# Chapter VI

# Comparison of Surveillance Method and Adoption of Surveillance Method

This chapter devoted details of surveillance method in rice crop, three types of farmers using in different way of surveillance, their system of practicing, farmers trend to monitoring, the trend of pest control by farmers, cost of production, and benefit earned by farmers. Secondly, results of the descriptive statistical analysis their trend of sustainability, comparison of three types of farmers using surveillance methods is presented. Finally another statistical analysis proved which factors are responsible for farmers adoption of surveillance.

For comparison of three different types of farmers with respect to surveillance and adoption of surveillance method we selected multiple regression model and multinomial logistic regression model. We had to consider different variables of farmers land size, farming practices, historical profile of farming practices, frequency of crop field visit by farmers, method of pest control by different farmers, etc. That's why we discussed those variables situation by individual tables of analysis first. Later on statistical analysis results would be discussed.



## 6.1 Types of Farmers and Sample Size

Results from the survey found that most of the farmers who were in the sample are smallholder. Smallholders are those farmers who are the owners of land size 0.2- 1.0 hectare. Maximum rice cultivable land for individual farmer of IPM and Non-IPM were 10,000 $m^2$ which was equivalent to 1 hectare (Table 6.1). But for contact farmers maximum land size was 30,000 $m^2$ which is equivalent to 3 hectares of land. Minimum land size for individual farmer in IPM and Non-IPM is 5,000 $m^2$, and for contact farmer 10,000 $m^2$. The irrigation systems for three types of farmers were from underground water. Farmers had been adopting surveillance method for long time of their own. The three types of monitoring system were significantly different from each other.

When consider surveillance method 50 farmers were in IPM practices, 50 farmers were in traditional practices, which we called Non-IPM and 25 farmers were in contact farmer's practices. In Figure 6.1 graph shows the number of farmer in X axis and land size in Y axis, where highest number of farmers that is 27 (21.6%) under 10,000 $m^2$ land size and lowest number of farmers that is 2 (1.6%) under 20,000 $m^2$ land size.

**Table 6.1 Rice cultivated land extent in the sample**

| Land Extent ($m^2$) | Number of IPM Farmers | Number of Non-IPM Farmers | Number of Contact Farmers | Total Farmers | Farmer Percentage (According total no. of farmers) |
|---|---|---|---|---|---|
| 5,000 | 9 | 14 | - | 23 | 18.4% |
| 7,000 | 5 | 10 | - | 15 | 12% |
| 7,500 | 7 | 14 | - | 21 | 16.8% |
| 9,000 | 11 | 4 | - | 15 | 12% |
| 10,000 | 18 | 8 | 1 | 27 | 21.6% |
| 13,000 | - | - | 6 | 6 | 4.8% |
| 15,000 | - | - | 5 | 5 | 4% |
| 17,000 | - | - | 4 | 4 | 3.2% |
| 20,000 | - | - | 2 | 2 | 1.6% |
| 25,000 | - | - | 4 | 4 | 3.2% |
| 30,000 | - | - | 3 | 3 | 2.4% |
| **Total** | **50** | **50** | **25** | **125** | **100.00** |

