

ReviewArticle

Assessment of Agro forestry Adoption Problems in Harbu Kebele, Kallu Woreda of South Wollo Zone, Amhara Region, Ethiopia

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Agroforestry has an important role like alleviating deforestation and low income and providing different wood products. This study was conducted to investigate major agro-forestry adoption problems and constraints in Harbu kebele, south Wollo. Stratified systematic sampling methods was employed, and 5% (of total 54) of households were taken as respondent. Questionnaire, field observation and key informants were the major sources of data. Lack of knowledge to integrate trees with agricultural crops forced farmers to stay in monoculture production on exhausted land, this increase their demand of fertilizers and finally they imposed to high cost of fertilizers and increase the problem of shortage of land. It is true that farmers have been long ago pastoralist with drought and them farming, now the land is exhausted, so the best way of maximizing production is using fertilizer or adoption of agro-forestry techniques and solving related problems. From the total respondents, 57.4 % of them have a good attitude for the adoption of agro forestry technologies due to its benefit such as income generation, employment opportunity, biodiversity conservation, farm materials, sources of fire wood and charcoal. There are lack of many problems so the concerned body should creates awareness for the people to solve the problems of agro forestry adoption in the area

Keywords: Agro forestry; adoption

INTRODUCTION

In Ethiopia forests have been once the main and considerable resources. However forest degradation rate has been a serious challenge to the country. The major causes for the forest degradation are multifaceted and attribute a mixture of different factors. The problem of forest degradation is exacerbated when it is associated with rapid population growth, which implies further clearing of vegetation and cultivation of marginal areas to feed the increasing population. The long term repercussion of such activities is, therefore, indisputable.. Surprisingly, the rate of forest degradation in the country, particularly in the Amhara region, is still alarmingly high. The researcher conceptualizes agroforestry as a dynamic, ecologically based, natural resource management system that, through the integration of trees on farms and in the agricultural landscape, and seeks to diversify and sustain production for increased social, economic and environmental benefits for land users at all levels. There are different means or approaches that can be employed at different levels to restore degraded forest or at least to minimize the problems. The major one includes enrichment planting, developing large scale plantation and use of agro forestry (Karl, 1994).

Different studies indicated that agro forestry is one of the appropriate strategies and directional to successful restoration and land rehabilitation program in areas where land resource is limited, like the case in the Amhara region. Agro forestry is dynamics ecological based natural resources management system that through the integration of trees on farms and in the agricultural land scape diversifies and sustains production for increased social, economic and environmental benefits(world agro forestry center, 2003). Agro forestry has both biophysical and socio-economic role wherever it is practiced. The farmer roles include enhancement of biodiversity, soil conservation and prevention of soil erosion by wind and water, improvement of soil fertility through fixation of nitrogen, where as increasing farmers income and alleviation of poverty, creation of employment opportunity, provision of fuel wood, fodder and construction wood, provision of food and medicine are the socio economic role of agro forestry. In Ethiopia integrating multipurpose tress with food crops and livestock intimate association is an ancient activity practiced since long time ago. Nevertheless in order to strength and make the existing practice effective introduction of new agro forestry technology is required. For farmers to manage new agro forestry technologies, their understanding and developing interests as well as skill of paramount importance. Farmers do have different perceptions on new agro forestry innovations; they

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may think that adoption of agro forestry technologies might result in reduction of crop and livestock productivity. Farmers are not willing to accept the risk of such reduction, and are therefore not willing to adopt the new agro forestry technologies. In situation where markets for agroforestry products have not been developed farmers may not perceive the technologies as having any utility once they produce them. Moreover, farmers perceive the technologies as labor demanding and are therefore not willing to adopt them. South highland of south Wollo is highly degraded due to inappropriate land use. Harbu is one of the kebele in Kallu woreda. The farming systems that exist in Harbu kebele are progressively impoverished and more vulnerable (Sollomon, 2008). These are serious constraints to sustainable development and a main cause of unstable, over simplified and drought prone production systems. In fact, maintain and or plants tree in their farm land primarily to obtain various tree products and to some extent to conserve the soil. The existing local practices has designed different agro forestry technology packages since the year 1996. The most common introduced agro forestry technologies packages include, home garden agro forestry, wood lots, alley cropping, boundary tree planting on gullies, gully rehabilitation. Currently the practice has been rain forced with integrated water shade development approach in each peasant association. With the hope that this practices will have considerable impact in water shade management due to their role in increasing the vegetation cover, soil fertility improvement and acting as a biological soil conservation activities.

