Multinomial Logit Analysis of Small-Scale Farmers’ Choice of Organic Soil Management Practices in Bungoma County, Kenya

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Abstract: Bungoma County is one of the areas in Kenya where maize is produced on small-scale basis; however, the County is facing soil nutrient depletion due to continuous and unsustainable cultivation of land. Various interventions have sensitized farmers into adopting organic soil management techniques of enhancing soil fertility and upholding environmental sustainability. The study was aimed at establishing the most preferred organic soil management techniques among farmers and the factors influencing the choice of these techniques. This was based on an exploratory study of small-scale organic maize farmers in Bungoma County. A simple random sampling approach was used to select a sample of 150 smallholder maize farmers and primary data was collected using a semi-structured questionnaire. In the analyses, descriptive statistics and a multinomial Logit model were employed using STATA computer program. The results indicated that extension, farm size, household size, gender, age, education, credit, group membership, land tenure, farm distance and slope of land significantly influenced the choice of different techniques. Therefore, the study recommends that policies in support of organic soil management should disaggregate farmers according to their socioeconomic, farmer and farm characteristics in order to achieve their intended objectives. Further, there is need to increase extension visits to improve farmer awareness on the advantages of the various techniques.

Keywords: Choice, multinomial logit, organic soil management practices

INTRODUCTION

Small-scale farming in Kenya, particularly in western Kenya, is primarily constrained by continuous soil nutrient mining, which affects the production of adequate food for family subsistence needs and surplus for commercial purposes (Tungani et al., 2002; Marenya and Barrett, 2007). One of the strategies employed by farmers to solve the problem of soil nutrient mining is by practicing organic agriculture through the adoption of Organic Soil Management Practices (OSMP). Organic agriculture relies strongly on closed on-farm nutrient cycling and a set of management practices by avoiding the use of synthetic pesticides and fertilizers. It combines traditional and modern techniques of enhancing soil fertility to benefit the shared environment and uphold high-quality life for all (Ifoam, 2009a; Fibl and Ifoam, 2011). Organic agriculture production systems are based on four principles; health, care, fairness and ecology (Ifoam, 2009b). Farmer’s uptake of OSMP is important in enhancing soil fertility which leads to high productivity. Reganold et al. (1987) found out that soil erosion was less frequent on organic farms than in conventional farms leading to more fertile topsoil important for agricultural production.

A quarter of the global organic land is located in developing countries (Willer et al., 2009). However, organic farming in Kenya is still relatively small though it is fast growing. About 0.69 % of the total agricultural area in Kenya (over 182,000 ha) is under organic management. In addition, about 30,000 farms have changed from conventional farming techniques to organic cultivation methods (Ifoam and Fibl, 2006).

Maize is the dominant staple food in Kenya whose consumption is estimated at 98 kg/capita/year and it is produced by over 90% of the rural households. Small-scale maize production accounts for approximately 70% of the total maize produced in the country (Ministry of Agriculture) (MOA, 2006). Bungoma County is one of the areas in Kenya where maize is produced on small-scale basis. The County is experiencing soil nutrient depletion due to continuous and unsustainable cultivation of land (Tungani et al., 2002). The government of Kenya and non-governmental organizations, particularly SACRED AFRICA and One Acre Fund, has been promoting organic farming as a means of promoting sustainable maize production.
As a result of this initiative, some small-scale maize farmers have adopted organic farming through uptake of OSMP. These farmers choose among the different OSMP technologies available to them to adopt. However, it is not clear whichof the adopted OSMP are mainly preferred by farmers and whichinstitutional, farm and farmer characteristics influence the choice of the main OSMP in Bungoma County. Therefore, the study aims to fill this knowledge gap based on an exploratory study among small-scale organic maize farmers in Bungoma County. From the results, relevant policy recommendations will be proposed to organic farming stakeholders so that they can be relied upon when promoting specific OSMP as a soil fertility enhancement initiative.

