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Attitude, Adoption and Economic Potentials of Agroforestry in Kilosa District, Tanzania

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***Abstract* – The paper aimed at describing the existing agroforestry systems and technologies, examining the level of attitudes towards agroforestry, identifying socio-economic factors influencing agroforestry adoption and estimating costs and benefits of agroforestry in Kilosa District. Information and data on agroforestry was obtained by interviewing a random sample of 120 households based upon questionnaire. Results revealed that agroforestry systems practiced were agrosilvopastoral and agrosilvicultural arranged in mixed intercropping, boundary planting and homegardens. A substantial number of respondents had a positive attitude towards commercialization (90%), land resource conservation (89%) and attitude towards land productivity (82%). Farm labour force, farm size, attitude towards land productivity, commercialization and attitude towards land resource conservation significantly influenced adoption of agroforestry at P < 0.05. The selected agroforestry systems had positive Net Present Value per hectare and Benefit Cost Ratio was greater than one at discount rate of 10% meaning that the systems were economically viable. Internal Rate of Return was higher than the World Bank's rate of 10% indicating the worth of investing in agroforestry. It is recommended that, the government and development agencies should provide education and training to farmers who are ignorant of the benefits of engaging in agroforestry farming. Further, agroforestry disseminators should improve the benefits of agroforestry practice since high attitude towards agroforestry were due to the respondents' perception that investment in agroforestry was associated with more benefits than costs. Increasing the efficiency of agroforestry through technology development, improving marketing systems and credits will improve the economic benefits from agroforestry.**

***Keywords* – Agroforestry, Attitude, Socio-economic Factors, CBA.**

I. INTRODUCTION

Throughout the world, natural resources degradation including rapid land deterioration is among the most critical challenge facing the world and indeed, the developing world today. There is decreasing agricultural productivity as a result of increasing land degradation, reduced ability of forest resources to provide goods and services due to deforestation and forest degradation (Gama *et al.*, 2013). One way that appears suitable for providing a solution to the adverse effect of deforestation is the adoption of agroforestry as an approach to sustainable land use system. Agroforestry is a suitable farming system that imitates the structure and processes of natural forest vegetation. Such systems have high potential to increase the productivity of farming systems and sustain continuous crop production (Kalabisova and Kristkova, 2010).Tanzania is one of the countries facing the problem of increasing pressure on limited land resources especially in the rural areas. Land degradation through poor agricultural practices has greatly impacted negatively on the forest resources threatening their extinction (Gama *et al.*, 2013). Subsistence farmers in these areas practice traditional bush clearing and burning bush at short intervals to grow annual food crops. The problem of population growth coupled with economic pressure has resulted in a high rate of deforestation of the country's natural forests. Deforestation has also been on the increase due to the increasing demand for fuelwood, tree fodder, timber, poles and agricultural land. Therefore, deforestation has worsened the demand-supply situation of fuelwood, building materials and a highly demanded tropical timber (Senkondo, 2000). With the depletion of natural forests and increasing pressures on the forest reserves, research in agroforestry as a land use system is still important to reduce land degradation so as to guarantee the future of the existing forest reserves (Buake, 2005). Consideration of agroforestry practices has been advocated to alleviate these problems (Senkondo, 2000) and is one of the options for reversing the prevalent land degradation thereby conserving the natural forest (Irshad*et al.*, 2011). The practice of agroforestry in Tanzania is widely spread, and its acceptability in terms of attitude, adoption of agroforestry systems and technologies have been well demonstrated in the country and in different regions of the world (Senkondo, 2000; Neupane*et al.*, 2002; Simon *et al.*, 2011; Ajayi, 2007; Gao, 2012). These studies have revealed that, the potentials for optimal domestication of suitable tree species for use in agroforestry system depend on the attitude and perceived benefits by local users. However, this information and systematic feedback regarding farmers' attitude and adoption of the agroforestry is relatively insufficient in the context of Kilosa District. Therefore, this brings the need to unveil on why some farmers adopt agroforestry and others do not, to see the extent of adoption and the influencing socio-economic factors.

