International Journal of Agricultural Sciences
Volume 14 | Issue 1 | January, 2018 | 202-206 ■ e ISSN-0976-5670
DOI:10.15740/HAS/IJAS/14.1/202-206
Visit us : *www.researchjournal.co.in*

RESEARCH PAPER

Assessment of commercial flower crops as intercropping system in coconut garden for additional returns

Nagappa Desai*, Chandru Patil[1] **and** Nagaraj Kusagur[2]
Krishi Vigyan Kendra (U.A.S.), Konehalli, TUMKURU (KARNATAKA) INDIA
(Email : agridesai@gmail.com)

Abstract : The farm trials was conducted for assessment of commercial flower crops as intercropping system in coconut garden for additional returns at farmer's field of Gubbi taluk, Tumkur district of Karnataka state to study the influence of intercropping system on coconut yield, economics of coconut based intercropping system with commercial flower crops. The experiment consisted of four different intercropping systems *viz.*, coconut sole cropping as farmers practice (T_1), coconut + marigold (T_2), coconut + china aster (T_3) and coconut + chrysanthemum (T_4) with seven replication (trials) in 38 year old coconut garden of Tiptur tall variety planted with a spacing of 9 m x 9 m. The results of experiment show that growth and yield parameters of coconut were not significantly affected by growing commercial flower crops such as marigold, china aster and chrysanthemum. The yield of coconut was found to higher (8932 nuts/ha/year) under chrysanthemum as intercrop in coconut garden, which was on far with other intercrops in coconut garden. The highest net annual income Rs. 1,43,810/ha and B:C ratio 3.13 were recorded in coconut + chrysanthemum intercropping system with more additional income and market demand of chrysanthemum, which was on far with coconut + China aster (Net annual income Rs. 1,13,300/ha and B:C ratio (3.06) and less market demand of marigold, where as lowest net annual income Rs. 47,310/ha and B:C ratio 2.26 were recorded in coconut sole cropping with no additional income from the farmers practices.

Key Words : : Assessment, Coconut, Flower crops, Income, Intercrops, Yield

View Point Article : Desai, Nagappa, Patil, Chandru and Kusagur, Nagaraj (2018). Assessment of commercial flower crops as intercropping system in coconut garden for additional returns. *Internat. J. agric. Sci.*, **14** (1) : 202-206, **DOI:10.15740/HAS/IJAS/14.1/202-206.**

Article History : Received : 05.09.2017**; Revised :** 02.12.2017**; Accepted :** 14.12.2017

INTRODUCTION

Coconut (*Cocos nucifera* L.) is a high value perennial plantation crop grown in an area of 2.07 million ha with a production of 23,351 million nuts and productivity 11277 nuts/ha in India during 2012-13 (Anonymous, 2015). Coconut cultivated in 19 states and 3 Union Territories in India. Kerala, Tamil Nadu, Karnataka and Andhra Pradesh contribute 90 per cent of area and 91 per cent of production. 90 per cent coconut holdings are owned by small and marginal farmers in the country contributes more than Rs.10,000 crores annually

*** Author for correspondence:**
[1]Department of Horticulture, College of Horticulture (U.A.H.S.), Hiriyur, CHITRADURGA (KARNATAKA) INDIA
[2]Department of Fruit Science, College of Horticulture, (U.A.H.S.), Hiriyur, CHITRADURGA (KARNATAKA) INDIA

to GDP (Anonymous, 2012). The unstable copra prices in the national and international markets, small and marginal land holdings, lack of value addition facilities etc. have aggravated the economic difficulties to many coconut farmers. However, research efforts have resulted in evolving viable technologies to increase the productivity of coconut. Studies have revealed that sole crop of coconut with a spacing of 7.5m x 7.5m effectively uses only 22.3 per cent of land area (Durieux,1997), while the average air space utilization by the canopy is about 30 per cent and solar radiation interception is about 50 per cent (Thiruvarassan *et al.*, 2014 and Dan *et al.*, 2005). Adoption of coconut based intercropping system is one of the ways to utilize the natural resources effectively. The potential for increasing the productivity per unit area of land, time and inputs through coconut based cropping system is considerably higher net return per unit area in perennial crops (Bavappa *et al*., 1986 and Bavappa and Jacob, 1982).

Krishi Vigyan Kendra are grass root level of organizations meant for application of technology through assessment, refinement and demonstration of proven technologies under different 'micro farming' situations in a district (Das, 2007). The main aim of the KVKs is to reduce the time lag between generation of technology at the research institution and its transfer to the farmers for increasing productivity and income from the agriculture and allied sectors on sustained basis.

Objective of research:

– To study the influence of intercropping system on growth and yield of coconut.

– To study economics of coconut based intercropping system with commercial flower crops as compared to farmers practice.