MATERIALS AND METHODS

Study area, sampling and data: The study covered Bungoma County which occupies approximately 2,068.5 km² with a population of roughly 1,630,934 people and a population density of 482 persons/km² (KNBS, 2009). The County is located between longitude 34° 21.4′ and 35° 04′ East and latitude 0° 25.3 and 0° 53.2′ North. There is a bimodal rainfall pattern; the long rains (March–July) and the short rains (August–October). The annual rainfall ranges between 1250 and 1800 mm. The altitude ranges between 1200 and 2000 m Above Sea Level (A.S.L) and temperature ranges between 21-25°C during the year (GoK, 2005). The County is endowed with well-drained, rich and fertile arable soils but poor husbandry methods and a bulging population have resulted in declining yields, deforestation and soil erosion. Small scale crop and livestock production has been an important component of agricultural activity in this area.

Bungoma County was selected because it is one of the areas in Kenya where maize farming is practiced on small scale basis and where OSMP have been widely promoted and adopted through interventions by non-governmental organizations such as SACRED Africa. A sample of 150 respondents was selected from a population of small scale maize farmers in Bungoma County. Out of the seven administrative districts in the County, two districts were purposively selected; Bungoma South and Bungoma Central. Primary data was collected through observations and interviews, using a semi-structured questionnaire during the months between April to May 2011.

Model specification; Multinomial logistic regression: The Multinomial Logit (MNL) model is used to analyse the factors influencing choice of OSMP among maize farmers in Bungoma County. The model was preferred because it permits the analysis of decisions across more than two categories in the dependent variable; hence it becomes possible to determine choice probabilities for the different OSMP’s. On the contrary, the binary probit or logit models are limited to a maximum of two choice categories (Maddala, 1983). The MNL was preferred for this study because it is simple to compute than its counterpart, the multinomial probit model (Hassan and Nhachema, 2008).

The MNL model is expressed as follows:

\[ P(y = j/x) = \frac{\exp(x\beta_j)}{1 + \sum_{h=1}^{J} \exp(x\beta_h)}, \quad j = 12, \ldots, J \]

where, \( y \) denotes a random variable taking on the values \{1, 2, \ldots, J\} for a positive integer \( J \) and \( x \) denote a set of conditioning variables. \( X \) is a 1xK vector with first element unity and \( \beta \) is a K×1 vector with \( j = 2, \ldots, J \). In this case, \( y \) denotes organic soil management practices or categories while \( x \) denotes specific household and institutional characteristics of the maize farmer. The inherent question is how changes in the household and institutional characteristics affect the response probabilities \( P(y = j/x) \), \( j = 1, 2, \ldots, J \). Since the probabilities must sum to unity, \( P(y = j/x) \) is determined once the probabilities for \( j = 1, 2, \ldots, J \) are known. For this study, the OSMPs used in the study area were characterised, after which the most common techniques preferred by farmers (or decision categories) were identified. These techniques comprised the decision categories for the multinomial Logit model.

In order for the parameter estimates of the MNL model in Eq. (1) to be unbiased and consistent, the Independence of Irrelevant Alternatives (IIA) is assumed to hold (Deressa et al., 2008). The IIA assumption requires that the probability of using one OSMP by a given maize farmer must be independent of the remaining probabilities. This assumption requires that the probability of using one OSMP is independent of the probability of choosing another OSMP (that is, \( P_j/P_k \) is independent of the remaining probabilities). The basis of this assumption is the independent and homoscedastic disturbance terms of the basic model in Eq. (1).

The parameter estimates of the MNL model only provide the direction of the effect of the independent variables on the dependent (choice) variable; thus the estimates represent neither the actual magnitude of change nor the probabilities. Instead, the marginal effects are used to measure the expected change in probability of a particular technique being chosen with respect to a unit change in an independent variable from the mean (Greene, 2000). To obtain the marginal effects...
Table 1: Variables used in the MNL model and their expected signs

