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INTERCROPPING FLOWER CROPS A BEST OPTION IN COCONUT BASED CROPPING SYSTEM OF MAHARASHTRA

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ABSTRACT

Performance of flower crops was assessed at All India Coordinated Research Project on Palms, Regional Coconut Research Station Bhatye, Ratnagiri during 2013 to 2015. The yield of coconut incresaed to 165 nuts/palm/year due to intercropping, as against 96 nuts/palm/year in monocropping (coconut alone). According to two years of data (2014 to 2015) the average yield of flower crops revealed that the Lily crop recorded 168381 numbers of spikes/hectare, Jasminum multiflorum recorded 48656 kg/hectare, Heliconia spp. recorded 96982.5 number of spikes/hectare. Jasminum sambac recorded 1123.2 kg/hectare follwed by Michelia champaka recorded only 12690 number flowers. In respect of economics, Coconut +Lily spp. system recorded the highest net return of Rs. 12,19,962/- per hectare followed by Rs. 7,63,197/- in Coconut + Jasminum multiflorum system, Coconut + Heliconiaspp. recorded Rs. 6,37,495.25, Coconut +Jasminum sambac recorded Rs. 553102.53, Coconut + Michelia champaka Rs. 12690.00, net income realised in the monocropping of coconut was Rs. 65,025/- per ha only. Coconut nut to get additional income depending upon market. The results indicated the possibility of growing Lily and Jasminum multiflorum as intercrops in coconut fields.

Key words : Coconut, intercropping, flower crops*, Lily, Heliconia*

Introduction

Generating and establishing more sustainable cropping system is need of today's era. Multi species and multi-storeyed cropping system ensures maximum utilization of resources for higher yield per unit area. There are many coconut based cropping systems in various countries and states of the nation. Effective and efficient utilization of available resources for higher yield is the modern concept of cropping system Merely growing coconut crop as mono crop is not the most efficient way for the exploitation of natural (Ghosh and Bando padhyay, 2011). Adoption of coconut based commercial flower cropping system emerges as the most profitable way for improving the economic status of coconut farmers. Improvement in the soil properties and biological activities in the rhizosphere due to intercropping results in the modification of soil environment for the benefit of the plant growth (Maheshwarappa *et al*., 1998). Studies revealed that natural resources i.e. soil water, air space and solar reclamation are not fully utilized under the spacing schedule 7.5 m x7.5 m. Further in India, coconut is primarily a crop of small and marginal farmers (Rethinam, 1990). Many of the coconut workers have reported that a well designed high density multi species crop model suited to a given agro-climatic situation generates returns of biomass output, yields, more economic returns and higher total income, additional employment opportunities for family labours and meets diversified needs of the coconut farmers, such as food, fruit, vegetables, fuel etc. (Retinam, 1990; Ghosh and Hore, 2007; Hore*etal.,* 2007, Ghosh *et al.*, 2008). Flowers are good source of economic returns. It has great use in daily

activities for religious and felicitations programmes. Now a day's demand for flower are increasing tremendously. *Jasminum sambac, Jasminum multiflorum, Lily spp., Heliconia spp., Michelia champaka etc.* are the most demanded flowers have demanded in domestic market. Hence these flower crops are included in present study during the year 2013-14. The flowers were supplied to the market and the feedbacks from the buyers were documented. The flower crops were selected as per the demand from the flower market of Ratnagiri. All five types of flowers are most important in state and also in India. Present study was undertaken during the year 2013-14 to find out the suitable flower crops for coconut based multiple cropping system formaximization of returns per unit area.

Material and Methods

The experiment was carried out in 29 years old coconut plantation of AICRP on palms at Regional Coconut Research Station, Bhatye, Ratnagiri under Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli (M.S) during the year 2013-14. The research station is situated at 17.00° N latitude and 73.40° E longitude with altitude of 3 m above the mean see level. Farm is situated on the creek of Bhatye village facing towards Arabian Sea. The soil of the experimental plot was sandy loam in texture, well drained with medium fertility status. The coconut palms were spaced at 7.5 x 7.5 m as recommended by CPCRI for tall verities. The study was based on five flower types which are mostly commercial and has year round demand in the market. The flower species were used as intercrops are scented, heliconea is exotic type and has demand for decoration in various function. The treatments employed were six cropping pattterns:T_1: Coconut alone *(Monocrop)* T_2:Coconut +*Jasminum sambac,* T_3:Coconut + *Jasminum multiflorum,*T_4:Coconut +*Lily spp.,* T_5:Coconut +*Heliconia spp.and* T_6 :Coconut +*Michelia champaka.* The experiment was started in 2012. Experimental plots were prepared by repeated ploughing and 10 t/ha FYM was added during land preparation. The intercrops (flower plants) were planted at a distance of 2 m from base of the palm trees.

Details of the nutrient management and cultural aspects of different intercropping systems has been presented in Table 1. The productivity of coconut as well as flowers were measured at maturity. The benefit or net return:cost ratios of different cropping models were calculated on the basis of cost of cultivation, gross return and net return (Table 3). The economic assessment was carried out considering the cost, inputs and market rates of the produce during the period of investigation.

