Opportunities and Challenges of Scaling up Agroforestry Practices in Sub-Saharan Africa: A Review

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ABSTRACT

Agroforestry is a land-use system and technologies where woody perennials are deliberately used on equivalent land management units as crops and/or animals. Its systems combine tree growing with the assembly of different crops or animals. Hence, developing positive ecological and economic interactions between components, agroforestry systems aim to produce a variety of environmental, economic and social advantages to farming communities. It plays a major role in soil conservation and global climate change mitigation particularly due to its tree component. Trees control soil degradation through their roots and accumulate greenhouse emission (GHG) in their biomass. What is more, it conjointly helps in global climate change adaptation. It’s a long-time undeniable fact that despite our gift effort at global climate change mitigation (GHG reduction), there is an additional pressing ought to address the impact of global climate change (adaptation). Peoples ought to be acutely aware regarding the scope and advantages of agroforestry and that they ought to participate in the implementation and development of agroforestry within the country. Thus, this paper reviews different analysis findings on the opportunities and challenges for scaling up agroforestry practices. Therefore, the agroforestry system is economically and ecologically sound practices with an improvement of overall farm productivity, soil enrichment through litterfall, maintaining environmental services like international global climate change mitigation (carbon sequestration), phytoremediation, watershed protection and biodiversity conservation.

Key words: Agroforestry, Climate change, Phytoremediation, Soil conservation.

Agriculture within the 21st century faces multiple challenges: it’s to provide additional food and fiber to feed a growing population with a smaller rural working class, additional feedstocks for (Silvana et al., 2016) most likely large bioenergy market, contribute to overall development at intervals the many agriculture dependent developing countries, adopt a lot of economical and property production methods and adapt to climate (FAO, 2016; Tamirat, 2019). Endemic knowledge-based agriculture depends on low input technologies practiced for hundreds of years, by using natural ideas or models to optimize long-run productivity instead of short-term gains.

The reintegration of endemic technical knowledge into current farming practices to stop the disruption of social relations, which regularly results in rural poverty and famine. Agro-ecology with its core ecological principles paved the method for the emergence of agroforestry as a discipline within the 1970s to provide a mixture of parts that make heterogeneous, profitable and safer land-use systems (Zemede, 2001; USDA, 2017). Adding trees to farms will restore soil fertility, turn out animal feed, facilitate the combination of stock into croplands, secure organic fertilizer within the sort of manure, alleviate the fuelwood shortage, mitigate deforestation and global climate change and especially, improve agricultural yields and incomes, making certain safer keep for peoples (Susila et al., 2012; Srivastavaa et al., 2012).

Agro-forestry may be a new scientific term for a group of an old practice of land management within which trees, crops and animals move within the same house and time (Dover et al., 1987; Dove, 1992; Jean Baptiste, 2013).

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Agroforestry may be a collective name for a land-use system and technologies wherever woody perennial, crops and animals are deliberately used on constant land management or temporal sequence (Lundgren and Raintree, 1982; USDA, 2017). This definition implies that agroforestry ordinarily involves two or additional species of plants/animals, a minimum of one among that is woody perennial perpetually has two or additional outputs, the cycle is over one year and additional complicated in ecologically (structurally and functionally) and economically than the mono-cropping system. Currently given the prevalence of environmental degradation, food insecurity and economic condition within the developing countries, agroforestry is seen because the leading practice to assist innumerable families to address hunger, malnutrition, alleviate economic conditions, enhance food security, solve environmental issues and ecological quandary (Sanchez, 1995; Jean Baptiste, 2013; PDA, 2018).

According to Thomas (1990) cited in Nair (1993) despite the opportunities of agroforestry, there are several
challenges to retard the scaling up of agroforestry practices. These are issues regarding social (demographic factors, land possession, the unavailability of markets, infrastructure), economic (financial incentives, economic benefits) and environmental (soil erosion, water quality, global climate change) constraints are essential to the success of agroforestry programs.