<table>
<thead>
<tr>
<th>Variables</th>
<th>Definition and measurement</th>
<th>Expected sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSMPchoice</td>
<td>Choice set of organic soil management techniques</td>
<td>±</td>
</tr>
<tr>
<td>Educ Yrs</td>
<td>Number of years of formal education of the household head.</td>
<td>±</td>
</tr>
<tr>
<td>Age</td>
<td>Age in years of the chief decision maker (continuous)</td>
<td>±</td>
</tr>
<tr>
<td>Gender</td>
<td>Gender of the chief decision maker (Dummy 1 = Male, 0 = Female)</td>
<td>±</td>
</tr>
<tr>
<td>H/h Size</td>
<td>Number of household members (continuous)</td>
<td>±</td>
</tr>
<tr>
<td>Fm Size</td>
<td>Size of the farm available in hectares (continuous)</td>
<td>±</td>
</tr>
<tr>
<td>Fmg Exp</td>
<td>Amount of years of farming experience of the household head (continuous)</td>
<td>±</td>
</tr>
<tr>
<td>Off Inc</td>
<td>Amount of off-farm income received in a year (continuous)</td>
<td>±</td>
</tr>
<tr>
<td>Ld Tenure</td>
<td>Land ownership by title deed (1= owned by title deed, 0 = Otherwise)</td>
<td>+</td>
</tr>
<tr>
<td>Credit</td>
<td>Amount of credit access by the farmer in thousands Kenya Shillings (continuous)</td>
<td>−</td>
</tr>
<tr>
<td>Extn</td>
<td>Number of extension contacts access by the farmer, (continuous)</td>
<td>−</td>
</tr>
<tr>
<td>Training</td>
<td>Number of training sessions the farmer attended (continuous)</td>
<td>+</td>
</tr>
<tr>
<td>Slop Erosn</td>
<td>If the slope of the land leads to soil erosion (1 = Yes, 0 = Otherwise)</td>
<td>±</td>
</tr>
<tr>
<td>Gm Ship</td>
<td>If a farmer belong to agricultural related group (1 = belong to a group, 0 = Otherwise)</td>
<td>±</td>
</tr>
<tr>
<td>Fm Dista</td>
<td>Distance in kilometers of the farm from the farmer’s homestead (continuous)</td>
<td>±</td>
</tr>
<tr>
<td>Percep</td>
<td>Farmer perception towards organic farming activities. (5 = strongly agree 4 = Agree 3 = Neutral Undecided 2 = Disagree 1 = strongly disagree)</td>
<td>±</td>
</tr>
</tbody>
</table>

for the model, Eq. (1) is differentiated with respect to the explanatory variables as shown in Eq. (2):

$$ \frac{dp_j}{dx_k} = p_j(\beta_{jk} - \sum_{j=1}^{l-1} p_j \beta_{jk}) $$

(2)

It has also been noted that the signs of the marginal effects and respective coefficients may be different (Hassan and Nhemachena, 2008), since the former depends on the sign and magnitude of all other coefficients.

The empirical specification for examining the influence of explanatory variables which are described in Table 1 on the choice of OSMP (Y) is given as follows:

$$ Y_{i=1...I} = \beta_0 + \beta_1 EducYrs + \beta_2 Age + \beta_3 Gender + \beta_4 OffInc + \beta_5 LdTenure + \beta_6 FmgExper + \beta_7 SlopErosn + \beta_8 Training + \beta_9 Extn + \beta_{10} GmShip + \beta_{11} FmDista + \beta_{12} Percep + \mu $$

(3)

**RESULTS AND DISCUSSION**

**Socioeconomic characteristics:** The summary of the socio-economic characteristics is presented in Table 2. A comparative analysis of the mean and proportion of the socio-economic variables between adopters of OSMP and non-adopters showed that, there exist significant differences between four variables. These are; age of the household head, household size, education level of the household head and the number of extension visits received. In addition, adopters of OSMP projected higher mean and proportion values in the four significant variables. The other variables (farm size, farming experience, farmer training and farm distance from the homestead) indicated insignificant difference between adopters and non-adopters of OSMP.

Figure 1 shows how farmers adopted different OSMP. Use of Farm Yard Manure (FYM) was practiced by majority of the respondents (21%) indicating that farmers appreciate its importance in maize production as a means of improving soil fertility. In addition to supplying nutrients to the soil, FYM improves the physical, chemical and biological properties of the soil which helps to maintain the soil productivity and soil health (Tolessa and Friesen, 2001).