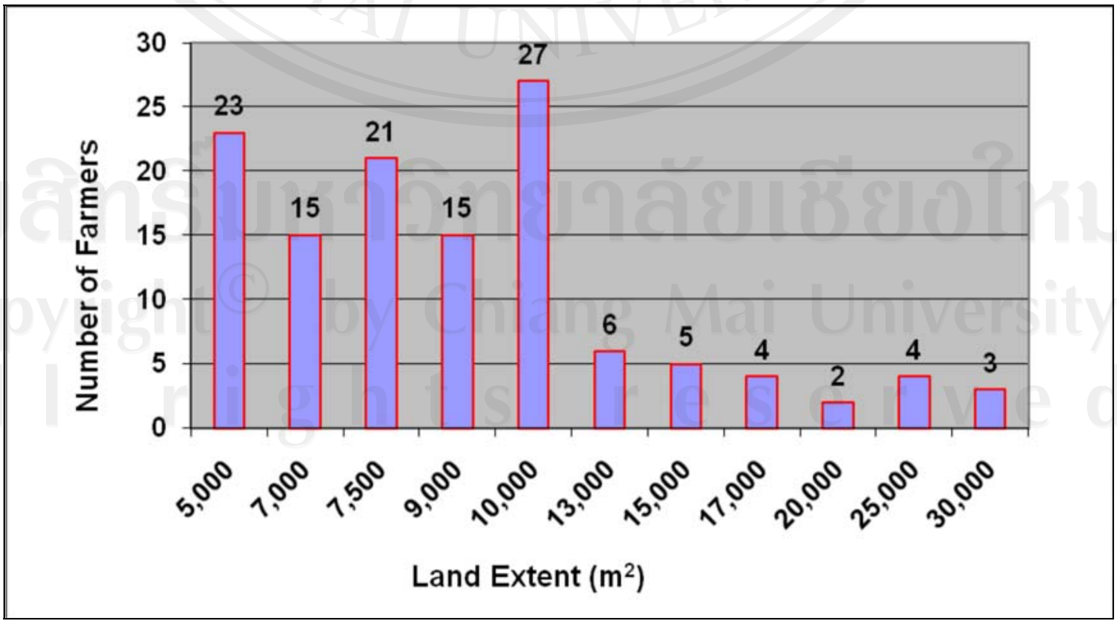


**Figure 6.1 Graph shows the land size frequency for different number of farmers**

### 6.1.1 Farming System Practices by Different Types of Farmers

From the survey we found that both IPM and contact farmers grow rice in line sowing (100%) while all of Non-IPM farmers use broadcasting method for their rice cultivation (100%) (Table 6.2). The contact farmers had been followed the line sowing method but they are different from IPM farmers. Regarding monitoring and surveillance contact farmers group did not follow the method which is suitable to line sowing. It is only because they were guided by their owner and some previous neighbouring practices. During statistical analysis we found this difference of monitoring system from that of IPM practice.

**Table 6.2 Farming system practices by different types of farmers**

| Current Farming Practices | IPM Farmers (n) | % | Non-IPM Farmers (n) | % | Contact Farmers (n) | % | P value |
|---|---|---|---|---|---|---|---|
| Line sowing | 50 | 100.0 | 0 | 0.0 | 25 | 100.0 | 0.001 |
| Broadcasting | 0 | 0.0 | 50 | 100.0 | 0.0 | 0.0 | 0.001 |
| Total | 50 | 100.0 | 50 | 100.0 | 25 | 100.0 | |

### 6.1.2 Historical Profile of Major Pest Infestation Record (7 Years Record)

By the close-ended questionnaire survey farmers had been asked the past 7 years farming practices especially for pest control whether they recall it correctly or not. Maximum IPM farmers did it correctly; they could answer the pest infestation record in their respective field. For IPM farmers, out of 50 farmers, 47 can recall correctly (94%), Non-IPM farmers recall it with 70% correctly, they answered that they have remembered the past seven years infestation record. For contact farmers, they recall it with 88% of farmers (Table 6.3).

**Table 6.3 Historical profile of major pest infestation record (7 years record)**

| Infestation Record Remember | IPM Farmers (n) | % | Non-IPM Farmers (n) | % | Contact Farmers (n) | % |
|---|---|---|---|---|---|---|
| Yes | 47 | 94.0 | 35 | 70.0 | 22 | 88.0 |
| No | 3 | 6.0 | 15 | 30.0 | 3 | 12.0 |
| Total | 50 | 100.0 | 50 | 100.0 | 25 | 100.0 |

### 6.1.3 Frequency of Crop Field Visit by Farmers in a Week

Monitoring is a vital step for surveillance and forecasting. The various crop stages are susceptible for various insects. Sometimes within one day or 12 hours interval some stain of insects significantly increases and crosses ETL (Economic threshold level). The Table 6.4 showed that for crop field visit by IPM farmers were significantly punctual and regular than those of Non-IPM. Only 2% Non-IPM farmers were in regular monitoring practices, whereas 10% were in two days interval and rest and large number of farmers (88%) had been done their monitoring works for one week interval. The one week interval monitoring was not a well ahead monitoring system. Contact farmers were in mixed nature and only 24% farmers had been done in regular every day visit, 56% were in one day interval, 20% were in two days interval and no farmer was in one week interval (Table 6.4).

