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Review Article

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# Parkland Agroforestry Practices on Biodiversity Conservation-A Review

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## ABSTRACT

Globally, forests hold more than 75% of the world's terrestrial biodiversity but between 2010 and 2015, about 3.3 million hectares of forest lands were lost. The conversion of forest to agricultural land was a major reason for biodiversity losses in tropics where most of the world's biodiversity reserves are found. High population growth in the regions causes loss of biodiversity. Currently, biodiversity conservation and mitigation of climate changes are environmental challenges. To reduce deforestation, farmers integrate trees on their farmland to acquire ecological, economic and social benefits from natural forests and woodlands. Thus, the aim of this paper is reviewing the benefit of parkland agroforestry practices on biodiversity conservation. Parkland agroforestry practices have given more emphasis to climate amelioration, fertility improvement, water conservation, and biodiversity improvement. The practice is known by growing scattered trees on farmland by integrating annual crops; which maintains species diversity. Their rich diversity makes them ecologically resilient and provides more and better ecological functions. Parkland agroforestry practices reduce deforestation and pressure on protected forests by providing alternative bioenergy, timber and other forest products from farmers' fields. Moreover, it is used as an ecological corridor allowing species to move between habitats. In other ways, the interactions between tree, crop and livestock components in parkland agroforestry can be positive, negative or neutral. Biodiversity conservation has an effect on ecological interaction under parkland agroforestry. Thus, promoting parkland agroforestry practices plays a role in the conservation of biodiversity in varieties of ways if implemented based on the principles that control leaving bare land.

**Key-words:** Agroforestry, Biodiversity, Conservation, Ecological corridors, Parkland, Resilient

## INTRODUCTION

The vast majorities of forests particularly in tropics have either been transformed or degraded by anthropogenic activity, with agricultural expansion being widely recognized as a driver of the change [1]. In where, the high population pressure makes land management practices challenging [2]. A high rate of deforestation and land degradation continue to raise the questions in most parts of the continents. International communities are facing challenges to finding strategy convenient to both rural livelihoods and biodiversity conservation [3]. Land-sparing and land-sharing have emerged in recent years as contrasting strategies to tackle the trade-offs between livelihoods and biodiversity conservation [1].

Agroforestry is a multifunctional land-use that involves agriculture and forest production system in the same unit of land [4], which is widely promoted for the conservation of biodiversity to support rural livelihoods [5]. The agroforestry system approach is an integrated tactic of using the interactive benefits from combining trees with crops and livestock. It combines agricultural and forestry technologies to create more diverse, productive, profitable, healthy and sustainable land-use systems [6].

Agricultural expansion and intensifications are the main drivers of the current biodiversity crisis [1,4]. Obviously, for last past 25 years, the world's forest area has

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declined from 4.1 billion ha to just under 4 billion ha, decrease of 3.1%. The rate of global forest area net loss has slowed by more than 50% between the periods 1990–2000 and 2010–2015 [7]. These changes in biodiversity are driven by combinations of drivers that work overtime, on different scales, and that tend to amplify each other. In addition to this, there is also a worldwide concern that human activities such as pollution, habitat destruction, overexploitation and foreign plant and animal invasions are resulting in the ever-increasing loss of the earth's biological diversity [8]. This is because, the major challenges in tropical land management are meeting the growing demand for agricultural products while conserving biodiversity, providing ecosystem services, and sustaining rural livelihoods.

To do this, onsite or out of the site conservation, approach like parkland agroforestry practices, home-garden agroforestry practices, trees and water conservation measures, alley cropping and so on should be implemented, to reduce deforestation problems [9]. Farmers use their indigenous knowledge to conserve their environment; the CBD 2014 suggested the use of traditional knowledge, innovation and practices of aboriginal and local communities to achieve the strategic plan of Biodiversity 2011–2020 [10].

Now-a-days, out of 46% of agricultural land trees in the world, an estimated 30% of the world's rural population uses for different purpose [10]. Integrating trees and shrubs in food crop systems helps to address food insecurity, increase sequestration of $CO_2$ [11] and reduce agricultural systems hazards [2,3]. Almost half of agricultural lands in the world have tree cover of 10%, suggesting that agroforestry system like parkland agroforestry is an integrated system mixing trees, crops and livestock within agricultural landscape [10]. Moreover, the role of complex agroforestry and other agroforestry systems have gained attention due to the urgency of increased concerns about the loss of biodiversity and ecosystems services [1,6]. Thus, they are an alternative to the segregated approach of agricultural simplification, where ecological functions are substituted by technical means and external inputs [12]. This has led to increasing interest in quantifying the tradeoffs between integrated and separated landscapes because; the role of agroforestry in achieving biodiversity conservation goals has gained hastening attention in third world countries.

