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Involvement of selected arable crop farmers in agro-forestry practices in Ekiti state, Nigeria

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Abstract

This study assessed the involvement of selected arable crop farmers in agro-forestry in Ekiti State, Nigeria. Specifically, the study examined the social economic characteristics of the arable crops farmer in Ekiti State, Nigeria; described the different types of agroforestry practices; determined the level of involvement of the arable crops farmers in agroforestry practices and identified the constraints to involvement in agroforestry practices. Multi-stage sampling techniques were used to select 240 respondents. The analytical techniques involved descriptive and inferential statistics. The results showed that majority of the respondents were ducated (93.0%), married (59.2%), male (62.9%), Christians (72.9%) farmers with age bracket between 31 – 50 years old. Majority of the respondents had household (51.7%) size of 6-10 persons. The study also showed that respondents who cultivated less than 1 ha (49.6%), had no access to formal credit (84.2%), Majority (62.9%) of the farmers have low level of involvement in agroforestry practice. The correlation results confirmed that the respondent's Years of Experience (r= -0.204; P=0.001) and Extension contact (r= 0.232; P=0.000) have significant relationship with involvement in agroforestry practices at 5%, Chi-square analysis showed that, there was a positive and significant association between Years of experience ($\chi 2$= 10.702;P=0.013) at p< 0.05, also there was a positive and significant association between Land ownership ($\chi 2$=18.844; P=0.004) at p< 0.01. However, the major constraints to agroforestry practices in the study area based on the average mean score (2,50) were fire outbreak severity (mean=3.19), Non-availability of seeds/seedlings (mean=2.81), Time consuming (mean=2.65), Pest /rodents and diseases (mean=2.64), Land tenure system (mean=2.60), Long gestation period (mean=2.59). The study concluded that agroforestry is an alternative agricultural practices that has been adopted by some arable crops farmers for the provision of income and forest products in the study area. Based on the findings of this study, it was recommended that adequate measures to prevent and control fire outbreak should be put in places, Extension agents should intensify effort to disseminate adequate skills, required knowledge and timely information on agroforestry practices. Above all, there is need for proper documentation on agroforestry practices which would help the policy makers to make wise decision on appropriate management practices that can intensify agroforestry technology in the study area.

Keywords: Involvement, Arable crops, Farmers, Production, Agroforestry, Practices.

1. Introduction

Despite the country's rapid urbanization, Seventy percent of Nigeria's population still lives in rural areas, and the majority of these people rely on forest products and natural resources for their survival (Liverpool-Tasie et al., 2015, Johnsom et al.,2018). Consequently, Agriculture remains a vital part of the Nigerian economy, as it provides both jobs and food for the country's rapidly expanding population FAO (2021). However, the sector's importance has

resulted in the widespread environmental damage and alarmingly high rates of deforestation (Izuchukwu, 2011; Nigerian National Bureau of Statistics, 2016). In Nigeria, about 350,000 hectares of land are lost due to deforestation and the small-scale farmers are affected by these scenarios, though they also contributed to the degradation through sustainable agricultural practices, yet they are partly to blame because of their commitment to environmentally friendly farming methods (FAO 2020). However, the small-scale arable crop farmers who make up the bulk of Nigeria's agricultural contributors are the country's best chance of attaining sustainable agriculture (Sabo et al., 2017). Based on the current agricultural challenges in Nigeria, it is possible that farming alone won't be enough to end rural poverty. This shows the significance of the agroforestry in the pursuit of the Sustainable Development Goals (Odoh & Nwibo, 2019).

