ACTA SCIENTIFIC AGRICULTURE (ISSN: 2581-365X)

Volume 3 Issue 9 September 2019

Review Article

Agroforestry System: Approaches for Climate Change Mitigation and Adaptation

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Received: July 23, 2019; **Published:** August 19, 2019

Abstract

Climate change is the burning issue of today's world. Climate change itself as a natural process but in recent years it will lead to changes in rainfall pattern, variation in temperature, sea level rises, increasing severity and various extreme weather events. Small landholder farmers (Subsistence) are unable to cope with such climatic hazards but there is a tremendous scope of expanding agroforestry. Climate change is well buffered and resilience builds up by Agroforestry. It is the sustainable land use system where integration of woody perennials, crops and livestock on the same unit of land. Improved farm productivity, environmental sustainability, food security, income diversification, specific coping strategies, better standard of living, soil and water conservation etc are major benefit of agroforestry. Sustainability attributes of agroforestry and carbon sequestration by trees shown potential towards climate change mitigation(GHG reduction) and adaptation. Various Agroforestry systems have own mitigation and adaptation potential towards climate variability. Among various categories and components, Tree like *Dalbergia sisoo, Acacia nilotica, Magnifera indica, Gmelina* etc plays a crucial role in agroforestry. Tree on farm perform production (Wood, timber, gums, essential oil), protection (Physical, biological), regulation (hydrological cycle, global warming, carbon sequestration) functions. So, Agroforestry considered as a weapon in climate change fight. Agroforestry could be a viable option of livelihood development as well. Therefore, an attempt was made to review on Agroforestry, benefits, its role in carbon sequestration and potential towards climate change mitigation and adaptation.

Keywords: Agroforestry; Climate Change; Land Use

Introduction

Climate change is the burning issue of today's world. Climate change itself as a natural process but in recent years it will lead to changes in rainfall pattern, variation in temperature, sea level rises, increasing severity and various extreme weather events. Severe impacts of climate changes are seen in agricultural, forestry and fisheries. In order to cope with various extreme conditions we must need to identify, promote and practices technology that can develop coping capacity. Agroforestry has been proposed as potential strategy to reduce vulnerability of climate change. It is the sustainable land use system where integration of woody perennials, crops and livestock on the same unit of land. Agro forestry is popular in developing countries because of small land holder farmer and their limitation to utilize it for maximizes their resources.

Figure 1

Objectives

To study about sustainability attributes of Agroforestry and its potential towards climate change mitigation and adaptation.

Methodology

- This article is based on review of various article and book.
- Scanning, Skimming and sorting were adopted during reviewing.

Findings

Agroforestry is a dynamic, ecologically sounded, resource management system which integrates trees on farm and in agricultural landscape, diversification and sustainable production for land users at all levels. It provides wide range of economic, environmental and social benefits. Improved farm productivity through decreased soil erosion and increased soil fertility, environmental sustainability, food security, increase in earning through income diversification from tree products sale, several specific coping strategies against drought and flood, better standard of living, soil and water conservation etc are major benefit of agroforestry. It could be a viable option of livelihood development as well.

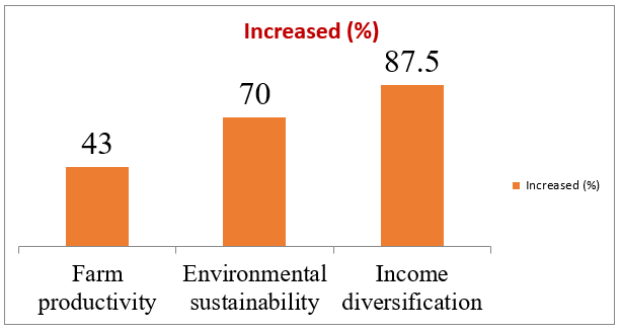

Figure 2: Evaluation of potential contribution of agroforestry in Nyando district of western Kenya.

Among various categories and components, Tree like *Dalbergia sisoo, Acacia nilotica, Magnifera indica, Leucaena spp, Albizia spp, Bauhinia spp* etc plays a crucial role in agroforestry. Tree on farm perform production, protection and regulation functions. The production functions includes Timber, Non-timber products Wood, honey, medicinal herbs, gums, essential oil, grasses, fodder) whereas protection functions include physical and biological functions. The protective function of mountain forest and its relation with climate change are increasingly becoming important. The regulatory function of tree is maintenance of hydrological cycle, reducing global warming, mitigate climate change and sequester atmospheric carbon. Microclimate improvement, water conservation, soil fertility improvement, nutrient cycling etc are others benefit of tree in agroforestry. Tree accumulates CO2 in their biomass. Similarly, Sustainability attributers of agroforestry contributes to climate change adaptation. It is a landscape approach which favors synergy between adaptation and mitigation various ecological niche and tree cover are able to buffer the impact of climate change. Agroforestry, Animal agroforestry, Crops under tree cover, Agroforestry in a linear arrangement, Agroforestry and sequential agroforestry are categories of agroforestry and that have own mitigation and adaptation potential towards climate change.

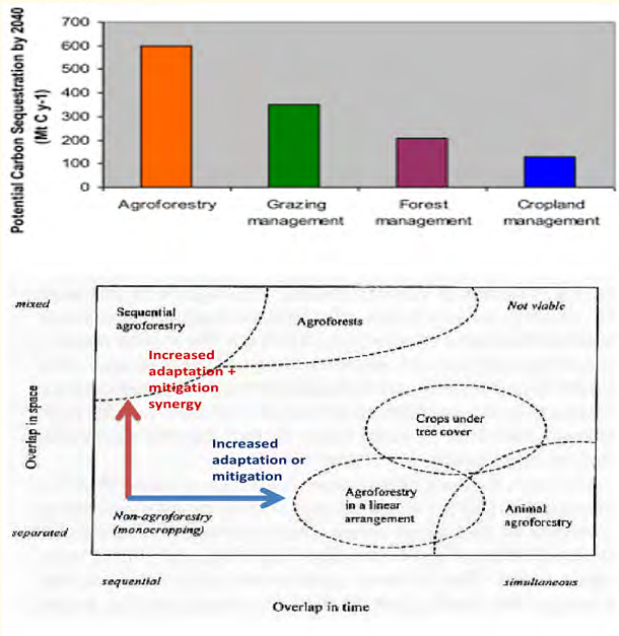

Figure 3

Figures; Potential carbon sequestration and climate change adaptation potential of various categories of agroforestry.

Carbon sequestration is major mitigation of climate change by Agroforestry whereas multicropping, organic matter enhancement, fertility improvement are major adaptation through Agroforestry. Agroforestry are a strategy for carbon sequestration and Sustainable adjustment of it. By the end of year 2040, Agroforestry has a potential of high carbon sequestration due to of lands can potentially be turned into Agroforestry. Climate change is well buffered and resilience builds up by agroforestry. CO_2 concentration and provides an empirical foundation to support expanding agroforerstry. Bird's eye views on issues of Agroforestry we can see double potential to solve climate change. So, It is considered as a weapon in climate change fight [1-5].

Conclusion

Agroforestry has been proposed as potential strategy to reduce vulnerability of climate change. It is a dynamic, ecologically sounded, resource management system which integrates trees on farm. Tree on farm perform production, protection and regulation functions. It is a landscape approach which favors synergy between adaptation and mitigation where carbon sequestration is major mitigation of climate change. Hence, Agroforestry is considered as a weapon in climate change fight.

Note: This article was presented in First South Asian Agroforestry conference in Kathmandu Nepal from July 2 to 3.

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Volume 3 Issue 9 September 2019
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