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Assessing Farmers Perception and the Role of Agro Forestry in Improving the Livelihood of Farmers in Mehalmecharekebele around Woldia

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Abstract

Agroforestry is the collective name for land uses system and practice in which wood perennial are deliberately in grated with crop and animal on the same land management unit. The study was assessed to the farmer's perception on the role of agroforestry in improving the livelihood of the local farmer's households in MehalMechare kebele, around woldia, north Wollo, Amhara, Ethiopia. The techniques of data collection were obtained and data was summarized by direct observation and questioners the forms of tables. The results of the study area shows that the land use system consist of different types of agroforestry practice. Among of these activities used 40% used scattered tree and, 6.67% were cultivates naturally existing types of plants. Also 20%used agro forestry for income generation and 10.66% used for medicinal purpose home garden, woodlot, scattered trees in crop land, live fence, and animal with goods and service for the local farmers. The factors which affect farmer's perception are positive attitudes, negative attitudes and neutral attitude. About 64% of the respondents were excellent attitudes whereas 16% were neutral attitudes. The study was carried out in South Wollo zone around Woldia woreda specifically in MehalMechare Kebele. The factors that affect the farmers' perception on agro forestry practices were both positive and negative. These techniques of data collection was attained and data was summarized in the form of tables and histogram Among these increasing supply food, increasing the quality and nutrients in the soil and services like soil erosion control and increasing the organic matter by litter fall and so on were the positive factors. Whereas the negative factors were practicing conventional tillage and introduction of allopathic tree species which results in yield reduction from agro forestry practices. The results of the study area show that the land use systems consists of different types of agro forestry practices and among these were: home gardens, wood lots, scattered trees in crop land, live fence and animal production with crop provide different goods and services for the local farmers. Based on the problem identified in the study area farmer's need to improve irrigation system, to avoid introduction of exotic tree species which are invasive and having allopathic effect and instead practice local one providing the productivity to agro forestry.

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Keywords

Agroforestry practice, Farmers, Woldia.

Introduction

Background of the study

Agro forestry or agro ecology is a term used to define land-use systems that combine agricultural and Silviculture practices to produce food, wood, and other products. Agro forestry systems are defined in different ways by research (Atangana *et al.*, 2014; Ramachandran 1993). The definition used in this paper is based on the commonly used definition of the World Agro forestry Centre (ICRAF) (Ramachandran 1993):

“Agro forestry is a collective name for land-use systems and technologies where woody perennials (trees, shrubs, palms, bamboos, etc.) are deliberately used on the same land management units as agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence.”

Agro forestry systems have been increasingly promoted as land-use systems that can support nature conservation, especially in the tropics (Ramachandran 1993; Atangana *et al.*, 2014; Beenhouwer *et al.*, 2013). Agro forestry in the tropics has also been gaining recognition as a tool for reducing poverty, improving food self-sufficiency for farmers, and increasing the productivity and income for small scale farmers (Atangana *et al.*, 2014; Ramachandran 1993; Leakey 2014). Even if agro forestry systems have a great potential for more sustainable use of natural resources and land, and can improve the livelihood of small scale farmers in the tropics, it is important to point out that this is not a “silver-bullet” or a “one size-fits-all” approach for reconciling nature conservation and agricultural production (Atangana *et al.*, 2014; Ramachandran 1993).

If agro forestry systems are going to be used as part of a strategy for biodiversity conservation, it is necessary to identify the characteristics that will make these systems suitable for supporting its local biodiversity. The two main areas that influence on the biodiversity conservation value of agro forests are: the species and structural composition of agro forests (Rolim & Chiarello 2003) and the degree of the management intensity and human disturbance in these systems (Cassano *et al.*, 2014). It is important to point out that agro forestry systems cannot simply replace the biodiversity value and ecosystems services

provided by natural forests, but if agro forests contain similar species and structural composition as native

forests and they are not intensively managed they can be used as part of a broader regional biodiversity conservation strategy, and potentially serve as buffer zones or ecological corridors (Cassano *et al.*, 2014).

