CHAPTER V

FACTORS AFFECTING THE ADOPTION ON SOIL CONSERVATION MEASURES USING ORGANIC MATERIALS

This chapter presents empirical results of logistic models determining probability of the adoption of soil conservation using organic materials under the application of crop residues, application of compost and growing of green manure of the surveyed households.

The binary responses with regards to the adoption (0 or 1) can be modeled with binary logit and probit regression. In order to explain the behavior of this type of dichotomous dependent variable, logistic model uses cumulative logistic function; but probit model uses the normal cumulative distribution function. However, the results of logistic analysis can be easily interpreted and method is simple to analyze (Bacha *et al.*, 2001). Logistic regression uses an assumed relationship between the independent and dependent variables that resembles an S-shape curve, not linear. In this study, therefore, three logistic models were used to identify the factors affecting the adoption of different soil conservation practices using organic materials. Each model was run independently.

5.1 Logistic regression models for the adoption of soil conservation using organic materials

Three logistic regression analyses were conducted to identify personal characteristics, economic, bio-physical and technological factors that related to the adoption of soil conservation using organic materials. As there were three models, there were three dependent variables tested against such independent variables as age, education, experience, ethnic group, farm income, off-farm income, farming status, land tenure, number of cattle owned, soil fertility, soil type, three types of slope, farm size, water scarcity, good and partial irrigation access, amount of crop residues used as fodder, amount of crop residues used as fuel and three types of soil erosion, farmers' knowledge, cropping intensity, extension visit, demonstration by extension workers and three types of cropping patterns. Firstly, all proposed explanatory variables were run for each model independently by using SPSS 16 statistical program. After that, statistically insignificant independent variables associated with each dependent variable were taken out from each model. Also, strongly correlated variables within the independent variables were taken out form each model. Each model was run many times to improve the parameters of the model. Finally, the best one was selected to present as a result. All variables entered into the three regression equations had a significant effect on prediction each dependent variable because the Omnibus tests of model coefficients for all models were significantly at 0.01 level. All Cox & Snell R^2 value were nearly 0.5 and Nagelkerke R^2 value were about 0.7 for all models. These R^2 values revealed nearly 50% and 70% of each dependent variable variation can be explained by all the predictor variables in each model respectively. In these three models, all regression equations correctly predicted the adoption or non-adoption of soil conservation using organic materials over 85% of the time. Moreover, all Hosmer and Lemeshow's tests were not significant and it means that all models do not significantly differ from observed data. Therefore, all models were goodness-of-fit tests.

According to the results of the three models, it can be summarized as follows.

Among the proposed independent variables, eleven variables were run for the first model applying crop residues and only eight variables were significantly related with dependent variable. Nine variables were selected for the second model applying compost and all variables were significantly related with the dependent variable. Six variables were selected for the third model growing green manure and all variables were also significantly related with dependent variable.

Although age was statistically significant at 0.01 level and negatively related with the adoption of crop residues application, it was only statistically significant at 0.1 level and positively related with the adoption of compost application. Education was not statistically significant in adoption of crop residues application but it was statistically highly significant and positively related with the adoption of compost application. Total farm size was statistically highly significant and positively related with the adoption of crop residues application and green manure growing. Although the amount of crop residues used as fodder was statistically significant at 0.05 level and negatively related with adoption of crop residues application, it was statistically significant at 0.01 level and positively related with the adoption of compost application. Farm income was statistically significant at 0.05 level and positively related with the adoption of crop residues application but it was only significant at 0.01 level and negatively related with the adoption of green manure application. Knowledge was significant at 0.01 level and negatively related with the adoption of crop residues application while it was significant at 0.01 level and positively related with the adoption of compost application. Although cropping intensity was not significant for the adoption of crop residues application, it was highly significant and negatively related with the adoption of compost application. Oil seed-legume cropping pattern was significant at 0.1 level and positively related with the adoption of crop residues application while it was significant at 0.05 level and negatively related with the adoption of compost application. Partial irrigation access was significant at 0.05 level and negatively related with the adoption of compost application but good irrigation access was significant at 0.01 level and positively related with the adoption of green manure growing. Extension workers visit was highly significant and positively related with the adoption of both compost application and green manure growing.

