Investigating the factors that influenced the excess use of pesticides by the vegetable farmers in Badulla and Nuwara-Eliya districts

M. T. D. C. Perera and M. G. P. P. Mahindarathne
Faculty of Animal Science and Export Agriculture, Uva Wellassa University of Sri Lanka

Introduction

Pesticides are the results of modern technology and synthetic organic poisons used to exterminate specific organisms by inhibiting certain vital functions. They are applied predominately to kill or control weeds, insect pests and animals. Pesticides are widely used because of ease of application, high efficiency, temporary economic return and etc. (Nagenthirarajah and Thiruchelvam, 2008). When pesticides are help to farmers to get high production, massive usage of pesticides have been reported in many of commercial cultivations in whole around the world (Wilson and Tiddsell, 2001). Similar to many developing countries, pesticide related issues in Sri Lanka have become a major concern in the present day context. Majority of cases have been occurred due to the excessive usage of pesticides. Excess uses of pesticides have severe effects on environment and human health that may lead to an immediate and long term effects.

Therefore it is important to identify the factors effect on excess use of pesticides which can help to overcome the intensive use of pesticides over the years in vegetable cultivation. In this context, the objectives of the study were (i) To investigate the farmers' level of awareness in use of pesticides and (ii) To investigate the factors that cause to excess use of pesticides.

Methodology

The research was carried out in up country vegetable growing areas of Badulla and Nuwara Eliya district. Bandarawela, Welimada and Nuwara-Eliya Divisional Secretariat divisions were selected as the study area. Stratified random sampling technique was used to select 600 vegetable farmers from Nuwara-Eliya, Walimada and Bandarawela Divisional Secretariat divisions. Information were collected from farmers based on a semi structured pre-tested questionnaire. Both descriptive statistical method and binary logistic regression technique were used to analyze the data. Minitab 15 Statistical Software was used to get the output of binary logistic analysis. The variables defined for the empirical model are shown in Table 1.

Empirical model

$$Y = \beta_0 + \beta_1 LEX + \beta_2 CT + \beta_3 UHL + \beta_4 UFM + \beta_5 SE + \beta_6 THE + \beta_7 CP + \beta_8 AGE + \beta_9 EDUL + \beta_{10} EXP + \beta_{11} ND + \beta_{12} SP + \beta_{13} TF + \beta_{14} PLF + \beta_{15} MF + \beta_{16} FA + \varepsilon_i \quad \ldots\ldots\ldots\ldots (1)$$

Where, β_0 to β_{16} = coefficients; ε_i = error terms

Table 1: Description of variables in the empirical model

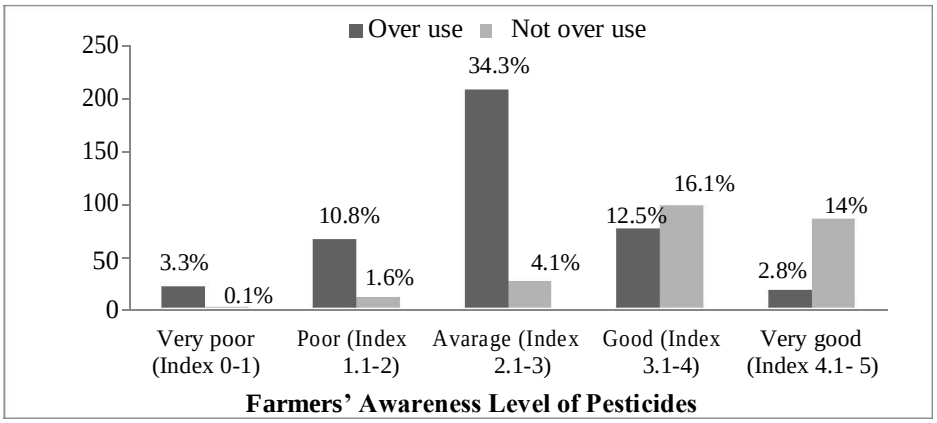
Notation	Variables	Remarks
Y	Farmers' probability of excess use of pesticides	If excess use = 1 Otherwise = 0
LEX	Cultivated land extent	Acre
CT	Cropping type	If mono cropping = 1 Otherwise = 0
UHL	Use of hired labour	If use hired labour =1Otherwise = 0
UFM	Use of farm machinery	If use machineries = 1Otherwise = 0
SI	Seasonal income	Rupees
THI	Total household income per season	Rupees
CP	Cost of pesticides	Rupees
AGE	Age of farmer	Years
EDUL	Farmers' education level	Years
EXP	Farmers' experience on vegetable cultivation	Years
ND	Number of dependents	Count
SF	Social factors	Five point likert scale
TF	Technical factors	Five point likert scale
PLF	Policy and legal factors	Five point likert scale
MF	Market factors	Five point likert scale
FA	Farmer awareness	Awareness scores