Agroforestry practices have been supported in several locations across the globe to diversify agricultural production and improve ecological benefits of farm systems, Sabastian, *et al., (*2019). Agroforestry has been defined in various manners by different researchers. Leakey RRB. (2022). adopted the International Centre for Research in Agroforestry (ICRAF) current definition of agroforestry which describe agroforestry as a collective name for land-use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land-management unit. The integration can be either in a spatial mixture or in a temporal sequence. The most well-known agroforestry frameworks are: Agrisilvicultural which is the mixture of crops and trees, for example, alley cropping or home garden. Silvopastoral systems consolidate forestry service and grazing of domesticated animals or pastures and Agrosylvopastoral, comprises the combination of the three components, in particular trees, animals and crops, can be integrated, (Atangana *et al.*,2014)

Agro forestry is progressively advanced for reestablishing forest, degraded environment, diminishing greenhouse gases, and increasing other co-benefits, Shukla et al (2021). Richard, *et al.*,(2009); FAO. (2017) additionally pointed out agro-forestry as an economic improvement programs, which includes: Biodiversity conservation, environmental (watershed) Protection, and Climate change moderation and adjustment. The maintenance of trees in farming systems has been perceived to build crop yield in the semi-arid region Amadi, *et al*., (2013). Ajake (2012) likewise perceived the capacity of forest trees in term of income generation, great Medicare, employment generation, raw materials, and arrangement of food among others. As discovered by Maren and Carolyn (2011), agroforestry improved the socioeconomics livelihood of rural farmer by improving income acquiring possibilities, provision of nourishment and healthful security as well as arrangement of fuel wood, fodder for animal consumption and employment, because of its potential to improve agricultural land use, provide lasting benefits, and mitigate unfavourable ecological impacts on local and global scales, agro-forestry practices are increasingly advocated as potential remedies.

Zerihun *et al.,* (2014) also see agroforestry as an innovation created to improve profitability and livelihoods of rural farmers. From the apparent advantage of agroforestry practices, its potential to elevate the financial states of the arable crop farmers has been recognized. Since agroforestry is seen as a viable option for incorporating both indigenous and exotic trees species into West African cropping systems and assessing their impact on the productivity of smallholder farmers (Georges et al., 2018). Despite the value of Agroforestry, tropical forests are losing species and having their habitats altered at a faster rate than any other ecosystem in history (Smith and Jeremy, 2022). At the turn of the 19th century, it was widely believed that people had a little influence on the natural world; as a result, sophisticated ecosystems supporting a wide variety of plant and animal life had evolved with little human interference (FAO, 2016). Tomma et al., (2021). given that global warming is now widely acknowledged as a crucial concern of the 21st century and threatens our survival, it is clear that we must take action. The average worldwide temperature rise and the accompanying global climate change are attributable to the increased emissions of greenhouse gases caused by human sources. Therefore Tomma *et al.,* (2021). proposed that agroforestry has immense potential in mitigating climate change concerns by lessening global warming since vegetation assimilates the CO_2 gas in the process of photosynthesis which is one of the main contributors to greenhouse gases.

Therefore, the study assessed involvement of agroforestry practices among arable crop farmers in Ekiti State, Nigeria. The objectives of the study were to describe the socio-economic characteristics of the arable crop farmers, identify the different types of agro-forestry system practices by them, determine the level of involvement of the arable crop farmers in agroforestry practices, and identify the constraints to involvement in agroforestry practices by respondent in the study area.