5.2 Model I: Factors affecting the adoption of soil conservation using crop residues

The dependent variable took the value of 1 if the households applied crop residues to their field for soil conservation and 0 otherwise. Variables that were hypothesized to affect the adoption of soil conservation using crop residues included personal characteristics of household head such as age, level of education. In addition, it was also included some economic factors of sample households such as farm income, farming status; some bio-physical factors such as total farm size, soil type, amount of crop residues used as fodder and some technological factors such as farmer's knowledge, cropping intensity, oil seed-legume cropping pattern and oil seed-cereal cropping pattern.

Age, total farm size, and farming status were hypothesized to affect either positively or negatively the adoption of soil conservation using crop residues. Level of education, soil type, farm income, knowledge, cropping intensity and oil seed-legume cropping pattern were hypothesized to affect positively while amount of crop residues used as fodder and oil seed-cereal cropping pattern was hypothesized to affect negatively to the probability of soil conservation using crop residues. The logistic regression model was applied to analyze the effects of these variables on households' adoption decisions to apply crop residues for soil conservation.

5.2.1 Significance of model I's variables

According to the results shown in Table 5.1, eight predictor variables were significantly influencing on the adoption of crop residues application for soil conservation. These significant variables were AGE, TOTALFS, SOILT, FODDERUSE, FARMIC, KNOWLEDGE, OILLEG and OILCEREAL.

Table 5.1 Logistic regression analysis for the adoption of soil conservation using crop residues

Variables	Coefficient (β)	S.E.	Odds ratio (Exp β)	Significance
AGE (Year)	-0.20	0.04	0.82	0.00***
EDU (Year)	-0.15	0.09	0.86	0.12^{ns}
TOTALFS (Acre)	0.16	0.03	1.17	0.00***
SOILT (Sandy =1, no = 0)	1.49	0.62	4.41	0.02**
FODDERUSE (Ton / year)	-0.09	0.04	0.91	0.03**
FARMIC (Kyat / year)	0.04	0.02	1.04	0.03**
FARMSTAT (Full =1, part = 0)	1.42	1.27	4.15	0.26^{ns}
KNOWLEDGE (Score)	-0.12	0.05	0.89	0.01***
CI (Index)	0.02	0.01	1.02	0.12^{ns}
OILLEG (Yes =1, otherwise = 0)	5.07	2.96	159.85	0.09*
OILCEREAL (Yes =1, otherwise = 0)	-2.38	1.26	0.09	0.06*
Constant	-2.35	4.60	0.10	0.61^{ns}

Source: Survey data (2010)

Note: *, **, *** and ns show 10%, 5%, 1% level of significance and non significance respectively

1 ha = 2.47 acres; 1 US$ = 1000 Kyats

Omnibus Tests of Model Coefficients	X^2 = 123.44, df = 11, Sig = 0.000
Nagelkerke R^2	0.70
Hosmer and Lemeshow Test	X^2 = 9.31, df = 8, Sig = 0.32
% of correct predictions	85.5%

Where,

AGE	= Age of household head
EDU	= Education level of household head
TOTALFS	= Total farm size
SOILT	= Soil type
FODDERUSE	= Amount of crop residues used as fodder
FARMIC	= Farm income
FARMSTAT	= Farming status
KNOWLEDGE	= Farmers' knowledge on soil conservation
CI	= Cropping intensity
OILLEG	= Oil seed-legume cropping pattern
OILCEREAL	= Oil seed-cereal cropping pattern

Illukpitiya and Gopalakrishnan (2004) stated that when farmers became older, they might be more interested in short-term activities. This short-term planning horizon led to less investment for future benefits such as soil conservation. McDowell and Sparts (1989) found that older farmers were less likely to use conservation practices. Younger farmers might be more educated and more involved with current innovation farming activities and thus had more awareness of erosion problems and available solutions. In this study, coefficient of household age and farmers' knowledge were significant at 0.01 level but they were negatively related with the adoption. It means that the farmers who got older and had higher knowledge did not want to adopt. The older farmers were less likely to adopt soil conservation practice using crop residues although they had some knowledge on soil conservation. The odds ratios (Exp β) associated with age and knowledge were 0.82 and 0.89. These odds ratios can be interpreted that the increase in age and knowledge will not lead farmers to adopt crop residues for soil conservation as the odds ratio is less than 1.