Agro forestry systems have the potential to improve the livelihood of small scale farmers and alleviate poverty, but there are certain limiting factors as well. Small scale farmers are defined in this paper according to how “family farmers” are defined in the Brazilian Atlantic Forest Law (Presidência da República, 2006), which is:

“Farmers that own a farm not bigger than 50 hectares, and work their farms with their own personal work and with the work of their family, with the eventual help of third parties, (also collectives where the area of the land per person is not bigger than 50 hectares), and at least 80% of the gross income of the farm has to come from activities related to agriculture, livestock or silviculture or from rural extractives’.”

Some of the potential benefits for small scale farmers in using agro forestry systems are the increase in the land’s quality and productivity (Leakey 2014), food security (Kang & Akinnifesi 2000), the diversification of the produced goods (Ramachandran 1993), and the increase in resilience towards biological diseases, market impairs and climate change (Atangana *et al.*, 2014). On the other side, some of the most relevant limitations for small scale farmers when working with agro forestry are the challenge of managing woody perennials and agricultural crops in the same land management unit (Tanana *et al.*, 2014), the difficult marketability of some products (Ramachandran, 1993), and other legal aspects such as the environmental protection of certain trees or licenses needed for cutting down woody perennials (Porro & Miccolis 2011).

Another disadvantage of working with agro forestry systems is that initially it takes a long time for the trees and woody perennials to produce goods and it prolongs the time of getting returns from the investment done in these types of plant species (Rolim & Chiarello A. G. 2003). Also, in many countries (especially in countries like Brazil, where the legislation is often not being enforced) there is an uncertainty regarding ownership of land, meaning that that the land ownership is not guaranteed. All these limitations and disadvantages can lead to farmers investing more in crops that generate returns in the short-term instead of systems that generate higher financial returns in the long term (Porro & Miccolis 2011).

Statement of the problems

Agro forestry is affected by several land degradation in mehalmechare. In rural areas, people are still poor due to dependence on farming and livestock keeping with production at subsistence level and at the same time affected by irrigation, drought and poor market and considered to have potential to improve farming in the MehalMechare. However it has been observed that some problems are affecting the adaption of agroforestry.

Unavailability of land to practice the technology and inadequate education on agro forestry. This has consequently result in low adaption of agro forestry technologies because few agencies have been introduced the technologies to the farmers in the study area. most farmers have very little knowledge about new agro forestry technologies to the farmers in the study area. Most farmers do not have known what types of land to use to agro forestry practices specific types of technology of education on the adoption of agro forestry technology and therefore, complain in adequate land due to low level of education on the adoption of agro forestry technology. These problem as a result of led to few farmers adopting how and why farmers makes adoption and land use decisions and the factor that influence their adoption behavior in order to enhance agro forestry adoption. Over the last two decades research and development organizations have made considered efforts in promoting agro forestry technology to increase and sustain farm productivity and improve environmental conservation. However the adoption levels of many this technology less than satisfactory several studies.

Objectives

General objective

To assess farmers perception and the role of agro forestry in improving the livelihood of farmers in Mehal Mecharekebele around woldia.

Specific objectives

To determine the role of agro forestry in improving livelihood of rural farmers.

To assess the perception of farmers on agro forestry practices.

To evaluate the existing strategies of agro forestry practices.

Significance of the study

The output of the study may be important for researchers, expert agricultural Bureau, governmental official, non-governmental organization, farmers and other institution. To address household needs such as foods, fodder and fuel wood. To provide guidance for further investigation and more productive feedback loops between researchers and practitioners as much as possible to include results observed environmental conservation and economic development agency in rural area and also works towards land protections, salinity, soil erosion control and water logging control. The study also has provided significance for any who wants to know and practice agro forestry.

Research questions

What is the role of agro forestry in improving the livelihood of local community?

How do the local people perceive agro forestry in improving livelihood?

What management practices of agro forestry practiced by local farmers?

What type of agro forestry components are incorporated in practiced by local farmers?

Literature Review

The roles of agro forestry in improving the livelihood of rural farming households

The rural people of many countries cultivate trees food crops in the same plot of land and they improve agro forestry practice system of the part to develop and fulfill their need of food and wood demand. Primary objective of agro Forest practice and system is food production, either directly or indirectly facilitating sustained food production (Nair, 1989). The most direct connection between woody species in agricultural landscape and food security in the food items produced from tree fruits, leave, root and gum and shrubs either growing naturally in the wild or cultivated from the woody species such and around the home.