2.0 Material and methods

2.1 Study Area

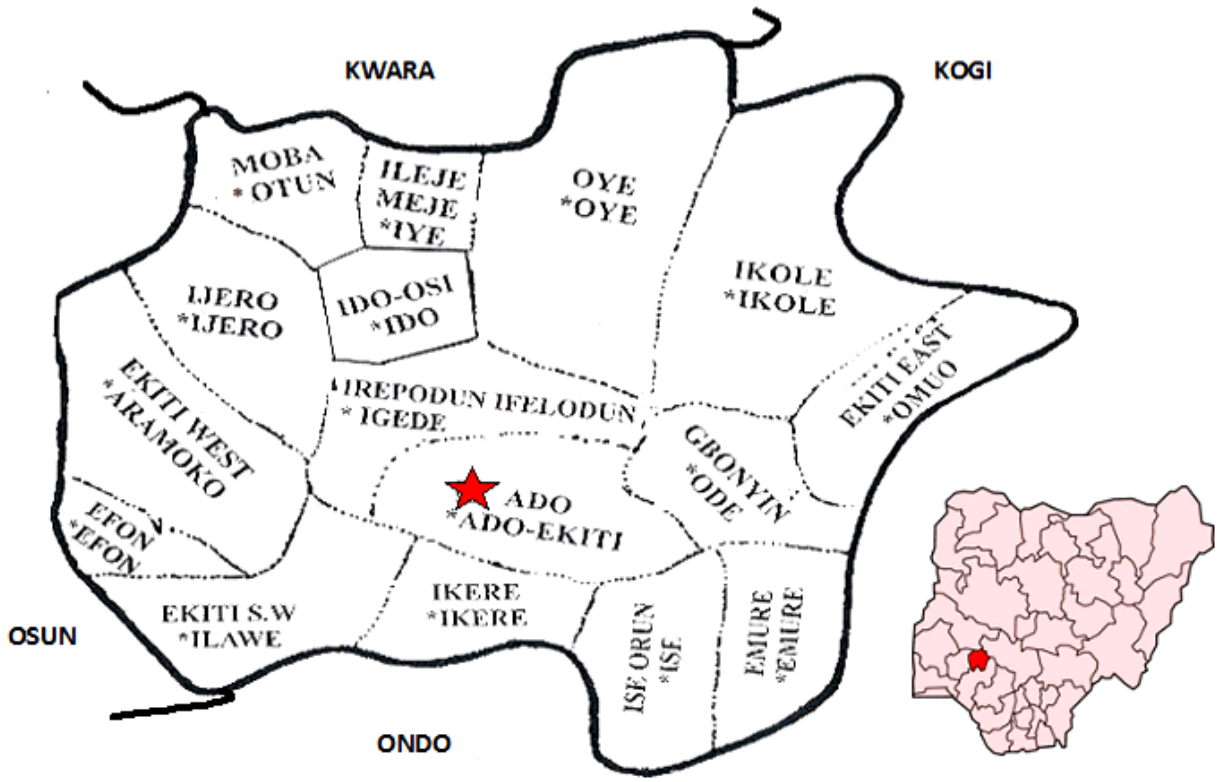


Fig. 1: Map of Ekiti State, Nigeria

The study was carried out in Ekiti State, Nigeria. The state consists of 16 Local government areas. The state is located between longitudes 4° 45° and 5° 45° East of the Greenwich meridian and latitudes 7° 15° and 8° 15° North of the equator. Ekiti State is bounded on the North by Kwara State; South by Ondo State; West by Osun State and on the East by Kogi State. The state has two climatic marked major seasons: the rainy season which lasts between April to October, and the dry season lasting from November to March. The prevailing temperature in the state ranges between 21°C to 28°C with high humidity.

Topical forest exists in the south, while savannah occupies the northern peripheries.Topographically, the state is mainly an upland area, rising over 250 meters above sea level, It lies on an undulating metamorphic rock. (Ekiti State Government, 2008). The 2006 population census by the National population census put the population of Ekiti State at 2,384,212 people.(NPC, 2006). Ekiti state is typically an agrarian state with majority of her inhabitants engaging in farming, providing income and employment for more than 75 % of the population. Moreover, the land is buoyant in agricultural resources with cocoa as its leading cash crop.

Food crops such as yam, cassava and also grains like rice and maize are grown in large quantities.The land is also known for its forest resources, notably timber because of the favourable climatic conditions. Other notable crops such as kola nut and varieties of fruits and timber trees are also cultivated in commercialize quantities. (Ekiti State Ministry of Agriculture and Food Security 2019).

2.1.1 Sampling Procedure and Sampling size

The study employed the multi-stage and proportionate sampling procedure in the selection of respondents. The first stage is the purposive selection of four (4) Local Government Area from the Agriculture Development Programme Zones in the State. The second stage involves a random selection of three villages from each of the Local

Government Areas to make twelve (12) villages. The third stage involves a random and proportional selection of arable crops farmers from each of the villages using the ADP registered farmers record to make 240 respondents.

2.1.1.1 Data Analysis

The study employed Descriptive Statistics such as frequencies and percentages were used to analyze the socio-economic characteristics of the respondents while Chi square Model was used to detect relationship where demographic variables were assessed at the nominal level on the choice of agroforestry practices adopted by the farmers.