Contact farmers monitoring and visit depended on their pesticide application time selection. Sometimes they visited crop field for fertilizer application and irrigation, sometimes for intercultural operation.

Broadcasting sowing practices of Non-IPM farmers kept them away to understand every plant's original condition. That's why they often reluctant to visit regularly in crop field.

**Table 6.4 Frequency of crop field visit by farmers in a week**

| Frequency of Monitoring | IPM Farmers (n) | % | Non-IPM Farmers (n) | % | Contact Farmers (n) | % |
|---|---|---|---|---|---|---|
| Every morning | 50 | 100.0 | 1 | 2.0 | 6 | 24.0 |
| One day interval | 0 | 0.0 | 0 | 0.0 | 14 | 56.0 |
| Two days interval | 0 | 0.0 | 5 | 10.0 | 5 | 20.0 |
| One week interval | 0 | 0.0 | 44 | 88.0 | 0 | 0.0 |
| Total | 50 | 100.0 | 50 | 100.0 | 25 | 100.0 |

### 6.1.4 Method of Pest Control

Table 6.5 showed that all IPM farmers used mechanical and cultural methods of pest control. While all Non-IPM farmers (100%) used chemical method of pest control. This is quite similar to contact farmers. Eighty-eight percent of contact farmers used chemical method of pest control, only 12% used mechanical method of pest control. This might be due to lack of proper monitoring and lack of IPM knowledge. Using chemical pesticide Non-IPM and contact farmers increased their cost of production, since all most all chemical pesticides were imported item for Bangladesh and cost lots of foreign exchange.

**Table 6.5 Different method taken for pest control**

| Pest control method | IPM Farmers (n) | % | Non-IPM Farmers (n) | % | Contact Farmers (n) | % | P Value |
|---|---|---|---|---|---|---|---|
| Mechanical | 50 | 100.0 | 0 | 0.0 | 3 | 12.0 | |
| Cultural | 50 | 100.0 | 0 | 0.0 | 0 | 0.0 | 0.001 |
| Chemical | 0 | 0.0 | 50 | 100 | 22 | 88.0 | |

### 6.1.5 Analysis of Pest-defender Ratio in Different Kind of Farmers Field

Table 6.7 showed that Non-IPM farmers field had highest number of average pest (1209.8) comparing to IPM (700.5) and contact farmers (700.76). In case of defender (natural enemy) IPM farmers field had highest average number of defender (120) comparing to Non-IPM (27) and contact farmers (30.8). So, we found average pest-defender ratio in IPM farmers field was 5.84, in Non-IPM field was 44.8, and in contact farmers field was 22.75. In case of IPM field on an average for every six pests there would be one defender that was most sustainable condition in rice field for biological control of insect pest. In Non-IPM field the biological control situation was worst among these three types of farmers. For contact farmers field it was also not ideal for biological control of rice insect pest. Excessive use of chemical pesticide and lack of monitoring might be the cause of this kind of high pest-defender ratio.