– To study the soil fertility status of coconut garden growing with flower crops as intercrops before and after conduct of on farm trials.

MATERIAL AND METHODS

The farm trials was conducted for assessment of commercial flower crops as intercropping system in coconut garden at farmer's field of Tumkur district, Karnataka state during the year 2016-17. The experiment was laid out in four treatments with seven trials in a 38 year old coconut garden of Tiptur Tall variety planted with a spacing of 9 m x 9 m. A plot of coconut as mono-cropping was maintained as control (Farmers practice). Marigold (African yellow), China aster (Arka Kamini) and chrysanthemum (Yellow gold) as intercrops in coconut garden. Muganahunse village of Gubbi taluks was selected for conducting on farm trials.

T_1 - Coconut as mono-cropping (Farmers practice)
T_2 – Coconut + marigold (African yellow),
T_3 - Coconut + China aster (Arka Kamini)
T_4 - Coconut + chrysanthemum (Yellow gold)

The critical inputs were supplied to farmers and applied as per treatments (T_2) followed University of Horticutlural Sciences, Bagalkot package of practices and treatments T_3 and T_4 followed by Central Plantation Crops Research Institute (CPCRI), Kasaragod as source of technology. On farm trial plots at farmer's fields were regularly monitored by scientists of Krishi Vigyan Kendra, Konehalli, Tiptur. Basic data of the farmer's field were collected before initiation of on farm trials. The data were analysed with appropriate statistical procedures.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Influence of intercropping system on growth and yield parameters of coconut :

The growth and yield parameters of coconut (Table 1) were not significantly affected by growing the

Table 1: Growth and yield parameters of coconut in cropping system

Tech. option	Details of technology	Growth and yield parameters of coconut						
		No. of functional leaves/ palm/year	No. of buttons/ palm/ year	No. of bunches /palm/ year	No. of nuts /palm/ year	Yield of coconut (nuts/ha/ year)	Copra content (g /nut)	Copra yield (kg/palm /year)
T_1	Coconut sole crop (Farmers practice)	27.4	179.5	10.92	69.00	8487	136.2	9.40
T_2	Coconut + Marigold	30.2	172.6	11.25	70.81	8710	140.5	9.95
T_3	Coconut + China aster	28.9	168.3	10.96	69.84	8590	137.6	9.61
T_4	Coconut + Chrysanthemum	32.0	190.8	11.90	72.62	8932	143.3	10.41

intercropping with commercial flower crops during the year 2016-17.The maximum growth and yield parameters such as number of functional leaves (32/palm/year), number of buttons (190.8/palm/year), number of bunches (11.90/palm/year), number of nuts (72.62/palm/year), nut yield (8932/ha/year), copra content (143.3 g/nut) and copra yield (10.41 kg/palm/year) were recorded in chrysanthemum as intercrop in coconut. Where as growth and yield parameters of coconut were also non significantly affected by other treatments irrespectively with marigold or China aster as intercrops in coconut garden (Varghese *et al*., 2013 and Ahmed *et al*., 2007). This might be due to that utilizing available space, light and soil nutrient for growing flower crops without effect on coconut palm during the year. Results analogous to these finding were also reported by Marimuthu (2005) and Maheswarappa *et al.* (2003).

Influenced of intercrop (flower crops) yield by cropping system:

The growth and yield parameters of flower crops (Table 2) were not significantly affected by the main coconut palm with irrespective of growing commercial flower crops as intercrops during the cropping period. But additional yield of flower crop such as marigold (2250 kg/ha), China aster (1650 kg/ha) and chysanthemum (3050 kg/ha) were obtained by growing commercial flower crop as intercrops in coconut garden for additional income (Khandekar *et al*., 2014 and Islam *et al*., 2008). Whereas, no additional crops yield was obtained in farmers practices as coconut mono-cropping (Sujatha *et al*., 2011 and Bavappa, 1990).

Table 2: Influence of intercrop yield by cropping system

Tech. option	Details of technology	Growth and yield parameters of flower crops						
		Plant height (cm)	No. of branches/ plant	Days taken for flower initiation	No. of flowers /plant	Flower head diameter (cm)	100 flower weight (g)	Yield of flowers (kg/ha)
T_1	Coconut sole crop (Farmers practice)	--	--	--	--	--	--	--
T_2	Coconut + Marigold	77.60	19.45	78.30	42	5.2	196	2250
T_3	Coconut + China aster	59.60	16.62	69.50	54	5.9	225	1650
T_4	Coconut + Chrysanthemum	61.40	21.54	94.34	63	4.8	162	3050

