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An assessment of adoption levels of agrosilvicultural practices in Kitwe District Zambia . A case of small-scale farmers of Misaka

Loyce Joy Sakala[1*], Catherine Zulu[2] Weston Davy Sakala[3]

[1, 2] *The University of Zambia, Forestry Department, Division of Forest Product Research*
[3]*Zambia Forestry College*

*Corresponding Author Email: Loyce sakala@gmail.com

ABSTRACT

The purpose of this study was to assess the adoption levels of agrosilvicultural practices among small-scale farmers of Misaka in Kitwe District of Zambia. Agroforestry practices, especially evergreen agriculture and conservation agriculture with trees have emerged as sustainable measures of addressing land degradation and loss of soil fertility. Although agroforestry is known to be beneficial to farmers and the environment, its adoption rate is very poor. The present study reviewed several publications on the adoption of agroforestry in Southern Africa and complemented the review with household and key informant interviews to obtain evidence from farmers and agriculture extension officers on the factors affecting the adoption of agrosilvicultural practices. The study revealed that the adoption of agrosilvicultural practices is very low. the results indicate that 44.9 % of respondents have not adopted the agrosilvicultural practices whereas only 21.4 % have adapted agrosilvicultural practices. Of those who have adopted, however, the retention rate for both technologies is low. Up to 84% of the key informants indicated that awareness of the connection between agrosilvicultural practices and land quality improvement could lead to wide-scale adoption of the technology. There is also a need to institutionalize sustainable agricultural land management practices through policy formulation, budgetary allocation for extension officers, and farmer training and starter-up inputs. The promotion of agroforestry should be coupled with investment in awareness creation, farmer-centered approaches in selecting technology, and provision of inputs in the initial stages. Strong collaboration among policymakers, researchers, and extension providers will be required to harmonize messages to be delivered to farming communities. The results, however, do not support the adoption of agrosilvicultural practices in the Misaka area.

Keywords: Agroforestry; Adoption rate; Misaka; Practices; small scale- farmers.

1. INTRODUCTION

About 1.2 billion people worldwide depend on Agroforestry practices and services for their livelihoods (Garrity, 2006; Garrity et al., 2010). Agroforestry practices are defined as intentional combinations of trees with crops and/or livestock which involve intensive management of the interactions between the components as an integrated agroecosystem. Thus agroforestry has the potential to enhance food and nutritional security, human

health and environmental sustainability especially among subsistence farmers (Smith et al., 2012). Since 1970s, there has been a significant amount of experimental research done on Agroforestry (AF) with much of this having been conducted in Africa, indicating a significant potential for AF to increase resource income and meet household needs (Garrity, 2006). Since the 1980s there have been also various researches done on Agroforestry (AF) with priority areas being the, Northern, Southern and the Western zones of Africa (Smith et al., 2012). Agroforestry systems are practices that may be influenced by a number of factors such as socio- economic characteristics of farmers which include; access to resources, provision of extension services, preference and attitude of a farmer and market availability (Jose et al., 2012). These may result into different levels of adoption among individuals, groups and different communities, thus leading to different adoption status (Mosquera-Losadet al., 2012;Waldron, et al., 2017).

