Economics of intensification and diversification of the exiting cropping system in plain zone area of Nasik, India

R.B. HILE*, Y.J. PATIL AND H. M. PATIL

Department of Agronomy, Cropping Systems Research Project, MPKV, RAHURI (M.S.) INDIA

ABSTRACT

A field experiment was conducted on cultivators' field for three years i.e. during *Kharif, Rabi* and *Summer seasons* of 2003 to 2006 on medium black soils in the plain zone area of Nasik district of Maharashtra in order to study the intensification and diversification of nutrients uptake in maize-wheat, maize-groundnut, maize-onion and maize-chilli in cropping sequences. The field experiment was laid out on permanent site in Randomized Block Design with six replications and four treatments with application of 100 % RDF in the respective crops with adequate supply of irrigation water. Maize variety cv. 'Super 900M' was sown in the second week of July followed by wheat variety cv. 'NIAW 301' in the third week of November, groundnut variety cv. 'TG-26' in the first week of February, onion variety cv. 'N-2-4-1' in the second week of October and chilli cv. 'Sitara' during each season. Out of four crop sequences, soil fertility status including organic carbon, available nitrogen, phosphorus and potassium has been improved with significant increase in yield. Singh,*et al.* (1998).reported that the productivity and economics of different cropping systems were significantly higher in gross monetary returns, net monetary returns and B: C ratio. The maximum productivity and net returns, improvement in fertility status and chemical properties of soil could be possible from this cropping sequence. Maize-chilli cropping system was found significantly superior as it gave higher net monetary returns and B: C ratio followed by maize-onion, maize-wheat and maize-groundnut cropping system as compared to other cropping systems.

Key words : Intensification, Diversification, Cropping sequences

INTRODUCTION

In plain zone area of Nasik district is a common practice to grow the maize after wheat crop sequence without any modification. The farmers are facing problem of unsustainable yields particularly during summer due to ill distribution of water between head and the tail end. Therefore, it has been recommended to grow light irrigated crops during summer, but there is urgent need to evaluate suitable remunerative crops equivalent to maize. Mahapatra (1985) reported that in southern states, *viz*. Andhra Pradesh, Tamilnadu, Karnataka, Kerala, rice-rice-rice system had indicated highest yield by rice-rice-maize and rice-mung-rice. Whereas in eastern part of India the rice-rice rotation was the best in lowlands and rice wheat rotation was superior under slightly dry hot zone (AICARP, 1986). Hence, the present study was undertaken to find out suitable alternate crops for *rabi* and *summer* crops like maize grown in *kharif* season while wheat, groundnut, onion and chilli on receding moisture along with protective irrigations at critical growth stages.

The present study entitled "Economics of Diversification and intensification of the existing cropping system in plain zone area of Nasik disrtict in Maharashtra" was undertaken to evaluate profitability and productivity of different cropping systems under various level stages of crops with the following objectives.

1. To identify the existing cropping system in order to achieve maximum crop productivity and economic returns.
2. To work out the economics of different cropping systems.

MATERIALS AND METHODS

An experiment was conducted during the cool and dry seasons of 2003 to 2006 in semi- arid climatic conditions under irrigated ecosystem in plain zone area in Nasik disrtict of Maharashtra for experiments on cultivators fields scheme. The soil was medium black with pH 8.26; organic carbon 0.62 per cent, available N, P and K in the soil was 195.45, 13.49 and 535.25 kg/ha, respectively. The experimental design was split plot with six replications, four treatments and four cropping systems. Sub-plot treatment (Cropping Systems) were T_1 - Maize-Wheat, T_2 -Maize-Groundnut, T_3 Maize- Onion and T_4 -Maize-Chilli in cropping sequences. The gross and net plot size was 200 m^2 and 100 m^2, respectively. After the harvest of general crop of maize in *Kharif* four crops*, viz.* chilli, onion, wheat and groundnut were grown. All the treatments were replicated 24 times.

* Author for correspondence.

Recommended varieties and agronomic practices were followed for all the crops.

RESULTS AND DISCUSSION
Effect of alternate crops on yield of maize :

During *kharif* 2003, general crop of maize was grown and data on maize yield were not significant, indicating uniformity of the experiment on cultivator's field

(255.63qtls/ha). The yields of groundnut were not sustainable when grown after maize.