In developing agroforestry systems farmers tend to focus on the relative input and output prices of crops and trees (Cacho and Hean, 2004) with the aim of economic gain or benefits (Wijayanto, 2011). Since agroforestry components on farms are associated with costs and benefits values of which information is limited hence, estimation of costs and benefits is vital to provide information in terms of values perceived by farmers as a result of running agroforestry practices taking into consideration farmers expected benefits. Further, this study provide baseline information which will have potential value in the design of appropriate financial incentives for promoting the wider cultivation of mostly preferred suitable trees species in Kilosa District and other similar areas. In addition, these findings can help to

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improve uptake of agroforestry technologies and in turn also improve farmer livelihoods. It is also hoped that these findings provide better understanding of household's economy in relation to agroforestry production cycle and thus contribute to the process of agroforestry implementation.

II. METHODOLOGY

2.1 *Description of the Study Area*

This study was conducted in four villages namely Kitete, Magomeni, Nyameni and Peapea in Kilosa District(Fig. 1). The four villages were randomly selected out of the eight villages under the EPINAV project on "Lesser Known and Lesser Utilized Indigenous Agroforestry Timber Tree species" which is implemented in Kilosa District. The sampling frame was based on a village register book and respondents were selected randomly using random numbers.

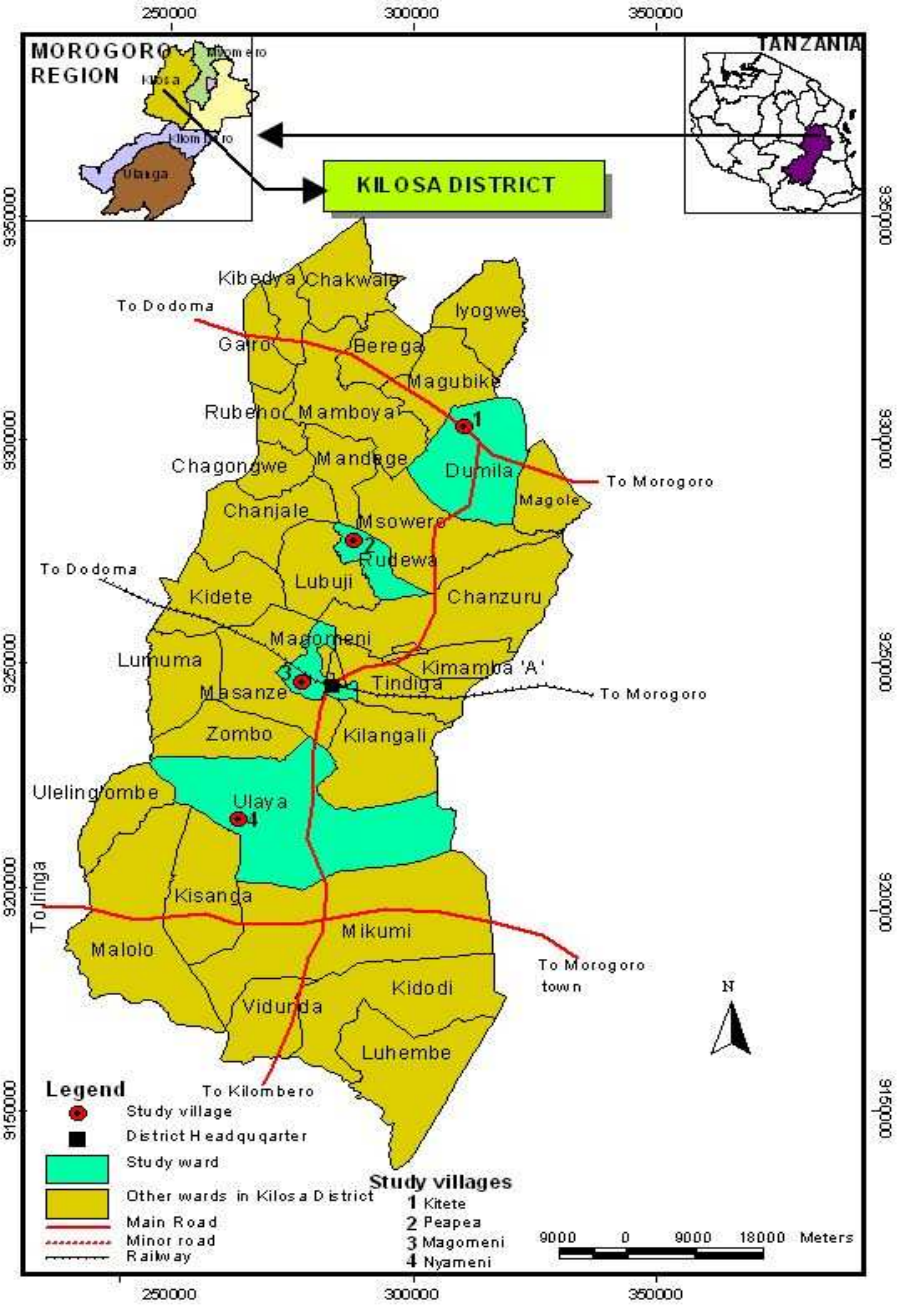

Fig. 1. Kilosa District Map showing surveyed villages
Source: SUA GIS laboratory 2013

2.2 *Data Collection*

Primary data were collected by using structured questionnaire. The questionnaire was designed to collect data on farming systems including agroforestry systems and technologiesand socio-economic factors influencing adoption of agroforestry. Further information on the costs and benefits accrued from agroforestry practices as well as the attitude towards the practices was inquired.One hundred and twenty respondents were interviewed in all four villages. Key informants and participant's observation were also employed. Secondary data were collected to supplement primary data.

2.3 *Data Analysis*

Statistical Package for Social Science (SPSS) based on descriptive statistics was used to analyse the data obtained aiming at describing agroforestry systems and technologies practiced.Thenthe data were presented in the form of tables. Logit regression model was used in characterizing agroforestry adoption by the sample households.Factor analysis was utilized as a method of items (statements) analysis for attitudinal index in order to identify the appropriate items that determine attitude towards agroforestry practice.Cost-Benefit Analysis (CBA) was applied to estimatethe costs and benefits accrued from agroforestry practices.

2.3 *Examining the Level of Attitudes of Local Community Towards Agroforestry Practices*