**Table 6.6 Pest-defender ratio in three types of farmers field**

| Types of farmers field | Average Number of Pest | Average Number of Defender | Ratio |
|---|---|---|---|
| IPM | 700.5 | 120 | 5.84 |
| Non-IPM | 1209.8 | 27 | 44.8 |
| Contact Farmer | 700.76 | 30.8 | 22.75 |

### 6.1.6 Comparison of Percentage of Pest Infestation in Rice Field

Pest infestation status is one of the main factors which influence benefit-cost ratio and future sustainability of farming. In the Table 6.7 showed us during this study average pest infestation of three different types of farmers field found with significant differences. In case of IPM farmers field it was 1.2% where ranges were 0%- 4%. For Non-IPM farmers field average infestation was 20.24% where ranges were 13%-27%, and in contact farmers field it was 15% where ranges were 11% - 19%. So, the less infestation causes less loss of total production. In that sense IPM field got less amount of production loss due to insect pest attack. On the other hand Non-IPM field (20.24%) got highest production loss due to pest attack among these three types of farmers followed by contact farmers group which was 15%.

**Table 6.7 Percentage of pest infestation in three different types of field**

| Types of Farmer | Average Percentage of Pest Infestation | Range of Pest Infestation |
|---|---|---|
| IPM | 1.2% | 0- 4% |
| Non-IPM | 20.24% | 13- 27% |
| Contact Farmer | 15% | 11- 19% |

### 6.1.7 Comparison of Labour Force Engaged in Different Types of Rice Farming

Labour force is another key factors for rice farming. Labour force is needed in rice cultivation from transplanting to harvesting of the crop. In our study we found that the labour needed for IPM practice was pretty low than that of Non-IPM and contact farmers practices. Table 6.8 showed that in IPM practices average labour needed 5.36/hectare, While for Non-IPM it was 17.2 and for contact farmer it was 21.36. The range of average labour forces in IPM 4 -7/hectare, Non-IPM 10-19/hectare and contact farmer were 18-24/hectare. So, we found for contact farmers practices needed more labour than Non-IPM and last IPM. The increase number of labour might be needed in Non-IPM and contact farmer practices for extra use of pesticide, inter-cultural operation, and sometimes using extra dose of fertilizers to make up the excess yield loss by insect pest damages. Increase number of labour force effect negatively on cost of production as well as benefit-cost ratio. In IPM method we observed earlier they did not use chemical pesticide and much more family labour engaging is another cause of less number of labour forces in this practice.

**Table 6.8 Average labour forces engaged in different types of farming**

| Types of Farmer | Average Number of Labour Forces Engaged/ha | Range of Labour Forces Engaged/ha |
|---|---|---|
| IPM | 5.36 | 4- 7 |
| Non-IPM | 17.2 | 10- 19 |
| Contact Farmer | 21.36 | 18- 24 |

### 6.1.8 Comparison of Benefit-cost Ratio in Different Types of Farmers Practice

Benefit-cost ratio is one of the major factors for any kind of farming. In rice farming it is a complex matter as lots of factors are related with it. Farmers usually give much more emphasis on benefit-cost ratio rather than any other factors related to rice farming. Table 6.9 showed us how benefit-cost ratio differs from one practice to another. In our study we observed that in case of IPM practice average benefit-cost ratio was highest (5.76) than Non-IPM (1.29) and contact farmers (3.98) practice. The ranges of benefit-cost ratio was for IPM from 4.45- 6.69, Non-IPM 0.67- 2, and for contact farmers 3.11- 5.67. Higher benefit-cost ratio proves the more sustainable rice farming. In our study for IPM practices they did not use any kind of chemical pesticide at all which we found in previous section. The other causes of higher benefit-cost ratio in case of IPM practices were less damage of crop due to insect pest attack, lower number of labour forces, judicial use of fertilizer and less cost of inter-cultural operation. In case of Non-IPM farmer broadcasting method of farming increases their intercultural operation cost and reduces per hectare total production. Again chemical pesticides cost, excess labour cost were other causes of low benefit-cost ratio. In case of contact farmer higher numbers of labour forces, chemical pesticides cost, crop loss due to insect pest attack were the causes of low benefit-cost ratio.

