Journal of Plantation Crops **28** (2): 167-170, August 2000

AGROFORESTRY APPROACH IN CULTIVATION OF PEPPER AND CARDAMOM IN MARGINAL UPLANDS - AN ECONOMIC EVALUATION

Manuscript received: 2.8.99; revised: 5.2.2000; accepted: 20.3.2000

Key words: Agroforestry, Cardamom, Pepper

Agroforestry in a developing country like India has today become a new approach of integrated land management system not only for renewable resource production but also for ecological considerations. The combinations ranging from association of trees with horticulture to agroforestry and crop cultures are practiced due to diverse climates and topography.

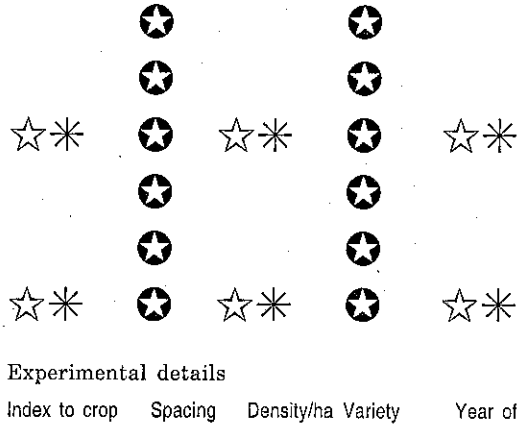
Crop diversification methods like crop rotation, mixed cropping, double cropping have been found successful in many situations. The major advantages of these methods of diversification include reduced soil erosion, improved soil fertility, increased yield, overall sustained returns and also they reduce the risk of crop failure.

Cardamom is cultivated as an undergrowth in evergreen forests, which in itself is a multistoreyed cropping system. Pepper is yet another important ecofriendly and high value spice crop, which can be trailed on the trunks of shade trees in the Western ghats. Besides Kerala, Karnataka is emerging as a major pepper growing state in India in the recent years.

Agroforestry approach of cultivation of cardamom and pepper along with silver oak as shade trees contributes to enhancing the over all productivity per unit of soil, light and water and safeguards the environment. Besides these, the system can improve the economic returns of small and marginal farmers who constitute ove 80 per cent.

With this background, in the present paper an attempt has been made to analyse the costs and returns of Agroforestry approach in pepper and cardamom cultivation in Kodagu district of Karnataka.

Field experiment was conducted to study the costs and returns of Agroforestry approach of cardamom and pepper cultivation on marginal open upland (Fig. 1). Regular cultural operations and irrigation were carried out and recommended does of nutrients applied for cardamom and pepper as per schedule (Korikanthimath and



Experimental details

Index to crop	Spacing	Density/ha	Variety	Year of Planting
☆ Silver oak	3x3 m	1111	-	1987
✳ Pepper	3x3 m	1111	Panniyur-1	1991
✪ Cardamom	3x0.9 m	3704	C1.37 (Malabar)	1993

Fig. 1. Plan of layout

Venugopal, 1989). Yield data was accounted as realised in the experiment. The financial analysis was carried out using financial feasibility measures viz., Net Present Worth, Benefit Cost Ratio and Internal Rate of Return. The costs and returns were discounted at 14 per cent discount rate.

Yield pattern of cardamom and pepper in agroforestry approach

The details of yield realised in the experiment is presented in the Table 1. The yield levels of pepper showed an increasing trend during three cropping seasons (1995-96 to 1997-98). The highest yield was obtained during 1997-98 (2020 kg/ha) with an average of 1.82 kg per vine. On an average the yield obtained in pepper was 1531 kg/ha (dry).

Cardamom introduced during the year 1993-94 started bearing in the third year (1995-96) of planting with a highest maiden crop of 1250 kg/ha (dry). In the subsequent two years the decline in cardamom yield was noticed. One of the reasons for the low yield after attaining the highest yield is due to the fact that cardamom is rhizomatous crop which comes to full bearing during third year of planting. Hence the maiden crop is backed by two years of vegetative growth and the resultant accumulation of photosynthates. Subsequent crop yields are backed by one year of vegetative growth and resultant food storage (Korikanthimath, 1995). The total yield of 3103.68 kg/ha was obtained during three crop seasons (1995-98) averaging to 1034.56 kg/ha of dry cardamom which is 8.62 times more than the National average yield of 120 kg/ha.

Table 1. ***Yield realisation in cardamom and pepper in agroforestry approach***

Year	Yield kg/ha	
	Pepper	Cardamom
1995-96	1023.00	1250.00
1996-97	1550.00	870.00
1997-98	2020.00	983.68
Total	4593.00	3103.68
Average	1531.00	1034.56

Costs and returns in the mix cropping system of silver oak+ pepper+cardamom

Until the introduction of pepper, the cost of maintaining the silver oak orchard varied between Rs. 3030 to Rs. 3610/ha. (Table 2). The cost of establishing the silver oak orchard worked out to Rs. 8932/ha. The cost of cultivation was high during 1991-92 and 1993-94 as in the respective years pepper and cardamom were introduced in the system.