Three indices were developed namely the attitude towards Land Productivity, Land Resource Conservation and Attitude towards Commercialization. In this study thirty seven statements were constructed, and then clustered into the above attitudinal variables. The respondents were asked to rank the statements based on their opinion on the extent to which they can favour or disfavourthe above attitudinal variables as a result of practicing agroforestry. Answers from those statements were entered into factor analysis to determine the most important factors among the sets of statements determining each index variable. In factor analysis, Principal Components Analysis (PCA), a default method for factor extraction in SPSS/PC + was used as a method of factor extraction. Selection of the items/variables was based on the Eigen value of the extracted factor. Items falling under the factor with the highest Eigen Value (normally >1.0) was selected to give the score for the attitudinal concept/latent variable depending on the relative factor loading of the items. The higher the factor loading the more that item contributes to the total score of that factor. Factor loading of statements of at least 0.3 were considered to be significant factors determining the index variables and therefore selected (Tabachnick and Fidell, 2007; Simon *et al.,* 2011). The selected statements were then used to calculate the index variables and therefore these indices were included in the logistic regression analysis.

2.4 *Determining Socio-economic Factors Influencing Adoption of Agroforestry*

Adoption of agroforestry practice has been defined as a binomial variable taking the value of one in case a farmer has adopted agroforestry and zero when otherwise. In this study a farmer was considered as an adopter when he or she has included at least a single tree on the farm and non-adopter when he or she has not included a tree on farm. The logistic model was applied to the data in characterizing agroforestry adoption using the Logistic Regression command in SPSS version 16. The model was expressed as follows;

$$\text{Log}\,[Pi/1- Pi] = \beta_o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \ldots, + \beta_kX_k + e_i$$

Where: i = 1, 2…k = are the observation, β_o = Intercept, β = Regression parameter to be estimated, $X_1, X_2, X_3, \ldots, X_k$ = predictor variables, Pi = The probability of observing a specific outcome of the dependent variable and e = Random error term.In this study, Adoption of agroforestry was the dependent variable. The predictor variableswere; sex and education level (dummy variables taking value of 0 and 1) and the following variableswere entered in the model as continuous variables ; Age (in years), farm labour force, farm size and household size (in number), attitude towards commercialization, attitude towards land resource conservation and attitude towards land productivity (measured as an index). The explanatory power of the models was based on the value of the coefficient of determination of Cox and Snell R^2 and Negelkerke R^2.