**Table 6.9 Average benefit-cost ratio in different types of farming**

| Types of Farmer | Average Benefit-cost Ratio | Range of Benefit-cost Ratio |
|---|---|---|
| IPM | 5.76 | 4.45- 6.9 |
| Non-IPM | 1.29 | 0.67- 2 |
| Contact Farmer | 3.98 | 3.11- 5.67 |

## 6.2 Factors Affecting Benefit-cost Ratio in Different Types of Farmers

Three types of farmer using surveillance and forecasting method trends to different impact on cost of production and return from unit crop land. Multiple regression analysis determines the result of benefit-cost ratio. First of all three models had been run for IPM farmers, then two for Non-IPM farmers, and third analysis is done with two different models for contact farmers.

The determinants of Benefit-cost ratio for all farmers had been run with 125 farmers all together in seven different models. Details of these model results have been shown in the Tables 6.10a, 6.10b, 6.10c, and 6.11.

### 6.2.1 Benefit-cost Ratio in Different Parameters in IPM Farmer

Number of labour forces engaged/ha, percentage of pest infestation, pesticide application time, area ($m^2$), time of field visit and number of household members were drop from the equation and three regression equations were fixed, that include three independents variables, that are number of defender, number of pest and frequency of crop field visit by farmers in a week in IPM farmer, which influenced the benefit-cost ratio.

Results from multiple regression analysis showed that number of defender, number of insect pest and frequency of crop field visit by farmers in a week were statistically significant at 1.0 and 5.0% levels, where adjusted $R^2$ is 87.2% (Table 6.10 a). Number of defender and number of insect pest are significant at 1% level that's why we can say in case of IPM practices increased number of defender significantly influenced positively on benefit-cost ratio with the marginal coefficient level 0.037. Again increased number of pest in IPM practice of this study influence directly on benefit-cost ratio with the marginal coefficient level 0.006. Both showed significant value at 1% level of significance. Number of crop field visit showed significant value at 5% level of significance, so higher number of field visit has positive effect on benefit-cost ratio with the marginal coefficient level 0.162. If field visit increases then benefit-cost ratio increases with marginal coefficient level 0.162 on the other hand if field visit reduces than benefit-cost ratio would be hampered.

**Table 6.10 (a) Determinants of benefit-cost ratio in different parameters in IPM farmer**

| **Independent Variables** | **Coefficient** |
|---|---|
| Constant | -3.764 |
| Number of defender (natural enemy) | 0.037*** |
| Number of insect pest | 0.006*** |
| Number of crop field visit by farmers in a week | 0.162** |
| Number of labour forces engaged/ha | 0.012 |
| Percentage of insect pest infestation | -0.032 |
| Pesticide application time | -0.038 |
| Area ($m^2$) | 0.028 |
| Time of field visit | -0.031 |
| Number of household member | 0.042 |

**$R^2$ = 0.88, Adj. $R^2$ = 0.872, F Statistics = 6.564, P Value = 0.014, N = 50**

*Source: Computed from field and household survey during 2009*

The symbol *** and ** indicate that the slope coefficients is significantly difference at the 1 percent and 5 percent level respectively (Table 6.10 a).

### 6.2.2 Benefit-cost Ratio in Different Parameters in Non-IPM Farmer

Number of defender, number of labour forces engaged/ha, percentage of pest infestation, pesticide application time, area ($m^2$), time of field visit and number of household members were drop from the equation and two regression equations were fixed, that include two independents variables, that are number of pest and frequency of crop field visit by farmers in a week in Non-IPM farmer, which influenced the benefit-cost ratio (Table 6.10b).

Results from multiple regression analysis showed that number of insect pest and number of crop field visit by farmers were statistically significant at 1.0 and 5.0% levels, where adjusted $R^2$ is 92.1% (Table 6.10b). Number of insect pest showed significant value in here. So, in Non-IPM practices large number of insect pest significantly influenced on benefit-cost ratio with the marginal coefficient level 0.001. But as the defender was not proportionate to pest it has no significant influence on benefit-cost ratio. Again number of crop field visit has significant influence on benefit-cost ratio but showed negative value of marginal coefficient value -0.697. It means in Non-IPM practices less number of field visit has negative effect on benefit-cost ratio. If it is reduces benefit-cost ratio hampered in opposite direction. Both independent variables are significant at 1% level of significance.