Biodiversity in agroforestry systems is usually higher than that of conventional agricultural systems due to the scattered trees on farmland agroforestry practices, which create more complex habitat that, support a wider variety of fauna [13]. In this agroforestry practices, the multipurpose trees decisively selected and maintained when conversion of woodland to farmland is taken. It favors the survival of native plants and improves the yield of crops and minimizes the impact on the companion crop [14].

Commonly, the parkland agroforestry practice is the result of farmers' strategy to keep the advantage of gathering from the wild plant's resources while producing it there. It combines different trees and cereal crops within the same land, reduce risks in agricultural production and enhance biodiversity [6,15]. This practice also illustrates how farmers value and manage plant resources in their territory, which contributes to the conservation of plant genetic resources and biodiversity conservation as whole [16], which keep wide range of species in farmland and increase efficiency of parkland agroforestry practices. Thus this review paper was aimed to review the potential of parkland agroforestry practices on biodiversity conservation.

**Agroforestry**- Agroforestry combines agricultural and forestry technologies to create integrated, productive, diverse, healthy and sustainable land-use system. Agroforestry is a feature of agriculture landscapes throughout the world, but the extent to which it is practised varies from region to region [7]. It ranks high among the significant initiatives in improving land management's that occurred during the past few decades. Today, nearly a billion hectares of agricultural landscapes already have more than 10% tree cover and an estimated total of 1.6 billion hectares of land worldwide has the potential to be under agroforestry management in the foreseeable future [5,16]. Globally, about 560 million people live in agricultural ecosystems that contain a tree cover of more than 10%, which equates to 31% of all humans inhabit farm landscapes.

According to the ICRAF definition, about 22.2 million square kilometer agricultural land and minimum of 10% trees of cover agroforestry world widely.

A high percentage of tree cover is found in nearly all continents of the world, highest being in Central America and Southeast Asia. Although Africa shows a smaller percentage of tree cover at a continental level, the most

 

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widespread farming system in Africa is the so-called agroforestry parkland (scattered trees in cropland), making Africa a typically "treed continent" in agricultural areas [5].

**Table 1:** Global forest area change, 1990–2015

| | | Annual net Change | | |
|---|---|---|---|---|
| **Year** | **Forests (Thousand ha)** | **Period** | **Area (Thousand ha)** | **Rate (%)** |
| 1990 | 4,128,269 | – | – | – |
| 2000 | 4,055,602 | 1990-2000 | -7,267 | -0.18 |
| 2005 | 4,032, 743 | 2000-2005 | -4,572 | -0.11 |
| 2010 | 4,015,673 | 2005-2010 | -3,414 | -0.08 |
| 2015 | 3,999,134 | 2010-2015 | -3.308 | -0.08 |

**Calculated as the compound annual growth rate**

**Agroforestry on Biodiversity conservation**- The growing human population, in combination with the increasing costs for fossil energy will enhance pressure on the land [17]. On intensively managed land, increased biomass production could cause additional pressure on ecological functions of agro-ecosystems, and on soil and water resources [18]. Consequently, now a day the two greatest challenges facing world agriculture are the production of sufficient food for the world's population and the conservation of biodiversity. Among the different alternatives that have been suggested by scholars is agroforestry, which is a series of land-use management principles based on a high number and diversity of components, and flexible technical management, aimed at increasing land productivity while taking into consideration ecological and economic concerns. It is one of the innovative solutions whose approach ensures higher productivity without further damaging natural resources base and allow adaptation to the changing climatic conditions world. Combining trees and crops in agroforestry systems improves the efficiency of utilization of resources (water, nutrient and light) and thus leads to an overall higher biomass production [19]. Simultaneously, it reduces soil erosion and nutrients leaching and landscape biodiversity increment [20]. Agroforestry is an innovative land use system in different parts of the world, moreover, in marginal regions and on degraded lands, agroforestry systems is the best approaches this is due via a forestation and reforestation could lead to modification of land use systems and bids new income possibility for the respective communities.