Agroforestry is the deliberate growing of woody perennials on the same unit of land as agricultural crops and/or animals, either in some form of spatial mixture or sequence (Masangano & Miles,2004). Agroforestry also is considered as a system in which different components are benefiting from each other in several different ways (Garrity, 2006). There are variety of agroforestry systems that are used around the world, and they are classified in a number of different ways depending on the criteria employed and also ranges from very simple and sparse to very complex and dense systems which holds a wide range of practices (Waldron, et al., 2017).
According to (Opio, 2001) the most common Agroforestry systems (AFs) in the tropics and subtropics include, agrosilviculture, silvopasture, agrosilvopasture, aquosilvicultural and aposilvicultural systems (Ajayi, 2007). On the other hand Agroforestry system, refers to the various way of arrangement of the components in an agroforestry practice (FAO, 2013; Fagerholm et al,. 2016). As findings on factors that influence adoption of agroforestry vary between studies, it is necessary to further probe the adoption levels so as to understand what actually influences adoption of Agroforestry practices. Therefore, this study focuses on assessing the levels of adoption of agrosilvicultural practice which includes; low adoption of agrosilvicultural practice, low farm productivity, uncoordinated and poor practice of the agrosilvicultural practice. It is true that agroforestry as a farming system provides a number of benefits to the farmer.Kabwe et al., (2016) stated that, “there is little or no agrosilvicultural practice adoption by small scale farmers in certain areas of the country.” In Zambia agroforestry systems have been extensively researched and introduced to small scale farmers for over two decades. Despite conducting many previous studies and intensifying the extension effort over many years, few farmers have adopted these systems (Ajayi, 2006c). For instance by 2004 Eastern province of Zambia alone had over ten organizations promoting agroforestry systems (Atangana et al,. 2014). Despite several studies that have been done to understand the adoption potential of other agroforestry systems in other parts of the country studies on agrosilvicultural practices have not yet been done and known (Ajayi et al. 2006c).

According to research work of Kabwe et al., (2016) the problem of low agroforestry adoption levels are not only experienced with agroforestry system but also with many other successful agricultural initiatives This is a situation that has been observed in different areas which also apply to Southern Africa, of which Zambia is part (Ajayi et al , 2006c). The scenario above is not an exception for many small scale farmers on the Copperbelt province specifically Misaka area in Kitwe City. Misaka community has a vast land on which most of its population depends on for farming and their survival. However, most of the farmers in Misaka have lagged

behind on the adoption of agroforestry systems specifically agrosilvicultural practice and have been practicing unsustainable method of farming that is affecting their social economic status.

In Zambia, several previous studies have been achieved to understand the adoption potential of improved fallows, and to determine factors that affect its adoption, the significance of its adoption and also determine contribution of the adoption of improved fallows to overall economic performance of the country (Phiri etal ,2004). However, there are no data/or studies on the levels of adoption of agrosilvicultural practices in Misaka community. Therefore, the essence of this research was to address this specific gap. Over sixty percent of Zambia's population live in the rural areas and the majority of these depend on agriculture for their livelihoods (Government of Zambia, 2006). However, small scale farmers face many challenges such as low productivity, high dependence on rain fed agriculture, insecurity due to traditional land tenure system and environmental degradation due to unsustainable agricultural practices. As a result of these challenges, small scale farming remains at low productivity and has thus led to high incidences of poverty on rural small scale farmer households. The consequence of low productivity has increased pressure on government to provide food aid, which is also never sufficient to meet the needs of all affected households (Kwesiga et al, 2003). The need to support small scale agricultural productivity improvement is beneficial as it creates employment and income opportunities for the poor and ultimately reduces poverty (Government of Zambia, 2006). Part of the solution to address low land productivity is the adoption of new agroforestry technologies. As a response to declining land productivity, farmers open up forests to expand to new areas and this has led to loss of extensive forests and subsequent land degradation (Chidumayo,1988). Over time, agroforestry technologies in Zambia have been known and introduced at research stations since 1988 (Franzel et al, 2002) ,in particular improved fallows and biomass transfer technologies however there has been less development in the area of agrosilvicultural practices (Kwesiga et al, 2003). In Zambia, it has been observed that natural fallows for restoring soil fertility have been the most practiced (Chidumayo, 1988). However with rapid population increase and land use pressure, the number of years for fallows have been reduced as such the system cannot to sustain itself (Chirwa et al,.2003).

Nevertheless the quickest and easiest alternative for replacing fertility in the soil would be the use of inorganic fertilizers however, these are beyond most of the rural farmers' budgets. Therefore, agroforestry technologies specifically agrosilviculture practices offer an alternative solution to small scale-farmers, who in the absence of inorganic fertilizers would otherwise grow crops and harvest little or nothing for storage .
Agrosilviculture involves the integration of woody perennials with agricultural crops only in the same land unit (Holzmueller & Jose,2012). Trees may be grown on farmer's fields while crops are grown in the understory. The trees may also be dispersed widely either spaced systematically in a grid or scattered at random. The system is common where agricultural crop production is the dominant economic activity (Kwesiga et al, 2003). Annual crops are grown simultaneously with trees to provide better sustained production of crops, fodder and wood (Tsonkova et al.2012). The system may have varying benefits depending on the type of components that exit within the same land management unit. It provides benefits such as environmental benefits e.g. increment in soil nutrients through addition and decomposition of litter, economic benefits such as increase in level of farm income due to improved and sustained productivity (Lovell et al.. 2018).