This paper review was attempting to focus on the most important challenges and opportunities scaling up agroforestry practices in Sub-Saharan Africa. Prevailing in depth sorts of literature that are centered on opportunities and challenges in scaling up agroforestry practices and connected documents were reviewed. Additional central sources were books, journals, online materials, totally different reports and different relevant revealed documents. Moreover, Google was conjointly a vital method of carried out to access different connected publications. Finally, materials from the general library of Bonga University in 2018-2020 were reviewed. Different authorities were consulted through personal communication.

**History and concepts of agroforestry**

According to Divine et al. (2015) according that cultivating trees and crops in intimate combination with each other is an ancient apply that farmers have used throughout the globe. Consistent with King (1987) cited in Nair (1993) states that in Europe, it had been the overall custom to a clear-fell degraded forest, burn the slash, cultivate food crops for variable periods on the cleared space and plant or sow trees before, along with, or when sowing crops (Nair, 1993; Srivastava et al., 2012).

In tropical America, a farmer would plant coconut or papaya with a lower layer of bananas or citrus, a woody plant layer of the low or angiospermous tree, annuals of various stature like maize (Nair, 1993) and at last a spreading ground cowl like squash. Such an intimate mixture of assorted plants, every with a unique structure, imitated the bedded configuration of mixed tropical forests (Wilken, 1977) cited in (Nair, 1993). In Asia, the Hanunoo of the Philippines practiced a fancy and somewhat subtle form of “shifting” cultivation (Jean Baptiste, 2013; ASI, 2017). In clearing the forest for agricultural use, they deliberately spared bound trees that, by the tip of the rice-growing season, provided a partial cover of the latest foliage to stop excessive exposure of the soil to the sun (Conklin, 1957; Nair, 1993; PDA, 2018).

Incontinent of southern Nigeria; yams, maize, pumpkins and beans were usually grown along beneath a canopy of scattered trees (Forde, 1937; Srivastavaa et al., 2012). The Yoruba of western Nigeria, who have long practiced an intensive system of blending non-woody, shrub and tree crops, claims that the system may be a suggests that of preserving human energy by creating full use of the restricted house won from the dense forest and maintaining the soil's fertility, furthermore as combating erosion and nutrient natural process (Ojo, 1966; Sanz et al., 2017).

In Ethiopia, the variety in altitude, climate, soils and different physical features have created a range of agro-ecological zones that bring about to various forest flora and agricultural systems with opportunities for agroforestry in an exceedingly completely different setting (SUAF, 2018). Within the forested areas of Southwest Ethiopia, home gardens are started within the forest that permits year-around production of food, reduces the risk of production failure, reduces the risk of pests and disease, will increase productivity and output flexibility and improves the microclimatic and soil condition (Zemede, 2001; FAO, 2016).

Many factors and developments within the 1970s contributed to the overall acceptance of agroforestry as a system of land management that applies to each farm and forest. These factors included the re-assessment of development policies by the magnetic flux unit, the reexamination of biological science policies by FAO of the United Nation, the reawakening of scientific interest in each intercropping and farming systems, the deteriorating food scenario in several areas of the developing world, the increasing unfold of tropical deforestation and ecological degradation, the energy crisis of the Seventies and sequent worth step-up and absence of fertilizers and also the institution by the international development center of North American country of a project for the identification of tropical biological science analysis priorities (Nair, 1993).

When the thought of agroforestry was given a concrete form in 1975s, it had been outlined as a permanent system of land use that upgrades the overall production of the soil through the permanent or consecutive growing of perennial food crops, principally tree crops and also the use rolled plants, either or not together with animal breeding, management and designing of the system ought to correspond as closely as doable to the cultural pattern of the individuals concerned, whereas on the market labor ought to be used as efficiently as possible (Wassink, 1977; Dumont et al., 2014). Agroforestry is a very important habitat category planted a forest that has the potential to supply farmers, communities, associated society at massive with a big range of forest-related product and services and progressively being known as an integrated land use which will directly enhance plant diversity whereas reducing home ground loss and fragmentation (Noble and Dirzo, 1997; PDA, 2018).