2.5 *Estimating the Costs and Benefits Accrued from Agroforestry Practices*

Costs were categorized into two components, common costs and direct costs. Common costs were those which were applicable to the whole range of the components in the mixture. These were labour cost for land preparation and weeding. Weeding was an annual event which occurs in the second year onwards. Due to high weed growth, it was carried out twice a year. Direct costs are those which are specific for each component, for example planting, pruning and tending, harvesting, marketing, pesticides and seedling costs. Another classification of cost was done in livestock enterprise which distinguished between investment and operating costs. Investment costs were barn construction, initial costs of livestock and milk utensils. Operating costs were labour, veterinary drugs and annual maintenance of the barn. Costs and benefits were valued using constant 2012 prices which were believed to reflect the opportunity cost.

This study disregarded the use of minimum wage and took into account the opportunity costs of labour. The cost of hired labour in the study area varies with seasons and between the four villages surveyed. For example during slack season the cost is low. An average value Tshs 4500 per day was considered as the opportunity cost of labour in Magomeni, Peapea and Kitete villages whereas 3000 Tshs was used in Nyameni village.Labour input was obtained by converting number of days devoted for agroforestry activities in monetary terms using the opportunity costs of labour per manday then, multiplied by the total time (days) invested in agroforestry activities multiplied by number of people (Days X opportunity costs of labour X number of people). Benefits were taken as the value of production of the various components for 20 years. CBA was then done using the costs and benefits obtained. Intangible costs and benefits such as improved soil fertility and reduction of

soil erosion among others were reflected in crops yield and tree growth by using a system approach.

III. Results and Discussion

3.1 *Agroforestry Practices in the Study Area*

The survey results showed that, on average about 87.5% of the respondents practice agroforestry while 12.5% do not practice agroforestry (Table 1). Therefore, agroforestry practice was not new in the study area which might be due to various sources of information that contributed to the practice of agroforestry.

3.1.1 *Agroforestry Systems in the Study Area*

Agroforestry can also be classified on the basis of how the various agroforestry components are arranged on the resources management unit (agroforestry technologies). The arrangements of biotic components in the surveyed villages were mixed intercropping, boundary planting and homegardens or a mixture of both as shown in table 3. On average mixed intercropping arrangement was more common compared to other technologies (33.3%) in both villages as shown in Table 3

3.1.2 *Agroforestry Technologies in the Study Area*

The study identified two types of agroforestry systems based on the components in the four villages surveyed. These were agrosilvicultural system (woody perennials and herbaceous crops) and agrosilvopastoral system (woody perennials, herbaceous crops and animals). Results in Table 2 shows that 36.1% of the respondents practiced both agrosilviculturaland agrosilvopastoral systems (36.1%). Kitete village had mainly agrosilvopastoral System (55%) due to large herd sizes of livestock whereas Nyameni, Magomeni and Peapea villages had mainly agrosilvicultural system (Table 2).

Table 1: Proportion of Respondents Practicing Agroforestry

Village	Kitete (n=30)	Magomeni (n=30)	Nyameni (n=30)	Peapea (n=30)	Total (N=120)
	% of respondents				
Adopters	96.7	73.3	96.7	83.3	87.5
Non adopters	3.3	26.7	3.3	16.7	12.5

Source: Field survey (2012/1

Table 2: Agroforestry systems in the study area

Village/Agroforestry system	Kitete (n=30)	Magomeni (n=30)	Nyameni (n=30)	Peapea (n=30)	Overall (N=120)
	% of respondents				
Agrosilvicultural	18	25	46.7	23.3	24.1
Agrosilvopastoral	55	51	52	02	62 9
Both agrosilvicultural and agrosilvopastoral	27	33.3	30.0	37.4	36.1
Non adopter	0	26.7	3.3	13.3	10.8
Total	52	52	52	52	5100

Source: Field survey (2012/13)

3.2 *Attitude towards Agroforestry Practices*

Based on the results, 82% of the respondents had positive attitude towards land productivity (Table 4) meaning that, respondents realize the contribution of agroforestry on their farm plot. On the other hand, farmers' attitude towards commercialization was high with an overall average of 90% of respondents showing a positive attitude towards commercialization (Table 4). This shows

that farmers objective in farming was indicated as to produce cash crops for selling in the future as a means of earning their living. Unlike the results obtained by Senkondo (2000) in Babati that farmers were observed to attach more weight to the production for home consumption and therefore they had a low attitude towards commercialization. The results show that about 89% of the respondents in the survey area had a positive attitude towards land resource conservation (Table 4). Discussions with farmers in the study area showed that floods in the area make farmers to have a positive attitude towards land resource conservation.