Production obtained from farm woody land such as fuel/wood, fruit or fodder and construction woods also help to gain income from selling of these goods. In addition woody spears in agro forestry have an important

indirect influence on food production by maintaining and improve soil fertility, tree grow on farm can help to sustain yields, process by which tree maintain or improve soil or through by biomass production (litter and root disease). Maintain organic matter and fixing nitrogen, protect the soil, water and wind erosion, enhancing the nutrients use, and improve physical property and modifications of soil temperature (Nair 1993, Young, 1989).

Agro forestry as the source of incomes

This important agro forestry products such as fuel wood, fodder, fruit, construction wood, wood generate cash income help to gain good income from selling of this product's. Agro forestry system create aesthetic value as it include planting of various multipurpose trees and shrubs through their green foliage varying color shading of flowers, fruit also which permit fragrance and high levels of employment (Singh,1994).

Agroforestry as sources of fodder and fuel wood

There is acute shortage of green fodder in many parts during dry season and when the rainfall is not uniformly distributed in the area. Agro forestry can solve the problems as it is great potential.

It's because of that the Agro forestry components especially the tree fruits can remains throughout of the year farmers and pastoralists have long experience in feeding fodder trees and shrubs to their livestock to increase the benefits allowing browsing or by cutting (FAO, 2005).

The role Agroforestry for controlling of soil erosion

Agro forestry served as the sources to control soil erosion and conservation by reducing wind speed and effect of rain water by enhancing percolation and interception of high velocity rain drop. This is because of Agro forestry and shrubs wasted long time than agriculture crop in the land.

The root protect soil from erosion by soil holding the sitters serve as buffer to direct rain drop and runoff erosion, crown and slows high forces of rain drop directly come from cloud. In generally the particular relevance of the Agro forestry to control soil erosion is the initial costs of establishing erosion control of were based on Agro forestry whether in terms of capital/ labor is frequency lower than that of terracing and bunds.

Role for of Agro forestry land productivity and soil fertility

Land productivity capacity of land to support the growth of useful plant, including crops and pastures on sustained buys and soil fertility are an identified feature of sustained proportion of the most Agro forestry system (Young, 1989). Agro forestry practice can play useful pole meets the demand of organic manures by supplying lifter, decay of root.

Woodlots

According to Nshubemuki (1998), the term "woodlots" means a near replica of wood vegetation assortments in smallholdings. It is a tract of land of any size and shape that contain naturally occurring or planted trees (Ramadhani *et al.*, 2002 cited by TAFORI, 2004b). Therefore, woodlot is the mature stand of trees with no further intercropping; conserved for multiple benefits like wood fuel, poles, thatch grasses, fodder, hoe handles, oxen yokes, timber and honey while also restoring the soil fertility. According to FAO (2004) wood fuel is all types of biofuels from trees and shrubs grown in forest and no forest lands, including on-farms. The term includes fuel wood and charcoal derived from silviculture activities such as thinning, pruning and harvesting such as tops, roots and branches. Sometimes establishment of woodlots may go through various phases from establishment, fallow and post-fallow alternating with crops; a practice termed as rotational woodlots.

According to Ramadhani *et al.*, (2002) and National Agro forestry Steering Committee (NASCO) (2006), rotational woodlots involve alternative phases of woodlots and crops where three phases take place. First phase entail a tree establishment phase (2 – 3 years) where trees are planted with crops; second phase involve a tree fallow phase where there is no more intercropping, grasses and bushes are allowed to regenerate and a third phase is post fallow where trees are harvested and cropping start again. For tree species that do not coppice at post-fallow or re-cropping phase, new tree seedlings are established and the cycle starts again. Therefore, rotational woodlot is a low cost AF option that involves alternating arable crops with multipurpose trees on the same piece of land over time (Otsyina *et al.*, 1996). A Multipurpose tree is one grown or conserved with the purpose of providing more than one significant contribution to the production or services to the community (Wood and Burley, 1991). The commonly

used wood perennials in woodlots are arranged in square or rectangular in which the trees/shrubs in rows or columns spaced equally or unequally depending on the purpose of the farmer. The commonly used tree species in woodlots are exotics rather than indigenous species. However, the idea of rotating has not been practiced in some places like in semi-arid areas of Shinyanga, Tanzania. Rotational woodlots farmers in Shinyanga felt better to conserve their fields for woodlots for production of fodder, poles, tree seeds and firewood rather than clear felling and re-cropping again (TAFORI, 2004b). This indicates that, the technology delivered to farmers can undergo innovation depending on farmer's needs and interest. Therefore, from the woodlots, farmers can obtain different benefits for domestic uses and income generation, all of which contribute to improvement of livelihood.