Carlson *et al*. (1977) found that increasing levels of education, farm size, and gross income were moderately associated with soil conservation practices. Education, double cropping and increasing net farm income successfully predicted the application of soil conservation of Australian farmers. In this study, coefficient of total farm size was also significant at 0.01 level. It indicated an expected sign and positively related to adoption of crop residues application for soil conservation. The farmers who owned more farms wanted to adopt. The odds ratio (1.17) showed that the odds that farmers to accept crop residues application for soil conservation will increase 17% if total farm size increase one unit.

Coefficient of other three variables; soil type, amount of crop residues used as fodder and farm income were significant at 0.05 level. The soil type and farm income were positively related with the adoption but the amount of crop residues used as fodder was negatively related with the adoption as expected in hypothesis. The odds ratios associated with soil type and farm income were 4.41 and 1.04 that can be concluded that it can lead to 4.41 times if the soil type is more sandy and 4% increase in the odds ratio to adopt the crop residues application for soil conservation if farm income is increased one unit. The odds ratio associated with the amount of crop residues used as fodder (0.91) revealed that as the amount of crop residues used as fodder increases, the livelihood to adopt them for soil conservation decreases.

Reardon *et al*. (1995) showed that conservation decisions were also linked with crop diversification. In this study, the coefficient of the remaining two variables, oil seed-legume and oil seed-cereal cropping patterns were significant at 0.1 level. Oil seed-legume cropping pattern was positively correlated with adoption but oil seed-cereal cropping pattern was negatively correlated with adoption as expected in hypothesis. The odds ratios associated with oil seed-legume and oil seed-cereal cropping patterns were 159.85 and 0.09. It means that the oil seed-legume cropping pattern increases the odds of adoption of crop residues substantially (159 times) and the oil seed-cereal cropping pattern decreases the livelihood of their adoption.

In this model, although the level of education and cropping intensity were expected in positive sign and farming status were expected either positive or negative signs, these were not significantly affecting the adoption of soil conservation using crop residues.

According to the results of logistic regression model for the adoption of soil conservation applying crop residues; the cumulative logistic distribution function is as follows;

$$\text{Ln}\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + e$$

$$= -2.35 + (-0.20*AGE) + (-0.15*EDU) + (0.16*TOTALFS) + (1.49*SOILT) + (-0.09*FODDERUSE) + (0.04*FARMIC) + (1.42*FARMSTAT) + (-0.12*KNOWELDGE) + (0.02*CI) + (5.07*OILLEG) + (-2.38*OILCEREAL)$$

5.2.2 Goodness-of-fit of model I

One of the outputs of a logistic regression model is the model of coefficients. The Omnibus tests of model coefficients show whether or not all of the variables entered into the regression equation have a significant effect on predicting the dependent variable. The Chi-square value of 123.440 as shown in Table 5.2 is significant value at 0.01 level with the eleven variables in the regression equation. This means that eleven variables entered into the regression equation had a significant effect on predicting the dependent variable.

Table 5.2 Omnibus Tests of Model Coefficient

		Chi-square	df	Sig.
Step 1	Step	123.440	11	0.000
	Block	123.440	11	0.000
	Model	123.440	11	0.000

The results of Model Summary in Table 5.3 show the -2 Log likelihood and the R^2 for different tests (Cox & Snell and Nagelkerke). These tests are used to indicate how well the model fits the data. The smaller -2 Log likelihood values indicate that the model fits the data better; a perfect model has a value of zero. The -2LL is 104.565. This value tells about the model as a whole whereas the block tells how the model has improved since the last block. The change in the amount of information explained by the model is significant.