The Chi square (x^2) model

$$x^2 = \sum \frac{(Fo - Fe)^2}{F_e} \qquad (1)$$

Where :
x^2 = Chi – square
Σ = Summation
Fo= Observed frequencies of demographic characteristics and
Fe = Expected frequencies of the demographic characteristics.

3.0 Results and Discussions1

3.1 Socioeconomic Characteristics of Respondents

From the table below, it is shown that 14.6% of the respondents are within 21-30 years, while (35.8%) of the respondents are between the age of 31-40 years, about 27.1% of the respondents are between 41-50 years of age, 15.0% of the respondents had age grade of 51-60 years and the retirement age of 60 years above had a percentage of 7.5%,. The average age of the respondents is 46 years. According to Asiabaka, (2020), people in this age bracket are active and they can motivate, innovate an adaptive agricultural innovations. Also, it is indicated that the majority (62.9%) of the respondents were male while the remaining (37.1%) were female. implies that farming in the study area was dominated by men. The male dominancy is expected in agriculture due to great energy demand of farming activities and high level of unemployment, this aligned with the work of Akinwalere , 2017 and Asadu*et al.*,2018. The majority of respondents (59.2%) were married, the singles were 27.1%, while divorced and widowed were 6.7% and 7.1% respectively. This suggests that farmers in the study area are majorly married men and women. Also from the result respondents are responsible for household welfare and needs, due to more obligations acquired through marriage, hence they tend to involved in various non-farm activities such as agroforestry, aside from crops farming (Okolo, Omoregbee & Alufohai, 2018; Sichone & Kwenye, 2018).

As shown in Table 1, majority (93.0%) of the respondents had formal education, while 6.70% of them had no formal education. Out of those that had formal education, 10% went for adult education, 7.5% of them attended primary school, and 52.5% attended secondary school, while 23% had acquired a certain form of tertiary education certificate. This implies that majority of the respondents were literate. The ability of the majority of the farmers to read is expected to have positive influence on them adopting agroforestry practice, (USAID 2010). Table 1 shows that (51.7%) of the respondents had household size of 6-10 persons, 30.80% lived in households with 1-5 person, 14.20% lived in households with 11-15 person, and 3.30 % lived in households with 16 people or more. According to surveys, there are 6.5 people per family on average (about 6 persons).. The results is consistent with those of Adepoju and Obayelu (2013), A larger household size suggests a higher demand for goods and services. This implies that more people will be involved in agroforestry in the study area also majority (52.50%) of the respondents had farming as their primary occupation, while 67.10% had farming as their secondary occupation, others occupations such as civil servants, trading and artisans were reported to be 3.30%, 20.40% and 9.20% respectively. This finding suggests that majority of the sampled respondents practice agroforestry.

As shown in Table 1, (27.1%) of the farmers had 1-10 years experience, 48.8% had 11-20 years, and 16.3% had 21-30 years of farming experience while the average farming experience was about 14 years. Farming involves a lot of risks and uncertainties, therefore to be competent enough to handle all the vagaries of agriculture, farmers must have practice farming for quite some time (Ogundele and Okoruwa, 2006). The majority (49.6%) of the respondents cultivated less than 1 ha, 41.70% had farm sizes ranging from 1-3 ha, and 8.80% of the respondents cultivated 3-4 ha of land. The mean farm size of the respondents was 1.5 ha. Akinwalere ,(2017), reported a mean farm size of 2.7 hectares for farmers in Southwest, Nigeria, which is an indication that majority of the farmers are small – scale farmers.

Table 1 shows that, most (38.8%) of the respondents depends on hired labour for farm operations, followed by self labour with 29.6%, while 28.3% and 3.3% were using family and community labour respectively. The study indicated that farmers who utilized their family labour were few. This affirmed the study of (FAO 2019), who mentioned that farmers whose main source of income is agriculture might be discouraged from allocating family labour for agroforestry activities. Also majority (62.5%) of the respondents were land owners basd on inheritance (35.0%), purchased (22.5%) and gift (5.0%) respectively, that is they own the plots of land, while 24.6% rented their lands, 6.7% were on lease,3.3% cultivate on community land and 2.9% depends on Government land. This implies that respondents in the study area are land secured. This conclusion corroborated with the results of Amusa and Simonyan (2018), Odoh et al. (2020).