**Classification of agroforestry systems**

The most common set of criteria used to classify agroforestry systems and practices are the structural basis (the composition and arrangement of the components, each spatial and temporal), purposeful basis (the main operate or role of the components), socioeconomic basis (the intensity or scale of management and goals of the system) and ecological basis (the environmental and ecological quality of systems). All agroforestry systems are characterized by three basic elements namely; the woody perennials (trees/shrubs), the herbaceous plants (crops) and also the animals. Supported these three basic components, agroforestry systems may also be classified as agro-silvicultural, silvopastoral and agrosilvopastoral (Nair, 1989;
Kang, 1996; Tolunay et al., 2007). These are:

(i) Agrosilvicultural Systems - This is an agroforestry system where agricultural crops are combined with shrubs/trees on the same unit of land for higher or better sustained production of annual crops, fodder and wood.

(ii) Silvopastoral Systems - This is an agroforestry system where variable crops and/or animals and trees are combined for higher production of grasses and fodder. It plays a vital role in mitigating risks related to climate variability and unsteady costs by providing short-term (forage and livestock) and long-run (timber) financial gain sources (Cubbage et al., 2012; Schoeneberger et al., 2012).

(iii) Agrosilvopastoral Systems - This is an agroforestry application during which trees, livestock and crops are combined, maintains and will increase nutrients levels and so enhances soil structure (Ndlovu and Mugabe, 2002). Once animals, crops and trees are properly managed, the result will produce one in every of the foremost property forms of agriculture. A conceptual map showing three various ways to classify the agroforestry system is shown in Fig 3.1.

Types of agroforestry practice

Scattered trees on cropland

The practice of growing and maintenance of scattered trees on cropland has also supported the protection and management of selected mature trees already on the positioning (Rocheleau et al., 1988; Mehari, 2012). Scattered trees on farmlands function food, fuelwood, construction wood, fodder, mulch, raw materials for creating agricultural implements, household utensils; produce employment and financial gain for the farmers (Mehari, 2012).

Improved fallow

Improved tree fallow is outlined as enrichment of a natural fallow with leguminous trees or shrubs planted at high density to boost soil fertility (Badege et al., 2013). The first aim of improved fallow is the promotion of food security through exaggerated soil productivity. Improved fallow consists of planting trees, chiefly legume tree species, to counterpoint the soil among a shorter fundamental measure, compared with natural fallow.

Rotational woodlots

Woodlot refers to a segment of a woodland or forest capable of small-scale production of forest products such as wood fuel and timber. Many woodlots occur as part of a farm or as buffers and undeveloped land between properties (Badege et al., 2013), such as housing subdivisions, industrial forests, or public properties. Rotational woodlots associate the philosophies of crop production and forest management to supply several products. The technology involves growing trees and crops in three interrelated phases; initial tree establishment, where trees are intercropped with crops; second tree fallow; and third cropping after tree harvests (Nyadzi et al., 2003; Jean Baptiste, 2013; PDA, 2018).

Alley cropping

Alley cropping is the planting of trees or woody shrubs in two or a lot of sets of single or multiple rows, with agronomic, horticultural, or forage crops cultivated within the rows (USD, 2017). This agroforestry practice is used to enhance or diversifies farm products, reduce surface water runoff and erosion, improve utilization of nutrients, reduce water and wind erosion, modify the microclimate for improved crop production, improve wildlife habitat and enhance the aesthetics of the area (Badege et al., 2013).

Live fencing, hedges and boundary markers

Live fencing, hedges and boundary markers will function productive and ecologically valuable elements of agroforestry systems (Badege et al., 2013). The most objective of this follow is to provide another supply of money to farmers and to provide improved. Such tree plantings can even indirectly influence the crop-livestock production system by acting as windbreaks and shelterbelts. The hedges are cropped sporadically throughout the crops’ growth to supply biomass and enhance soil nutrient standing (Nair, 1989; Jean Baptiste, 2013).