The R^2 values indicate that how many percentage of dependent variable variation can be explained by all the predictor variables in the model. The Cox & Snell R^2 value is 0.527. This value revealed 52.7% of dependent variable variation can be explained by all the predictor variables in the model. Similarly, The Nagelkerke R^2 value (0.703) revealed that 70.3% of dependent variable variation can be explained by all the predictor variables in the model.

Table 5.3 Model Summary

Step	-2 Log likelihood	Cox & Snell R^2	Nagelkerke R^2
1	104.565[a]	0.527	0.703

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than .001.

In the regression model, a classification table compares the predicted values for the dependent variable with the actual observed values in the data. According to Table 5.4, it is shown that the regression equation of eleven independent variables predicts the adoption or non-adoption of soil conservation using crop residues practices correctly 85.5% of the time. Specifically, 73 of the 88 adopters and 68 of the 77 non-adopters were predicted correctly. These shows that the eleven variables taken as a whole have a significant predictive capability on the decision by farmers on whether or not to adopt the soil conservation using crop residues.

Table 5.4 Classification table [a]

Observed		Predicted		
		Crop residues application		Percentage correct
		No	Yes	
Step 1 Crop residues application	No	68	9	88.3
	Yes	15	73	83.0
Overall percentage				85.5

a. The cut value is 0.500

The Hosmer and Lemeshow's test statistic tests the hypothesis that the observed data are significantly different from the predicted values from the model. When this test is significant, it means that the observed data and predicted values by the model are not close, and the model does not describe the data well. When this test is not significant, it means that the model does not significantly differ from observed data. The important part of this test statistic itself (9.309) and the significant value (0.317) shown in Table 5.5. This result shows that the Hosmer and Lemeshow's test is not significant. So, it means that the model does not significantly differ from observed data and the model is goodness-of-fit test.

Table 5.5 Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	9.309	8	0.317

5.3 Model II: Factors affecting the adoption of soil conservation using compost

The dependent variable took the value of 1 if the household applied compost to their field for soil conservation and 0 otherwise. Variables that were hypothesized to affect the adoption of soil conservation applying compost included personal characteristics of household head such as age, level of education. In addition, it was also included one economic factors of sample households such as number of cattle owned; some bio-physical factors such as the amount of crop residues used as fodder and partial irrigation access and some technological factors such as farmer's knowledge, cropping intensity, oil seed-legume cropping pattern and times of extension visit.

Age was hypothesized to affect either positively or negatively on the probability of soil conservation using compost. However, level of education, knowledge, cropping intensity, number of cattle owned, oil seed-legume cropping pattern, partial irrigation access and times of extension visit were hypothesized to affect positively, while the amount of crop residues used as fodder was hypothesized to affect negatively on the probability of soil conservation using crop residues.

The logistic regression model was applied to analyze the effects of these variables on households' adoption decisions to apply compost for soil conservation.

5.3.1 Significance of model II's variables

According to the results, nine predicator variables significantly influenced on the adoption of compost application for soil conservation. These variables were AGE, EDU, FODDERUSE, KNOWLEDGE, CI, OILLEG, PARTIALIRRI, CATTLE and EXTEVISIT.

Table 5.6 Logistic regression analysis for the adoption of soil conservation applying compost

Variables	Coefficient (β)	S.E.	Odds ratio (Exp β)	Significance
AGE (Year)	0.05	0.03	1.05	0.06*
EDU (Year)	0.20	0.08	1.22	0.10***
FODDERUSE (Ton / year)	0.14	0.05	1.15	0.00***
KNOWLEDGE (Score)	0.10	0.04	1.10	0.01***
CI (Index)	-0.03	0.01	0.97	0.00***
OILLEG (Yes =1, otherwise = 0)	-3.82	1.97	0.02	0.05**
PARTIALIRRI (Yes =1, otherwise = 0)	-1.70	0.81	0.18	0.04**
CATTLE (Number)	-0.21	0.12	0.81	0.08*
EXTVISIT (Times / year)	0.41	0.10	1.50	0.00***
Constant	0.22	3.63	1.25	0.95^{ns}