Benefits that agroforestry provides immense among which biodiversity conservation is one of the most important issues due it is the approaches of diversification. Biodiversity is the variability of all life forms across all levels of biological organization, in agricultural landscapes, biodiversity occurs as a mosaic of farms with different crops and vegetation actively managed by farmers.

Agroforestry often increases biodiversity through integration of crops, shrubs, trees and/or animals into the system. Agroforestry contributes to biodiversity conservation through providing additional habitats for species that tolerate lower levels of disturbance [21], conservation of remnant native species and their gene pools, erosion control and water recharge thereby preventing the degradation and loss of surrounding habitat, buffering the pressure on deforestation of the surrounding natural habitat and provision of corridors and stepping stones for persistence and movement of area-sensitive floral and faunal species through linking fragmented habitats in the landscape [20,21].

Agroforestry system also helps to maintain a greater number of species outside their native forest areas. Conservation of woody species on smallholder farms for different traditional practice has a long history, particularly in the tropics. For example, forest gardens in Sumarta and West Kalimantan, Indonesia was reported i.e. 50–80% diversity, which is comparable to natural forest and also indicated that converting coffee and cocoa agroforestry systems to plantation reduced species richness by 46%, while conversion of natural

 

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forest to agroforestry resulted in merely an 11% reduction in species richness, farmers have a tradition of keeping valuable tree species and their farms act as refugees [18]. At the landscape level, agroforestry provides habitats that are suitable for a large number of native fauna and refuges biodiversity including ants, bats, frogs, lizards, bees, beetles and birds [17,19].

There are considerable differences in species richness between different agroforestry practices. Reviews shown that the presence of highest number of plant species in traditional agroforestry, followed by coffee farming, tree-cropping and cocoa farming systems. Studies indicate that there are between 17 (fruit tree system) and 429 plant species (various agroforestry systems) grown in agroforestry systems in Ethiopia, where they are not the only supporter of local livelihoods but also are important in conserving the native biodiversity. Another study in Ethiopia also by Endale *et al.* [18] indicated a total of 165 plant species comprising 31% tree, 18% shrub and 45% herbaceous plants growing in homesteads, farms and pasturelands. The research reported, which was found by Rice [22] indicates that the practice of tree integration in farmland production systems plays a very important role in biodiversity conservation this is owing to many local people, who are short of forest goods and services, introduce trees in agricultural landscapes of different types of agroforestry practices, the research report from Uganda indicated also tree planting and conservation common practices in the traditional farming systems of agroforestry systems suggests that farmers may be contributing to tree diversity conservation by actively planting trees in their farms [15,23], there are various agroforestry practices that could play a crucial role in ecological, economical and socio-cultural aspects namely parkland agroforestry practices, home garden agroforestry practices, alley cropping, relay cropping, hedgerows, windbreaks and shelterbelts, trees on soil and water conservation structures.

**Parkland agroforestry practices-** Parkland agroforestry practices is the consistent presence of well grown trees distributed on cultivated or recently tilled fields. In this practice of agroforestry systems, the trees are purposefully associated with the agricultural environment due to their specific use. In parkland practices, the main goal of practicing agroforestry systems is domestication of selected trees for enhancing soil productivity through a combination of multipurpose selected trees and food crops on the same farmland [17].

In the ICRAF agroforestry systems list, parkland agroforestry is categorized under multipurpose trees on farmlands. Under this, woody species in parklands are often considered as a source of products and services important to the farmers' livelihood and welfare. Recently, it is recognized as a part of woody species in landscapes and plays an important role in maintaining biodiversity [19]. Agroforestry parkland practices are mainly cropland areas with dispersed trees (often Native). Among the characteristics of traditional agroforestry, parklands are the diversity of tree species they contain. They provide favorable micro-climates (especially through shade) and buffer extreme conditions (as a windbreak and shelter belt). Commonly, parklands are found primarily in the semi-arid and sub humid zones like in West Africa. *Faidherbia albida* based agroforestry practices in which cereal cropping systems is pre-dominant throughout the Sahelian zone and in some parts of East Africa. In many parts of the world, local peoples use these systems to fulfill their food security problem, for income generation and protection of their environments.