The cost of cultivation of the mix cropping system during bearing period of pepper and cardamom (1995-96 to 1997-98) varied between Rs. 84,790.65 to Rs. 96,703.17/ha of which the cost of cultivation of cardamom accounted for the major share. During the bearing period, the cost fluctuated in tune with the variations in the yield pattern of cardamom as the harvesting of cardamom is the most labour intensive operation which spreads almost 4-5 months in a year.

The highest gross and net returns were realised during 1995-96 which was due to highest maiden crop of cardamom of 1250 kg/ha (dry) and highest price realised during that particular crop season. In the subsequent years, the returns showed fluctuating trend due to variations in the cardamom yield, though steady increasing trend was observed in pepper yield.

Table 2. ***Costs and returns in the mixed cropping system of silver oak+pepper+cardamom***

Year	Gross returns			Cost of cultivation			Net returns
	Pepper	Cardamom	Total	Pepper	Cardamom	Total	
1987-88	-	-	-	8932.00*	-	8932.00	- 8932.00
1988-89	-	-	-	3030.00	-	3030.00	- 3030.00
1989-90	-	-	-	3470.00	-	3470.00	- 3470.00
1990-91	-	-	-	3610.00	-	3610.00	- 3610.00
1991-92	-	-	-	12945.75	-	12945.75	- 12945.75
1992-93	-	-	-	8346.00	-	8346.00	- 8346.00
1993-94	-	-	-	7901.80	26474.0	34375.80	- 34375.80
1994-95	-	-	-	8762.92	15042.0	23804.92	- 23804.92
1995-96	76725.00	60250.00	682975.00	19937.00	66329.5	86266.50	596708.50
1996-97	232500.00	26100.00	493500.00	24301.50	60489.15	84790.65	408709.35
1997-98	393900.00	280348.00	674248.80	27263.96	69439.21	96703.17	577545.63
Total	-	-	1850723.80	-	-	366274.79	1484449.01
Average	-	-	168247.62	--	--	33297.71	134949.91

*Cost of cultivation of silver oak

Financial feasibility measures

The financial feasibility measures viz., Net Present Worth (NPW), Benefit Cost Ratio (BCR) and Internal Rate of Return (IRR) were computed and presented in the Table-3. The table reveals that, NPW is greater than zero (Rs. 3,83,742.78), BCR is

Table-3. ***Discounted gross and net returns in the mixed cropping system of silver oak+ pepper+cardamom***

Year	Discounted gross returns	Discounted cost of cultivation	Discounted net returns
1987-88	-	7833.36	7833.36
1988-89	-	2330.07	2330.07
1989-90	-	2342.25	2342.25
1990-91	-	2137.12	2137.12
1991-92	-	6718.84	6718.84
1992-93	-	3805.78	3805.78
1993-94	-	13750.32	13750.32
1994-95	-	8355.53	8355.53
1995-96	210356.30	26570.08	183786.22
1996-97	133245.00	22893.48	110351.52
1997-98	159796.97	22918.66	136878.31
Total	503398.27	119655.49	383742.78
Average	45763.48	10877.77	34885.71

NPW = Rs. 3,83,742.78
BCR = 4.21
IRR = 80.56

more than unity (4) and IRR is higher than the current rate of interest (80.50%) indicating the economic viability of the system. The study compared well with earlier studies involving coconut and arecanut (Bavappa, *et al.* 1986)

Thus the results arising out of the present study have a direct bearing on the afforestation of degraded marginal lands in the high ranges of Western ghats for the efficient utilisation of natural resources for a sustained production of ecologically feasible and economically viable spices like pepper and cardamom.

REFERENCES

BAVAPPA, K.V.A., KAILASAM, C., KHADER, K.A., BIDDAPPA, C.C., KHAN, H.H., KASTURIBAI, K.V., RAMADASAN, A., SUNDERARAJA, P., BOPAIAH, B.M., THOMAS, G.V., MISHRA, L.P., BALASIMHA, D. BHAT, N.D. and BHAT K, S. 1986. *J. Plantn Crops* **14(2)**: 74-97.

KORIKANTHIMATH, V.S. 1995. *J. of Spices and Aromatic Crops* **4(2)**: 119-128.

KORIKANTHIMATH, V.S. and VENUGOPAL, M.N. 1989. High Production Technology in Cardamom. *Technical Bulletin.* National Research Centre for Spices, Calicut.

KORIKANTHIMATH, V.S. and VENUGOPAL, M.N. and SADANANDAN, A.K., 1989. *Spice India* **2(2)**: 5-11.

Indian Institute of Spice Research
Cardamom Research Centre
Appangala, Madikeri-571 201
Kodagu, Karnataka

V. S. KORIKANTHIMATH
G. M. HIREMATH
RAJENDRA HEGDE