Statement of the problems

In the study area there was some adoption of agro forestry technologies that gives different benefits for local people such as soil fertility, ecological sustainability, economical and social benefits in Harbu kebele at the recent years. The introducing of agro forestry in this kebele includes scatter trees on crop land, alley cropping, wind break, homestead trees and home garden. However, Harbu kebele has some agro forestry adoption problems such as lack of knowledge and attitude, shortage of land, livestock grazing (Solomon, 2008). There is no enough study takes place to minimize the problem of agro forestry in the area. Therefore the intention of this paper motivated us to do the assessment of agro forestry adoption problems in Harbu kebele.

MATERIALS AND METHOD

Kallu is one of the woreda administration in south Wollo zone, it located north east of Addis Ababa and also Harbu kebele is one of the kebele that found in Kallu woreda which has the longitude and latitude is 39°45'59" East and 11°05' north respectively and also away from 345 km from Addis Ababa, 442 km Bahir Dar, 42 km Dessie and 19 km from Kombolcha. The area lies on the same plain with its woreda, so it possibly shares most of the description of the area. Total area of the kebele is 2645 hectares and the forest coverage of the area is 8.5% and the agro forestry coverage of the area is 89 hectares (3.4 %). It is found between at the north Chorysa, at the south Weldeya, at the East Agamsa, and at the west Meawa kebele and also the altitude of the study area is 1550 masl (woreda office of agriculture, 2006). The major soil types of covering the large part of south wollo are phaezome, cambis soil and vertisols.

Wollo is one of the degraded zone of Amhara region. Presently, most of the model households and also the 33 sample size were male households of which 19 were role model households. In addition to this, the 28 were literate and 26 were illiterate households and otherwise the 1 was rich, 33 medium and 20 were poor households. At the same time, there were taken the age of respondent from 20-60 years of households. Due to those reason systematic sampling method to be taken as representative sampling of collected data [1].

Sample size and sampling techniques

Methods of data collection

There has been recent information from households and to check wrong information which can add information in analysis both self administrated, interview, questionnaire, personal observation and focus group discussion is used. Some questions are administrated through interview with information's like kebele officials and agricultural bureau workers were participated.

Methods of data analysis and presentation

As indicated in the methods of data collection two methods were used. These are being questionnaire and interview. After the questionnaires were returned tables were prepared and percentages were calculated for each item and was used descriptive and systematic techniques to analysis the collected data. We have changed the value in to percentage because it is made the task easier. Based on the tabulated data, the necessary analysis has given under each table. Finally, conclusion and recommendations are forwarded on the findings

RESULT AND DISCUSSION

Out of the total 54(100%) respondents, 9(16.7%) are young, 28(51.9%) are adults and the remaining 17(31.5%) are old age groups (in year). The dominant age group of the sampled household head farmers is adults that comprising 51.9% of the total sampled households. This shows that the land holdings in Harbu kebele are those farmers whose age is between 30 and 55 years old, which is being the productive age group out of the total respondents. These age groups is easily adopt and have experience about agro forestry technology. This is also true by other studies. According to Sonii (1992) reported that age of farmers affect adoption of agro forestry technologies. As the farmers age increase it is expected that farmers become conservative and also the young people participated more in agro forestry due to their ability to acquire (obtain) and use information about new technologies faster than the old people. Meghan (2008) also reported that age contributed negatively to the adoption of agro forestry technologies. Sex distribution of the respondents are 21(38.9 %) are female and 33(61.1 %) are male out of the total sampled households in the Harbu kebele. This indicates that some of the female household head used their sons to carry out their farming practices while some of their lands are rent out to others due to different constraints to work and lack of their own sons who is able in farming activities for their farm lands. From the total respondents, 28(51.9 %) are literate and the remaining 26 (48.1%) are illiterate. This is being due to the fact that the farmer would be accessed for simply read and writes with awareness towards

education. The literates are easily adopt agro forestry practices but the illiterate are not easily adopt the new technologies and they are laggards to accept the new technologies. From the total respondents land holding size, 28 (51.9 %) of them have between 0.25-0.75, 16 (29.6 %) of them have between 0.76-

1.25 and the remaining 10 (18.5 %) of the respondent households have between 1.26-2.5 hectares of land. At this area which has been a shortage of land holding size due to high population growth, land fragmentation among increasing

Table 1. Socio-economic characteristics of the respondents.