**Roles of Parkland agroforestry practices**- Usually, the communities, who are mostly living in dry and semi dry areas by default use the integration of trees on their farm land for increasing of land productivity [7], biodiversity conservation and socio-economic and cultural roles in which the integration of perennial woody species is inseparable and very much interconnected for the productivity and sustainability of the system as a whole [24].

**Parkland Agroforestry practices use for increase of Land productivity**- Generally, land productivity will be assured if the land use system is tree based approach like parkland agroforestry practices in which scattered types of trees on farm land is common, the presence of trees on land doesn't allow the soil to be eroded easily rather the roots of perennial plant species merges the soil structures in together.

Productive roles of the system refer to the production of food, timber, shelter, fodder, manure, fuel wood, and the like [24], which are mainly goods required to meet basic need of the communities.

 

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Trees in the park-land contribute to livelihoods in different mechanisms mainly in production broadening of forage feed for livestock [25] that enables the producers to include animals in their agricultural system thus creating additional income diversification and food for times when crop harvest is less than an expected, fuel wood, construction materials, [10,18] for instances, the perennial tree species *F. albida,* which is most known parkland agroforestry tree species, nitrogen fixing tree, null negative effects of its shade on underneath crop/plant species and the most researched agroforestry species in different countries which improves barley and maize productivity [10,26].

The assumption in agroforestry is that productivity is higher in agroforestry systems as compared to monoculture systems due to complementary in resource capture in which trees acquire resources that the crops alone would not. This is based on the ecological theory of niche differentiation; different species obtain resources from different parts of the environment. Tree roots generally extend deeper than crop roots and are therefore able to access soil nutrients and water unavailable to crops, as well as absorbing nutrients leached from the crop rhizosphere, moreover, these nutrients are then recycled via leaf fall onto the soil surface fine root turnover. Thus, the situation in agroforestry leads to greater nutrient capture and higher yields by the integrated tree crop system compared monocultures agricultural systems.

**Parkland agroforestry practices for Biodiversity conservation-** Forests hold more than 75% of the world's terrestrial biodiversity [7] but between 2010 and 2015, the world lost 3.3 million hectares of forest areas. The change of forest land to agricultural land is the major reason for biodiversity losses in tropical regions where most of the world's biodiversity reserves are found. High population rates in these regions continue to drive the expansion of agricultural land [17] as a result, currently, conservation of biodiversity and mitigation of climate change are the most important global environmental challenges, particularly in the tropics [18,19]. The pressure of human population due by the expansion of agriculture and consequently resulted in declining the productivity of the soil which manifested in the crisis of loss of biodiversity, both are the main drivers of the current biodiversity crisis [9].

The roles of parkland agroforestry practices are considered as protective and give more emphasis to the sustainability of the systems services such as climate amelioration, improving soil fertility, reducing wind erosion, soil and water conservation, and biodiversity improvement [24]. The practice is an indigenous rural land use system which allows farmers to grow annual crops in combination with useful perennial trees [6] but could be fulfilled if parkland species diversity is adequately conserved. The plantation of multipurpose trees for enhancing soil productivity through a combination of selected trees and food crops on farmland is one of the reasons for practicing parkland agroforestry [15], which is a good example of traditional land use systems that have been using for biodiversity conservation. Though the agroforestry has less species diversity than the tropical forest, they have a variety of species diversity compared with traditional agricultural systems [7]. Their rich diversity makes them ecologically resilient and thus gives them the ability to provide more and better ecological functions, review also indicated that AF is diverse and have low-input strategies; these have greater biological interactions and thus are richer in biodiversity [6]. In addition to this, the parkland agroforestry practices can also reduce deforestation and pressure on protected forests by providing alternative bioenergy, timber and other forest products from farmers' fields [19]. It provides a range of ecosystem services that benefit the surrounding landscape and thus prevent habitat degradation. Apart from having indirect effects, trees on farm could also host a significant part of the biodiversity found in tropical forests reserves, as the species richness in it is higher compared to agricultural fields with annual crops [21]. Many of the species living in forest reserves are also better protected if agroforestry buffer zones are created around the forests. Moreover, parkland agroforestry farms used as ecological corridors allowing species to move between different habitats [17]. Such corridors are very important in a fragmented landscape as the vitality and survival of a population of species is often dependent on genetic exchange between subpopulations [9].