Windbreaks

Windbreaks are strips of trees and/or shrubs planted and maintained to change wind flow and improve microclimate, thereby protective a selected space. Windbreaks have often been reported to enhance yields of the crops grown between the widely spaced tree lines (Jat and Poonia, 2006). On fairly stable soils and for moderately responsive crops like cereals, the commonly adopted distance between windbreaks is 15-25 H (Badege et al., 2013). For forage crops, the spacing of 10-14 H is also even if the extra yield is enough to balance the losses from the reduced crop production space. Dense crowns, stout boles, retention of lower limbs and uniform rates of growth are all characteristics that contribute to making effective windbreaks (Byington, 1990; USDA, 2017).

Home-gardens

According to Fernandes and Nair (1986), home gardens are defined as land-use practices involving deliberate management of multipurpose woody species in intimate association with annual and perennial horticultural crops and invariably, livestock inside the living compound, the entire crop-tree-animal unit being managed by the household labor. It was thought that home gardens arose from shifting cultivations to beat resource constraints and to establish the rights to natural resources by smallholder farmers (Fernandes and Nair, 1986; Abay, 2019). Home gardens play a significant role as a supply of minerals and nutrients (Asfaw and Wolde, 1997). Additionally, the various product offered year-around contribute to food security particularly throughout dry seasons (Galhena et al., 2013). In keeping with Abay (2019) reported that trees within the home garden are usually used for food security, fuelwood, agricultural...
improvement, constriction, fodder drugs and financial gain generation. Besides this, it will function models for the planning of improved agroforestry practices (Kumar and Nair, 2004).

**Opportunities of agroforestry practice**

The opportunities for the applying of agroforestry principles within the developed countries may be separated into ecological, economic and social elements (Lassoie and Buck, 1991; Ndukwe et al., 2017). Agroforestry has each ecological and economic importance to extend the productivity of land and property of the setting in developing countries (Bjorn, 1991). It additionally generates employment by growing crops and promoting the trees and tree-derived products like fruit, latex, resins, nuts, ginseng, timber, berries and meddicative products (Leakey, 1999; Ndukwe et al., 2017). During a broader sense, agro-forestry includes a good vary of practices that involve establishing

**Table 1:** Nitrogen added into the soil through biomass incorporation by different fallow species in western Kenya.

| Fallow species       | Added nitrogen (kg/ha) |
|----------------------|------------------------|
| *Gliricidia sepium*  | 264                    |
| *Calliandra calothyrsus* | 644                |
| Non-coppicing        | 84                     |
| *Sesbania sesban*    | 305                    |
| *Tephrosia vogelii*  | 188                    |

Source: Kiwia et al., (2009); Badege et al., (2013).

**Fig 1:** This photo shows maize alley cropped with fast-growing Eucalyptus hybrids in commercial farms in Brazil. Photo by Laércio Couto, Brazil.

**Fig 2:** Live Fence and Hedgerow (http://www.agroforestry.info, 2014).

**Fig 3:** Shows home garden agroforestry (Badege et al., 2013).

**Fig 3.1:** Examples of a conceptual map showing three various ways to classify the agroforestry system.
and managing trees by design around or at intervals croplands, pasture lands and stock grounds with the aim of dominant wearing, increase soil fertility, give fuelwood, animal fodder and modify microclimate of the world, developing property agricultural production systems, rising life home ground and rural landscape, mitigating environmental pollution and increasing farm economy through the harvest of tree-based specialty products (Chaturvedi et al., 2009; USDA, 2017). The following points described below are the major opportunities for agroforestry practices. These are:

Rehabilitation of degraded soil

As reportable by Nair (1993) several factors of development within the 1970s contributed to the final acceptance of agroforestry as a system of land management, that applies to each farm and forest. It is the potential for improvement within the physical, chemical and biological conditions of soils and so the most advantage of agroforestry systems is in their ability to bring favorable changes altogether the three conditions (Maikhuri et al., 1997; Nebiyou et al., 2016).

