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*Review Article*

# ALTERNATE LAND USE SYSTEM IN DRY LAND – A REVIEW

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**Abstract:** Diversified farming system involving crops, fruit trees, agroforestry, animal husbandry, fisheries in farm ponds or tanks and farm mechanization, is the only option for sustaining the livelihood and pave the ways for profitable agriculture in dry land. Current dry land farming systems and practices have to be surveyed to catogerise the ecological, social, cultural and political environments in which these systems operates. Evaluation of strength and weaknesses of existing systems and possible means of improving then have to be the next set of goals. Integrated farming system averts farmers getting below disaster level of income due to monsoon failures. Livestock is a critical component of the farming mechanism to cope with drought in rainfed areas. In rainfall dependent systems, sheep and goat play predominant role. There is a vital need for agroforestry research because alternate land use systems play a major role in the risk management of rainfed agriculture. Agroforestry provides opportunities of not only preventing further degradation of marginal lands but also obtain additional income. Considerable research efforts are being made in developing improved agroforestry systems. Literature on alternate land use system in dry land is reviewed and presented below.

**Keywords:** Alternate land use system, Agroforestry, Dry land.

## INTRODUCTION

Alternate land use system is appropriate in areas where subsistence farming is practiced in fragile ecosystems and it poses more potentiality and flexibility in land use than the traditional crop production systems. An ideal system for dry land areas should have a judicious mix of crops, trees and grasses only then the natural resources will be judiciously utilized and returns maximized without any detrimental effect to environment (Pratap Narain, 2008).

### Agroforestry

Agroforestry is a part of alternate land use system. Agroforestry is a collective name for land use systems in which woody perennials are grown in association with herbaceous plants (crop

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and pastures) or livestock, in a spatial arrangement, a rotation, or both, there are usually both ecological and economic interactions between the tree and other components of the system (Solanki and Ram Newaj, 1999).

In agro-forestry system, livestock production is integrated into agricultural crops and trees. They commonly exhibit a layered vertical structure of trees, shrubs and ground cover plants that recreate some of the properties of nutrient recycling, soil protection and effective use of space above and below the soil surface. They are also used to spread farm work, output and income more evenly throughout the year.

**Agri silviculture**

Twelve multipurpose tree species were tested and reported that the yield of wheat was higher from the interspaces of *Hardwickia, Acacia, Casuarina* and *Emblica* than the other tree species. Better growth of tree and crop was mainly due to the application of fertilizers and weeding.

At Hyderabad, association of cowpea with *Albizia lebbeck* reduced the yield drastically. The benefit cost ratios were higher and more favourable under nitrogen fixing trees than in sole crops. The productivity of agrisilviculture system (crops + trees) in agroforestry systems is 24 per cent higher than that in sole cropping systems (Arvind Bijalwan *et al.,* 2009).

**Horti silvipasture**

Horti silvipasture involves integration of fruit trees with pasture. Agricultural, horticultural, livestock and agri horti silvi pastoral based farming system research approach for the North Eastern Himalayan hill region of India was identified. Growing crops with fruit trees are highly economical and liable to minimize the risk occurring with sole cropping under low rainfall areas. Trees help in nutrient pumping from lower soil strata to the crop root zone.

Guava - glyricidia - maize (African tall) based hortisilvipastoral system was found to be the best for semi-arid regions of Tamil Nadu by producing higher output in terms of fodder and fruit yield (Ganeche *et al.,* 2000). Grasses like *Cenchrus ciliaris* and *Cenchrus glaucus* and trees like *Prosopis cineraria* and *Acacia senegal* were suited for this system. *Stylosanthes* and *Cenchrus* were compatible fodder crops with guava, custard apple and mango (Ramasamy *et al.,* 2007).

**Agri-horticultural system**

In agri-horticultural system, short duration arable crops raised in the interspaces of fruit trees provide seasonal revenue. Singh *et al.* (1999) reported that maximum height, collar diameter and biomass production were attained by *Emblica officinalis* compared to

*Hardwickia binata*. The organic carbon content of the soil was increased from 65 to 109 per cent below the canopy of aonla when compared to open canopy due to falling of leaves.

After ten years of adoption of agri-horticulture system, annual net income obtained was Rs.11715 $ha^{-1}$ as against the net income of Rs. 3,400 $ha^{-1}$ obtained prior to the adoption of agri-horti land-use system on marginal lands under rainfed conditions of Budelkhand region. Aonla based agri-horti system was highly profitable and sustainable as aonla was a regular bearer and exerts comparatively less affect on associated crop and requires low management and inputs (Dwivedi *et al.,* 2007).

**Horti-pastoral system**

Horti-pastoral system involved integration of fruit trees with pasture. Changing maturity of forage from vegetative to reproductive stage decreased the intake rate of forage by lambs and that affects the availability of nutrients in forage. Feeding *Cenchrus glaucus* at flowering stage could meet the maintenance protein needs of sheep when offered as the sole feed.

Crude protein intake was more essential for maintenance and production needs of the sheep. Significantly higher average daily gain was observed with complementary grazing on *Stylosanthes hamata* and *Cenchrus ciliaris* forage. Gill *et al.* (2000) reported that growing of cowpea fodder in the inter row space of mango orchard proved to be an advantageous proposition in all agro climatic conditions.

Ramana *et al.* (2000) reported that relatively lower average daily gain observed in the lambs supplemented with *Leucaena leucocephala* foliage than complementary grazing on *Stylosanthes hamata* forage. The *Leucaena leucocephala* foliage contain phenolics and tannins and these antinutritional factors lower feed digestibility and nutrient utilization in ruminants. Low pasture quality impairs the productivity of ruminant livestock especially when grazing was the main feeding system (Pamo *et al.,* 2001).

Supplementation of plant protein sources, which contain medium to high crude protein levels will alleviate crude protein deficiency of fibrous feeds and improve feed intake. Net gain from hortipastoral systems ranged from 1320 to 3120 Rs. $ha^{-1}$ through ram lamb production. Further, higher income was observed with complementary grazing on established pasture or supplementation of *Leucaena leucocephala* foliage from the orchards.

Performance of Nellore Zodpi ram lambs with complementary grazing on established hortipastoral systems (mango and sweet orange orchards above 5 years old with *Cenchrus ciliaris* + *Stylosanthes hamata* established pastures and boundary plantation of *Leucaena leucocephala*) or supplemented with *Leucaena leucocephala* foliage in addition to grazing on

natural pasture gained significantly higher live weight than grazed solely on natural pasture (Melaku *et al.,* 2004).

**Conclusion**

From the foregoing review, it is clear that alternate land use system is of immense importance in the tropics especially in dry lands and watershed development areas. In dry and inhospitable climates, tree growth conserves soil moisture, improves soil fertility, protects field crops against scorching and desiccating effects of wind and generally modifies the climate to be more equable and pleasant, thereby stepping up agricultural yields. Although these beneficial effects have been fully demonstrated in some advanced countries, no systematic effort has been made in India. Further, the integration of fodder trees would provide the much-needed top feed for sustenance of livestock during the lean period. In other words, it is necessary to device a land management and farming system which would produce food, fruit, fodder and fuel and conserve the ecosystem at the same time.

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