The role of agroforestry practices in attaining biodiversity conservation goals has gained accelerating attention in recent years [6]. In this regard, there is an emerging trend toward major public investments for rewarding farmers for the ecosystems services that their

 

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properties provide to society, in both the emerging economies and the developed world such as India and China [19]. This suggests that the integration of trees into agricultural systems (parkland) will be a major issue in the coming decades for biodiversity conservation. On the contrary of this, measures to increase biodiversity in agricultural landscapes often reduce yield or increase costs which imply that there is a strong disincentive for farmers to adopt biodiversity-friendly practices [27]. These disincentives might be overcome by economic incentives or internalized by legal obligations for instances, in the developed world, governments have been implementing agri-environmental schemes that couple legal obligations and economic subsidies to achieve biodiversity-friendly management in agricultural settings of parkland agroforestry practices [28]. Specifically, agroforestry systems contribute to biodiversity conservation on landscape level in three most important ways, these are:

1. Provide the supplementary secondary habitat for species that tolerate a certain level of disturbance;
2. Reduce the rates of conversion of natural habitat in certain cases, and
3. Create a more benign and permeable "matrix" between habitat remnants compared with less tree-dominated land uses;

Human-driven land-use changes increasingly threaten biodiversity, particularly in tropical forests where both species diversity and human pressures on natural environments are high [18]. In this, the rapid conversion of tropical forests for agriculture, timber production and other uses has generated vast, human-dominated landscapes are the potentially risks for biodiversity conservation, which is the result of habitat conversion [18,27] for instances in Madagascar due to habitat conversion and fragmentation the survival of carnivores diversity became questionable in which the carnivores are one of the most threatened groups of terrestrial diversity [29]. This is because, declines and changes in biodiversity can have direct or indirect impacts on ecosystem function, persistence, and services [16,23], consequently, species that are unable to shift their geographic distributions or have narrow environmental tolerances will be at an increased risk of extinction [10,29].
The semi-forested structure i.e. agroforestry farm, as opposed to a mono crop plantation system without trees, provides habitat for migratory birds and secondary habitat for species that tolerate a certain level of disturbance [22], which shows that the agroforestry systems that situates close to natural forest may have a greater diversity of forest birds, mammals and insects as being the alternative habitat for those organisms unlike non tree based systems. Moreover, agroforestry farmland also used as home for various wild animals, which have diverse function in balancing ecosystem for instances, research in cocoa based agroforestry farms in Panama found that higher numbers of insects and spiders attacking the cocoa plants, and more leaf damage when native birds were prevented from visiting the plantation than it found in normal farms, illustrating that maintaining bird populations through agroforestry based coverage plays an important role in controlling harmful insects [7].
Agroforestry systems like scattered types of trees on farmland has also the capacity to conserve biodiversity while promoting agricultural production [21] and can be used to enhance resilience to climate change [1] in reducing the rate of natural habitat. Thus, parkland systems, plays a positive roles in conserving biodiversity by providing perennial habitat for species, preservation of germplasm for sensitive species, corridors between habitat remnants needed for the conservation of area-sensitive plant and animal species and also used for erosion control and water quality protection [12].

**Component interaction in Parkland agroforestry practices**- Generally, the interactions between the tree crop and livestock components can be positive, negative or neutral. In the case of complementary results in increasing the capture of a limiting resource, and greater total production than if the two components had been grown separately. In this, negative interaction, when the two components overlap in their resource use, can lead to competition and hence lower productivity than if the components are grown separately. Where there are no direct interactions between system components, the net effect of combining them is neutral [17], generally, the situation in component interactions of the parkland agroforestry practices is indicated in the following sections, there are:

**Microclimate balance and Animal welfare**- Trees balance microclimatic conditions including temperature, water vapor content and wind speed, which can have beneficial effects on crop growth and animal welfare [18].

 

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Wind speed reductions can extend to 30 times the height of tree belts on the leeward side [20,24]. Wind speed can be reduced due to the presence of trees on farmland acts as the windbreaks and shelter belts. The resultant decline in wind erosion effects can have multiple benefits for crops including increased growth rate and quality, protection from windblown soil, moisture management and soil protection, on the contrary of this the extreme temperature and wind speed has a detrimental effects on agricultural production, and forestry resources on farm and the same is true for animal resources [8,14].

Multipurpose tree species on farmland also have multifunction Eg. Trees they provide resources for animals like diversity of forage resources; it provides shelter from rain and wind, shade from the sun, which is mainly true in semiarid and arid areas.