Soil and water conservation

In several, the world of the planet soil erosion poses economic and environmental issues wherever farming may be a vital and increasing activity like within the tropical uplands. Supporters of agroforestry claim that it is a property land use that may stop or mitigate eating away while not seriously compromising the economic welfare of little farmers in these areas. In many African countries, the introduction of agroforestry practices to rural communities has well improved the farm economy and reduced hunger by up soil fertility and thus increasing crop production (Maikhuri et al., 1997; Garrity, 2004; Ndukwe et al., 2017). Soil fertility is improved or sustained by the addition of vegetative organic matter, i.e. decomposition of bilulate biomass and roots. Integrated systems of trees and/or shrubs with pasture can reduce runoff by 50 to 80%, sediment transport by 80% and about 50% of total N and total P (Daniels and Gilliam, 1996; Sanz et al., 2017). Additionally, to erosion management, the less controversial biophysical effects of contour hedgerows on soil embody the rise of organic matter and variety, organic process, improvement of physical properties (soil structure, porosity and moisture retention) and increased potency of nutrient use (Nair, 1993; Ndukwe et al., 2017).

Trees have inherent skills to enhance water infiltration, scale back runoff volume and shut down the contaminated runoff and sediment (Rockwood et al., 2004; Khalid and Islam, 2017). In step with Rhoades (1996) reported that exaggerated soil water (4.53% larger than in open) within the crop root zone below agroforestry species canopies. Agroforestry technologies are shown to be effective in reducing pollution from agricultural activities after they are well designed and properly settled within the watershed (Dosskey, 2002).

Soil fertility improvement

In the broad sense, the productivity of the land is its quality for production, the most elements of that are lightweight, water and soil. Tamirat (2019) and Frank Place et al., (2003) outlined soil fertility because of the capability of the soil to support the expansion of plants, on a sustained basis below the given condition of the climate and different relevant properties of the land. Concerning the soil fertility, Eysau (2002) has reportable that soil fertility contains physical changes, that is that the capability of the soil to produce plants with foothold, wetness and air and chemical conditions that verify the capability of the soil to produce plants with nutrients.

Soil fertility decline results from the combined impact of lowering of soil organic matter, deterioration of physical properties, lowering of nutrient content and in some cases action, which is usually related to the decline in soil fertility (Khalid and Islam, 2017; Tamirat, 2019). Similarly, Udawatta et al., (2002) reportable that maintenance and improvement of soil fertility area unit important for international food security and environmental property. But, if measures do not seem to be taken on time to avoid the loss of soil fertility, it would be a headache to the growing population particularly in developing countries. In line with this, Eysau (2002) reportable that declining soil fertility in tropical rain-fed agriculture is changing into a heavy downside for a growing range of individuals. Likewise, Kandji et al., (2006) reportable that low soil fertility may be a major downside to food production and one amongst the key biophysical constraints to redoubled agricultural growth in Sub-Saharan Africa.

To control the issues of soil fertility, the agroforestry approach would possibly play an optimistic impact. There are differing types of agroforestry practices that improve soil fertility managements like fallows, hedgerows, alley cropping, tree on cropland, plantation on physical structures (Tamirat, 2019). Consistently, Roa et al. (1998) and Weil and Brady (2016) reported that herb trees species have shown some potential for soil fertility improvement and conservation since soil fertility improvement is achieved through biomass transfer, long/short term fallows, organic process. Within the same method, Ajayi et al. (2008) reported that trees/shrubs improve the physical properties of soils.