Furthermore, the use of FYM helps farmers to avoid the high costs of purchasing inorganic fertilizers. However, incorporation of crop residues in the farm was least practiced among adopters (5%) of OSMP. This could be attributed to the fact that many farmers in the area practice mixed farming and therefore prefer to use crop residue as fodder for their livestock because their farm sizes are small and therefore they cannot afford to cultivate enough feed for their animals. Moreover, about 27% of the respondents (inorganic farmers) reported not to have adopted any of the OSMP due to shortage of land, labor and organic inputs as well as pest and disease challenges as shown in Fig. 2.

About 40% of the non-adopters of OSMP indicated that shortage of organic inputs such as crop residues and compost materials was a major constraint hindering them from adopting OSMP. Approximately 31% of the non-adopters of OSMP indicated that their small pieces of land did not allow them to invest in these activities. Shortage of land was attributed to high population pressure in the area, forcing farmers to intensively farm on small plot of land. This hindered them from...
Table 2: Farmer’s socio-economic characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adopters</td>
<td>Non-adopters</td>
<td>Overall</td>
</tr>
<tr>
<td>Age (years)</td>
<td>48.35</td>
<td>43.23</td>
</tr>
<tr>
<td>Household size (number)</td>
<td>8.06</td>
<td>4.88</td>
</tr>
<tr>
<td>Education (years)</td>
<td>14.31</td>
<td>12.03</td>
</tr>
<tr>
<td>Farm size (ha)</td>
<td>1.85</td>
<td>2.11</td>
</tr>
<tr>
<td>Experience (years)</td>
<td>18.98</td>
<td>16.45</td>
</tr>
<tr>
<td>Extension (contacts)</td>
<td>2.11</td>
<td>0.18</td>
</tr>
<tr>
<td>Training (contacts)</td>
<td>2.81</td>
<td>1.58</td>
</tr>
<tr>
<td>Farm distance (km)</td>
<td>0.75</td>
<td>1.43</td>
</tr>
</tbody>
</table>

***: Significant at 1% level; **: Significant at 5 level

![Fig. 1: Farmers’ choice of organic soil management practices](image)

![Fig. 2: Constraints to adoption of organic soil management practices](image)

practicing organic techniques such as crop rotation and agroforestry which require large agricultural land. In addition, 18% of the non-adopters of OSMP indicated that it is difficult to control pests and diseases using biological methods under OSMP. Shortage of labour, was identified by 11% of the farmers as a constraint to practicing OSMP since the technique is labour-intensive particularly in the preparation and application of FYM and compost manure. Therefore, households with low number of members working on the farm are less effective since these practices are labor-intensive (Douglas et al., 2005).

**Empirical results:** Table 3 presents the results of the multinominal Logit model which indicated that 11 out of 15 variables used in the model were statistically significant at 10% levels. The chi-square value of 168.77 showed that likelihood ratio statistics are highly significant (p<0.0001) suggesting the model has a strong explanatory power. The pseudo-R square was 0.4218 indicating the explanatory variable explained about 42% of the variation in choice of OSMP.

Gender of the household head had a significant effect on the choice of compost manure and agroforestry practices at 5% and 1% level, respectively. Male-headed households had a higher probability of practicing agroforestry techniques by 31.02%; however, they had a lower probability of practicing compost manure by 31.93%. Male-headed households have been found to undertake risky businesses. In addition, they have a higher access to resources and information that give them greater capacity to adopt new technologies than female-headed households due to traditional social barriers (Kaliba et al., 2000; Asfaw and Admassie, 2004; Odendo et al., 2009). On the other hand, Gopal and Kanokporn (2011) indicated that more female than male-headed households planted organic vegetables.

The results showed that age of the household head significantly influenced the likelihood of choosing not
those with lower education (Feder et al., 1985). These results tally with those of Mbaga-Semgale and Folmer (2000) and Odendo et al. (2009) where they found out that adoption of improved natural resource conservation technologies such as OSMP requires an understanding of the environment in which these activities are taking place thus, household heads with higher education levels have a higher probability of adopting new technologies. However, other studies have indicated that education level of the household head negatively influences the use of soil and water conservation measures and organic agricultural system (Gould et al., 1989; Furruh et al., 2007).

