

Cultivation of crops in association of mango under two tier system of agro forestry

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ABSTRACT

The study was under taken during 1997-98 to 2003 -04 under World Bank Aided Project of Uttar Pradesh. The objective of this study was to find out the extent of diffusion of agro -forestry with mango in mango growing tract of central U.P. The farm families of Marhara, Soron, Kashganj, Patiyali, Ganj Dundwara blocks of Etah district adopted the cultivation of wheat, lentil, chikori, oat (green fodder), potato and brinjal in association of mango. Potato, potato+ pumpkin, pumpkin after potato, brinjal vegetable pea, pu mpkin after vegetable pea, garlic and onion after potato in association of mango are being followed by farm house holds of Sandila block of Hardoi district. Likewise, the farm families of Auras, Miyanganj, Hasanganj and Safipur blocks of Unnao district, Kamalganj and Kaimganj blocks of Farrukhabad district and Malihabad and Kakori block s of Lucknow district followed the wheat cultivation in association of Dashari mango. At initial stage, mango gave 20-25 q/ha fruits. Wheat, lentil, chikori, oat (green fodder), potato, brinjal, green fruits of pumpkin, green pods of vegetable pea, garlic, onion and pumpkin green fruits in potato + pumpkin system yielded 30, 10, 120, 380, 210, 215, 275, 90, 75,260 and 185q/ha, respectively. The mango based cropping systems have maintained cash flow system and improved the standards of living of farm families and created eco-friendly environment.

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Fruit trees *viz.*; guava, aonla, ber and citrus are commonly grown in the central tract of U.P. Among these fruit trees mango is the king of this tract while guava covers the major part of sandy loam and loamy sand group of soils, located at river side. The alluvial soils of U.P. has deeper depth and is most suitable for the cultivation of fruit trees and field crops, therefore, mango based agro -forestry system a viable option. The mango has slow growing nature and it is planted at wider space. This provides an opportunity to use the available natural resources. In younger garden of mango, the field crops can be economically harvested up to 5-6 years and some time 8-9 years. The younger mango trees have little or no adverse effect on growth and yield of field crops. Alone Dashari mango cultivation is being adopted by farm house holds of U.P. since long time. The mango based agro-forestry system with valuable field crops was found more remunerative. On the basis of the suitability of this system, the agricultural scientists have recommended this system to the farm families of Gangetic alluvial part of U.P. The farm families reside in the central part of U.P. have tested and accepted mango based agro -forestry system. The diffusion extent of mango based agro -forestry system and harvested yield levels of associated different crops are the subject matter of this manuscript.

MATERIALS AND METHODS

The study was carried out during 1997-98 to 2003 -04 in central Gangetic plain of U.P. The selected blocks of different districts typically represent soils, climate and socio-economic condition of Agro- climatic zone IV and V. The twenty years mean annual rainfall of area is 832 mm. The length of growing period of representative area varies between 120-150 days. The soil of representative area developed over alluvium. The major soil belong to loamy sand, sandy loam and loam are most suitable for filler cropping with mango. Generally farmers planted Dashari mango at the distance of 8x8 meter in rows. The associated crop of wheat sown at the distance of 22.5 cm in 27 rows between two rows of mango and adjusted 77% plant stand. Lentil was planted 30cm apart in 20 rows between two rows of mango and adjusted 74% planted stand. Potato planted at the distance of 50 cm apart on 12 ridges between two rows of mango and adjusted 75% plant stand. Onion planted in 40 rows at 15 cm apart in the inter spaces of two rows of mango and 75% plant stand was adjusted. Pumpkin raised at 50-75 cm apart on every third ridge of standing crop of potato. Under this system 75% plant stand of pumpkin was adjusted. After harvesting of potato 3 rows of pumpkin were planted between two rows of mango at 200x50-75 cm apart and adjusted 75% lant population. Vegetable pea planted in 20 rows at 30 cm apart between two rows of mango and plant stand was adjusted 75%.

Brinjal planted at 60 cm apart in 10 rows between two rows of mango and adjusted 72% plant population in the interspaces of mango. The 75% plant stand of garlic was adjusted with plantation of 40 rows at 15 cm apart between two rows of mango. The broadcasting of industrial crop of chikori was done for adjusting 75% plant stand in the interspaces of mango rows after leaving the distance of 0.50 meter from both sides of mango rows for easy management of both crops. Similarly, after

q/ha at initial stage from agro - forestry system, which was equal to the fruits yield of mono cropping of mango. The filler crop of wheat gave average grain yield of 30q/ha. The associated crop of lentil gave 10q/ha grain yield at 74% plant stand. The potato yielded 210q/ha tubers. Onion yielded 260 q/ha bulbs from the interspaces of mango. The pumpkin gave 185q/ha green fruits under potato+ pumpkin cropping system without any loss of tubers yield of potato. The filler crop of

Table 1: Yield of different crops in agro- forestry system

Location	System	Planting distance of mango (m)	Planting distance of companion crops (cm)	No. of rows of companion crops in two rows of mango	Plant stand of companion crops (%/ha)	Average yield (q/ha)	
						Mango	Companion crops
Etah, Unnao Farrukhabad & Lucknow	Mango + wheat	8x8	22.5	27	77	20-25	30
Etah	Mango+ chikori	8x8	Broadcasting	-	75	20-25	120 (green stage)
Etah	Mango+ oat	8x8	Broadcasting	-	75	20-25	380 (green fodder in two cuttings)
Etah	Mango +lentil	8x8	30.0	20	74	20-25	10
Hardoi & Etah	Mango +potato	8x8	50.0	12	75	20-25	210
Hardoi & Etah	Mango + brinjal	8x8	60.0	10	72	20-25	215
Hardoi	Mango + vegetable pea	8x8	30.0	20	75	20-25	90 (green pods)
Hardoi	Mango+ pumpkin	8x8	200x50-75	3	75	20-25	275
Hardoi	Mango + onion	8x8	15.0	40	75	20-25	260
Hardoi	Mango + garlic	8x8	15.0	40	75	20-25	75
Hardoi	Mango + potato	8x8	-	-	-	20-25	-
	+pumpkin (a) Potato	-	50.0	12	75	-	207
	(b) Pumpkin	-	50-75 on potato riges	3	75	-	185

leaving 0.50 meter space from both sides of mango rows, broadcasting of oat was done for green fodder and thus adjusted 75% plant stand. The recommended doses of fertilizers were given to the associated crops and no fertilizer was applied to mango. The irrigations were given to the different crops as and when required. After harvesting of associated crops, the deep intercultural was done in mango garden and field was sanitized. Mango fruits plucked when they showed the sign of maturity and marketed after post product ion management.

RESULTS AND DISCUSSION

The yields recorded under mango based agro forestry system have been reported in Table 1. The farm families harvested mango fruits by 20.00 -25.00

pumpkin gave 275 q/ha green fruits from mango +pumpkin system of agro-forestry. The vegetable pea planted for green pods in the interspaces of mango gave 90q/ha green pods. The associated vegetable crop of brinjal yielded 215q/ha fruits. The garlic raised in the inter spaces of mango yielded 75q/ha bulbs. The 75% adjusted plant stand of chikori gave 120q/ha green roots and leaves. The companion crop of oat gave 380q/ha green fodder from two cuttings. The mango based agro -forestry system added synergistic effect on the fruits yield of mango and yield of companion crops due to positive effect of root secretion of mango on associated crops and vice versa. These results are in concordant to the findings of Singh (2001), Singh (2003)and Chandra *et al.*(2006).

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