Age group (in year)	No of respondents	% of respondents
18-29	9	16.7
30-55	28	51.9
>55	17	31.5
Total	54	100
Male	33	61.1
Female	21	38.9
Total	54	100
Education status		
Literate	28	51.9
Illiterate	26	48.1
Total	54	100
Landholding size (in hectares)		
0.76-1.25	16	29.6
2.16-2.5	10	18.5
Total	54	100

Constraints for adoption of agro forestry technology

From the total respondents, 31 (57.4 %) respondents have a good attitude for the adoption of agro forestry technologies due to its benefit such as income generation, alleviating poverty, bio physical and biological conservation, employment opportunity, farm materials, source of fire wood and charcoal, traditional medicine, social and political benefits, shade for animals during dry season, windbreak, fencing material, sources of fodder for animals and homestead trees are the major sources of fuel wood. This study is the same as Solomon (2008) in Kallu and Dessie zuriya woreda. However, 23 (42.6 %) of the respondents have not a good attitude for the adoption of agro forestry in the study area due to its shading effect, supporting of weed growth, reducing landholding size, difficult to plough due to the presences of root, computing of annual crop and also there are many factors that influence the adoption of agro forestry technologies such as lack of knowledge, organization involvement and labor, shortage of seedling and land, inadequate market situation and so on. This study is the same as Young (1997); Hasan and Alam (2006).4.2.1 Lack of knowledge Out of the total respondents, 35 (64.8 %) of them replied that lack of knowledge is the major agro forestry adoption problems in this kebele because they did not get enough access for training about tree planting activities, sustainable utilization and conservation of agro forestry and other natural resources in the study area and also they have no enough about which species are more important and harm on the farm except Eucalyptus and Acacia species. At the same time they have no enough knowledge on hole size and spacing for tree planting. The respondents of the kebele did not fully understand the use of fertilizers and pesticides that increase their production potential. According to report negligence of potential knowledge would have a negative effect on the production and adoption of agro forestry extension; this is the same as our study. But according to knowledge of tree planting and maintenance does not appear to be constraints for the planting of trees on the farm, this study oppose to our study.

Lack of labor

From the total respondents, 7 (13 %) of them said that lack of

labor is the main sources of agro forestry adoption problems. There reason was agro forestry is a complex farming system that needs many labors for planting, weeding, pruning, thinning, fencing and harvesting activities. This leads the shifting of complex farming system of agro forestry practice a simple system of mono cropping system in the study area. This study is the same as Anon (1995) reported that agro forestry technologies like alley cropping are even highly inflexible the timing of labor requirements especially for pruning and weeding activities. Hence it is unlike agro forestry technologies will be adopted where labor is already a limiting factor. Out of the total respondents, 42 (77.8 %) of them replied that lack of organization involvements in the study area is the major agro forestry adoption problems. Either forestry or agro forestry is an activity which need the contribution of professionals as well as incentives and resources for their proper implementation but the 77.8% of the respondents replied that there is no enough individual or organizations which provides seedling, seed, training and experience share incentives to them, rather they subjected them to high costs of fertilizers especially the accessibility of fertilizers by the government organization to the farmers are not accepted by the respondents.

The respondents said that the developmental agent is not work anymore practically rather than giving advices. Even the little accessibility of agro forestry practices by the government may not be accepted by the respondents. This study also reported by Paula. M (1998), he explained that lack of organization involvement reduces agro forestry productivity, reduced biodiversity, increase birth rate of people, this argument is true with this study [2].

Lack of organization involvement (attention)

Out of the total respondents, 42 (77.8 %) of them replied that lack of organization involvements in the study area is the major agro forestry adoption problems. Either forestry or agro forestry is an activity which need the contribution of professionals as well as incentives and resources for their proper implementation but the 77.8% of the respondents replied that there is no enough

individual or organizations which provides seedling, seed, training and experience share incentives to them, rather they subjected them to high costs of fertilizers especially the accessibility of fertilizers by the government organization to the farmers are not accepted by the respondents. The respondents said that the developmental agent is not work anymore practically rather than giving advices. Even the little accessibility of agro forestry practices by the government may not be accepted by the respondents. This study also reported by Paula. M (1998), he explained that lack of organization involvement reduces agro forestry productivity, reduced biodiversity, increase birth rate of people, this argument is true with this study [3].