Especially, soil aggregation is higher in fields wherever trees are being fully grown and this enhances water infiltration and water holding capability of soils thereby reducing water runoff and eroding. It is conjointly reported by Acharya and Kafle (2009) and Tamirat (2019) that leaf litters in agroforestry systems enrich the soil fertility by providing organic matters, leaves management the speed of the raindrops and permit them to travel right down to the land surface slowly that helps water to infiltrate into lower a part of the soil surface. Agroforestry systems have a high potential in finding the matter of soil fertility compared to nontree/shrub-based systems. Systematically, Roa et al., (1998) explicit that the upkeep of soil fertility in Agroforestry
primarily based systems might be achieved through an increase or maintain nutrient standing, increasing soil fauna and flora, higher soil aggregation, lower bulk density, improved soil body; increase water infiltration had compared to the bare soil.

**Climate change adaptation and mitigation**

Climate change is an increased part concentration of GHG (Greenhouse Gases), which ends up from human-induced deforestation and fuel burning, has led to unprecedented precipitation patterns and has caused droughts and floods in several components of the world, particularly in Africa (Jean-Pascal Van, 2017). Global climate change can affect developing countries additional severely owing to their low capability for adaptation (IPCC, 2001; Ndukwe et al., 2017). Moreover, it is a further threat that may affect a country’s ability to fulfill pressing rural development demands as well as the advance of food security, financial condition reduction, associated provision of an adequate commonplace of living for growing populations (Louis, 2011; Sanz et al., 2017). Agro-forestry systems have sensible potential to be climate and living good practices (Verchot et al., 2007; Raj, 2016). Considering its wide pertinence, agroforestry encompasses a high potential to mitigate global climate change through carbon sequestration in soil and biomass (IPCC, 2000). Consistent with Vlek et al., (2004) incontestable the challenge of utilizing non-cultivated lands for carbon comes incontinent, suggesting that any program in continent planning to put aside land for the aim of sequestering carbon can run into ethical conflict with the necessity to extend food security (Badege et al., 2013; Ndukwe et al., 2017).

Agro-forestry has importance as a carbon sequestration strategy owing to the carbon storage potential in its multiple plant species and soil further as its pertinence in agricultural lands. For carbon sequestration, the steps might embrace conversion, restoration and rehabilitation of degraded land and wetlands, improved tree management observe to extend growth rates and implementation of agroforestry practices on agriculture pasture land (Chaturvedi et al., 2009; Raj, 2016). Additionally, for carbon sequestration, it is going to be conservation of biomass and soil carbon in existing sinks, improved potency of wood process, heath protection and simpler use of burning in each forest and agricultural systems and for the carbon substitution increase use of biofuel and increase conversion of wood biomass to the sturdy wood product to be used in situ of energy-intensive materials (Torquebiau, 2013; Ndukwe et al., 2017). The agroforestry system is primarily designed for carbon sequestration, presents a novel chance to extend carbon stocks within the terrestrial region (Table 2).

**Socio-economic and employment**

Agro-forestry is exclusive in several respects, each as a science and as a follow. One such side is its indivisible mixture of biophysical principles and social objectives. This is often notably apparent once agroforestry is viewed from the event perspective, with special stress on tree-people relationships (Nair, 1993; Ganesamoorthi et al., 2003; USDA, 2017). In different words, the agricultural poor is normally thought about because the primary beneficiaries of agroforestry; consequently, agroforestry technologies square measure expected to be particularly relevant and applicable to small-scale land-users with low capital and energy requirements and to yield product and advantages directed to immediate human wants instead of industrial benefits. Therefore, social acceptableness could be a way more necessary to live of success for agroforestry technologies than for commercially-oriented, high-input agricultural and biology technologies (Chaturvedi et al., 2009; Bijarpas et al., 2015).