Thus the adoption of the system is influenced by agricultural crop production being the major social activity of the community which gives several benefits within a short time such as improving soil fertility,

providing fuel wood and other valuable products (Ajayi et al, 2006b & Ajayi, 2007).) this technology takes less period of time for their benefits to be realized making it affordable to subsistence farmers. It has been observed that preference across agroforestry technologies adoption are much more influenced by what the farmers see as incentive or dicentive (Jordan &Warmerhim, 2013) but as for agrosilvicultural practice the biggest incentive is the income that is obtained from the sale of the products, increased yield, the medicinal value derived from such technologies and the improvement of welfare due to raised farm income (Valdiviaa et al, 2012) . Although the people in Misaka for years have been practicing Agroforestry, the level of adoption of various Agroforestry systems and technologies by the communities has not been determined and documented. However, unless farmers widely adopt agrosilviculture practice as part of their farming system, the potential benefits of agroforestry on livelihoods and the environment will not be realized by the rural people of Misaka community.

The rationale of this study was to assess and document the adoption level of agrosilvicultural practices by the local communities in Misaka. The information gathered would make a significant contribution to Agroforestry promotion and provide useful feedback to researchers, policy makers and other stakeholders in terms of developing and providing strategies related to Agroforestry scaling up interventions and associated local development with regards to community needs. Therefore, the purpose of this study was to assess the levels of adoption of agrosilvicultural practices by small scale -farmers of Misaka.

2. MATERIALS AND METHODS

2.1 Description of the study area and location of the study area

Kitwe is Zambia's third largest city and it is located in the central part of the Copperbelt province. It is currently the most populated district on Copperbelt Province and the second most populated district in Zambia With a population of 504,194 (Central statistics office, 2010). Kitwe is one of the most developed commercial and industrial areas in the country with the core economic activity being mining and mining-oriented activities. Misaka is a peri urban area of Kitwe and it was degazatted in 1963 during the constructional works of Kamfinsa Prisons. It is among the settlement areas found in Mwekera region. Other settlements include Chankalamu and Mabote. It covers an area of about 777 square kilometers and it is endowed with vast natural resources such as forests. Misaka is located next to Mwekera national forest number 6 approximately 26.15 kilometers South-East of Kitwe on the Copperbelt and lies between longitude 280 20`E and 290 26`E and between latitude 120 45`S and 130 00`. It has an elevation of between 3900 m and 4150 m. The mean altitude of Kitwe is about 1295 meters above sea level while its total area is about 777 km². The forest reserve has a coverage area of approximately, 17, 887 hectares.

2.2 Population

According to the 2010 census, the population for Copperbelt Province was 1,958,623 of this population 49.7 % were males and 50.3 % were females and whereas the population of Misaka was 2,192 with an area of 109 km² and population density of 99.32 per km².

2.3 Land use and economic activities

The type of agriculture practiced in the area is subsistence farming where small scale farmers employ very limited capital in their cultivation processes (Kabwe et al., 2016). Food crops include maize, beans, cassava. Other food crops grown are sweet potatoes, and groundnuts. Livestock keeping is the second most important economic activity in the area. Livestock kept are goats and poultry. The total estimated forest land of Misaka is

28,321 hactares that has completely been depleted due to high human pressure on the forest. Other economic activities include beer brewing and beekeeping.

2.4 Vegetation type

Misaka area is located within Mwekera national forest number 6 it is mainly characterized by the Miombo type of vegetation dominated by *Julbernardia* species, *Brachysitedia* and *Isoberlinia* Spp (Chidumayo, 1988). The major tree species also includes *Pericopsis angolensis, Pterocarpus angolensis, Uapaca* species, *Marquesia* species and V*achelia* spp. The forest floor has a few shrubby species and a lot of grass, which pose a great hazardous fire danger outbreak in dry seasons.

