

# Influence of Socio-Economic Conditions of Farmers on the Control of Insect Pests of Citrus in Benue State, Nigeria

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## Abstract

Despite the significant losses of citrus fruits due to insect pests damage, not all farmers control the menace of these pests. Control of these pests is inevitable for high quality, sustained and increased production of the product and income for the farmers. It is, therefore, imperative in the study to empirically establish the socio-economic variables of citrus farmers influencing the control of citrus insect pests. To achieve this, data collected from a random sample of 50 commercial citrus farmers from the major producing areas of Benue State in 2014, through the use of questionnaire, were analyzed by employing descriptive statistics and logistic regression model. With the exception of age with a coefficient of -.035, which influenced the control of insect pests negatively, the influence of other variables such as education (.362), experience (.159), gender (.992), income from citrus (.002) and income from other enterprises (.001) were positive, although only education and income earned from citrus were significant at 10% and 1% level of probability, respectively. Control of insect pests of citrus can be better achieved by potential and existing farmers if their education and earning from citrus production are continually and simultaneously increased.

**Keywords:** farmers, citrus, control, insect pests, logistic regression

## 1. Introduction

The common species of citrus produced worldwide include grape fruit (*Citrus paradisi*), sweet orange (*Citrus sinensis*), lemon (*Citrus lemon*), lime (*Citrus aurantifolia*), mandarin/tangelo (*Citrus reticulata*), pummelo/shaddock (*Citrus grandis*), sour or Seville orange (*Citrus aurantium*) and rough lemon (Cobley & Steele, 1976). Out of the estimated annual world citrus production of over 135 million metric tonnes, 3,800,000 metric tonnes are produced in Nigeria from an estimated land area of 795,000 hectares (FAOSTAT, 2013). Sweet orange is the most widely cultivated species in Nigeria (Umeh, 2008). Citrus is an industrial crop, an important source of food rich in vitamins and minerals, as well as a major source of income for producers. The potential for domestic and export markets of citrus is enormous.

The menace of insect pests and diseases are major threat to the realization of maximum yield of citrus fruits in Nigeria (Umeh, 2008). Of particular economic significance in Nigeria are fruit flies and fruit piercing moths. The females of fruit flies attack citrus by making oviposition holes in the skins of fruits in which they lay their eggs. The feeding of the larvae that emerge on the flesh of the fruits and possible exposure to attack by fungi and bacteria, lead to rotting around the holes and subsequent damage to and premature falling of fruits (Amatobi, 2007). Depending on the severity of damage, yield losses due to fruit flies alone are estimated at between 40% to 70% (Umeh, 2004; Amatobi, 2007).

For high yield and quality, competitive domestic and export markets, and consequently high income for farmers, control of insect pests is inevitable. There are already effective chemical, biological and environmentally safe control measures available from research efforts. The implication for control or otherwise of insect pests of citrus, which may have impact on the promotion and sustainability of production and consequently income of the farmers is being addressed in the study. The specific objectives are centred on the socio-economic variables influencing the control of insect pests of citrus.

## 2. Methods

The study area was Benue State. Benue State, which is the leading producer of citrus in Nigeria is located

between longitude 6°35'E and 10°E, and between latitudes 6°30'N and 8°10'N (U. M. Ater, P. I. Ater, & Shima, 2010). In all, 50 out of 115 commercial citrus farmers were randomly selected as respondents from Gboko and Aliade communities noted for producing citrus in large quantities after a reconnaissance survey. The 50 respondents were those with the required information elicited. The others without the necessary data were not used. A questionnaire administered on the respondents, by trained enumerators, was the instrument used for data collection on the socio-economic variables of the farmers, losses of fruits due to fruit pests and the production characteristics for 2014 cropping season in a duration of one month. The analytical tools used were descriptive statistics and logistic regression analysis. The formula used for the logistic regression model is given mathematically in its explicit form as:

$$Z = \ln \left( \frac{p}{1-p} \right) = \beta_0 + \beta_i X_i + e \quad (1)$$

Where,

$Z$  = Logit, 1 for control, 0 for no control of insect pests;

$p$  = the probability of occurrence, computed as  $\frac{\exp^{\beta_i}}{1 + \exp^{\beta_i}}$ ;

$\frac{p_i}{1-p}$  = log odds;

$\ln$  = natural logarithm;

$\beta_0$  = constant;

$\beta_i X_i$  = vector of variables such as age, education, experience, gender, income from citrus and income from other enterprises. Age, education, experience are expressed in years and income in naira;

$e$  = error term.

Statistical Package for social science (SPSS) was the software used for the analysis.

### 3. Results and Discussion

#### 3.1 Socio-Economic and Production Characteristics of the Farmers

The statistics of the socio-economic and production characteristics of citrus farmers are presented in Table 1. The mean values of age (46.74 years), literacy level (11.74 years) and experience (20.34 years) were indications that citrus farmers were relatively young, educated and experienced in citrus production. Age, education, and experience are the personal attributes of the respondents that could affect their responses to production and marketing dynamics. Negative contribution is often expected at very old age and low levels of literacy and experience, while positive contribution is expected at youthful age and high levels of literacy and experience (Olagunju, Adesiyan, & Ezekiel, 2007; Idiong, 2007). For a tree crop, it is apparent that those at the minimum age and experience groups might have inherited the citrus farms they operated.