**Table 6.10 (b) Determinants of benefit-cost ratio in different parameters in Non-IPM farmer**

| **Independent Variables** | **Coefficient** |
|---|---|
| Constant | 1.357 |
| Number of defender (natural enemy) | -0.051 |
| Number of insect pest | 0.001*** |
| Number of crop field visit by farmers in a week | -0.697*** |
| Number of labour forces engaged/ha | -0.007 |
| Percentage of insect pest infestation | 0.005 |
| Pesticide application time | -0.002 |
| Area ($m^2$) | 0.019 |
| Time of field visit | -0.016 |
| Number of household member | -0.028 |

**$R^2$ = 0.924, Adj. $R^2$ = 0.921, F Statistics = 7.094, P Value = 0.011, N = 50**

*Source: Computed from field and household survey during 2009*

The symbol *** indicates that the slope coefficients is significantly difference at the 1 percent level (Table 6.10 b).

### 6.2.3 Benefit-cost Ratio in Different Parameters in Contact Farmers Group

Frequency of crop field visit in a week, number of labour forces engaged/ha, percentage of pest infestation, pesticide application time, area ($m^2$), time of field visit and number of household members were drop from the equation and two regression equations were fixed, that include two independents variables, that are number of insect pest and number of defender (natural enemy) have significant relationship in contact farmers' group, which influenced the benefit-cost ratio (Table 6.10c).

Results from multiple regression analysis showed that number of defender and number of pest were statistically significant at 1.0 and 5.0% level, where adjusted $R^2$ is 93.8% (Table 6.11c). In contact farmers' group number of defender and number of pest significantly related with benefit-cost ratio. The number of defender and number of insect pest have also positive influence on benefit-cost ratio with the marginal co-efficient level 0.028 and 0.005 respectively. Both variables are significant at 1% level of significance.

**Table 6.10(c) Determinants of benefit cost ratio in different parameters in contact farmers group**

| Independent Variables | Coefficient |
|---|---|
| Constant | -0.700*** |
| Number of defender (natural enemy) | 0.028*** |
| Number of insect pest | 0.005*** |
| Number of crop field visit by farmers in a week | 0.010 |
| Number of labour forces engaged/ha | -0.026 |
| Percentage of insect pest infestation | -0.028 |
| Pesticide application time | -0.021 |
| Area ($m^2$) | 0.090 |
| Time of field visit | 0.047 |
| Number of household member | -0.003 |

**$R^2$ = 0.943, Adj. $R^2$ = 0.938, F Statistics = 10.98, P Value = 0.003, N = 25**

*Source: Computed from field and household survey during 2009*

The symbol *** and ** indicate that the slope coefficients is significantly difference at the 1 percent and 5 percent level respectively (Table 6.10c).

### 6.2.4 Benefit-cost Ratio in Different Parameters for All Farmers (n=125)

In Table 6.11, we found time of field visit and number of household members were drop from the equation and seven regression equations were fixed, that include seven independent variables, that are number of defender, number of insect pest, frequency of crop field visit by farmers in a week, number of labour forces engaged/hectare, percentage of pest infestation, pesticide application time and area ($m^2$) in all farmer, which influenced the benefit-cost ratio.

Results from multiple regression analysis showed that the independent variables number of defender, number of insect pest, number of crop field visit in a week, number of labour forces engaged/ha, percentage of pest infestation, pesticide application time, and area ($m^2$) were statistically significant at 1.0 and 5.0% levels, where adjusted $R^2$ is 95.5%.

Number of insect pest, frequency of crop field visit by farmers, and number of pesticide application were significant with negative value of marginal coefficient. That means with all 125 farmers when number of pest increases it would affect negatively on benefit-cost ratio with the marginal co-efficient level 0.002. Again, when field visit decreases it affect negatively on benefit-cost ratio with the marginal co-efficient level 0.220. Application of pesticide negatively affect on benefit-cost ratio with marginal co-efficient level 0.116. That means by using pesticides one or several times it influence the benefit cost ratio with opposite direction.