Source: Survey data (2010)

Note: *, **, *** and ns show 10%, 5%, 1% level of significance and non significance respectively

Omnibus Tests of Model Coefficients	X^2 = 101.15, df = 9, Sig = 0.000
Nagelkerke R^2	0.62
Hosmer and Lemeshow Test	X^2 = 7.23, df = 8, Sig = 0.51
% of correct predictions	86.7%

Where,

AGE	= Age of household head
EDU	= Education level of household head
FODDERUSE	= Amount of crop residues sued as fodder
KNOWLEDGE	= Farmers' knowledge on soil conservation

CI = Cropping intensity

OILLEG = Oil seed-legume cropping pattern

PARTIALIRRI = Partial irrigation access

CATTLE = Numbers of cattle owned

EXTVISIT = Times of extension workers visit

Illukpitiya and Gopalakrishnan (2004) stated that education had a positive coefficient and it was significant. Education was associated with access to information on the consequences of soil erosion and conservation measures. Mbaga-Semgalawe and Folmer (2000) stated that households' knowledge or recognition of soil erosion increased the likelihood of adoption. Fernando and Sangchyoswat (2010) stated that extension contacts also showed positive and significantly affected to the adoption of farm yard manure application. Other studies Nowak and Korsching (1983) found those farmer characteristics such as age, education affected farmers' adoption of new practices, in particular, soil conservation practices.

In this study, coefficient of the amount of crop residues used as fodder, CI, oil seed-legume cropping pattern, partial irrigation access, and numbers of cattle owns were indicated unexpected opposite signs and the others coefficients were indicated as expected signs in hypothesis. Coefficient of five variables; education, the amount of crop residues used as fodder, extension visit, knowledge and CI were significant at 0.01 level and they were positively related with adoption except CI. CI was negatively related with adoption. The odds ratios associated with education (1.22), the amount of crop residues used as fodder (1.15), time of extension visit (1.50) and knowledge (1.10) can be interpreted that the odds that the farmer to adopt compost application for soil conservation can increase 22% ,15%, 50% and 10% respectively if each of respective variables is increased one unit. However, the odds ratio associated with CI (0.97) can be interpreted that if the unit of CI is increased by one, there is a tendency not to adopt compost. Coefficient of other two variables; partial irrigation access and oil seed-legume cropping pattern were significant at 0.05 level. In this study, partial irrigation access and oil seed-legume cropping pattern were negatively related. The odds ratio associated with partial irrigation access (0.18) and oil seed-legume cropping pattern (0.02) can be interpreted as the odds to adopt compost application for soil conservation for farmers with partial irrigation access and oil seed-legume cropping pattern are very low (not like to adopt).

Simtowe (2006) found a negative influence of age on technology adoption but Damisa and Igonoh (2007) argued that older farmers were more likely to try new technologies as they were rich with more resources than younger farmers. Nkamleu (2007) stated that the possession of livestock had significant and a negative effect on the utilization of organic inputs for soil fertility management. Purchased composts made from urban wastes and internally manufactured composts from household wastes (includes animal refuse) were substitutes for animal manure. Farmers using animal manure were less likely to adopt composts. It seems that farmers preferred to use manure directly than making compost with. In this study, coefficient of the last two; age and number of cattle was significant at 0.1 level and although age was positively related with adoption, number of cattle owned was negatively related with adoption. The odds ratio associated with age (1.05) can be interpreted as if age is increased one unit, the odds ratio to adopt compost application for soil conservation can increase 5%. The odds ratio associated with cattle number (0.81) can be interpreted as if the number of cattle number is increased one unit, there is a tendency not to adopt compost.