Shortage of land

From the total respondents, 24 (44%) of them said that shortage land is the major agro forestry problems. Based on the landholding size of the respondents 28 (51.9 %) of the respondents have between 0.25- 0.75 hector, 16(29.6 %) of the respondents also have between 0.76-1.25 hector and the remaining 10 (18.5 %) of the respondents have between 1.26-2.5 hectors of land in the study area. Agro forestry has many practices, so it needs many parcels of land for uneducated farmer but it takes a small parcel of land for educated one. So the major causes of agro forestry adoption problems are shortage of land in that kebele. Some respondents said that the expansion of agro forestry in this small parcel of land, especially tree planting activities on the farm, there is no intermediate benefits that satisfy their basic needs in a short period of time. Due to this reason shortage of land is the main cause of agro forestry adoption problems in Harbu kebele. According to Bellow (2008) landholding size have a relation with farmers' adoption potential for agro forestry technologies. A farmer with landholding size is more expected to participate in agro forestry practices than the others. In other way the small landholding size is not more expected to participate in agro forestry practices. These studies have good similarity with our studies.

Inadequate market situation for agro forestry products

According to Warnner (1993) reported that a good market for agro forestry product that leads more agro forestry adoption, in other way the low price of the product results agro forestry adoption problems for farmers. This study also the same as Warnner explanation, out of the total sample of the respondents 39 (72.2 %) of them replied that there is no good or attractive market situation in the study area. Because there was similar items bring to market at the same harvesting time and also highly perishable, especially home garden products. These leads the product of the market is very cheap and also

the investment of some agro forestry practices take long period of time, specially tree plantation investment that do not fulfill the immediate basic needs of the respondents. Because of this, inadequate market situation is one of the main sources of agro forestry adoption problems in the study area.

Shortage of seedlings

From the total respondents, 25 (46.3 %) of them told as there is no enough seedling sources either private or governmental access in the study area. Even though, there is natural regeneration seedlings, agricultural support from the nursery site and sometimes private seedlings are not ready with the appropriate season and improper holding ability of farmers. Such problems happened when the time of transport and planting. In case of this lack of seedling the major sources of adoption problems in agro forestry practice.

Free grazing

This study showed that, 23 (42.6 %) of the respondents were replied that there is no restricted rule for preventing over grazing that damage specially agro forestry tree species in the farm land by animals, mostly by goats and camels. The reason they did not restrict grazing of animals from the farm is that the income generation from livestock production is better than agro forestry products because livestock products give income in a short period of time, it is not easily perishable and good market situation at a movements of time that satisfy the subsistence needs of the respondents than agro forestry production. Due to this reason, free grazing is the main agro forestry adoption problems in that kebele. But this study is opposed from the study conducted by Ajayi (2003) explained that the effectiveness of laws against browsing various depending on the types of cultural communities involved and the level of agro pastoral farming. The effectiveness of by the laws was an understanding the exact provision of various components in the community [4].

Wealth measures

From the total respondents, 5 (9.3%) of them replied that wealth status influences the adoption of agro forestry practice. Because the initial investment for agro forestry practice needs high amount of money to buy different materials like, pesticides, seeds, fertilizers, water pump for irrigation purpose and other expenses. Wealth is expected to affect adoption decisions for a number of reasons, including that wealthier farmers have greater access to resources and may be more able to assume risk (Doss, 2003), this argument is true for this study.

Table 2. Constraints for agro forestry adoption in Harbu kebele.

List of problems	No of respondents	% of respondents
Lack organization involvement(attention)	42	77.8
Inadequate market	39	72.2
Lack of knowledge	35	64.8
Shortage of seedling	25	46.3
Shortage of land	24	44
Free grazing	23	42.6
Lack of labor	7	13
Wealth measure	5	9.3

Tree planting activities

Out of the total respondents, 10 (18.5%) of them replied that tree planting of today were not important for the future the reason why the trees minimize land size, computation of annual crops by consuming water and organic matter, supports weed growth and shading effect on the farm land. Due to this reason 18.5 % of the respondents are not planting trees in their farm land. On the other hand, 90 (81.5%) of the respondents replied that tree planting of today were a very important for the future generation because the tree planting is increase soil fertility, environmental cleaning, Social and economical services [5].