Table 3: Yield and economics of coconut based cropping system with flower crops

Tech. option	Details of technology	Yield of coconut (nuts/ha/yr)	Yield of flowers (kg/ha)	Gross return (Rs./ha)	Cost of production (Rs./ha)	Net return (Rs./ha/yr)	B:C ratio
T_1	Coconut sole crop (Farmers practice)	8487	--	84,870	37,560	47,310	2.26
T_2	Coconut + Marigold	8710	2250	1,32,100	47,650	84,450	2.77
T_3	Coconut + China aster	8590	1650	1,68,400	55,100	1,13,300	3.06
T_4	Coconut + Chrysanthemum	8932	3050	2,11,320	67,510	1,43,810	3.13

(Price of Coconut Rs. 10/nut, Marigold Rs. 20/kg, China aster Rs. 50/kg and Chrysanthemum Rs. 40/kg)

Table 4 : Soil fertility status of coconut intercrops with flower crops

Tech. option	Details of technology	Soil fertility status					
		Soil sample drawn	N (kg/ha)	P (kg/ha)	K (kg/ha)	pH	EC (ds/m)
T_1	Coconut sole crop (Farmers practice)	Pre-treatment	282	18.64	136.64	7.74	0.31
		Post treatment	279	18.53	134.61	7.78	0.33
T_2	Coconut + Marigold	Pre-treatment	282	18.64	136.64	7.74	0.31
		Post treatment	281	18.42	135.30	7.72	0.32
T_3	Coconut + China aster	Pre-treatment	282	18.64	136.64	7.74	0.31
		Post treatment	278	18.37	134.67	7.79	0.31
T_4	Coconut + Chrysanthemum	Pre-treatment	282	18.64	136.64	7.74	0.31
		Post treatment	280	18.40	134.56	7.78	0.32

Economics of intercropping system in coconut:

The economic of intercropping system in coconut was worked out by calculating total cost of cultivation, gross return, net return and B:C ratio (BCR) of all treatment. Total cost of cultivation was calculated by total sum of expenditure of land preparation, seed, manure and fertilizers, plant protection measures, irrigation and labour component, etc. in coconut and intercrops. The data (Table 3) revealed that highest net returns (Rs. 1,43,810/ha/year) and B:C ratio (3.13) was obtained in chrysanthemum as intercrops in coconut followed by China aster as intercrops in coconut with net return (Rs. 1,13,300/ha/year) and B:C ratio (3.06). Whereas lowest net returns (Rs. 47,310/ha/year) and B:C ratio (2.26) was obtained in coconut as sole crop in farmers practice. This might be due to that additional income obtained from growing chrysanthemum and china aster as intercrops in coconut garden and also high market rate and more demand in market of chrysanthemum and china aster flowers as compared to marigold as less demand in market (Bari and Rahim, 2010 and Nair and Gopalakrishnan, 1990). The farmers sold the coconut at Rs. 10/nut, price of marigold Rs. 20/ kg, China aster Rs. 50/kg and chrysanthemum Rs. 40/ kg at farmer field and on that basis, profitability was calculated (Bari and Rahim, 2012 and Maheswari *et al*., 1985).

Effect of intercrops on soil fertility status of coconut garden :

The soil fertility status *viz*., NPK availability, pH and electrical conductivity (EC) in soil were analyzed before initiation and after the experiment and compared with the pre-experimental (Farmers practice) soil fertility status. NPK availability, pH and electrical conductivity (EC) in soil were not significantly affected by intercropping system of growing commercial flower crops. The available NPK status was on far with each treatment. This might be due to that uptake of residual soil nutrient in interspaced area by flower crops and applied recommended doses of nutrient management separately to main coconut palm and intercropped commercial flower crops (Mini *et al*., 2015; Maheswarappa *et al*., 2013 and Shajikumar, 1991).

Conclusion:

The experiment concluded that growth and yield parameter of coconut were not significantly affected by growing commercial flower crops such as marigold, China aster and chrysanthemum, but the highest nut yield, annual net return and B:C ratio were recorded in chrysanthemum as intercrops in coconut garden with more additional income and market demand of chrysanthemum, which is on far with china aster as intercrops in coconut garden, less market price and demand of marigold, where as lowest net annual income were recorded in coconut sole cropping with no additional income from the farmers practices. Chrysanthemum and China aster as intercrops in coconut garden is more suitable cropping system to boost economy of farmers.

REFERENCES

Ahmed, F., Rahim, M. A., Alam, M. S., Hamid, M.A. and Haque, K. M. (2007). Performance of medicinal plants and species in coconut based agroforestry system. *J. Agrofor. Envion.*, **1**: 51-53.

Anonymous (2012). Coconut Development Board. Kochi, Annual Report 2011-12, pp. 6 - 10.

Anonymous (2015). Vision 2050. Central Plantation Crops Research Institute, Kasaragod-671124, Kerala.