Table 3: Proportion of respondents practicing different agroforestry technologies

Technology/Village	Kitete (n=30)	Magomeni (n=30)	Nyameni(n=30)	Peapea(n=30)	Total (N=120))
	% of respondents				
Boundary planting	10.0	0	0	02.5	
Boundary planting and mixed intercropping	6.7	13.3	46.7	16.7	20.8
Homegarden	03.	3	03.3	15.8	
Boundary planting , mixed intercropping and homegarden	10.0	16.7	30.0	06.7	1.7
Mixed intercropping	40.0	20.0	20.0	53.3	33.3
Mixed intercropping and homegarden	36.7	10.0	0	06.7	13.3
Not practicing agroforestry	6.7	26.7	3.	3	13.3 12.5
Total	100.0	100.0	100.0	100.0	100.0

Source: Field survey (2012/13)

3.3 *Socio-economic Factors Influencing Adoption of Agroforestry*

This study found that five variables were significant in explaining the adoption of agroforestry. Farm labour force was statistically significant ($P < 0.05$) and positively related with adoption of agroforestry practices. This imply that, when, farm labour force increased by one unit, there was an increase in the probability that the household adopted agroforestry by the amount of the coefficient estimates (Table 5). The results are similar to what Buyinza and Naagula, 2009 found that, size of family labour force is positively associated with probability to adopt agroforestry technologies. They based their argument on the fact that combining tree resources and food crops on the farm is labour demanding and families constrained with labour force may not be able to practice agroforestry. Farm size of farmers was positively related to adoption of agroforestry practices and was statistically significant ($P < 0.05$) implying that as the farmers' farm sizes increase they adopt more of agroforestry practices and vice versa. The same result was observed by Kwayu*et al.* (2013) who found out that farm size was positive and significant determinant of farmer participation in the Equitable Payments for Watershed Services program in Morogoro. They also noted that, farmers who have large land holdings are more likely to adopt sustainable land management practices such as agroforestry than small land holders. Similarly, Kabwe (2010) found that the size of farm was found to positively influence trialling of improved fallows in Zambia, meaning that when farmers consider whether to adopt a technology, they are restricted by the size of the land available to them. Moreover, the study done by Enete*et al*. (2010) revealed that the size of the household farm was positive and important in explaining the level of women's contributions to farming decisions.

The coefficient of attitude towards land productivity was statistically significant ($P < 0.05$) and negatively related with adoption of agroforestry practices. This indicates that respondents with negative attitudes towards agroforestry practices are less likely to use it due to less benefits associated with the practices. Therefore they are less likely to make efforts to establish it. This brings the need to change the negative attitude of farmers in the study area. Attitude towards land resource conservation was found to

have positive relationship with adoption of agroforestry practices and was statistically significant ($P < 0.05$). This suggests that, farmers with higher positive attitudes towards agroforestry practices have stronger views of the technology and they are convinced that the practice contributes more benefits to conservation of land resource than not having it. The study supports the findings of Meghan *et al*. (2008) who found that attitude towards rain forest conservation was positively related to adoption of agroforestry. The authors add that more positive attitudes about conservation have positive impacts on farmers' intentions to adopt agroforestry.The coefficient of attitude towards commercialization was statistically significant ($P < 0.05$) and positively related with adoption of agroforestry practices. This shows that farmers with higher positive attitudes towards adoption of agroforestry in terms of commercialization is expected to produce cash crops for selling rather than for home consumption as a means of earning their living.