Boundary planting

The boundary site by definition implies a special situation with respect to land and tree tenure (Rocheleau *et al.*, 1988). This is AF technology in which, the wood perennials (trees or shrubs) are planted along the farm boundaries to obtain various wood products and for demarcation to avoid conflict with neighboring farmers. Also, trees may be planted on the windward sides as windbreaks to protect crops against strong winds. In semi-arid areas, this practice is adopted most by farmers who have shortage of land. According to Rocheleau *et al.*, (1988), boundary planting may be widely or closely spaced, in single or multiple lines. However, the common form of boundary planting consists of a single line of widely spaced trees and shrubs. Depending on the tree species availability, along the boundary, it may be possible to combine with timber, firewood.

Livefence

These are lines of wood perennials planted closely around a land of management unit of herbaceous crops, livestock or homestead with protective purposes or privacy. In Central America live fences are used in delineating crop fields, pastures, and farm boundaries and forming elaborate networks of tree cover across rural landscapes (Harvey *et al.*, 2005).

It is also the most used land use system in many communities in Africa for controlling movement of animals and checking winds speeds (Rocheleau *et al.*, 1988). Live fences may also form livestock driveways and enclosures of separate fields, which are in different

rotations of crop or pasture management (paddocks). Live fences should have the property of growing closely, roughness or thorniness and coppicing after cuts or trims. Therefore, trees or shrubs are planted close together in one or more rows.

In semi-arid areas, species mostly used in this technology is *Euphorbia tilucalli* because it grows and establish easily through cuttings (Rocheleau *et al.*, 1988). Thus, if the live fences are managed properly can play an important role in resource management and agriculture development.3. Materials and Method

Description of the study area

The study was conducted in the district located around Woldia, Amhara, Ethiopia. It located 521km away from Addis Ababa, and 370km far from Bahirdar. Geographically it is located at 2112m above sea level, and at latitude and longitude of 11°50.N 39°36.E/11.833°N 39.600°E respectively. The temperatures of district are uniformly all year round with the hottest month being may with about 32°C the mean monthly temperatures is about 25.5°C The district experiences a double maximum rainfall with the mean annual rainfall ranging from 850mm and 650mm.

The relative humidity of the district is highest in the winter season. The area is characterized by woynadega (subtropical) and dega climatic zone with the average elevation 2112m above sea level having average rainfall of 650-851ml and 22°C average daily temperature (woldia communication affair offices).The subject of the study will be local communities of woldia; ethnically, majority of the population are Amhara and Amharic language is widely spoken language and this study will be conducted on February to May 2011E.C. The vegetation type's district farmers practice both farming crops and livelihood. In the study areas the most crops of growth are sorghum.

Sampling techniques

The research was conducted in MehalMecharekebele, Woldia, Amhara, Ethiopia. This research site randomly selected from farmers who are practicing Agro forestry and those who potentially adapts Agro forestry in the study areas. The main purposive sampling was to focus on particular characters of community and availabilities of data that are interest, which were best answer the research questions. The research include data collection components

Methods of Data Collections

This study was based on a cross sectional survey data from farming households across in MehalMechare, to assess agro forestry upon rural population. The research site was selected randomly while respondent selected purposively because of the availability of data from farmers, who are practicing agro forestry and those who potentially adapt agro forestry in the study area.

The main goal of purposive sampling was to focus on particular character of population and availabilities of data that was best answer the research questions. A total of 300 farming households were used to investigate farmers improving agro forestry and adaptations practice being used by farmers. One focus was conducted to double check the survey data assistance of one kebele agricultural officers. The selection of the community was based on the accessibility and knowledge of agricultural officers.

Data analysis

Data analysis was done assistance from the community while in the field and information obtain from group discussion with key informant, personal observation and informal discussion were analyzed using contents analysis according to stemler(2001), It is a systematic, replicable techniques for compressing many words of text into fewer content and making inference by objectively and systematically identifying special characteristics of result in the forms of tables with percentage and pictures of certain study area.

