

Economics of crop rotations in Ratnagiri, India

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ABSTRACT

The important crop rotations found were rice-fallow and Nagli- fallow. The pulses like Pawta, kulthi, tur, wal and vegetables like tomato, brinjal, chilli, watermelon and groundnut, a oil seed crop were the margin crops grain after rice. Rice-fallow rotation was found to be most common with 65 cultivators with per farm area was 0.26 hectares. It was pointed out that per farm area under first crop was 1.20 hectares and under second crop it was 0.32 hectares in crop rotation. In economics of crop rotation, gross return was maximum in case of rice-tomato (Rs. 1, 20,002.00). Regarding input cost, maximum cost incurred for rice-tomato i.e. Rs. 66,248/-. Maximum net income was obtained from rice-tomato rotation (Rs. 59,753.60). Rice-chilli rotation provided maximum employment which was 723 days. Per farm gross income was Rs. 70649. The major income was from high yielding varieties of rice (Rs. 19080/-). Farmers earned farm business income of Rs. 42,228.00. Capital output ratio (17.22) as well as labour output ratio was highest (19.48) for coconut crop. In case of rice-fallow, capital and labour output ratio was 1.23 and 2.18, respectively.

Key words : Crop rotation, Physical inputs, Employment generation.

INTRODUCTION

The role of cropping system in intensive cropping is to increase the cropping intensity in irrigated as well as rain fed areas of the country. The net sown area in the country has remained almost steady at 143 million hectares over the past few years and there is ample scope for bringing the additional area under cultivation. The only possibility of expansion of cropped area is through the increase in area sown more than once. The cropping intensity can be increased both in rain fed as well as irrigated areas. The farming in India is carried out under diverse condition of agro climate, soil types and individual farm resources. Different crop rotations are used on different farms and in different regions to suit local situations and to fulfill individual household requirements.

Objective of the present study is to know the input use, cost and return structure of different Crop rotations and to analyze economic efficiency through income and employment generation.

MATERIALS AND METHODS

Ratnagiri district of the Konkan region was selected purposively for the study as it has more diversified farming practices. For the selection of cultivators, three stage random sampling technique was followed with tahsil as primary unit, village as secondary unit and cultivator as ultimate unit to draw a cross sectorial sample of 120 cultivators. The data pertained to the agriculture year 2003 – 04.

RESULTS AND DISSCUSSION

The information regarding crop rotation followed by

sample cultivators eleven crop rotations were identified in the study area (Table 1). Rice – Fallow rotation was found to the most common with 65 cultivators and 31.20 hectare area with per farm area 0.26 ha. This is because the soil in the study area was very light which do not and therefore, growing second crop is not possible on extensive scale. Where soils are retentive of moisture in plain area. The rotation like rice-Pawta (48 farmer), rice-kulthi (17 farmer), rice-tur (20 farmer), rice-wal (20 farmer) were followed. Maximum area was found in rice-Pawta rotation (26.40 ha) followed by rice-tur (8.40 ha) rotation.

Where irrigation is available, the rotation like rice – tomato (18 farmers), rice – brinjal (13 farmers), rice – chilli (12 farmers), and rice – watermelon (8 farmers) were followed. The maximum area was found in rice – tomato rotation (7.20 ha) followed by rice – brinjal and rice – chilli with 3.60 ha of area in end.

Nagli –Fallow rotation was followed as Nagli crop is grown on hill slopes where there is no moisture in *rabi* season and hence no second crop was possible.

There is limited scope for growing second crop under present situations due to poor moisture holding capacity of the soil and limited irrigation facilities in the study areas. Growing second crop on wider scale will be possible only if more irrigation facilities are available. Therefore, efforts need to be made to provide surface and ground water irrigation wherever possible.

Use of physical inputs

Physical inputs included labour, seed, manure, fertilizers, insecticides, pesticides and raw material per

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Table 1: Crop rotation

S. No.	Crop rotation	No. of cultivators	First crop		Second crop	
			Actual area (ha)	Per farm area	Actual area (ha)	Per farm area
1.	Rice – Fallow	65	31.20	0.26	--	--
2.	Nagli - Fallow	52	46.80	0.39	--	--
3.	Rice – Pawta	48	26.40	0.22	18.00	0.15
4.	Rice – Kulthi	17	6.0	0.05	3.60	0.03
5.	Rice – Tur	20	8.40	0.07	2.40	0.02
6.	Rice - Wal	20	6.00	0.05	2.40	0.02
7.	Rice – Tomato	18	7.20	0.06	2.40	0.02
8.	Rice – Brinjal	13	3.60	0.03	2.40	0.02
9.	Rice – Chilli	12	3.60	0.03	1.20	0.01
10.	Rice-Watermelon	6	2.40	0.02	1.20	0.01
11.	Rice– Groundnut	8	2.40	0.02	4.80	0.04
Total		-	144.00	1.20	38.40	0.32

rotations. Use of physical inputs is given in Table 2.