Table 1 : Frequency distribution of the respondents according to their Socio-Economic characteristics

Socio – Economic Variables	Frequency (n=240)	Percentage (%)
Age (years)		
21-30	35.0	14.6
31-40	86.0	35.8
41-50	65.0	27.1
51-60	36.0	15.0
>60	18.0	7.50
Gender		
Male	151	62.9
Female	89.0	37.1
Marital Status		
Single	65.0	27.1
Married	142	59.2
Divorced	16.0	6.70
Widowed	17.0	7.10
Educational Qualifications		
No formal Education	16 .0	6.70
Adult literacy	24.0	10.0
Primary Education	18.0	7.50
Secondary Education	126	52.5
` Tertiary Education	56.0	23,0
Household size		
1-5	124	51.7
6-10	74.0	30.8
11-15	34.0	14.2
>16	8.00	3.30
Primary Occupation		
Farming	126	52.5
Civil Servant	82.0	34.2
Trading	31.0	12.9
Artisan	0.01	0.40
Cooperative Association		
Yes	144	60.0
No	96.0	40.0
Years of Farming Experience		
1 – 10	65.0	27.1
11 – 20	117	48.8
21 – 30	39.0	16.3
≥ 31	19.0	7.90
Farm Size		
<1 Ha	119	49.6
1 - 2.99 Ha	100	41.7
3 - 4.99 ha	21.0	8.80
Labour Type		

Self	71.0	29.6
Family	68.0	28.3
Hired	93.0	38.8
Communal	8.00	3.30
Source of Land		
Purchased	4.00	22.5
Rented	59.0	24.6
Leased	16.0	6.70
Inherited	84.0	35.0
Communal	8.00	3.30
Government	7.00	2.90
Gifted	12.0	5.00

3.2 Types of Agroforestry practices

The prevalence of agroforestry methods in the research region was mapped out in tables below. The findings revealed that almost all respondents engaged in agroforestry. Homestead gardens with animals (73.3%), Taungya farming (64.6%), retaining economic trees on farmlands (60.8%), shifting cultivation/improving bush fallow (60.4%), fuel wood production (57.1%), shelterbelts/wind breaks (54.2%), alley cropping (50.4%), and life fencing (50%), and sericulture (Silkworm farming) (20%) were the most common improved agroforestry practices. Some farmers in the vicinity seemed to be growing cash crops and/or orchards, based on my observations from the field. The customary habit of keeping productive trees on one's land also exists.

Table 2 : Types of Agroforestry practices in the study area

Types of Agroforestry practices	No (%)	Yes (%)
Home gardening involving animals	26.7	73.3
Taungya farming	35.4	64.6
Home stead gardens	36.7	63.3
Retaining trees on farmlands	39.2	60.8
Shifting cultivation/ Improve bush fallow	39.6	60.4
Fuel wood production	42.9	57.1
Shelterbelts/wind break	45.8	54.2
Alley cropping	49.6	50.4
Life fencing	49.6	50.4
Apiculture (Bee keeping)	51.7	48.3
Integrated Taungya	55.4	44.6
Aquaforestry	65.0	35.0
Protein bank /Biomass transfer	67.5	32.5
Trees in social conservation (parkland)	68.7	31.3
Sericulture (cultivation of silkworm)	80.0	20.0

3.3 Involvement in Agroforestry Practice by the Farmers in the Study Area

According to the average value in the table 3, Farmers in the study area were most likely to engage in agroforestry practices like tree retention (3.11%), alley cropping (2.89%), integrated taungya (2.73%), fuel wood production (2.68%), taungya farming (2.55%), and home stead gardens (2.52%), while respondents seldom engage in apiculture (1.46%), aquaforestry (1.32%), and sericulture (1.28%) in the study area.

