 probability levels, respectively.