

# Tree-Crop Interaction Management in Agroforestry: A Review

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## Mini Review

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## Abstract

Agroforestry is a complex land use management system in which trees or shrubs are grown with crops or pastureland. The main aim of the system is to optimize positive interaction between various biological components like trees, shrubs and agricultural crops or animal and between the components and the physical environment, so as to obtain more diversified and more sustainable productive system from the land. The soil fertility potential of the system helps to increase productivity, improve nutrient cycling and also improve the socio-economic status of farmers. Besides to this, agroforestry systems also have a great potential to increase carbon stocks in the soil and certainly merit consideration in mechanisms that propose payments for mitigation of greenhouse gas emissions to reduce climate change. But the negative interaction, such as competition for nutrient, moisture, and light and allelopathy influences the maximum production and protection potential of the system. Therefore, managing the components through selecting comparable species, pruning, mulching, using diversified species and fallowing reduces the negative effect and maximize the multidisciplinary role of agroforestry.

**Keywords:** Increased Productivity; Improved Soil Fertility; Nutrient Cycling; Soil Conservation

## Introduction

Agroforestry can reap substantial benefits both economically and environmentally, producing more output and proving to be more sustainable than agricultural monocultures. The productivity of agroforestry system is often attributed to mixture of species as they make better use of growth resources than the same species grown separately [1]. Components in agroforestry interact one to another that leads an interaction effect. Interaction is defined as the effect of one component of a system on the performance of another component and/or the overall system [2].

Increased productivity, improved soil fertility, nutrient cycling, soil conservation are the major positive effect of interaction and competition is the main negative effect, which substantially reduces the crop yield. It may be space, light, nutrients and moisture [3]. This indicated that tree crop interactions depend upon availability of growth resources, site conditions and the moisture / nutrient status of the site [4]. Studying about interaction helps to know how the component of agroforestry utilize and share the resources of the environment and how the growth and development of any of the components will influence the others. Therefore, tree-crop interactions are a key consideration when designing agrisilvicultural type

of agroforestry system and a layout for planting. Because the aim of agroforestry includes increasing the overall value of the system, maximize complementarity, decrease or eliminate competition and minimize crop displacement, through appropriate tree management. Interactions in agroforestry requires the examination of a number of complex processes. It can be simplified if the interactions are categorized according to the factors that are most affected [5]. These relate to soil fertility (F) [which includes soil chemical (Sc), soil physical (Sp) and soil biological (Sb) interactions], competition (C) [which includes competitive interactions for soil water (Sw), soil nutrients (Sn) and radiation (r)], microclimate (M), pests and diseases (P) [which include interactions related to weeds (Pp), insects (Pi) and diseases (Pd)], soil conservation (L) and allelopathy (A). Therefore, minimizing the competitive interaction effect through different management activities are crucial in order to increase the overall benefits generated from agroforestry. Hence the present review point out management options of the agrisilvicultural agroforestry system.

### Aboveground Interaction

Above ground interactions such as competition for light, temperature, and humidity have possible effects on understory crops.

### Belowground Interaction

Below-ground interactions are the most important aspects concerning yield reduction. The perennials compete water and soil nutrient with annual crops. These reduce crop production.

### Management Activities

The goals of management practices are to increase the production of the desired products and decrease growth and competition of undesired components. The following management activities probably the most powerful method for capitalizing on the beneficial effects of trees while reducing negative ones.

- Pruning: Fast growing trees usually have a broad distributed canopy thus, through pruning aboveground competition (shading) can be reduced.
- Fallow: the land can be beneficial where residual effects of the trees benefit the crops in subsequent years.

- Choice of tree species: is critical with regard to shading effects, root competition or production of useful products
- Density: depending on the species type and site condition, determination of tree density will minimize sharing of growing resource
- Mulch: incorporating trees residue improves soil fertility. Decomposition of organic residues has a direct effect on crop growth.
- Using different species: it is safe to say that a greater diversity of species is more favourable, as it results in a more complete occupation of space above and below the soil, and the variation in the characteristics of the species reduces competition.
- Arrangement of components
- Other common management operations such as fertilization, application of manure and thinning.

### Conclusion

Applying tree-crop management options for both negative influences of aboveground and belowground interaction improves the productivity of the site. This in turn, will meet the objectives of smallscale and largescale practices of agroforestry.

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