From those four analyses we observed that whenever the number of independent variable increases then the expected $R^2$ value increases. It means the higher expectation will be observed by it. So, model 7 (Table 6.11) is the most desirable model to find out the result that influence on benefit-cost ratio by three different types of farmers using surveillance method ($R^2$ = 0.958).

**Table 6.11: Determinants of benefit-cost ratio in different parameters for all farmers (n=125)**

| Independent Variables | Coefficient |
|---|---|
| Constant | 2.715*** |
| Number of defender (natural enemy) | 0.042*** |
| Number of insect pest | -0.002*** |
| Number of crop field visit by farmers in a week | -0.220*** |
| Number of labour forces engaged/ha | 0.101*** |
| Percentage of insect pest infestation | 0.060*** |
| Pesticide application time | -0.116*** |
| Area ( $m^2$) | 0.0001*** |
| Time of field visit | -0.039 |
| Number of household member | -0.032 |

**Adj. $R^2$ = 0.955, F Statistics = 8.9, P Value = 0.003, N = 125**

*Source: Computed from field and household survey during 2009*

The symbol *** and ** indicate that the slope coefficients is significantly difference at the 1 percent and 5 percent level respectively (Table 6.11).

### 6.3 Multinomial Logit Model for Farmers' Surveillance Method Adoption

Though in context of benefit–cost ratio IPM practices for surveillance is the best suited method but in practical activities farmers choice of Surveillance method adoption depends much more on socio-economic and physical factors. The multinomial logistic model here is suitable to find out the factors which influence to choose the right method in the field level.

The data and information about farmers surveillance method adoption were collected during household survey and field observation. The study was conducted with the same 125 farmers who use three different farming practices for surveillance in their rice farming. The adoption of surveillance based on those variables they use during their monitoring system. The variables and their values used in this analysis were explained as in Table 6.12.

**Table 6.12 Definition of variables and variables values in multinomial regression**

| **Independent Variables Classification** | **Values** | **N** | **Marginal Percentage** |
|---|---|---|---|
| Number of defender (natural enemy) | 0-20=1 | 12 | 9.6 |
| | 21-40=2 | 20 | 16.0 |
| | 41-60=3 | 15 | 12.0 |
| | 61-80=4 | 14 | 11.2 |
| | 81-90=5 | 15 | 12.0 |
| | 91-110=6 | 17 | 13.6 |
| | 111-130=7 | 20 | 16.0 |
| | 131-150=8 | 12 | 9.6 |
| Number of insect pest | 600-700=1 | 4 | 3.2 |
| | 701-800=2 | 18 | 14.4 |
| | 801-900=3 | 10 | 8.0 |
| | 901-1000=4 | 24 | 19.2 |
| | 1001-1100=5 | 13 | 10.4 |
| | 1101-1200=6 | 14 | 11.2 |
| | 1201-1300=7 | 17 | 13.6 |
| | 1301-1400=8 | 19 | 15.2 |
| | 1401-1500=9 | 6 | 4.8 |
| Number of crop field visit by farmers in a week | 2-3=1 | 40 | 32.0 |