Result and Discussion

The nut yield (per ha per year) and flower crop yield in respect of (kg and numbers per ha) obtained during present investigation has been presented Table 2. All intercropping systems showed yield advantage. Maximum nut yield (23801.56 nut/ha) was recorded when coconut was cultivated along with lily as an intercrop, in comparison to its monocrop (16275 nuts/ha). The *Jasminium multiflorm* recorded second (22359.89 nuts/ha). The highest nut yield followed by lily was registered in *heliconia* (21306.25 nuts/ha) followed by *M. champaka* (20278.12 nuts/ha). The lowest yield among the different flower crop was recorded with the crop *Jasminium sambac* (20172.33 nuts/ha). Nut equivalent yield per ha for an intercrop was maximum in of lily (77861.91 nuts) followed by *J. multiflorum* (41239.75 nuts) (Table 3).

Nutrient status of the soils under different intercropping systems, at beginning and end of field trials, has been given in Table 4. The total nitrogen and available phosphorus and potassium content was maximum with the crop lily (277.10, 19.44 and 288.24 kg/ha respectively) followed by *Jasminum multiflorum* (274.11, 19.20 and 280.16 N, P_2O_5 and K_2O kg/ha). The minimum values for the nitrogen, phosphorus and potassium were observed in monocropping plots. The NPK contents under different cropping systems increased over the initial status, which indicated addition and recycling of organic

matter which added considerable amount of nutrients into the soil was also recorded earlier by Maheswarappa *et al*., (1998), Ghosh and Bandopadhyay (2011). The nitrogen, phosphorus and potassium content of each plot decreased with soil depth in all flower crops including monocrop which may be due to lower leaching losses or fixation than higher uptake of N, P_2O_5 and K_2O by crops (Sharma and Chowdhury, 2002; Bopaiah and Shetty, 1991) also reported the higher phosphatase enzyme activity in the coconut mixed farming plots favored the release of fixed phosphorus. The nitrogen fixers and phosphate solubliizing bacteria were more in mixed farming system as compared to coconut monocropping. The soil enzymes activities (urease and dehydrogenase) and soil microbial biomass were higher in coconut based mixed farming as compared to coconut monocropping.

It is well accepted that inter cropping system under coconut is more profitable than monocropping which promises to the farmers a lot besides generating additional employment opportunity. The results of present finding clearly indicated the economic viability of companion cropping system with coconut under littoral sandy soils of Maharashtra. Coconut based cropping system preferring flower crop, comprising of coconut + lily were found best under Konkan condition Maharashtra.

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Table 1: Agronomical and horticultural details and nutrient management of intercrops under coconut based cropping system

Treatments	Planting time	Plants	Spacing (cm)	FYM Kg	NPK (g/plant)
T_1 Coconut (*Monocrop*)	June,1988	175	750 x 750	25	1000:3000:2000
T_2 (Coconut +*J. sambac)*	Dec. 12	88	120 x 120	0.5	20:10:10
T_3(Coconut + *J. multiflorum*)	Dec. 12	61	120 x 120	0.5	20:10:10
T_4(Coconut +*Lily spp*)	Dec. 12	133	100 x 100	0.5	20:10:10
T_5 (Coconut +*Heliconiaspp*)	Dec. 12	133	100 x 100	0.5	20:10:10
T_6(Coconut +*M. champaka*)	May. 13	32	240 x 240	3.00	100:50:100

Note: Fertilizers were applied in two (June, Sept.) splits doses for intercrop and three splits for coconut.

Table 2: Intercrop and coconut yield under coconut base cropping system *(*Pooled data*)*

Treatments	Intercrop Yield/ha	Intercrop Yield/ha (Rs.)	Coconut yield (nuts/ha)	Coconut yield/ha (Rs)
T_1 Coconut (*Monocrop*)	-	-	16275.00	195300
T_2 (Coconut +*J. sambac)*	1123.2 kg	311034.53	20172.33	242068
T_3(Coconut + *J. multiflorum*)	48656 kg	494877.00	22359.89	268320
T_4(Coconut +*Lily spp*)	1683811 nos spike.	934343.00	23801.56	285619
T_5 (Coconut +*Heliconia spp*)	96982.5 nos	381803.25	21306.25	255672
T_6(Coconut +*M. champaka*)	12690 nos	12690.00	20278.12	243336

Table 3: Nut equivalent yield per hectare in coconut base cropping system *(Pooled data)*

Treatments	Coconut yield (Nut)	Intercrop Yield/ ha	Flower yield (Rs)
T_1 Coconut (*Monocrop*)	16275.00	-	-
T_2 (Coconut +*J. sambac)*	20172.33	1123.2 kg	311034.53
T_3(Coconut + *J. multiflorum*)	22359.89	48656 kg	494877.00
T_4(Coconut +*Lily spp*)	23801.56	1683811 nos	934343.00
T_5 (Coconut +*Heliconia spp*)	21306.25	96982.5 nos	381803.25
T_6(Coconut +*M. champaka*)	20278.12	12690 nos	12690.00

Table 4: Soil nutrient statues under different cropping systems

Treatments	Pre – experimental (kg/ha)			Post- experiment (kg/ha)		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
T_1 Coconut (*Monocrop*)	248	17.6	221.11	267.14	18.22	274.26
T_2 (Coconut +*J. sambac)*	248.14	17.8	221.12	269.26	18.86	279.10
T_3(Coconut + *J. multiflorum*)	253.16	17.4	222.16	274.11	19.20	280.16
T_4(Coconut +*Lily spp*)	259.10	17.9	221.18	277.10	19.44	288.24
T_5 (Coconut +*Heliconia spp*)	251.16	17.7	221.14	271.82	18.30	282.24
T_6(Coconut +*M. champaka*)	250.10	17.5	221.16	270.68	18.58	278.18