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Afforestation of Arid Lands

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trees association under arid environment**

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DESIRABLE CHARACTERISTICS FOR CROPS AND TREES ASSOCIATION UNDER ARID ENVIRONMENT

N.D. Yadava and I.C. Gupta

Introduction

The adverse climatic conditions, such as high solar incidence (450-500 calories / cm²/day), high temperature (upto 48° C), high wind velocity (Av. 10-12 km/hr) resulting in high potential evapotranspiration (PET) of 6 mm/day, low and erratic rainfall, scarce and poor quality ground water, and infertile soils increase the instability of crop production in arid zone. Therefore, combination of field crops and trees on the same piece of land in agroforestry system may be a valuable system to help in the development of optimal land uses in drought prone areas of western Rajasthan besides reducing the risk of uncertainty of production.

Characteristics of Crops and Trees Desirable for Agroforestry System

The success of crop in a given region does not indicate its success in any particular system. The crop in agroforestry system under rainfed condition has three major constraints viz. (i) availability of rain water for better crop growth beneath the tree canopy, (2) solar radiation available for crop, (3) germination and crop growth behaviour (Ereise, 1936). On the basis of the above three criteria the crop should meet out the following requirements for fitting well in agroforestry system.

- Crops and trees should not have any constraint for their growth and development in association viz. adverse residual effect, secretion of toxic elements by roots in soil, etc.
- Under rainfed condition crop water requirement should match with the amount of the rainfall received or soil moisture available beneath the tree during rainy season.
- Radiation should be optimum for fulfilling the photosynthetic requirement of crop.
- Growth of crop plants should not be adversely affected by trees.
- Crops grown under the system should not be of exhaustive nature but they should have the characteristics to improve the soil fertility.

The crops with the better yield potential in arid region which can be well fitted under agroforestry system are mentioned below (Saxena, 1984):

Crops	Varieties
Kharif	
Pearlmillet (<i>Pennisetum typhoides</i>)	BJ-104, BK-560,
Greengram (<i>Phaseolus radiatus</i>)	S-8, S-9, T-44,
Mothbean (<i>Vigna aconitifolius</i>)	Jadia, T-18

Clusterbean (<i>Cymopsis tetragonaloba</i>)	Durg. safed, Fs-277, Durgajay.
Sesame (<i>Seasamum indicum</i>)	T-13, Tc-25, Pratap.
Sewan (<i>Cenchrus ciliaris</i>)	-Local.
Rabi	
Raya (<i>Brassica campestris</i>)	T-59, Durgamani,
Chickpea (<i>Cicer arietinum</i>)	G-24, C-235, Rs-510.

In Rajasthan *Kharif* crops are grown as rainfed which give the full benefits of the integrated system with better utilisation of rain water with stabilised and increased production from the land. But during *rabi* without irrigation facility the crops could not be grown successfully on the conserved soil moisture, whereas the additional yield of trees can be obtained with very little management. The use of leguminous crops should be preferred more than the cereals because of their many advantages viz. (1) Addition of atmospheric nitrogen to the soil through their root nodules, (2) deep root system which can tolerate drought for longer period, (3) better soil binding ability which helps in checking soil erosion, and (4) high value of the crops. The amount of nitrogen added to soil through growing of different leguminous crops was highest e.g. 156 and 19 kg/ha at P₂O₅ level of 40 kg ha⁻¹, in mothbean and clusterbean, respectively whereas in greengram it was highest (86 kg ha⁻¹) at 60 kg P₂O₅ ha⁻¹ (Table 1).

Table 1. Nitrogen addition through legumes under different P₂O₅ levels

Crop/Variety	P ₂ O ₅ dose (kg/ha)				
	0	20	40	60	80
Greengram (S-8)	20	37	332	86	76
Mothbean (local)	68	122	156	106	105
Clusterbean (Fs-277)	55	187	192	168	156

Source : Agarwal et al. (1976)

Among different crops, pearlmillet and sesame showed the maximum resistance potential when rainfall was above average and ill distributed,