The effect of household size was significant for non-adoption, adoption of crop residues, FYM and agroforestry technique. An increase in the household size by one member decreased the probability of choosing non adoption and use of crop residues by 7.46% and 2.95%, respectively. However, it increased the probability of choosing FYM and agroforestry technique by 3.72 and 5.57%, respectively. Household size has been used as a proxy measure for the numbers of members available to provide farm labor. Large household size positively influences adoption of labor-

to use any OSMP at 1% level. In addition, age significantly influenced the chances of choosing to use crop residues and FYM at 5% level. An increase in age by one year increased the probability of choosing non-adoption of OSMP and use of crop residues by 1.08%. It also decreased the probability of choosing FYM by 1.32%. Young household heads are more interested in trying out new agricultural technologies because of their risk taking character. Older household heads are risk averse hence they are rigid in adopting new technologies such as manure.

Education level of the household head had a positive and significant effect on choice of leguminous crops. An increase in education level by 10 years increased the probability of choosing planting leguminous crops by 7.1%. Higher education gives farmers the ability to interpret and respond to new information much faster than their counterparts with lower education (Feder et al., 1985). These results tally with those of Mbaga-Semgale and Folmer (2000) and Odendo et al. (2009) where they found out that adoption of improved natural resource conservation technologies such as OSMP requires an understanding of the environment in which these activities are taking place thus, household heads with higher education levels have a higher probability of adopting new technologies. However, other studies have indicated that education level of the household head negatively influences the use of soil and water conservation measures and organic agricultural system (Gould et al., 1989; Furruh et al., 2007).

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Table 3: Marginal effects from the multinomial logit on the choice of OSMP

<table>
<thead>
<tr>
<th>Explanatory variables</th>
<th>No adoption</th>
<th>Crop rotation</th>
<th>Crop residues</th>
<th>FYM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>0.0075</td>
<td>0.177</td>
<td>0.0119</td>
<td>0.407</td>
</tr>
<tr>
<td>Age</td>
<td>0.0108</td>
<td>0.071</td>
<td>0.0017</td>
<td>0.327</td>
</tr>
<tr>
<td>Education</td>
<td>0.0063</td>
<td>0.524</td>
<td>0.0016</td>
<td>0.647</td>
</tr>
<tr>
<td>Household size</td>
<td>-0.0746**</td>
<td>0.030</td>
<td>-0.0052</td>
<td>0.526</td>
</tr>
<tr>
<td>Experience</td>
<td>-0.0012</td>
<td>0.733</td>
<td>-0.0014</td>
<td>0.278</td>
</tr>
<tr>
<td>Perception</td>
<td>-0.0275</td>
<td>0.573</td>
<td>-0.0117</td>
<td>0.482</td>
</tr>
<tr>
<td>Farm size</td>
<td>0.0521*</td>
<td>0.071</td>
<td>0.194*</td>
<td>0.057</td>
</tr>
<tr>
<td>Off-farm income</td>
<td>0.1304</td>
<td>0.205</td>
<td>0.0889</td>
<td>0.283</td>
</tr>
<tr>
<td>Extension</td>
<td>-0.1327***</td>
<td>0.001</td>
<td>-0.0321**</td>
<td>0.070</td>
</tr>
<tr>
<td>Training</td>
<td>-0.0035</td>
<td>0.764</td>
<td>-0.0011</td>
<td>0.726</td>
</tr>
<tr>
<td>Credit</td>
<td>0.0138**</td>
<td>0.027</td>
<td>-0.0072</td>
<td>0.340</td>
</tr>
<tr>
<td>Group membership</td>
<td>-0.0549</td>
<td>0.521</td>
<td>-0.0032</td>
<td>0.867</td>
</tr>
<tr>
<td>Land tenure</td>
<td>-0.0969*</td>
<td>0.083</td>
<td>0.0199</td>
<td>0.364</td>
</tr>
<tr>
<td>Farm distance</td>
<td>0.0277</td>
<td>0.292</td>
<td>0.0110</td>
<td>0.290</td>
</tr>
<tr>
<td>Slope erosion</td>
<td>-0.0560</td>
<td>0.332</td>
<td>-0.0043*</td>
<td>0.083</td>
</tr>
</tbody>
</table>