Table 1. Statistics of socio-economic and production characteristics of citrus farmers

| Variable  | Statistics |         |          |         |                    |
|---|------------|---------|----------|---------|--------------------|
|   | Percent    | Minimum | Maximum  | Mean    | Standard deviation |
| Age (years)                                     |            | 26.00   | 67.00    | 46.74   | 9.70               |
| Education                                       |            | 6.00    | 18.00    | 11.74   | 3.00               |
| Experience (years)                              |            | 5.00    | 46.00    | 20.34   | 9.40               |
| Area of land cultivated (ha.)                   |            | 1.00    | 13.00    | 5.53    | 3.00               |
| Quantity of citrus fruits produced (tons.)      |            | 7.50    | 1531.26  | 108.73  | 7.14               |
| Quantity of citrus fruits lost to pests (tons.) |            | 0.06    | 15.00    | 1.61    | 3.37               |
| Quantity of citrus fruits sold (tons.)          |            | 7.35    | 1986.54  | 1175.4  | 91.89              |
| Value of citrus fruits sold (₦000)              |            | 735     | 144000   | 44410   | 1032.4             |
| Income from other enterprises (₦000)            |            | 17.00   | 76765.00 | 2330.88 | 1295.26            |
| Males   | 92         |         |          |         |                    |
| Females   | 8          |         |          |         |                    |
| Those who controlled insect pests               | 80         |         |          |         |                    |
| Those who did not control insect pests          | 20         |         |          |         |                    |

The production characteristics - area of land cultivated, quantities of citrus fruits produced, lost to pests, sold and their values - depicted the varying levels of the performance of the predominantly male (92%) and few female (8%) farmers in the area. The performance figures indicated that Benue State is one of the leading producers of citrus in Nigeria. For the farmers, income from citrus was comparatively higher than from their other enterprises put together. The mean proportion of about 1.61 metric tonnes lost to pests attack could be attributed to the 20% of them who did not control pests and those whose control was ineffective.

### 3.2 Influence of Socio-Economic Factors on Control of Insect Pests of Citrus

The analysis of the logistic regression of the variables that influenced the control of insect pests of citrus by farmers are presented in Table 2. Apart from age, which influenced the control of insect pests negatively, the influence of other variables such as education, experience, gender, income from citrus and income from other enterprises were positive, although only education and income earned from citrus were significant at 10% and 1% level of probability, respectively. Farmers who had one year increase in their level of education, others variables held constant, were 1.436 times likely to control insect pests of citrus than those who had not. Similarly, if other variables are held constant, farmers who had one naira increase in income realized from citrus were 1.002 times likely to control insect pests of citrus than those who had not. Thus, the probability of the odds in favour of those with one unit increase in education was estimated to be about 59%. Also, the probability of the odds in favour of those with one naira increase in income realized from citrus was estimated to be about 50%. It is clear from the foregoing that both income earned from citrus and level of education are good motivations for controlling insect pests by farmers. Cognizance should be given to these variables in all efforts geared towards improving the quality, output and earnings of citrus farmers in the area. Although the difference per unit for income realized from citrus was just small, this can be important for the sales of large amounts.

Table 2. Logistic regression analysis of variables influencing the control of insect pests of citrus

| Variable                                    | Coefficient ( $\beta$ ) | Wald Statistic | Exp ( $\beta$ ) |
|---|-------------------------|----------------|-----------------|
| Constant                                    | -4.345                  | 0.920          | 0.013           |
| Age ( $\beta_1$ )                           | -0.035                  | 0.166          | 0.966           |
| Education ( $\beta_2$ )                     | 0.362                   | 3.096          | 1.436**         |
| Experience ( $\beta_3$ )                    | 0.159                   | 1.260          | 1.172           |
| Gender ( $\beta_4$ )                        | 0.992                   | 0.440          | 2.695           |
| Income from citrus ( $\beta_5$ )            | 0.002                   | 5.529          | 1.002*          |
| Income from other enterprises ( $\beta_6$ ) | 0.001                   | 0.442          | 1.001           |
| Log likelihood - 7.9426                     |                         |                |                 |
| Nagelkerke $R^2 = 0.035$                    |                         |                |                 |

Note. \*Significant at 1% level of probability, \*\*significant at 10% level of probability.

#### 4. Conclusion

Control of insect pests of citrus is necessary for high quality and output of the product. Apart from cost of control, the socio-economic conditions of the farmers also played key roles on the decision of farmers to control insect pests or otherwise. The ultimate desire is for all citrus farmers in all producing states of Benue, Nasarawa, Kogi, Ogun, Oyo, Osun, Ebonyi, Kaduna, Taraba, Ekiti, Imo, Kwara, Edo and Delta to control insect pests for maximum economic benefits.

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