Table 4: Respondents indicating positive attitude towards agroforestry practices

Village / Item	Kitete	Magomeni	Nyameni	Peapea	Total
	% of respondents				
Attitude towards land productivity	84.7	68.7	87.8	88.2	
Attitude towards commercialisation	91.8	59.5	59.1	90.1	
Attitude towards land resource conservation	90.8	79.4	48.8	88.9	
Overall					87

Source: Field survey (2012/13)

3.4. *Estimation of Costs and Benefits of Agroforestry Practices*

3.4.1 *CBA and Sensitivity of NPV*

Results revealed that the selected agroforestry systems in the villages surveyed had positive net present value per hectare (Table 6), meaning that the present worth of the benefit stream was greater than the present worth of the cost stream for each system. This implies that agroforestry systems in the surveyed villages were economically viable. The BCR of the selected agroforestry systems in all villages was greater than one (Table 6), implying that all the systems are beneficial in all villages at 10% discount rate. Moreover results in table 6 shows the maximum interest rate (IRR) for each village that agroforestry systems can pay for the resources used if the system was to recover its investment and operating expenses in twenty years' time and still break even. The IRR in all the systems was much higher than the World Bank's rate of 10% indicating the worth of investing in the selected agroforestry systems in all villages. Some studies on agroforestry projects for example (Mwakaje*et al.*, 2010; Dwivedi*et al.*, 2007; Franzel, 2004; Mai, 1999 and Senkondo, 1992 ;) suggest that such projects can be economically viable in using resources. On the other hand the contribution of livestock to NPV varied noticeably on different systems in Kitete village, the inclusion of livestock component in agroforestry systems was found to contribute on average of 76.5% of the calculated NPV (Table 7). This shows that farmers without livestock in their agroforestry systems have chances of improving their income by including livestock. It was also noted that, the agroforestry system remained economically viable when livestock systems were removed (Table 7).

The results as shown in table 6 indicate that the system to be economically unviable the costs have to increase by an average of 65%, when computed at 10% discount rate, holding all other factors constant. Benefits have to fall by an average of 32% before the systems become economically unviable. This implies that agroforestry systems in the surveyed villages will remain viable over a wide range of changes in costs except in terms of benefits, holding all other factors constant.It is therefore worth to invest in agroforestry practices in Kilosa District since the present worth of the benefit stream was greater than the present worth of the cost stream for each system in the surveyed villages. Thus agroforestry practice is economically viable in use of resources in the District.

From the findings, the study identified two different agroforestry systems in the sampled villages. In Nyameni, Magomeni and Peapea villages the system was mainly agrosilvicultural, where the main components were trees and agricultural crops. In Kitete village agrosilvopastoral system was observed due to inclusion of large herd size. In all villages, mixed intercropping, boundary planting and home-gardens are the various agroforestry arrangement observed. On average mixed intercropping arrangement

was more common compared to other technologies in both villages.It can be concluded that, respondents appreciate the contribution of agroforestry in improving nutritional status as well as meeting the diverse needs to uplift their socio-economic status.

The results showed that a substantial number of respondents have a positive attitude towards commercialization. This shows that farmers objective in farming was indicated as to produce cash crops for selling in the future as a means of earning their living. Further, considerable number of respondents had a positive attitude towards land resource conservation indicating that respondents appreciate the contribution of environmental services provided by agroforestry practices. Moreover, a substantial number of respondents had a positive attitude towards land productivity.Based on the logistic regression analysis, factors that significantly influence adoption of agroforestry practices in the study area were, farm labour force, farm size, attitude towards land productivity, attitude towards commercialization and attitude towards land resource conservation at P <0.05. A change in these factors will have influence in the uptake of agroforestry practices.The CBA results found that, the selected agroforestry systems in the sampled villages were economically viable when evaluated at 10% discount rate. It is therefore worth to invest in agroforestry practices in Kilosa District since the present worth of the benefit stream was greater than the present worth of the cost stream for each system in the surveyed villages. Moreover, the sensitivity results indicated that, the system to be economically unviable the costs have to increase by an average of 65%, when computed at 10% discount rate, holding all other factors constant. Benefits have to fall by an average of 32% before the systems become economically unviable. This implies that agroforestry systems in the surveyed villages will remain viable over a wide range of changes in costs except in terms of benefits, holding all other factors constant.

There is a need for the government and other development agencies to intervene by providing information and training to farmers who are ignorant of the benefits of engaging in agroforestry farming. For example information related to proper spacing of trees, which will optimise the benefits from agroforestry and reduce competition for nutrients, light and water.

High attitude towards agroforestry practices was found to be important in adoption of the practice. High attitude towards agroforestry practices were due to the respondents' perception that investment in agroforestry practices was associated with more benefits than costs. This suggests the need for agroforestry disseminators to improve the benefits of the practice so as to enhance high attitude towards agroforestry practices and the willingness to invest in it.