Number of observations: 150; Wald chi2 (90): 301.52; Prob > Chi2: 0.000; Pseudo R2: 0.4218; Log pseudolikelihood : -168.77. ***: significant at 1% level; **: significant at 5 level; *: 10 level

The effect of household size was significant for non-adoption, adoption of crop residues, FYM and agroforestry technique. An increase in the household size by one member decreased the probability of choosing non adoption and use of crop residues by 7.46% and 2.95%, respectively. However, it increased the probability of choosing FYM and agroforestry technique by 3.72 and 5.57%, respectively. Household size has been used as a proxy measure for the numbers of members available to provide farm labor. Large household size positively influences adoption of labor-
intensive agricultural technologies since they have the capacity to relax the labor constraints required during introduction of new technologies (Croppenstedt et al., 2003; Birungi, 2007; Nyangena, 2007; Odendo et al., 2009). On the other hand, households with large families may be forced to divert part of the labour force to off-farm activities in an attempt to earn more income in order to ease the consumption pressure imposed by a large family (Tizale, 2007; Yirga, 2007).

The choice of non-adoption, crop rotation, compost manure and agroforestry technique was significantly influenced by the size of farm. An increase in farm size by one hectare increased the probability of choosing non-adoption, crop rotation and agroforestry technique by 5.21, 1.94 and 16.01%, respectively and decreased the probability of choosing compost manure by 17.43%. Small land holding hinder the usage of technologies compared to large land holding. A large farm size allows a farmer to experiment new technologies on a portion of land without worrying about compromising the family food security. In addition, the benefits from large-scale adoption of new technologies are higher for larger farms (Zepeda, 1994).

The number of extension contacts received by farmers significantly influenced the choice of non-adoption as well as use of crop rotation, crop residues, leguminous crops and compost manure. An increase in extension contacts by one visit decreased the probability of choosing non-adoption of OSMP and adoption of crop rotation by 13.23 and 3.21%, respectively. However, a similar change in the number of extension contacts increased the probability of using crop residues, leguminous crops and compost manure by 2.48, 0.27 and 10.94%, respectively. Agricultural extension agents provide different information and alternatives depending on prevailing activities which impacts farmers differently and they are expected to choose an option that suits them best (Baethgen et al., 2003). The number of contacts with extension officers is a proxy measure for access to agricultural information and this positively contributes to awareness and subsequent adoption of new technologies (Adesina et al., 2000; Abdulai and Huffman, 2005; Menale et al., 2009; Tizale, 2007; Yirga, 2007). However, a study by Ayuya et al. (2011) contrasts this result where agricultural extension services were more focused on intensifying crop and livestock production at the expense of tree planting.

Amount of credit accessed by farmers positively influenced choice of FYM at 1% significance level and non-adoption of OSMP at 5% significance level. An increase in credit amount by KES 1,000 increased the likelihood of not adopting OSMP by 1.38% and choice of FYM by 3.91%. The amount of credit dissuaded non-adopters from engaging in OSMP because they were able to purchase inorganic fertilizers instead of using organic fertilizers whose preparation and application is perceived to be labor-intensive. A rise in use of FYM is attributed to an increase in the purchasing power as a result of the credit accessed hence farmers with higher amount of credit would acquire FYM from external sources and supplement what they prepare on-farm. Other studies have also indicated that there is a positive relationship between the intensity of use of various technologies and the availability of credit (Degu et al., 2000; Kandlinkar and Risbey, 2000; Feleke and Zegeye, 2006; Tizale, 2007; Yirga, 2007).

Group membership had a positive influence on choice of FYM at 10% significance level. Farmers who belong to an agricultural related group had a higher chance of choosing FYM by 14.96%. Members in a farmer group may influence one another to choose better technologies. Membership in groups exposes farmers to a wide range of ideas and sometimes gives farmers the opportunity to have better access to information, through training and extension services, which may positively change their attitude toward an innovation (Nkamleu, 2007). Similar studies found a positive relationship between group membership and adoption of organic and inorganic fertilizers as well as the intensity of use of improved yam seed technology (Nkamleu, 2007; Nchinda et al., 2010).