Bari, M. S. and Rahim, M. A. (2010). Bio-economic evaluation of Aloe vera in coconut based multistoried agro-forestry systems. *J. Agrofor. Envion.,* **3** (2) : 61-63.

Bari, M. S. and Rahim, M. A. (2012). Economic evaluation and yield performance of some medicinal plants in coconut based multistoried agro-forestry systems. *Sci. J. Krishi Foundation Agriculturists,* **10** (1): 71-80.

Bavappa, K.V.A. and Jacob, V.J. (1982). High density multispecies cropping – A new approach to small scale farming in the tropics. *World Crop,* **2**: 47-50.

Bavappa, K. V. A., Kailasam, C., Khader, K. B. and Biddappa, A. (1986). Coconut and arecanut based high density multispecies cropping system. *J. Plantation Crops,* **14**(2): 74-87.

Bavappa, K.V. A. (1990). An upto date research profile on coconut based farming system. In: *Cocotech meeting on coconut based farming system*, 27th June, Manila, Philippines. pp. 360-389.

Dan, C., Brainard, R., Bellinder, R. and Antonio, D. T. (2005). Effect of canopy shade on the morphology, phenology and seed characteristics of powell amaranth. *Weed Sci*., **53**: 175-186.

Das, P. (2007). Proceedings of the meeting of DDG (AE) ICAR with officials of state Departments, ICAR institutes and Agricultural Universities, NRC Mithun, Jharmapani, Zonal

Coordinating Unit, Zone-III. Barapani, Meghalaya, India. pp. 6.

Durieux, A. (1997). Effect of lighting on the production of vegetables crops. III International symposium on artificial lighting in horticulture. ISHS Acta Horticulturae 418, Netherlands.

Islam, K. K., Pervin, M. J., Rashid, M. H., Mondol, M. A. and Rahim, M. A. (2008). Performance of winter vegetables grown under coconut lemon based multistoried agroforestry system. *Tropical & Subtropical Agro-ecosystems*, **8**: 165-170.

Khandekar, R. G., Nagwekar, D. D., Sawant, V. S., Gurav, S. S. and Haldankar, P. M. (2014). Performance of *Morinda citrofolia* as mixed crop in coconut under Konkan region of Maharashtra. *Internat. J. Res. Emerging Sci. & Tech.*, **1**(4): 6-66.

Maheswarappa, H. P., Anitakumari, P. and Sairam, C.V. (2003). High density multispecies cropping system for root (wilt) affected coconut gardens – Its impact on productivity and economic viability. *J. Plantation Crops*, **31**(1): 23-27.

Maheswarappa, H.P., Dhanapal, R., Subramanian, P. and Palaniswami, C. (2013). Evaluation of coconut based high density multispecies cropping system under organic and integrated nutrient management. *J. Plantation Crops*, **41** (2): 130-135.

Maheswari, S. K., Dhantonde, B. N., Yadav, S. and Gangrade, S. K. (1985). Intercropping of *Rauvolfia serpentina* for higher monetary returns. *Indian J. Agric. Sci.*, **58**: 108-111.

Marimuthu, R. (2005). Multispecies cropping system in coconut garden, *Madras Agric. J.*, **92**(7&9): 404-406.

Mini, V., Usha Mathew and Indira, M. (2015). Nutrient uses strategies for coconut based cropping system in onattukara sandy tract, Kerala. *J. Agric. & Vet. Sci.*, **8** (3): 11-15.

Nair, M. K. and Gopalakrishnan, P. (1990). Coconut based farm family models in India In: *COCOTECH meeting on coconut based farming systems*, 27th Manila, Philippine. Proceedings of the meeting, pp. 360-389.

Shajikumar, V. M. (1991). Nutrient cycling in coconut based agroforestry system- contribution from litter fall of multipurpose trees. Project Report B.Sc.(Forestry), Kerala Agricultural University, Thrissur.

Sujatha, S., Bhat, R., Kannan, C. and Balasimha, D. (2011). Impact of intercropping of medicinal and aromatic plants with organic farming approach on resource use efficiency in arecanut (*Areca catechu* L.) plantation in India. *Industrial Crops & Products*, **33**(1): 78–83.

Thiruvarassan, S., Maheswarappa, H. P. and Subramani, T. (2014). Evaluation of Coconut based multispecies cropping systems for East Coast Region of Tamil Nadu. *J. Andaman Sci. Assoc.*, **19** (1): 59-64.

Varghese, P. T., Nair, P. K. R., Nelliat, E. V., Varma, Rama and Gopalsundaram, P. (2013). Intercropping with tuber crops in coconut garden, pp.399-415. In: *Proceedings of 1st plantation crops symposium* (PLACROSYM I). Placrosym standing committee, Kasaragod, India.