2.5 Climate

Misaka's climatic characteristics are mainly the dry, wet and hot season. The annual average rainfall ranges between 1000 mm to 1500 mm above sea level and it experiences three seasons annually and distribution is from November to April (Chidumayo, 1988). The hot to dry season is from September to November, hot to wet season from December to March with peak temperatures oscillating between 27-33°C minimum temperatures between 9-14°C, and cool to dry season from April to August.

2.6 Topography

Misaka area has the elevation of about 3900 m and 4500 m above sea level and the general slope of the area ranges from 3% - 5% elevation.

2.7 Soil type

The soil texture of the Misaka is mainly of sandy loam, sand clay loam and sand clay resulting from eluviations process. The soils of Misaka are of eluvia origin on basement quartzites, schist's and granites rocks (Chidumayo, 1997). The soil texture is sandy loam, sand clay loam and sand clay. Soil colour varies from shades of brown in the top soil of depth 0-30 cm to reddish and orange in the bottom soil on well and poorly drained sites, respectively (Chidumayo, 1997). The soils are classified as Oxisols, Ultisols or Alfisols that are acidic with pH ranging from 4 to 5 (Chidumayo,1988).

2.8 Methodology

This research employed a Case Study Method which is an appropriate method when the research seeks to explain the current situations and get the in-depth description of social phenomenon .The case study method was used because of its significance attributes in responding to "how" and "why" questions (Yin, 2014) in this case referring to the adoption of agroforestry technologies specifically agrosilvicultural practice.

Apart from using the case study method random sampling method was used for sampling the number of farmers because it's most effective to use when every sample size (from a population of size N) has an equal chance of being selected in a study of a particular area (Amin,2004; Agresti & Finlay 2009:Kothari , 2011)

2.9 Sample size

The level of confidence chosen for this research was ninety percent (10%) and the following formulae was used to determine the sample size (Yamane, 1973). As mentioned earlier Misaka has 122 total number of farmers (distribution of the survey), the sample size was calculated as follows: Selecting e=0.10 and given N=122, $n=122/1+122\ (0.10)^2 \quad =54$

Where, N=Population size, n=sample size and e=Level of significance

Thus the total number of questionnaires and repondents interviewed were 54. In terms of gender 8 females out of 54 and 46 males out of 54 repondents were administred with questionanires and interviewed.The Yamane formulae was used because only an finite population of Misaka was used to carry out the research as not the entire population of Misaka was researched on but only population size for farmers of Misaka.

2.10 Data collection

Categories of identified respondents were interviewed using specific open ended and closed ended questionnaires. Face to face questionnaires were used in this study in that they are practical and helped cover all aspects of study thus this also helped the researcher to develop deep understanding of how people in Misaka took their collective realities concerning agrosilvicultural practice .Additionally, the questionnaires has the potential in reaching out to a large number of respondents within a short time, able to give the respondents adequate time to respond to the items, offers a sense of security (confidentiality) to the respondent and it is an objective method since there is no biasness resulting from the personal characteristics (Kothari, 2011). The interviews were audio taped with permission of the respondents and assuring them that the data was going to be used for research purpose. The recordings were transcribed verbatim and the results were also analysed accordingly. All data used in the tables werethe researcher own field data collected in 2019.

Table 1 shows data collected by gender

Table 1: Respondents by Gender

Gender	**Number of respondnents by gender**	**Percentage**
Female	8	15.0
Male	46	85.0
Total	54	100.0

As indicated in table 1 eighty five percent were males and fifteen percent were female. it is important to segregate respondents by gender so that the implementation of training programmes in agrosilvicultural practice would offer equal opportunities for both men and women without any discrimination

A period of time was spent to gain firsthand experience through direct observations in the field of the farmer. During the direct observation of participants comprehensive field notes were taken throughout the process coupled with broad questions to the farmers. The narratives and field notes and observations made by the researcher contributed to a complete analysis of the situation. An observation schedule was also used by the researcher to collect data to corroborate the information obtained from the other instruments.