The choice of not adopting OSMP and agroforestry technique by farmers was significantly influenced by land tenure at 10% level. Farmers who possessed land title deeds had lower chances of choosing not to adopt OSMP by 9.69%. On the other hand, possession of land with security of tenure increased the probability of choosing agroforestry technique by 0.7%. Land title deeds serve as a security tool to acquire credit facilities from financial institutions. In addition, farmers who have full ownership of land are assured of future access to returns of investments (Menale et al., 2009). These results tally with those of Mwirigi et al. (2009) and Ayuya et al. (2011) where land tenure security positively influenced adoption of a new technology. However, another study indicated that privatization of land does not automatically increase investment in more sustainable agricultural practices (FAO, 2001).

Farm distance from the farmer’s homestead negatively influenced the choice of FYM at 5% significance level. An increase in farm distance by one kilometer reduced the probability of choosing FYM by 9.48%. Perhaps this could be a factor hindering adopters of OSMP from using FYM. This is be attributed to the high labor units required to prepare, carry and apply FYM to far distant fields hence, this
would be more convenient for fields closer to the homestead. Farms that are located close to the homestead positively influence adoption of new innovations (Chukwuji ad Ogisi, 2006; Alene et al., 2008; Olowale et al., 2009).

The decision to choose crop rotation, compost manure and agroforestry technique was significantly influenced by the slope of land. Farmers who possessed steep land had a lower probability of choosing crop rotation and compost manure by 0.43 and 28.38%, respectively. However, steep land increased the likelihood of choosing agroforestry technique by 21.06%. The likelihood of households choosing to practice soil conservation depends on the farmer perceives slope of the farm since steeper slopes are more prone to soil erosion (Menale et al., 2009). Sustainable agricultural systems are intuitively site-specific hence plot characteristics influence the decision to adopt conservation tillage (Lee, 2005). The slope of land influences adoption as well as the type of technology to be adopted such as the decision to combine use of compost and conservation tillage (Menale et al., 2009).

CONCLUSION AND POLICY RECOMMENDATIONS

The study used a Multinomial Logit (MNL) model to investigate the factors influencing a household’s decision to choose an OSMP. In the model, the dependent variables included six choice options while the explanatory variables included different household, institutional and social-economic factors. Farmers adopted organic soil management by using different techniques the main ones being; use of farm yard manure, agroforestry, crop rotation, compost manure, leguminous crops and crop residues. These techniques comprised the choice set for the multinomial Logit model. Farmers who did not adopt OSMP indicated that shortage of land, labor and organic inputs as well as pest and disease challenges were the major impediments to adoption of OSMP.

The study used a Multinomial Logit (MNL) model to investigate the effects of socioeconomic, farmer and farm characteristics on the choice of OSMP techniques as a way of addressing the current prevalent problem of soil nutrient mining. The results from the model indicate that most of the variables used in the model significantly influenced the choice of a technique. These include; gender, age and education level of the household head. Other variables include household size, number of extension visits, farmer access to credit, group membership, land tenure, farm distance from the homestead and the slope of land. However, the most outstanding determinants of choice of OSMP were number of extension visits, farm size and household size.

Therefore the study recommends that policies in support of organic soil management should disaggregate farmers according to their socioeconomic, farmer and farm characteristics in order to achieve their intended objectives. For instance, to enhance the choice of crop rotation technique, the relevant stakeholders should target farmers with large land holding as well as those with relatively less sloppy land. When promoting the use of crop residues, the promoters should target older farmers with small household size and support them with more extension contacts. To promote the use of farm yard manure, which is highly labor intensive especially in its preparation and application, the study recommends that young women headed households should be targeted. In addition, farmers should be encouraged to form groups to overcome the high labor demand. In the case of compost manure the target population could be farmers with small and less sloppy land holding. Frequent extension contacts should also be provided to enhance its choice. Agro-forestry technique should be promoted by targeting male headed households with larger land holding and household membership. In addition, there is need to ensure security of tenure for the land through provision of land title deeds.

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