In crop rotation, eleven crop rotation were identified. Labour required for rice – chilli was 723.12 days, followed by rice – tomato (719.76 days) and rice – brinjal (712.79 days). The minimum labour was required for nagli – fallow (120.29 days) rotation. Regarding bullock labour, maximum bullock labour used in rice – kulthi was 87.28 days followed by rice – groundnut (85.74 days) and rice – brinjal (70.39 days). Rice – wal required bullock pairs 66.45 days followed by rice – fallow (45.38 days). While, Nagli – fallow required lowest bullock pair (25.75 days). The

average level of use of important inputs like FYM and fertilizers was very low, per hectare yields of different crops were also much less than the expected yields.

Economics of crop rotations

Economics of crop rotations is studied in terms of gross value, input costs and income for first and second crop separately and also the total value (Table 3). In case of first crop, the gross return obtained from rice-fallow was Rs. 25575.75. In case of second crop, maximum gross return was obtained from tomato (Rs. 1,20,002.20)

Table 2 : Per hectare use of physical inputs for each corporation.

Crop rotation	Human labour (Days)			Bullock (Days)	Rab material (Qts.)	Seed (kg)	FYM (Qts.)	Fertilizer			Pesticide	Yield (Qts.)	
	M	F	Total					N	P	K		Main	By product
Rice Brinjal	254.81	457.98	712.79	70.39	33.09	51.64	235.08	183.00	16.03	16.03	-	115.98	29.90
Rice – Wal	117.97	264.31	382.28	66.45	33.09	74.54	44.77	73.06	16.03	16.03	-	35.98	29.90
Rice – Groundnut	161.64	285.90	447.54	85.74	33.09	134.54	45.18	83.06	16.03		-	43.73	29.90
Rice – Water melon	189.64	260.90	450.54	50.52	33.09	51.04	189.77	113.00	16.03	16.03		180.98	29.90

Crop rotation	Human labour (Days)			Bullock labour (Days)	Rab material (Qts.)	Seed (kg)	FYM (Qts.)	Fertilizer			Pesticide
	M	F	Total					N	P	K	
Rice – Fallow	77.17	171.47	249.24	45.38	38.75	72.93	47.38	57.89	8.03	8.03	-
Nagli – Fallow	44.81	75.48	120.29	25.5	43.86	5.67	37.00	37.06	25	25	-
Rice – Pawta	116.95	265.79	382.74	67.67	33.09	84.15	54.77	98.06	16.03	16.03	-
Rice – Kulthi	137.43	275.81	413.24	70.28	33.09	81.68	54.77	104.3	16.03	16.03	-
Rice – Tur	119.99	268.25	388.24	63.22	33.09	77.96	48.67	73	16.03	16.03	-
Rice – Tomato	248.81	470.95	719.76	63.71	33.09	54.79	230.69	168	16.03	16.03	1.0
Rice – chilli	249.64	473.48	723.12	65.46	33.09	54.54	239.77	163	16.03	16.03	1.0

Table 3 : Per hectare cost and return in different crop rotations

Crop combinations	No. of Cultivators	1 st crop			2 nd crop			Total	
		Gross value	Input cost	Income	Gross value	Input cost	Income	Gross value	Input cost
Rice – Fallow	65	25575.75	20777.74	4798.01	-	-	-	25375.75	20777.74
Nagli – Fallow	52	10280.00	6589.19	3690.81	-	-	-	10280.00	6589.19
Rice – Pawta	48	20002.00	17604.31	2397.69	15824.05	9871.29	5952.76	35826.05	27475.60
Rice – Kulthi	17	20002.00	17604.31	2397.69	12060.00	9657.45	2402.55	32062.00	27261.76
Rice – Tur	20	20002.00	17604.31	2397.69	9550.00	8812.16	737.84	29552.00	26416.47
Rice – Tomato	18	20002.00	17604.31	2397.69	100000.00	42644.49	57355.91	120002.00	66248.40
Rice – Chilli	12	20002.00	17604.31	2397.69	90000.00	43745.52	46254.48	11002.00	61349.83
Rice – Brinjal	18	20002.00	17604.31	2397.69	85000.00	43153.90	41846.10	105002.00	60758.21
Rice – Wal	20	20002.00	17604.31	2397.69	22250.00	8832.20	13417.80	42252.00	26436.51
Rice – Groundnut	8	20002.00	17604.31	2397.69	15300.00	16897.46	-1597.46	35278.00	34501.77
Rice – Water melon	6	20002.00	17604.31	2397.69	75000.00	22801.70	52198.30	95002.00	40406.01
Mango	34	56830.00	9868.44	46961.16	-	-	-	56830.00	9868.44
Arecanut	10	52500.00	4098.00	56598.00	-	-	-	52500.00	4098.00
Coconut	06	76830.00	4459.58	72370.42	-	-	-	76830.00	4459.58
Cashewnut	18	30000.00	3069.46	26930.54	-	-	-	30000.00	3069.46
Arecanut + Coconut	13	78950.00	7193.66	71756.04	-	-	-	78950.00	7193.96

followed by chilli (Rs. 110008.00) and minimum from nagli (Rs. 10280). Regarding gross return of both crops together, maximum gross return was obtained from rice-tomato (Rs.120002.20) followed by rice-chilli (Rs. 110008.60) and rice – brinjal (Rs. 105002.20) rotation.