Results and Discussion

The below table indicated that 9(12%) of the respondent were used for land productivity and soil fertility. 10(13.33%) of the respondent were uses for fodder and fuel wood. 15(20%) of the respondents were used agro forestry for income generation. 13(17.33%) of the respondent were used for live fence and wind break. 11(14.66%) of the respondent were used for prevent soil erosion. 8(10.66%) and 9(12%) of the respondent were used agro forestry for food, medicine and home garden and construction respectively.

Back Ground of the Respondents

The demographic characteristic of the respondents in terms of *Sex, Ages, Educational level* and *marital status* were presented in the below table.

The below table indicates that, 62(82.6%) of the respondent were males, whereas 13(17.4%) distribution of the respondent were females. According to their marital status, 11(14.67%), 52(69.33%), and 12(16%) of single, married and divorced respectively. Concerning the age range reveals that between age of 18-24 years 25(33.33%), 25-45 years 27(36%) and >46 years, 23(30.67). Concerning the educational level of the respondents, society that cannot write and read were 23 females and 30 males totally 70.67% and able to read and write were 7 females and 15 males totally 29.34%.

Knowledge and Perception of farmers towards agro forestry

From the above table, about 48(64%) of the respondents had excellent/great expectation towards agro forestry practice whereas about 15(20%) of the respondent were negative pertaining. Also certain numbers of respondent were neither positive attitude nor negative attitudes.

Evaluating the types of agro forestry existing in MehalMechare Kebele

The below table show that 30(40%) of the respondents were used scattered trees, 25(33.33%) were cultivate woodlots trees, 5(6.67%) were cultivates naturally existing plants and 15(20%) were cultivates crops.

Majority of MehalMechare kebele farmers have excellent consideration about agro forestry practice they pertained as presence of agro forestry uses for so many purpose among their advantages are role of agro forestry practice, It uses a source of fodder and fuel wood, as source of income for controlling of soil erosion, for the land productivity and soil fertility, as the source of domestic and local conception, also uses in conserving the biodiversity of flora and fauna and it could be increase the quality of land and nutrients, it also uses as boundary plants, live fence and so on are the major role of agro forestry practice. Within the same results, the information obtained from others source deals the same perception about agroforestry practice; It said that 'Agro forestry served as the source to control soil erosion and conservation by reducing wind speed and effect of rain water by enhancing percolation and interception of high velocity rain drop(FAO)(2005) *realizing the economic benefit of agroforestry expanses, lesson and challenges. The state of the world forest.* In contrast, certain farmers have very little knowledge about new agro forestry practice in our research study. They notified that agro forestry practice could decrease the productivity by the

increment number of fauna and flora that damage their production. Other negative impacts of agro forestry practice were completing of agro forestry component, especially crop for light, water, nutrient and space.

Also certain farmers have neutral perception to ward agro forestry practice they have neither support in the presence of agro forestry practice nor oppose absence of agro forestry

From the above table 3, the farmers have been uses agro forestry practices by different strategies. Among of the strategies existing were cultivation scattered plants, woodlot, home garden plants live fence and other practices were broadly found. Within the same results, the information obtained from others source deals the same perception about agro forestry practice; It said that Agroforestry as alternative sustainable land use system as a role to contribute to households' incomes, achievements of national poverty irradiation by 2015 and achievement of the MDGs by 2015. Even though there was no irrigation due to the absence of water bodies like River, lakes, ponds and others that use for increasing of agro forestry practices

Among the agro forestry practices existing in our study area, the woodlot practices is very crucial in MehalMechare kebele. It has various advantages for the farmers like that of, construction material, fuel, wood preparation of farming tools and generating cash income. The third types of agroforestry practice were home garden plants. They used as increasing cash income, foods, fuel wood, cash income, soil and water conservation. Not only this but also their is plant that uses as the fences. This live fence is provides for demarking farmers field boundary's protecting crops from damaging by animals and human. In the study area dominantly farmers practice *eucalyptus* plantation, this is because of most the time the farmers generate fuel and construction wood from *eucalyptus* and also It grows very fast and provided goods in short period of time The farmers also gain income by selling in the local market. *Kurkura* and *agam* also used as house and fence construction and generating income. From the home garden maize, sorghum, avocado and etc are largely practices. Especially sorghum is the main production of MehalMechare kebele farmers. They use for different purpose like that food consumption, for income generation and so on it.