Quantitative data were coded and analyzed by using the Statistical Packages for Social Science (SPSS) through the Descriptive Statistics (Bryman, & Cramer, 2009). However, qualitative data was analyzed according to their themes and were presented using texts.

3. RESULTS

The first part dealt with factors affecting farmer's decision to adopt agrosilvicultural in Misaka.

3.1 Factors affecting farmer's decision to adopt agrosilvicultural in Misaka

This section is a presentation of findings for responses related to the first research objective. The presentation is from semi structured questionnaires with small-scale farmers.

3.2 Education status

As shown in table 2 four percent of the respondents had never been to school, while eighty one percent had attained primary education, eleven percent attended secondary level of education and four percent had attained tertiary education.

Table 2: Education level attained by respondents

Education leve[	Number of respondents	Percentage
Non	2	4.0
Primary	44	81.0
Secondary	6	11.0
Tertiary	2	4.0
	54	Total 100.0

The level of respondents' education is important as it would help design training programmes that would cater for both literate and illiterate farmers in these new farming methods advocated.

3.3 Land Tenure

Table 3 indicates that twenty two percent own land for farming while seventy eight percent of the respondents rented land..

Table 3: Land tenure by respondents

Land tenure by respondents	Number of respondents	Percentage
Own land	12	22.0
Rent land	42	78..0
Total	54	100.0

Table 4: Area of land owned by respondents

Land area	Number ofrespondents	Percentage
Below 1 acre	16	30.0
1-3 acres	36	67.0
4-6 acres	2	3.0
Total	54	100.0

The table 4 indicates that thirty percent of the respondents own below 1 acre of land while sixty seven own between 1-3 acres of land. Only three percent own 4-6 acres of land in Misaka.

3.5 Small scale farmer's knowledge about agrosilvicultural practice.

As shown in table 5 fifty two percent of the respondents were not aware about the agrosilvicultural practices. Thus they had little information on agrosilvicultural practices. While thirty three percent of the respondents were aware. However,fifteen percent of the respondents were not sure.

Table 5*: knowledge of respondents on agrosilvicultural practice*.

Knowledge of respondents on agrosilvicultural practice	**Number of respondents**	**Percentage**
Aware	18	33.0
Not aware	28	52.0
Not sure	8	15.0
Total	54	100.0

3.6 Measures required for improving adoption of agrosilvicultural practices

Results on the measures required to improve the adoption of agrosilvicultural practices are presented in table 6. The majority of farmers (56%) suggested that harmonization of land tenure policy would, improve the adoption of agrosilvicultural practices. While seven percent of the respondents suggested that improvement of extension services would improve the adoption of agrosilvicultural practices, and thirteen percent suggested that formulation of policy, would improve the adoption of agrosilvicultural practices. Eleven percent indicated that introduction of improved tree species would improve the adoption of agrosilvicultural practices and nine percent suggested that enforcement of village by laws would improve the adoption of agrosilvicultural practices. Four percent had no suggestions on how to improve agrosilvicultural practices in their area.

Table 6: Measures to improve agrosilvicultural practices

Measures to improve agrosilvicultural practices	**Number of respondents**	**Percentage**
Improvement of extension services	4	7.0
Formulation of policy	7	13.0
Introduction of improved tree species	6	11..0
Enforcement of village by laws	5	9.0
Harmonization of land tenure policy	30	56.0
Not sure	2	4.0
Total	54	100.0

4. DISCUSSION

This section discusses the results presented in the previous section and compares with what other scholars have found in line with the specific objectives of the study.