The issue of land tenure should be solved by the village leaders so as to give room for farmers to practice agroforestry. In addition, land should be well distributed to make sure that all people have an access to land for agroforestry practices.

In general the government and project interventions are needed to supply tree seedlings and promoting tree planting as well as providing technical assistance. The supply of seedlings could be improved by; increasing availability of tree seeds for seedlings production from current suppliers, enhance community in establishing group or village based tree nurseries and increasing training of individual farmers on nursery establishment and management techniques so as to enable them to establish their own nurseries to sustain year to year supply of seedlings.In general the government and project donors should disseminate technology development in agroforestry through breeding, selection of crops and tree species for specific suitable characteristics. Characteristics such as drought tolerance, short maturity, and disease resistance should be considered. Moreover, improvements in the market for example on demand and access to markets for agroforestry products will improve the marketability of agroforestry products. In addition, establishment of rural financial institutions is important to address farmers' credit needs on loan terms with low interest rate.

Table 5: Results of Logistic Regression Analysis

Variables	B	S.E.	Wald	df	Significance level
Gender	-.014	.937	.000	1	.988
Age	-.002	.025	.004	1	.949
Farm labour force	3.497	1.129	9.590	1	.002*
Education level	-.453	1.379	.108	1	.743
Household size	-.054	.136	.159	1	.690
Farm size	.656	.317	4.279	1	.039*
Attitude towards land productivity	-1.742	.627	7.734	1	.005*

Attitude towards commercialization	1.133	.538	4.438	1	.035*
Attitude towards Land resource conservation	1.420	.477	8.850	1	.003*
Constant	.928	2.186	.180	1	.671
Performance Indicators for the Logit Model					
Model evaluation (overall)					
% correct predictions	94.9%				.
Cox & Snell R^2	.236				
Nagelkerke R^2	.454				
	X^2		df		P-value
Likelihood ratio test (Omnibus Tests of Model Coefficients)	31.430		9		.000
Goodness of fit test: Hosmer and Lemeshow Test	13.528		8		.095

***** Significance at 5% level

Source: Field survey (2012/13)

Table 6: *Summary of the calculated NPV, BCR, IRR and Switching valueof the selected agroforestry systems in the villages surveyed (values x 1000Tshs, using constant 2012 prices)*

Agroforestry systems	NPV	BCR	IRR%	Switching value %[1]	
				Benefits	Costs
Nyameni village					
Maize/Coconut / Grevillearobusta	2100.87	2.1	93	50	108
Rice / Coconut / Mangoes	3913.89	2.27	35	01	17
Maize / Beans / Oranges	1971.23	1.79	86	01	50
Kitete village					
Maize /Coconut /*Albiziagummifera* / Livestock	6990.04	1.47	32	84	0
Coconut / Banana /*Leucaenealeucocephala*/ Livestock	6849.47	1.45	62	94	1
Maize / Mangoes /*Albiziagummifera* /Livestock	4279.31	1.27	21	92	4
Maize/ Beans /*Leucaenealeucocephala* / Livestock	3311.42	1.26	51	11	6
Peapea village					
Maize / Mangoes / Bananas	2440.99	1.9	84	48	93
Maize / Sunflower / Banana / Oranges	1381.34	1.58	33	35	0
Magomeni village					
Maize/Mangoes/*Leucaenealeucocephala*	1571.26	1.4	61	17	85
Maize / Oranges / Coconut	1596.62	1.34	73	55	4
Overall				32	65

%1 Percent by which cost will have to increase or benefit will have to decrease before thesystems's NPV fall to zero.

Source: Field survey (2012/13)

Table 7: Contribution of livestock in agroforestry systems NPV in Kitete village at 10% discount rate ('000 Tshs constant 2012 prices)

Agroforestry systems	NPV with livestock	NPV without livestock	% contribution of livestock
Maize /Coconut /*Albiziagummifera* / Livestock	6990.039	3765.402	64.9
Coconut / Banana /*Leucaenealeucocephala*/ Livestock	6849.476	3659.636	65.2
Maize /Mangoes /*Albiziagummifera* /Livestock	4279.309	1101.847	79.5
Maize/ Beans / *Leucaenealeucocephala* / Livestock	3311.423	124.579	96.4
Average			76.5

Source: Field survey (2012/13)

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