Table.1 Demographic characteristics of respondents in MehalMechare area, Northern Ethiopia

(n=75)

Attributes	Farmers	Total %		
Gender				
Male	62	82.6%		
Female	13	17.4%		
Total	75	100%		
Marital status				
Single	11			
Married	52	14.675		
Divorced	12	69.33%		
Total	75	16%		
Age				
18-24	25	33.33%		
25-45	27	36%		
>46	23	30.67%		
Total	75	100%		
Educational status	Sex			
	Male	Females	Total	Total%
Cannot read and write	30	23	53	70.67%
Read and write only	15	7	22	29.34%

Table.2 The role of agro forestry in the study area

Role of agro forestry	Number of respondent	Percent of respondent%
Land productivity and soil fertility	9	12
Fodder and fuel wood	10	13.33
Income generation	15	20
For live fence and wind break	13	17.33
For prevent soil erosion	11	14.66
For food and medicinal purpose	8	10.66
For home garden and construction	9	12

Table.3 Perceptual attitudes of farmers towards the agro forestry practice

Numbers	Attitudes of respondents	Females	Males	Total percent
1	Positive attitudes	8	40	64%
2	Negative attitudes	3	12	20%
3	Neutral attitudes	2	10	16%

Table.4 Types of plants cultivates in this area were listed in the below tables

Types of trees and crops	Scientific names	Local names	Number of respondents	Total %
Scattered trees	Red acacia =>Acacia mill =>Ziziphus spina =>Caricaspinarum l.	Key girar =>NechGirar =>Kurkura =>Agam	30	
Woodlots	=>Juniperus procera =>Eucalyptus globulus =>Euphorbia =>Olivine =>Juniper tree =>Yushina Alpina	=>Tid =>Bahirzaf tileze weyira =>Ebuwacho =>shiwshiwa =>Kerero	25	33.33
Naturally existing types of plants	Dodonea angustifolia Acassia Crissa spinarum L. Ziziphus spina-christi (L.) Dest	Kitkita Giraragam kurkura	5	6.67
Types of crops	Persea Americana Steganotaenia araliacea Carica papayal	Teff(Am) Avocado(Av) Sorghum(En) Sugarcane(En) Papaya	15	20

Fig.1



Fig.2



Fig.3



Generally, agroforestry practice provide a lot of role to livelihood of local farmers of MehalMechare kebele through supplying goods such as food, fodder, timber, cash income and service such as shed, soil fertility improvement and ecological stabilization.

The socio-economic survey result showed that all household live in the area practiced one or more types of agro forestry practices but the good and service obtained by individual farmer were different according to the management type and size of agro forestry which they practiced however, the most observed was the home garden types of agro forestry.

Recommendations

Since agro forestry practice does not contribute much too total annual household income of the farmers in MehalMechare, concerted efforts is required on scaling up of best and management of agro forestry practices for more household income and poverty income reduction. Therefore, the following recommendations have been put forward for agro forestry scaling up, adoption and management improvement.

In making the agro forestry technologies be more productive, resistant to pests and diseases and meeting droughts condition, an array of both exotic and indigenous species are required. This kind of mixtures of

planting reduces drought conditions and pests and diseases that can affect single or related tree species. The range of species with fruit species inclusive can make farmers to benefit more from a range of products.

Recommendation for future studies Since there is a big difference of price of poles between farmers and that of retailers in MehalMechare, it is proposed that price cost analysis be conducted in order to find at what price a farmer could sell his or her agro forestry products for improvement of agroforestry contribution to total annual household income and income poverty reduction. More skills are required on how to best utilize the available productive resources like (time, labor and land) for maximum utilization and return from land for more household incomes.

Understanding the nature of community need assessment and create awareness creation program decision maker to solve the problem of negative perceptive towards AF practice.

The study show that there was lack irrigations, this led the community not to actively practiced AF practice, therefore in order to fulfill this, it's advisable to dig the ground and save rainfall during summery and by thus rain water it can be possible progress the AF practice. Better participation of local community is very crucial, thus to improving AF practice.

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