3.4 Aggregate Level of Involvement in Agroforestry Practice by the Farmers in the Study Area

The result in table 4 showed that 37.1% of respondents were highly involved in agroforestry practice, while the majority 62.9% affirmed that they have low level of involvement in agroforestry practice. This means a lower percentage of farmers were involved in the practice of agroforestry in the study area. The result revealed that the farmers may probably be aware of the potentials of agroforestry practices in increasing productivity per unit area. According to Akinbile et al. (2017), Consequently, it is crucial that farmers be actively involved in agroforestry techniques, since their degree of participation is a key factor in the success of agricultural production.

Table 3 : Involvement in Agroforestry Practice by the Farmers in the Study Area

Agroforestry Practices	NI(1)	SI (2)	MI (3)	HI (4)	Mean scores
Retaining trees on farmlands	12.5	12.1	27.1	48.3	3.11
Alley cropping	15.4	21.7	21.7	41.3	2.89
Integrated Taungya	14.2	24.2	36.7	25.0	2.73
Fuel wood production	20.4	24.2	22.9	32.5	2.68
Taungya farming	31.7	17.5	15.4	35.4	2.55
Home stead gardens	22.1	29.2	23.8	25.0	2.52
Home gardening involving animals	25.0	25.0	25.8	24.2	2.49
Shifting cultivation/ Improve bush fallow	28.8	20.4	24.6	26.3	2.48
Shelterbelts/wind breaks	22.5	32.9	22.1	22.5	2.45
Life fencing	25.4	26.7	27.1	20.8	2.43
Protein bank /Biomass transfer	27.5	28.3	25.4	18.8	2.35
Apiculture (bee keeping)	71.7	13.8	11.3	3.30	1.46
Trees in social conservation (parkland)	71.3	21.7	3.80	3.30	1.39
Aquaforestry	81.3	7.90	4.60	6.30	1.36
Sericulture (cultivation of silkworm)	81.3	12.9	2.90	2.90	1.28

Mean score = 2.50

Table 4 : Aggregate Level of Involvement in Agroforestry Practice by the Farmers in the Study Area

Statement	Low	High
Agroforestry involvement	151{62.9)	89{37.1}

3.5 Test of Hypothesis

3.5.1 Results of Chi-square analysis showing the association of some selected socio-economic

Table below shown the results of a chi-square test, which found a statistically significant relationship between years of experience (x^2 = 10.702; P= 0.013) and involvement in agroforestry practices in the study area. In this regard, this means that the more the experience, the higher the chance of involvement in agroforestry practices in the study area. Similarly, there was a significant relationship between respondents land ownership (x^2= 18.844, p= 0.004), this means that the larger the Land owns by the farmers, the higher the chance of involvement in agroforestry practices in the study area. The implication of the result means that the null hypothesis was ejected since some of the socio-economic characteristics of the respondents are related to involvement in agroforestry practices in the study area. This finding aligns with the study of Obinna (2014), Ovwigho (2014), Tafesse et al. (2020), Okolo, Omoregbee, and Alufohai (2018), and others, who found that farmers with greater experience and access to larger plots of land were more likely to engage in agroforestry.

Table 5 : Chi-square analysis showing the association of some selected socio-economic characteristics of the respondents and involvement in Agroforestry in the study area.

Variables	x^2	df	P-value	Decision
Sex	0.076	1	0.783	NS
Marital Status	7.162	3	0.067	NS
Education	4.349	4	0.361	NS
Year of experience	10.702**	3	0.013	S
Land ownership	18.844***	6	0.004	S