Tree management practice in the farm land

Out of the total respondents, 46 (85.2 % of them said that they are maintained trees on the farm by thinning, pruning and fencing of the trees in order to prevent damage trees from animals, to minimize water and nutrient computation, remove dead and unwanted branches of tree .From those 33 (61.1%) of the respondents manage their trees on their farm land by pruning and fencing, 9 (16.7%) of the respondents were managed trees on their farm land by fencing only and the remaining 2 (3.7%) of respondents were maintained trees in their farm land by thinning and fencing. The reason to manage trees on the farm and adoption of agro forestry practice in this kebele is to increase soil fertility, economical, social, environmental, and political and other aspects of trees in the study area. In addition to, it is a source of fuel wood, fodder, charcoal and farm materials and construction materials for the people in the kebele. On the other hand, the remaining 8(14.8%) of the sampled households from the total respondents replied that they are not maintain trees on their farm land. There reasons are shading effect, reducing landholding size and support weed growth. Out of the total respondents, 5 (9.3 %) of the sampled households said that tree management on their farm that leads shading effect and support weed growth on the farm land. Shading effect reduced the potential of crops by minimizing light penetration by computing nutrient and water potential. On the other hand, the remaining 3(5.6%) of them said that maintained of trees on the farm land that reduced landholding size.

Favorable species on farm land

Most of the farm households said that *Acacia tortilis* (29.6%)*Cordia Africana* (18.5 %), *Gravillea robusta* (14.8 %), *Ziziphus spinachristi* (27.8%) and *Sasbania sasban* (16.7%) are the most favorable tree species on the farm land of the study area. Due to the benefits of improve soil fertility, reduction of soil erosion, provision of fodder for livestock, fencing and farm material.

CONCLUSION

More than half of the farmers have good attitude towards agro forestry technology due to its benefits like fuel wood charcoal, traditional medicine, employment opportunity, income generation, increasing soil fertility, biodiversity conservation and also poverty alleviation. However, adoption of agro forestry technology influenced by different factors such as lack of knowledge and organization involvement, inadequate market, shortage of seedling and land , free grazing and shading of trees in the study area. Lack of organization involvement in the kebele is a major source of agro forestry adoption problems are not enough support for seedlings, seeds, training, experience share, incentives to them, rather they subjected them to high costs of fertilizers. All farmers are not equally benefited from the market system of agro forestry product because the wealth status, landholding size and period of the year affect supply and demands of agro forestry products which leads to discourage the adoption of agro forestry technologies. Most of the farmers do not access adequate training about land use system, tree

planting activities, sustainable utilization, conservation and adoption of agro forestry knowledge. More than 80% of farmers are maintained on their farm land by pruning, thinning and fencing activities due to social, economical, environmental and political benefits of agro forestry products. The major political role of agro forestry is used as boundary separation from one to the other resources due to its immobile. On the other hand some farmers are not maintained trees on their farms due to the shading effect; reducing landholding size and support weed growth on the farm land. The shading effect of agro forestry in the farm land is computing water and organic matter with annual crops reduced the amount of light which penetrate into the ground. The tree species like *Cordia Africana*, *Acacia abyssinica*, *Gravillea robusta*, *Ziziphus spinachristi* and *Sasbania sasban* are the most favorable tree species on the farm land of the study area.

RECOMMENDATIONS

There are many challenges and constraints for the adoption of agro forestry practices in the study area. The following is recommended. The local people should get enough knowledge and experience form governmental and nongovernmental organization, woreda official and role model farmers. The management system of trees should be known and done like pruning, thinning, coppicing, pollarding, fencing, fertilizer which systems are best for individual agro forestry practices for any individual farm lands. The people should develop the culture of preventing free grazing system and the market system is one of the discouraging factors for farmer activity, regarding the price, so the government needs to buy seeds and fertilizers when it is cheap at the time of production and the right period of sowing with optimum cost. The government should have smooth relationship with the local people and encourage the farmers' tree planting activities by using appropriate species to the area and varieties of species match with the agro ecological importance of the area.

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