Likewise, Dhyani et al. (2003) have highlighted the role of agroforestry product and environmental services to satisfy the subsistence desires of low-income households and providing a platform for the larger and sustained resource of society. Forest farming provides possibilities to provide short financial gain from prevailing woodlots, with the smallest amount of capital investment. In general, the social edges of agroforestry are improved in food security, rural diversification and community stability, land use coming up with a tool, choices to accommodate multiple uses and buffer zone within the rural-urban and transition from a protected space to production. Agroforestry will give an additional numerous farm economy and stimulate the complete rural economy, resulting

### Table 2: Potential carbon storage for agroforestry system in different eco-regions of the World (Dixon et al., 2004; Verchot et al., 2007).

| Eco-region          | System            | Mg C ha⁻¹ |
|---------------------|-------------------|-----------|
| Africa              | Humid tropical high | Agrosilvicultural | 29-53    |
| South Africa        | Humid tropical low | Agrosilvicultural | 39-102*  |
|                     | Dry lowlands      |            | 39-195   |
| Southeast Asia      | Humid tropical    | Agrosilvicultural | 12-228   |
|                     | Dry lowlands      |            | 68-81    |
| Australia           | Humid tropical low | Silvopastoral | 28-51    |
| North America       | Humid tropical high | Silvopastoral | 133-154  |
|                     | Humid tropical low | Silvopastoral | 104-198  |
|                     | Dry lowlands      | Silvopastoral | 90-175   |
| Northern Asia       | Humid tropical low | Silvopastoral | 15-18    |

A Carbon Storage Values were Standardized to 50-year rotation.
Food security and livestock feed production

Adoption of agroforestry depends on several management goals, drivers and discourse factors. In most cases, assets related to ecosystem services and food security are the main motivating factors in agroforestry adoption (DeSouza et al., 2012; Skole et al., 2013; Mbow et al., 2013). Solving the issues of food and nutrition security needs among different interventions a variety of interconnected agricultural approaches, as well as enhancements in staple crop productivity and therefore the cultivation of a wider range of edible plants that provide fruits, nuts, vegetables, etc., for additional varied diets (Frisson et al., 2011). Agro-forestry has a crucial role in increasing the yields of vegetables that with fruit, offer varied and nutritionally balanced diets instead of calories alone, providing shade and support for crops that require it, supporting animal production and improving soil fertility (Susila et al., 2012).

Agro-forestry trees offer necessary ecosystem services as well as soil, stream, stream and watershed protection; animal and plant biodiversity conservation and carbon sequestration and storage, all of that ultimately affect food and nutrition security (Garity, 2004; Dawson et al., 2014). As agroforestry is that the integration of trees with annual crop cultivation, livestock production will increase farm productivity once the assorted components occupy complementary niches and their associations are managed effectively (Stefan Dewenter et al., 2007; Dawson et al., 2014).

Generally, agroforestry offers several opportunities to govern the temporal arrangement of litter decay and nutrient unleash. This could be achieved through choosing tree species with differing rates of litter decomposition, dominant the temporal arrangement of the addition of pruning to the soil, through adjusting the temporal arrangement of pruning, tree cutting or conveyance of plant residues from external sources, pretreatment, the addition of recent materials or composing and dominant manner of addition that is placed on the bottom surface or plowed into the soil (Chaturvedi et al., 2009; Dawson et al., 2014).

Challenges of agroforestry practice

According to Thomas (1990) argue that a serious constraint is concerned in relevance social (demographic factors, land possession, the availability of markets, infrastructure), economic (financial incentives, economic benefits) and environmental (soil erosion, water quality, global climate change) constraints are essential to the success of agroforestry programs. Consistent with Nath et al., (2012) reportable that a number of the technical obstacles that limit the fast enlargement of agroforestry are the lack of knowledge regarding the planning and management techniques, choice and domestication of potential tree species, management guidelines, lack of attention given to tree products and services in information assortment, policy constraints and marketing (Kiyani et al., 2017). The basic constraints affecting the agroforestry practices are as follow. These are:

Unsecure land tenure system

Unsecured or ambiguous land tenure, lack of land use management is common in developing countries, leads to confusion regarding land delineation and rights. If people do not have title to land, there is a perception that there is no point in finance in trees, which may take a long time for benefits to be accomplished. It influences farmers’ selections by influencing the look horizon of a farmer. It is expected that farmers that feel secured (sure to inherit land they cultivate to their descendants) build the choice to take a position in future investment (Osemebo, 1987; Rioux, 2011; Holland et al., 2014; Kiyani et al., 2017).