*** Significant at 1%, **Significant at 5%.

3.6 Constraints to involvement of arable crop farmers in agroforestry practices

From the table below, the major constraints to agroforestry practices in the study area are fire outbreak (mean=3.19), Non-availability of seeds/seedlings (mean=2.81), Poor extension service (mean=2.67). The above results corroborate the report of Ibrahim *et al* (2018) in assessment of Agroforestry practices in Kaiama Local Government Area of Kwara State. Time consuming (mean=2.65), came fourth in the ranking of constrains influencing the involvement of agroforestry practices in the study area Pest /rodents and diseases (mean=2.64), Land tenure system (mean=2.60),This affirmed the study of Shuaibu*et al.*, (2018), which found that inadequate extension training, inadequate infrastructure, lack of access to market, poor access to credit and inadequate finance were serious constraints to involvement in non-farm activities, other constraint include Labour intensive/(mean=2.55), Lack of

technical know-how (mean=2.54), farmers claimed not to understand the technicalities involved in agroforestry practices, this could result to poor yield, low quality / market value and poor return to households (Mabel, 2015).

This study aligned with the study of Amusa T.A. and Simonyan J.B. (2018), that identified inadequate extension service, poor technical know – how, low income, high capital-intensive nature of agroforestry, land tenure system insufficient knowledge about source of credit and high cost of inputs required for tree planting as challenges influencing farmers willingness to engaged in agroforestry practices in Southwest, Nigeria. The ranking according to the mean score (2.50). values equal to and above the mean was tagged "constrained" and "not constrained" if below the mean values, this is an indication that majority of the farmers have many constraints hindering their involvement in agroforestry practices.

Table 5 : Constraints to involvement of arable crop farmers in agroforestry practices.

Items	NS	SS	MS	HS	Mean Score	Rank
Fire outbreak	51.3	29.2	7.1	12.5	3.19	I
Non-availability of seeds/seedlings	27.5	39.2	20.0	13.3	2.81	2
Poor extension service	17.1	44.6	26.3	12.1	2.67	3
Pest /rodents and diseases	22.1	34.6	28.3	15.0	2.64	4
Time consuming	23.3	33.3	28.3	15.0	2.65	5
Land tenure system	25.4	23.8	35.8	15.0	2.60	6
Long gestation period	21.3	32.9	29.6	16.3	2.59	7
Not properly understood because of its technicality	30.0	18.3	31.7	20.0	2.58	8
Lack of incentives	21.3	34.2	22.9	20.7	2.55	9
Labour intensive	23.3	24.6	36.3	15.8	2.55	9
Lack of technical know-how	22.9	28.3	28.8	20.0	2.54	11
Expensive to practice	19.2	27.5	35.8	17.5	2.48	12
Can not be practice on small piece of land	21.3	27.9	28.8	22.1	2.48	12
Hinders the use of modern farm technology	18.3	29.2	35.0	17.5	2.48	12
Small land holding	18.8	26.3	36.7	18.3	2,45	15
Tree casting shadow on crops	18.3	25.0	36.3	20.4	2.41	16
Unfavourable weather condition	20.0	22.5	30.0	27.5	2.35	17
Not meant for low income farmers	18.3	26.3	26.3	29.2	2.34	18
Not profitable	19.2	19.2	27.9	33.8	2.24	19

Mean = 2.50

4.0 Conclusions

The results of this study revealed that arable crop farmers in the study area were aware of agroforestry practices mostly through extension agents. It was also found that agroforestry is an alternative agricultural practices that has been adopted by some arable crops farmers for the provision of income and forest products. Woody perennials like tress, shrubs, palms, hedges etc retained on the farm lands grew to become wild plants most times,. With the benefits of agroforestry farmers in the study area perceived agroforestry practice to be favourable, but their level of involvement was low due to some certain constraints facing them.

5.0 Recommendations

Efforts should be made by farmers to prevent fire outbreak on the farm. Agroforestry innovations, inputs including exotic species, enhanced tree seeding, and nursery stock should be supported at cheap/subsidized costs. Education of farmers should be prioritized since their level of education determines the rate of involvement in agroforestry practices. Also, land ownership has the potential to influence farmers' decision on agroforestry tree planting. So, stakeholders should consider making promulgations on land tenure systems that give farmers sense of belongings on lands and this will make the farmers more willing to involve in agroforestry practices.

Above all, there is need for proper documentation on agroforestry practices which would help the policy makers to formulate strategies and make wise decision on appropriate management practices that can intensify agroforestry technology.

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