**Pest and Disease control-** Reduced pest problems in agroforestry systems have been recorded due to greater niche diversity and complexity than in monoculture systems [13,27]. This can be attributed to several mechanisms [2]. Variable distribution of host plants makes it more difficult for pests to find the plants. A plant species, which is highly attractive to pests, can act as a 'trap-crop', protecting nearby valuable species from herbivore attack. A plant species, which is repellent to pest herbivores, may also deter them from others. The presence of high inter-specific competition between pest and non-pest species shall restrict the spread of pests.

When the agroforestry components arranged in a manageable way, the systems could lead to greater structural and microclimatic diversity, increase stability, greater biomass and stable refuges for beneficial organisms [12,19].

**Negative interactions in components of Agroforestry-** The components (perennial tree crop and livestock/pasture) in parkland agroforestry practices overlap for their use of resources (nutrient, water and light) and then they compete which may lead to reduce productivity of the components as compared to a monoculture agricultural system. The competition situation for the respective resource varies from the region to region for instances, in northern temperate regions the main limiting resource for plants is usually light and studies have shown that shading has reduced yields in temperate agroforestry systems [10,16] and likewise competition for water between tree and crop components is likely to limit productivity in semiarid regions, although it is difficult to separate competition for water from that for nutrients [21] and indeed, reduced evapotranspiration due to tree shade effects on understory plants may increase soil water content compared to open pastures [16]. The completion between plants and micro-organisms also common in component interaction systems though it is the overlooked area in agroforestry practices, for instances some species of plants and fungi can have a direct negative impact on others through the production of bio-chemicals called allele-chemicals that influence germination, growth, development, reproduction and distribution of other organisms, these allele-chemicals can be released into the rhizosphere via plant root exudates [21].

**Biodiversity conservation in component interaction of agroforestry parkland-** Agroforestry is one of the sustainable approaches to land-use management where both agriculture and forestry combine into an integrated production system to get maximum benefits; accordingly biodiversity conservation is one of the positive effects of ecological interaction under the parkland agroforestry components.

Agroforestry helps in reducing biodiversity loss by providing a protective tree cover along agricultural fields. The presence of trees further enhances diversity by providing shelter and habitat to a diversity of other flora and fauna. It also helps in conserving genetic diversity of landraces and trees that are in danger of loss and require priority conservation [18]. Further, it also helps in conserving traditional knowledge about the conservation of wild varieties of trees and other plants, studies have shown also that higher biodiversity levels and species richness in AFS than in sole cropping systems.

The components in Agroforestry help in biodiversity conservation through different means mainly: via provision of secondary habitats for species; reduction in the rate of conversion of natural habitats, and creation of permeable matrix between habitat remnants [28].

At a given site, AFS has more diversity both at above- and belowground levels than the sole cropping system, it also provides homes to species in the event of some catastrophic fire, complex AFS has higher biodiversity levels than simple sun-grown crop system but lesser than from the primary forest.

Their rich diversity makes them ecologically resilient and

 

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thus gives them the ability to provide more and better ecological functions since, in addition to this, it also uses low-input strategies, which have resulted in greater biological interactions and thus are richer in biodiversity, thus component interaction in AFS is an excellent land-use practice for biodiversity conservation and sustainable development, and it also helps in reducing the dependence of local farmers on the natural resources of the protected areas like national parks and sanctuaries.

## CONCLUSIONS

The leading causes of global biodiversity loss are expansion and intensification of agricultural systems. The concept agroforestry holds many intermediate land-use forms, where trees cover a significant proportion of the landscape and influence microclimate, energy cycles, biotic processes and biodiversity conservation as well. Though, protection of natural habitats is the backbone for the conservation of biodiversity on agricultural land where natural habitats are highly fragmented to meet the demand of high population pressure. Agroforestry improves biodiversity as it provides more habitats and food for birds, small mammals, reptiles, earthworms and insects, which in turn lead to an increase in species diversity as a whole. Agroforestry practices like the parkland agroforestry help to reduce biodiversity loss by providing protective tree covers along agricultural fields for flora and fauna.

Generally, practising parkland agroforestry is important in conserving biodiversity, seizing carbon and in mitigating climate change. Promoting the system and advocating the principles not to allow the land to be left bare is the key point to realize the parkland agroforestry for the future.

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