| | | | |
|---|---|---|---|
| | 4-5=2 | 59 | 47.2 |
| | 6-7=3 | 26 | 20.8 |
| Number of labour forces engaged /ha | 16-23=1 | 24 | 19.2 |
| | 9-15=2 | 69 | 55.2 |
| | 4-8=3 | 32 | 25.6 |
| Percentage of insect pest infestation | 21%-30%=1 | 24 | 19.2 |
| | 10%-20%=2 | 41 | 32.8 |
| | 4%-10%=3 | 39 | 31.2 |
| | 2%-3%=4 | 21 | 16.8 |
| Pesticide application time (how many time) | 5-9=1 | 30 | 24.0 |
| | 2-4=2 | 67 | 53.6 |
| | 0-1=3 | 28 | 22.4 |
| Area ($m^2$) | 5000-7,500= 1 | 16 | 12.8 |
| | 8000-10,000=2 | 23 | 18.4 |
| | 11,000-15,000=3 | 36 | 28.8 |
| | 16,000-20000=4 | 34 | 27.2 |
| | 21000-30000=5 | 16 | 12.8 |
| Time of field visit | Afternoon=1 | 40 | 32.0 |
| | Noon=2 | 56 | 44.8 |
| | Morning=3 | 29 | 23.2 |
| Number of household member | 3-5 = 1 | 29 | 23.2 |
| | 6-8 = 2 | 64 | 51.2 |
| | 9-11= 3 | 32 | 25.6 |

### 6.3.1 Factors Affecting Adoption of Surveillance Method

In the Table 6.13, significant value of number of insect pest is 0.001 and is < 0.05; it means that insect pest number is significantly associated on surveillance method adoption. Significant value of number of defender 0.001 and is < 0.05, it means that number of defender is significantly related to surveillance method adoption. Significant value of crop field visit in a week is 0.001 and is < 0.05, it means that visit of crop field is significantly related by farmers method of surveillance adoption. Significant value of percent of insect pest infestation is 0.014 and is < 0.05; it means percent of insect pest infestation is significantly associated with farmers' method of surveillance adoption. Significant value of number of pesticide application is 0.004 and is < 0.05; it means the number of pesticide application in crop field is significantly associated with farmers method of surveillance adoption. Significant value of area of crop field is 0.001 and is < 0.05; it means the area of crop field is significantly associated with farmers method of surveillance adoption. Significant value of time of field visit is 0.003 and is < 0.05; it means the time of field visit by farmer is significantly associated with the method of surveillance adoption. Significant value of household member of one farm family is 0.02 and is < 0.05; it means number of household member is significantly associated with farmers method of surveillance adoption.

According to Table 6.13, the most important socio-economic and physical factors that influencing farmers adoption of surveillance method are number of insect pest, number of defender, number of crop field visit in a week, and area of crop field that use for monitoring. It means the method that reduces number of insect pest, is most adopted by farmers. Second most influencing factor is number of defender, so by that we observed when defender number increases by one practice it is most acceptable by farmers. The third one is frequency of crop field visit in a week, so increase number of field visit is suitable for surveillance method adoption. The fourth one is area by that we can assume the area which is suitable for close monitoring have increase the adoption of surveillance method.

**Table 6.13 Factors affecting adoption of surveillance method (likelihood ratio test)**

| **Effect** | **Model Fitting Criteria** | **Likelihood Ratio Test** | | |
|---|---|---|---|---|
| | -2 log likelihood | Chi-sq | df | Sig |
| Intercept | 1.407E2[a] | 0.000 | 0 | . |
| Number of insect pest | 190.001 | 49.284 | 14 | 0.001 |
| Number of defender (natural enemy) | 191.934 | 51.218 | 16 | 0.001 |
| Number of crop field visit by farmers in a week | 169.312 | 28.595 | 4 | 0.001 |
| Number of labour forces engaged /ha | 143.291 | 2.574 | 4 | 0.631 |
| Percentage of insect pest infestation | 156.762 | 16.046 | 6 | 0.014 |
| Pesticide application time (how many time) | 155.899 | 15.182 | 4 | 0.004 |
| Area ($m^2$) | 169.012 | 28.295 | 8 | 0.001 |
| Time of field visit | 156.496 | 15.779 | 4 | 0.003 |
| Number of household member | 152.400 | 11.683 | 4 | 0.020 |

a. This reduced model is equivalent to the final model because omitting the effect does not increase the degrees of freedom.

b. Unexpected singularities in the Hessian matrix are encountered. This indicates that either some predictor variables should be excluded or some categories should be merged.