Performance of Agricultural Crops under Mango based Horti-agricultural System in Konkan

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Abstract

The present experiment on Feasibility of intercropping some agricultural crops under mango based horti-agricultural system in Konkan region of Maharashtra was carried out at the experimental farm of All India Coordinated Research Project (AICRP) on Agroforestry, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli. This field experiment was conducted during 2007 to 2014 in a mango based horti-agricultural system of agroforestry, consisting of *Mangifera indica* as tree species, planted at spacing of 10 x 10 m and four agricultural crops *viz. Eleucine coracana* (Finger millet), *Panicum miliaceum* (Proso millet) *Guizotia abyssinica* (Niger) and *Arachis hypogaea* (Groundnut). Based on the data collected during last five years (2009-10 to 2013-14) grain yield data of agricultural crops, it was observed that groundnut gave significantly highest net returns (₹ 19,033 ha^{-1}) having B:C ratio 1:1.22. There were non-significant variation in the growth of mango tree due to intercropping of agricultural crops. Groundnut performed better in juvenile phase of mango cultivation. Thus, groundnut proved its superiority over other intercrops in terms of yield and returns. Therefore, *Mangifera indica* with *Arachis hypogaea* (Mango + Groundnut) based horti-agricultural system may be preferred under rainfed condition in Konkan region of Maharashtra.

Key words : Horti-agricultural system, Yield, Economics, Mango.

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Introduction

Konkan region is a hilly region. The predominant fruit trees of this region are Mango (*Mangifera indica)*, Cashew (*Anacardium occidentale)*, Coconut *(Cocos nucifera).* The area is ideal for development of different Agroforestry systems. This region is peculiar for cultivation of export-oriented fruit crops like Alphonso mango and Vengurla series of cashew varieties. The recommended spacing of mango and cashew orchards is wide and renders a lot of land wasteful especially in the early stages of these orchards. In Konkan region, most of the farmers are interested in planting fruit trees on their farms; cash generation is a major reason for their interest. Mango is generally a spreading type of tree crop and requires lot of space for its canopy spread. When the planting is recommended at a spacing of 10 x 10 m, the plants takes minimum 6-7 years to cover the entire allotted space in the initial years. This space can be made use of for planting suitable intercrops which would help in generation of additional income, conservation of soil and moisture and utilization of space and other natural resources more effectively in the juvenile stage of orchard life.

The prime aim of raising any tree crop under field condition is generally to make profit on capital investment (Rawat 1989). The overall goals of raising tree crops along with agricultural crops in farmlands are to increase production, to generate a sustained agricultural product base, to reduce environmental damage, and to raise the standard of living of the farmer (Betters 1988). Economic analysis helps a farmer to make decisions about allocation of scarce resources in a rational way in order to meet the targeted objectives (Hoekstra 1990). Depending on soil and climatic conditions and local situations, agricultural crops especillay millets and oilseed crops as per suitability are selected for intercropping. Intercropping in tree crops during the

establishment phase with food crops is an age-long practice in the tropics. The benefits of such a practice may include food security for household, income generation to partially offset the cost of establishment, weed control and better use of growth resources (Rodrigo *et al*. 2001).

Material and Methods

The present experiment on Performance of agricultural crops under mango based horti-agricultural system in Konkan was carried out at the experimental farm of All India Coordinated Research Project (AICRP) on Agroforestry, Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli during July 2009 to 2014. The experiment consisted of mango as tree species planted at spacing of 10 x 10 m and four agricultural crops *viz. Eleucine coracana* (Finger millet)*, Panicum miliaceum* (Proso millet) *Guizotia abyssinica* (Niger) and *Arachis hypogaea* (Groundnut) were intercultivated by adopting recommened practices of DBSKKV. Finger millet and proso millet were sown on raised beds in last week of May and transplanted in main orchard in 1st week of July with a spacing of 15 x 20 cm and Niger and Groundnut was directly sown on field in 2nd week of June with a spacing of 15 x 45 and 15 x 30 cm respectively. The experiment was laid out in Randomized Block Design (RBD) with three replications and four treatments. Land preparation started with one summer ploughing in the month of May, followed by two ploughings and laddering. The experimental plot was laid out into small plots of size 30 m x 30 m for different treatments. At the time of final land preparation, well decomposed Farm Yard Manure (FYM) 10 t ha^{-1} and recommended fertilizer doses for particular crops was given as per the university recommendations. The yield of intercrops were recorded and analyzed as per the procedure described for RBD (Panse and Sukhatme, 1985). Standard error of means i.e. SE (m) ± and Critical difference (CD) were calculated at 5 % level of significance and compared the treatments means, wherever 'F' test was found significant.