Regarding input cost maximum costs was incurred for rice – brinjal (Rs. 47111.79) and a minimum for rice – tur (Rs. 17802.60). Maximum net income was obtained from

rice – tomato (Rs. 76464.31) followed by rice – chilli (Rs. 58206.31). Regarding perennial crops, mango was most profitable with a net profit of Rs. 78950.00 followed by Arecanut + coconut inter cropping which was Rs. 71830.00.

Employment from crop rotation

Regarding employment generated from crop rotation it was observed that rice – chilli rotation provided

Table 4: Employment availed in different crop rotation.

S. No.	Rotations	Male	Female	Total	Bullock (pair days)
1.	Rice – Fallow	77.17	171.47	249.24	45.38
2.	Nagli – Fallow	44.81	75.48	120.29	25.75
3.	Rice – Pawta	116.95	265.79	382.74	67.67
4.	Rice – Kulthi	137.43	275.81	413.24	70.28
5.	Rice – Tur	119.99	268.25	388.24	63.22
6.	Rice – Tomato	248.81	470.95	719.76	63.71
7.	Rice – Chilli	249.64	473.48	723.12	65.46
8.	Rice – Brinjal	254.81	457.98	712.79	70.39
9.	Rice – Wal	117.97	264.31	382.28	66.45
10.	Rice – Groundnut	161.64	285.90	447.54	85.74
11.	Rice – Water melon	189.64	260.90	450.54	50.52
12.	Coconut	60	30	90	-
13.	Arecanut	90	60	150	-
14.	Cashewnut	52.70	39.73	92.43	-
15.	Mango	74.17	42.59	116.76	-
16.	Arecanut + coconut	120.33	70.00	793.33	-

Table 5: Economic efficiency of crop rotation.

Rotation	Total crop production (q/ha)			Capital output ratio	Labour output ratio
	First crop	Second crop	Total		
Rice – Fallow	38.13	-	38.13	1.23	2.18
Nagli – Fallow	17.13	-	17.13	1.56	2.24
Rice – Pawta	30.98	4.8	35.78	1.30	2.84
Rice – Kulthi	30.98	10.5	41.03	1.16	2.29
Rice – Tur	30.98	9.55	40.53	1.11	2.30
Rice – Wal	30.98	5.00	35.98	1.80	3.36
Rice – Tomato	30.98	100.00	130.98	1.81	4.69
Rice – Brinjal	30.98	85.00	115.98	1.72	4.12
Rice – Chilli	30.98	75.00	105.98	1.79	4.30
Rice – Water melon	30.98	150.00	180.98	2.35	11.20
Rice – Groundnut	30.98	12.75	43.73	1.03	2.28
Mango	56.83	-	56.83	5.75	11.24
Areca nut	7.5	-	7.5	12.80	8.23
Coconut (nuts)	12733	-	12733	17.22	19.48
Cashewnut	10	-	10	9.77	7.74
Areca nut + coconut	4.25 +	-	4.25 +	10.57	9.61
	8200	-	8200		

maximum employment of 723.12 days to human labour followed by rice – brinjal rotation (712.79 days). Rice – fallow rotation generated employment of 249.41 days. In perennial crops, areca nut + coconut generated 193.33 days employment. Where as nagli – fallow rotation generated employment of (120.29 days) (Table 4).

Economic efficiency of crop rotation:

The economic efficiency of crop combination/rotations is given in Table 5.

The economic efficiency is measured in terms of per hectare physical yield. Capital output ratio, labour output ratio and per day gross and net returns. The capital output ratio is worked out by dividing gross value of outputs by cost of inputs (working capital). Labour output ratio is computed by dividing gross value by cost of labour (both family and hired labour).

In case of seasonal crops, maximum quantity of output was obtained from rice – water melon (129.59 q/ha), whereas minimum quantity from nagli – fallow (17.13 q/ha). The capital output ratio was highest for coconut (17.22) followed by areca nut was (12.83).

Among the seasonal crops, ratio was highest for rice – water melon (2.35) followed by rice – brinjal (1.72) and rice – wal (0.88). The capital output ratio was higher in perennial crops as compared to field crops. In rice-

leguminous crops like pulses, there was rise due to these crops in yield because (pulses) leguminous crops fix atmospheric nitrogen from soil and increases productivity.

The labour output ratio indicated return to per rupee of labour cost. This ratio was highest in coconut (19.48) followed by mango (11.24) and rice – watermelon (11.20). In legume crops, labour output ratio was higher in rice – wal (3.36) followed by rice – pawata (2.84). The ratio was low for rice – fallow (2.18). This means that output was not sufficient to cover even the cost of labour.

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