Eight awareness statements were used to calculate attitude index in the above regression model. They are scaled according to the five point likert scale form "strongly agree" (5) to "strongly disagree" (1). The Attitude Index for each factory was then calculated using following equation, where the value 40 in the numerator shows the maximum value can be obtained if the respondent strongly agrees with 05 statements (i.e. 5 × 5).

$$\text{Attitude Index} = \frac{\text{Total score}}{40} \times 100 \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Result and Discussion

According to the descriptive statistics, it can be said that nearly 64% farmers over use pesticides and almost all the farmers depended on chemical pesticides for the management of pest and diseases. When consider the farmers level of awareness in use of pesticides, if farmers have less than good awareness then most of farmers tend to overuse of pesticides more than recommended rates. Similarly, when the farmers have very good awareness then most of farmers do not tend to over use of pesticides. Result shows that most of (38.4%) farmers have average knowledge on use of pesticides and 63.7% farmers tend to excess use of pesticides. Figure 1 shows the farmers level of awareness with pesticide usage.



Usage Figure 1: Farmers level of awareness with pesticide usage.

The Binary Logistic Regression model was used to determine the extent to which the identified factors affect farmers' probability of pesticide over usage and also quantify the relationship between dependent variable and independent variable. Binary Logistic Regression Model is yielded the following results.

Table 2: Results of the Binary Logistic Regression Analysis

Variable	Coefficient	Standard Error Coefficient	Significant Value
Constant	1.11215	2.58080	0.047**
LEX	1.41592	0.507591	0.005***
CT	0.376077	0.364109	0.302
UHL	-0.326939	0.432318	0.450
UFM	-0.260718	0.710540	0.714
SI	-0.0000011	0.0000033	0.736
THI	0.0000063	0.0000030	0.034**
CP	0.0000069	0.0000135	0.612
AGE	0.0118588	0.0308302	0.700
EDUL	-0.827147	0.293911	0.005***
EXP	-0.0613994	0.0323089	0.057*
ND	-0.139205	0.127996	0.277
SF	-2.11027	0.366147	0.0000***
TF	2.76283	0.477987	0.0000***
PLF	-0.782096	0.181910	0.0000***
MF	1.22547	0.271988	0.0000***
FA	-0.427377	0.0841074	0.0000***

Y = 1.11215 + 1.41592 LEX** + 0.376077 CT – 0.326939 UHL – 0.260718 UFM –0.0000011 SI – 0.0000063 THI* + 0.0000069 CP + 0.0118588 AGE – 0.827147EDUL** – 0.0613994 EXP** – 0.139205 ND – 2.11027 SF* + 2.76283 TF* – 0.782096 PLF* + 1.22547 MF* – 0.427377 FA*

*** Denotes significant at 0.01 level **Denotes significant at 0.05 level *Denotes significant at 0.1 level

R-Sq = 81.2%, Probability> F = 0.000

The model can be used to explain 81.2% of the variation of factors. Therefore this model is suitable to investigating the factors that influenced the excess use of pesticides.

Conclusion

According to the study most of farmers have "average level" (awareness index= 2.1-3) of awareness in pesticide usage. As well results revealed that when the farmers' awareness was higher than "average level", there was less probability on excess use of pesticides and when farmers have "average level" or less than "average level" (awareness index < 3.1) awareness on pesticide usage, there was high probability on excess use of pesticides. Alsothe study indicate that Land extent, Total household income, Educational level, Farmers experience, Social factors, Technical factors, Policy and legal factors, market factors and farmers awareness are the factors which significantly affect to the excess use of pesticides.

References

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