4.1 Factors affecting farmer's decision to adopt agrosilvicultural in Misaka.

The results on factors influencing the adoption of Agrosilvicultural practice are discussedas follows:

4.1.1 Land tenure and adoption of agrosilvicultural practice

Land tenure has been a factor that affects adoption of agrosilvicultural practice. Almost all of the respondents accepted that they did not own a piece of land for farming but mostly rented land to farm. This implies that land ownership issues are likely to be a key in the choice of whether to adopt or not to adopt agrosilvicultural practices. It was evident that many of respondents rented land between 1- 3 acres. This result agree with what (Ajayi et al, 2003; Lassoie et al.,2009) who revealed that through his studies that farm size had a positive association with farmers' decisions to plant and even continue with having a desire to improve their farm yields. This implies that most of the respondents had substantially no enough land for practicing agriculture and agrosilvicultural at the same time. This was likely a discouragement towards adoption of agrosilvicultural practcies. The researcher sought to know about land rights, it was clear that majority of the respondents did not own land privately but rented to farm. This was an indicator that they had no exclusive rights over the land use as long as it was not within the owner's regulations. This was also an indicator that agrosilvicultural practices could not be adopted by the farmers due hindrances over land rights. These findings agree with studies which have shown that ownership of land title increases total factor production (TFP) in all models. For instance (Masangano & Miles, 2004; Otsuki, 2010) asserted that having secure land title promotes a farmer's investment in land improvement of which it's not the case for famers in Misaka community.

4.1.2 Gender and adoption of agrosilvicultural practices

Gender is a factor that determines adoption of agrosilvicultural practice. It was evident that there was more male than females. The study also sought to establish the involvement of women in agrosilvicultural practices. The gender of the respondents in this study had an influence on the implementation of programmes in agriculture that would offer equal opportunities for both men and women. As observed from the findings more men engaged in farming than women. This finding agrees with (Chirwa et al., 2003; Tsonkova et al.,2012) who also observed that there is a gender disparity in environmental training programmes between men and women in Zambia. Consequently, there is need to cater for both men and women in training programmes for agrosilvicultural without any discrimination especially that men are more knowledgeable and traditionally are more practical in general agriculture. Thus, gender aspects need to be taken into account when designing and delivering training programmes in agrosilvicultural. In the same line, Adesina et al., (2000) have added that

unacceptable exposure to pesticides in farming is related to lack of proper education in application and implementation of sustainable agriculture. This could have been caused due to partial training between men and women in such important agriculture national policies.

4.1.3 Education Background

With regards to the education status of the respondents majority had attained and acquired primary education, few did attend secondary level of education and the least had attained tertiary education and little had never attained school. The implication of the findings is that the respondents had limited understanding of agrosilvicultural practices and hence were in need of information and training in agrosilvicultural pratices required to make informed decisions on the farming systems that would sustain the environment. Ajayi & Catacutan (2012), supports this assertion that when educational levels are low, sustainability of the environment is often affected through implementation, decision making and quality of life. Thus, some form of lifelong education is an essential tool in achieving sustainability of the environment in agricultural production. This therefore, calls for the design of applicable training programmes to cater for both literate and illiterate small-scale farmers in farming systems of sustainable agriculture. The applicable type of training would give farmers a proper understanding of the effects of environmental degradation that could result from their choice of farming systems. In agreement to this view, (Ajayi & Kwesiga, (2003;Waldron et al.,2017) argues that environmentalists and educators become concerned about the need to do more than raise awareness about issues or provide learners' with fun experiences but more is needed to be done in developing a broad range of methodological processes.

4.1.4 Knowledge of agrosilvicultural practice

The results in table 5 show that most of the respondents are not aware of the benefits of planting both trees and crops in the same land. It is likely to be inferred that people who know the benefits can easily be able to adopt agrosilviculture. This can be inferred to mean that the benefits accrued to agrosilvicultural are not evident amongst the respondents and that could be the reason why they have not adopted agrosilviculture. Findings regarding the state of awareness about agrosilvicultural practice presented shows that the majority of the respondents were not aware about agrosilvicultural while the least of the respondents had ideas about agrosilvicultural and its benefits. This scenario implied that awareness programmes on agrosilvicultural practice are not conducted in the study area and actually an engagement of farmers in the practice is a dead end.

Ajayi et al (2003) note that small holder farmers should be empowered with the benefit of agroecology methods for sustainability of their production systems which could be implemented through improved training and extension services. Therefore, small scale farmers in Misaka need regular extension services in evaluating the effectiveness of the awareness programmes in changing attitudes towards agrosilvicultural practice. Perhaps the contributing factor to the poor attitude towards the practice amongst the farmers could have been lack of early childhood training in such farming approaches. In the same line, (Opio,2001; FAO 2013) acknowledges that despite continued success stories in many parts of the world, agrosilvicultural practice has still not entered into formal curricular and extension services remain poor.