Results and Discussion

The average productive lifespan of mango is 30 to 35 years. It gives economic returns from the 7th year of planting and yield gets stabilized at the 15th year, produces economic yield up to the 35th year and then starts declining.

The pooled average yield 14.77 q ha^{-1} of groundnut was noticed under Mango + Groundnut followed by yield of prosomillet in Mango + Prosso millet 13.18 q ha^{-1} (Table 1). Yield of different crops under various agroforestry systems has also been reported by various researchers. Three wheat varieties were grown under *Populous deltoids* studied by (Singh *et al.* 1993*). Delbergia sissoo* with sesamum (Naugraiya and Singh 2005) and *Casuarina equisetifolia, Eucalyptus* hybrid, *Dalbergia sissoo* and *Tectona grandis* with finger millet, sesamum, black gram and cowpea have been studied by Mohanty *et al*. (2008).

The economic evaluation in terms of returns from crop yield, net returns and B:C ratio under tree crop combination ranged from ₹ 79,278 to ₹ 28,770 ha^{-1}. Groundnut generated highest gross returns as compared to other agricultural crops (Table 2). The net returns of the different treatments varied from ₹ 19,033 to (-) 5,283 ha^{-1}. Mango + Groundnut combination was proved to be the best combination among all the treatments tried from economic return point of view which is due to high yield and returns from Groundnut as compared to Proso millet, Finger millet and Niger. The B:C ratio of different tree crop combinations varied from 1.22 to 0.85, It was found highest in Mango + Groundnut combination (1:1.22), followed by Mango + Niger (1:1.06) and lowest was

Table 1. Year wise grain yield of agricultural crops (q ha^{-1})

Treatment	2009-10	2010-11	2011-12	2012-13	2013-14	Pooled Average
T_1-Finger millet	10.09	11.50	10.25	12.46	14.30	11.72
T_2-Proso millet	11.24	14.14	11.75	12.40	16.38	13.18
T_3-Niger	2.01	4.27	3.75	7.90	2.63	4.11
T_4-Ground nut	14.11	15.71	16.25	13.03	14.75	14.77
SE	0.204	0.233	3.668	0.105	0.105	0.765
CD at 5%	0.718	0.807	NS	0.364	0.360	2.210

Table 2. The cost and returns from agricultural crop in mango cultivation (ha^{-1})

Sr. No	Name of the crop	Economic returns from crop yield (₹)	Net returns	Cost benefit ratio
1	(T_2) Mango + Fingermillet	30124	(-) 5283	1:0.85
2	(T_3) Mango + Prosomillet	33740	(-) 2269	1:0.94
3	(T_4) Mango+ Niger	28770	1718	1:1.06
4	(T_6) Mango+ Groundnut	79278	19033	1:1.22

in mango + Finger millet combination (1:0.85). This may be attributed to high yield and price return of Groundnut and proportionately low labour cost in Niger cultivation in comparison with the other agricultural crops. Overall the economics of Groundnut as intercrop in Mango based horti-agricultural agroforestry system was appreciably higher than sole cropping in juvenile phase of mango plantation. The higher returns from agroforesry systems in comparison to sole cropping has been reported in coconut based farming system intercropped with rice, millet grain, legumes, oilseed crops, root crops, banana, pineapple and chilies (Das 1991). Sunflower, pigeon pea and pearl millet raised in *Leucaena leucocephala* (Ramshe *et al*. 1994); sorghum, groundnut and grasses grown under teak and subabhul (Mutanal *et al*. 2006). Moreover, the higher returns have been recorded for arable crops like maize, paddy, fodder maize and sunhemp raised in horticultural crop sapota and silvicultural crops like *E. terelicrnis*, *Albizia moluccana*, *C. equisetifolia, T. grandis* and *D. sissoo* (Patil *et al.* 2010) and coconut and guava based multistoried agroforestry system with medicinal crop like *Aloe indica*, *Asparagus racemosus* and *Kaempferia angustifolia* (Bari and Rahim, 2012).

Conclusion

Groundnut performed better in juvenile phase of mango cultivation, and proved superiority over all other intercrops in terms of yield and higher monetary returns with mango in combination, Therefore, *M. indica* + *A. hypogaea* based horti-agricultural system may be preferred and more beneficial under rainfed condition in Konkan region of Maharashtra.

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