According to the results of logistic regression model for the adoption of soil conservation applying compost; the cumulative logistic distribution function is as follows;

$$\text{Ln}\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + e$$

$$= 0.22 + (0.05*AGE) + (0.20*EDU) + (0.14*FODDERUSE) + (0.10*KNOWELDGE) + (-0.03*CI) + (-3.82*OILLEG) + (-1.70*PARTIALIRRI) + (-0.21*CATTLE) + (0.41*EXTVISIT)$$

5.3.2 Goodness-of-fit of model II

One of the outputs of a logistic regression model is the model of coefficients. The Omnibus tests of model coefficients show whether or not all of the variables entered into the regression equation have a significant effect on predicting the dependent variable. The Chi-square value of 101.149 as shown in Table 5.7 is significant value at 0.01 level with the nine variables in the regression equation. This means that nine variables entered into the regression equation had a significant effect on predicting the dependent variable.

Table 5.7 Omnibus Tests of Model Coefficient

		Chi-square	df	Sig.
Step 1	Step	101.149	9	0.000
	Block	101.149	9	0.000
	Model	101.149	9	0.000

The results of Model Summary in Table 5.8 show the -2 Log likelihood and the R^2 for different tests (Cox & Snell and Nagelkerke). These tests are used to indicate how well the model fits the data. The smaller -2 Log likelihood values indicate that the model fits the data better; a perfect model has a value of zero. The -2LL is 117.294. This value tells about the model as a whole whereas the block tells how the model has improved since the last block. The change in the amount of information explained by the model is significant.

Table 5.8 Model Summary

Step	-2 Log likelihood	Cox & Snell R^2	Nagelkerke R^2
1	117.294[a]	0.458	0.624

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

The R^2 values indicate that how many percentage of dependent variable variation can be explained by all the predictor variables in the model. The Cox & Snell R^2 value is 0.458. This value revealed 45.8% of dependent variable variation can be explained by all the predictor variables in the model. Similarly, The Nagelkerke R^2 value (0.624) revealed that 62.4% of dependent variable variation can be explained by all the predictor variables in the model.

In the regression model, a classification table compares the predicted values for the dependent variable with the actual observed values in the data. According to Table 5.9, it is shown that the regression equation of nine independent variables predicts the adoption or non-adoption of soil conservation using compost practices correctly 86.7% of the time. Specifically, 47 of the 62 adopters and 96 of the 103 non-adopters were predicted correctly. These shows that the nine variables taken as a whole have a significant predictive capability on the decision by farmers on whether or not to adopt the soil conservation applying compost.

Table 5.9 Classification table [a]

Observed		Predicted		
		Compost application		Percentage correct
		No	Yes	
Step 1 Compost application	No	96	7	93.2
	Yes	15	47	75.8
Overall percentage				86.7

a.The cut value is 0.500

The Hosmer and Lemeshow's test statistic tests the hypothesis that the observed data are significantly different from the predicted values from the model. When this test is significant, it means that the observed data and predicted values by the model are not close, and the model does not describe the data well. When this test is not significant, it means that the model does not significantly differ from observed data. The important part of this test statistic itself (7.232) and the significant value (0.512) shown in Table 5.10. This result shows that the Hosmer and Lemeshow's test is not significant. So, it means that the model does not significantly differ from observed data and the model is goodness-of-fit test.

Table 5.10 Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	7.232	8	0.512

5.4 Model III: Factors affecting the adoption of soil conservation growing green manure

The dependent variable took the value of 1 if the household growing green manure to their field for soil conservation and 0 otherwise. Variables that were hypothesized to affect the adoption of soil conservation growing green manure included personal characteristics of household head such as farming experiences. In addition, it was also included some economic factors of sample households such as farm income and off-farm income; some bio-physical factors such as total farm size and good irrigation access and one technological factor (times of extension visit).

All variables; farming experiences, farm income, off-farm income, good irrigation access and times of extension visit except total farm size were hypothesized to affect positively on the probability of soil conservation growing green manure. Total farm size was hypothesized to affect either positively or negatively on the probability of soil conservation growing green manure.