Maize equivalent grain yield :

The date reveled that none of the crop sequences out higher yielded maize-chilli sequence (226.63 kg/ha). However, this sequence was followed by maize-onion, maize-wheat and maize-groundnut sequences in terms

Table 1 : Yield of maize-wheat sequence crop (qtls. /ha.) during 2003-2006

Treatment Details	Crop sequence	Kharif yield (qtls./ha.)			Mean	Rabi /Summer yield (qtls./ha.)			Mean
		2003	2004	2005		2003	2004	2005	
T$_1$	Maize-wheat	41.36	48.32	49.34	46.34	40.75	44.72	43.40	42.95
T$_2$	Maize-groundnut	41.58	48.39	49.47	46.48	26.97	27.07	26.90	26.98
T$_3$	Maize-onion	41.70	48.22	49.46	46.46	244.08	264.08	258.75	255.63
T$_4$	Maize-chilli	41.89	48.41	49.07	46.45	50.57	77.89	79.45	69.30
SE.m.$\pm$	-	0.12	0.10	0.21	0.14	9.43	3.08	3.91	5.47
C.D.at 5%	-	0.34	N.S.	N.S.	0.11	25.95	9.29	11.80	15.68

Market rate: (Rs. / qtls.) Maize-500/-, Wheat-1100/-, Groundnut-1600/-, Straw-40/, and Onion-250/-, Chilli-1300/-

site. The data indicated that none of the crops after maize had adverse effect on yield of subsequent maize crop. However, during2003 to2006, chili crop yield was significantly higher where onion or groundnut was grown. Singh, *et al.* (1990) reported that the highest yield was obtained with maize followed by maize wheat sequence. and Nagalikar, *et al.*(1999) economic analysis of rice based cropping system for Tungabhadra project area and were analyzed by rice-rice sequence recorded highest net returns followed by rice-sesame sequence. The pooled data indicate that chili sequence produced highest yield

of maize equivalent yield of 174.27,141.24 and 132.81 kg/ha. respectively.

Economic analysis :

Gross and net monetary returns as well as B: C ratio, as influenced by different cropping systems is presented in Table-2. Net monetary returns obtained from Maize-chilli sequence recorded significantly higher (Rs.54,740/ha.) followed by maize-onion (Rs.52,050 /ha.) and maize-wheat (Rs.32,580/ha.). The benefit: cost ratio was however, higher in maize-chilli sequence (2.16) and

Table 2 : Pooled mean gross, net monetary returns (Rs./ha) and B: C ratio as by different cropping systems and maize equivalent yields (qt/ha.).

Crop sequence	Maize-eq-yield (qtls/ha)	Gross Monetary returns (Rs./ha.)	Net Monetary returns (Rs/ha.)	B C R	SYI	LUE
Maize-wheat	141.24	65.41	32.58	1.99	0.04	200
Maize-groundnut	132.81	65.10	29.47	1.81	0.04	200
Maize-onion	174.27	96.84	52.05	2.08	0.03	200
Maize-chilli	226.63	100.40	54.74	2.16	0.03	200
SE. m. $\pm$	0.06	1.189	1.19	0.05	0.01	200
C.D. at 5%	0.17	3.50	3.52	0.14	0.03	

SYI: Sustainable yield index, BCR: benefit cost ratio, LUE: land use efficiency,

followed by maize-onion sequence (2.08). The land use efficiency (LUE) was also same in all the sequence and sustainable yield index was higher in maize-wheat, maize-groundnut than the other cropping sequences. It was concluded though maize-chilli sequence recorded higher net return, maize-onion or maize-wheat could be the best alternative that resulted in high B: C ratio.

REFERENCES

AICARP (1986). Permanent plot experiment on integrated nutrient management supply in rice- rice cropping system, *Annual Report of All-India Co-ordinated Agronomic Research Project*, 1984-85.

Mahapatra, I.C. (1985). Cropping pattern in rice areas. In: *Rice Research in India*, ICAR, New Delhi, Publication, pp. 434-458.

Singh, G., Singh, P., Singh, R.S. and Yadav, R.S., Gangwar, K.S., Sharma, S.K. and Tomar, R.K. (1995). Evaluation of different cropping systems under irrigated upland conditions. *Indian Journal of Agronomy,* **40 (3):** 491-492.

Parihar, S.S., Shukla, R.K., Pandey, D., Verma, V.K. and Sharma, R.B. (1995). Productivity and economics of rice (Oryza sativa) based cropping sequences on clay-loam soil. *Indian Journal of Agronomy,* **40(4):** 535-537.

Nagalikar, V.P., Setty, R.A. and Channabasavanna, A.S. (1999). Economic analysis of rice based cropping system for Tungabhadra project area. *Indian Journal of Agronomy*, **44(3):** 456-458

Singh Ved, Ram Deo, Singh, V. and Deo, R. (1998). Productivity and economics of different cropping systems under various levels of irrigation. *Indian Journal of Agronomy,* **43 (3):** 419-425.