Labor

Cultivation is often done with family labor and also the labor shortage is commonly a reason why agroforestry practices do not seem to be adopted (Angelsen and Kaimowitz, 2004; Weil and Brady, 2016). Most agroforestry innovations demand changes within the labor practices of the farming system into that they are introduced. Moreover, labor necessities are scrutinized by rural individuals before they decide whether or not to adopt replacement agroforestry follow (Hoskins, 1987; Rioux, 2011). In line with Hoekstra (1990) reportable that the value of production is going to be increased significantly if extra labor should be employed. Though these extra labor prices are going to be offset by extra advantages, the immediate want for added labor might generally be a deterrence to the scaling up of agroforestry practice (Kang et al., 1990; Weil and Brady, 2016). It ought to be noted that labor intensity is one among the principal’s determinative factors in Raintree and Warner’s (1986), glorious analysis of intensification of land use from traditional shifting cultivation to intensive high-rise agroforestry practices.

Lack of available marketability of products

The information has indicated that access to markets and raw materials and structure and management skills are among the main constraints to the expansion of those enterprises (FAO, 2016). The choice of appropriate market infrastructure will increase the provision of essential raw materials. Another constraint in delivering tree product to markets for several tree product, markets are poorly structured and coordinated (Roshetko et al., 2007; Weil and Brady, 2016). This ends up in low and unstable returns to farmers and high prices for buyers of tree foods that limit...
their consumption. Issues typically cited by producers embrace the absence of a negotiation system, poor transport infrastructure and also the involvement of multiple intermediaries within the supply chain, all of that act to reduce farm prices. Traders additionally face several issues, like poor roads, corrupt officers and also the high value of collection from geographically scattered producers.

**Short-term thinking**

Unimproved access to markets might encourage farmers to follow unsustainable land management for gaining short profits. The more farmers sell products from their farms, the more severe the soil nutrient depletion becomes occurred. the lack of knowledge in tree seed plant management; pest and disease control; adequate seeds and germplasm provide is another constraint to agroforestry follow (Nkonya et al., 2004; Rioux, 2011). Additionally, the shortage of awareness by farmers within the environmental benefits of trees and misconceptions regarding trees like the worry of trees shade negatively affecting crops and fruit trees (Kiyani et al., 2017).

**Lack of resources**

Farmers are less likely to worry about soil fertility using manure on distant farm lots and a lot of seemingly to use slash-and-burn for land preparation, which ends up in increased nutrient loss and erosion (Weil and Brady, 2016). Inadequate access to capital and credit is usually considered as a serious constraint for increasing household production and financial gain to invest in additional economical land use. For any improvement of the farming practices, the essential public product funded by the state, like education, health care, agricultural research and extension and also the maintenance of rural roads ought to be in place (Hazell et al., 2007; Jones, 2015; Weil and Brady, 2016).

**CONCLUSION**

Climate change and soil degradation are the two commonest vital global factors that face all living organisms together with humans and disturbance of natural ecosystems, agriculture and well-being of the individuals. Throughout this case, agroforestry system as a sturdy farming practice addressing food security issues by creating foods to individuals’ feeds to animals, management eroding, mitigate adverse effects of global climate change by enhancing environmental quality, face up to economic viability and improve quality of life. Therefore, agroforestry practices and systems comprise numerous models in several regions worldwide, that plays a fascinating role to regulate the negative impact of global climate change and soil degradation by increasing tree-crop diversification that leads to a lot of carbon storage (carbon sequestration) and rehabilitation of degraded soil capability than alone cultivation of solitary crops.

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