The logistic regression model was applied to analyze the effects of these variables on households' adoption decisions to grow green manure for soil conservation.

5.4.1 Significance of model III's variables

According to the results, six predicator variables significantly influenced on the adoption of green manure growing for soil conservation. These variables were FARMEXP, TOTALFS, FARMIC, OFFFARMIC, GOODIRRI and EXTVISIT.

Table 5.11 Logistic regression analysis for the adoption of soil conservation growing green manure

Variables	Coefficient (β)	S.E.	Odds ratio (Exp β)	Significance
FARMEXP (Year)	-0.71	0.20	0.49	0.00***
TOTALFS (Acre)	0.32	0.10	1.38	0.00***
FARMIC (Kyat / year)	-0.10	0.04	0.90	0.01***
OFFFARMIC (Kyat /year)	-0.38	0.19	0.69	0.05**
GOODIRRI (Yes =1, otherwise = 0)	2.21	0.86	9.13	0.01***
EXTVISIT (Times / year)	0.70	0.18	2.00	0.00***
Constant	-7.43	2.29	0.00	0.00***

Source: Survey data (2010)

Note: ** and *** show 5% and 1% level of significance respectively

1 ha = 2.47 acres, 1 US$ = 1000 Kyats

Omnibus Tests of Model Coefficients	X^2 = 93.17, df = 6,Sig = 0.000
Nagelkerke R^2	0.75
Hosmer and Lemeshow Test	X^2 = 3.84, df = 8, Sig = 0.87
% of correct predictions	96.4%

Where,

FARMEXP	= Farming experiences of household head
TOTALFS	= Total farm size
FARMIC	= Farm income
OFFFARMIC	= Off-farm income
GOODIRRI	= Good irrigation access
EXTVISIT	= Times of extension workers visit

In this study, coefficient of farming experience, farm income and off farm income were indicated unexpected signs and the others coefficients were indicated as expected in hypothesis. Coefficients of all variables were significant at 0.01 level except off-farm income. Coefficient of off-farm income was significant at 0.05 level. Mbaga-Semgalawe and Folmer (2000) stated that off-farm income was less likely to use improved soil conservation measures. Possible explanations were that off-farm income earning activities reduced the time available for farm work and that off-farm income earners might have little concern about land quality due to their orientation towards off-farm earnings. Off-farm income had a significant negative impact, as in adoption model. Fernando and Sangchyoswat (2010) stated that elder farmers with long term experience were more inclined to adopt the rice straw application. This suggests that it was probably no longer viewed as a new nutrient management technology. Extension contacts also showed positive impacts on green manure application. Other studies by Nowak and Korsching (1983) found that farmer characteristics such as perception of erosion, farm size, off-farm employment and net income affected farmers' adoption of new practices, in particular, soil conservation practices.

In this study, coefficient of total farm size, good irrigation access, times of extension visit were positively related and farming experiences, farm income and off-farm income were negatively related with the adoption of green manure growing. The odds ratios associated with total farm size, good irrigation access and times of extension visit were 1.38, 9.13 and 2.00. These odds ratio can be interpreted as if each of respective variables is increased one unit, it can lead to 38%, 9.13 times and 100% increase in the odds ratios to adopt green manure growing respectively. The odds ratios associated with farming experience, farm income and off-farm income were 0.49, 0.90 and 0.69 respectively.

According to the results of logistic regression model for the adoption of soil conservation growing green manure; the cumulative logistic distribution function is as follows;

$$\mathrm{Ln}\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots + \beta_n X_n + e$$

$$= -7.43 + (-0.71*FARMEXP) + (0.32*TOTALFS) + (-0.10*FARMIC) + (-0.38*OFFFARMIC) + (2.21*GOODIRRI) + (0.70*EXTVISIT)$$

5.4.2 Goodness-of-fit of model III

One of the outputs of a logistic regression model is the model of coefficients. The Omnibus tests of model coefficients show whether or not all of the variables entered into the regression equation have a significant effect on predicting the dependent variable. The Chi-square value of 93.174 as shown in Table 5.12 is significant value at 0.01 level with the six variables in the regression equation. This means that six variables entered into the regression equation had a significant effect on predicting the dependent variable.