4.2 Measures required for improving adoption of agrosilvicultural practices.

The following are the measures that could improve the adoption of agrosilvicultural practice in Misaka.

4.2.1 Improvement of extension services

Observation that improvement of extension services by 7.5 % of the community enhanced the adoption of the agrosilvicultural practices compares well with the findings of (Kabwe etal., 2016) that in order to improve the adoption of innovations significantly, it was necessary to hold extension studies constantly and intensively. The findings were also reported by (Thevathasan et al, 2012 & Reid, 2016). Most farmers indicated that agricultural extension played a big role in improving agroforestry practices. In this vein poor agricultural extension could result into low in adoption rate of agroforestry technologies.

4.2.2 Formulation of Policy on agroforestry practices

The observation that development of policies which advocate for Agroforestry could be the best measure to improve the adoption of agrosilvicultural practice in the Misaka as supported by the findings of (Sharma et al ,2016). For Agroforestry to be adopted there must be conducive policies and institutional framework at both local and national levels since policies provide rules and regulations by which individuals and groups in a society are expected to follow and adopt to address and reach a given goal (Kabwe et al., 2016). Harmonization of different natural resources policy is needed because AF practices incorporate trees on agricultural land to contribute to livelihood and environmental sustainability. All contradictions and conflicting interests in different sector policies need to be addressed.

4.2.3 Improvement of the tree species

As indicated by eleven percent of the farmers in Misaka improved tree species were not readily available to farmers but also most farmers needed tree species that have extra benefits. The findings agree well with the

findings reported by (Wilson & Lovell, et al.,2016) who reported that germplasm of tree species need to be developed and ready available to farmers. It also agrees with the findings of Thevathasan et al, (2012) that if Agroforestry practices have to be part of the farming systems tree germplasms need to be available either through seed nursery or seed markets. While the findings by Ajayi et al., (2006c) agrees well with the current findings that seedlings should be supplied to farmers to make them adopt agrosilvicultural practices.

4.2.4 Enforcement of village by laws and promotion of traditional rules

The observation that formulation and enforcement of village by-laws by 9 % of the community enhance adoption of agrosilvicultural practice in the area as shown in table 6 agrees well with the findings reported by (Ajayi, 2007; Valdivia etal., 2012). Although traditional rules are informal and neither documented nor enacted by a defined legal body, still the communities adhere to them for natural resources management. This implies that customary bodies provide a strong social structure for changes among the society. If legislative changes concerning property rights could engage customary forms, then there would be full motivation for communities to adopt other new innovations specifically agrosilvicultural practices .

4.2.5 Harmonization of land tenure policy

The current findings also observed that it was important to harmonize land tenure system as reported by 55.0% of the community in table 6. This probably implies that most farmers lack land ownership resulting in farmers not to adopting agrosilvicultural practice. This implied that possession of land was necessary for adoption of agroforestry by farmers. The findings by (Miller et al, 2017) support well the current findings. Use of land rights was the requirement for farmers to adopt better land use management because where property rights are missing, tree planting and management becomes limited. It was also well supported by (Otsuka et al, 2003) that more secure land rights policies was required to encourage farmers to adopt and manage land resources sustainably.

5. CONCLUSION

This study has revealed that the adoption of agrosilvicultural practices were influenced by gender, level of education, and farming experience. Furtherrmore, small-scale farmers of Misaka area are lacking agrosilvicultural skills because there has been so much concentration on conventional methods of farming. Farmers have been provided with trainings on conventional methods. This has also contributed to low adoption of agrosilvicultural practices in the area. Therefore, the findings of this study could help to guide research and extension efforts that can lead to higher adoption and impact rates of agrosilvicultural practices. Furthermore,

understanding factors that influence farmers' decisions to adopt improved fallows are crucial to ensuring that many scale-small farmers adopt improved fallows. Therefore, an assessment of factors influencing farmers' decisions to adopt improved fallows should be investigated.

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