Table 5.12 Omnibus Tests of Model Coefficient

		Chi-square	df	Sig.
Step 1	Step	93.174	6	0.000
	Block	93.174	6	0.000
	Model	93.174	6	0.000

The results of Model Summary in Table 5.13 show the -2 Log likelihood and the R^2 for different tests (Cox & Snell and Nagelkerke). These tests are used to indicate how well the model fits the data. The smaller -2 Log likelihood values indicate that the model fits the data better; a perfect model has a value of zero. The -2LL is 47.185. This value tells about the model as a whole whereas the block tells how the model has improved since the last block. The change in the amount of information explained by the model is significant. The R^2 values indicate that how many percentage of dependent variable variation can be explained by all the predictor variables in the model. The Cox & Snell R^2 value is 0.431. This value revealed 43.1% of dependent variable variation can be explained by all the predictor variables in the model. Similarly, The Nagelkerke R^2 value (0.753) revealed that 75.3% of dependent variable variation can be explained by all the predictor variables in the model.

Table 5.13 Model Summary

Step	-2 Log likelihood	Cox & Snell R^2	Nagelkerke R^2
1	47.185[a]	0.431	0.753

a. Estimation terminated at iteration number 9 because parameter estimates changed by less than .001.

In the regression model, a classification table compares the predicted values for the dependent variable with the actual observed values in the data. According to Table 5.14, it is shown that the regression equation of six independent variables predicts the adoption or non-adoption of soil conservation growing green manure correctly 96.4% of the time. Specifically, 22 of the 25 adopters and 137 of the 140 non-adopters were predicted correctly. These shows that the six variables taken as a whole have a significant predictive capability on the decision by farmers on whether or not to adopt the soil conservation growing green manure.

Table 5.14 Classification table [a]

Observed		Predicted		
		Green manure growing		Percentage correct
		No	Yes	
Step 1 Green manure growing	No	137	3	97.9
	Yes	3	22	88.0
Overall percentage				96.4

a.The cut value is 0.500

Table 5.15 Hosmer and Lemeshow Test

Step	Chi-square	df	Sig.
1	3.835	8	0.872

The Hosmer and Lemeshow's test statistic tests the hypothesis that the observed data are significantly different from the predicted values from the model. When this test is significant, it means that the observed data and predicted values by the model are not close, and the model does not describe the data well. When this test is not significant, it means that the model does not significantly differ from observed data. The important part of this test statistic itself (3.835) and the significant value (0.872) shown in Table 5.15. This result shows that the Hosmer and Lemeshow's test is not significant. So, it means that the model does not significantly differ from observed data and the model is goodness-of-fit test.

5.5 Summary

In this chapter, three logistic regression models were run independently. There were some differences in factors influencing adoption of soil conservation measures.

The first logistic regression model revealed that the factors affected the adoption of soil conservation measure using crop residues included age, amount of crop residues used as fodder, farmer's knowledge and oil seed-cereal cropping pattern. These were negatively related with the adoption of crop residues application for soil conservation while total farm size, soil type, farm income and oil seed-legume cropping pattern also were statistically significant and were positively related. The second logistic regression model revealed that the factors affected the adoption of soil conservation measure using compost application were age, level of education, amount of crop residues used as fodder, farmer's knowledge, and times of extension visit. These variables were positively related with the adoption of compost application for soil conservation. On the other hand, cropping intensity, oil seed-legume cropping pattern, partial irrigation access and number of cattle owned were also significant but negatively related with the adoption of compost. The third logistic regression model revealed that the factors affected the adoption of soil conservation measure growing green manure crops included total farm size, good irrigation access and times of extension visit. These were positively related with the adoption of green manure growing for soil conservation while farming experiences, farm income and off-farm income were significant but negatively related.

Apart from the above mentioned variables, the others variables were found not to have statistically significance in each model.