

Effect of cropping systems on production potential of succeeding wheat (*Triticum aestivum*)

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ABSTRACT

A 3-year field experiment showed that maize (*Zea mays* L.) grain-equivalent yield increased by 14.41 q/ha in maize + cowpea (fodder) [*Vigna unguiculata* (L.) Walp.] cropping system. Yield of succeeding wheat (*Triticum aestivum* L. emend. Fiori & Paol.) increased by 8.44 q/ha with incorporation of cowpea (fodder) in cropping system over maize-wheat system. Maximum net return (Rs 23,292/ha) and benefit : cost ratio (3.1) were obtained in maize + cowpea (fodder)-wheat cropping system. Wheat responded to nitrogen significantly up to 120 kg N/ha.

Key words : Cropping system, Production potential, Economy, Wheat

Fertilizer is one of the costliest inputs in the crop production. Hence it is very important to find out the way of economy in the use of fertilizers. Inclusion of legumes in cropping system improves nitrogen status of soil and helps in increasing the yield of succeeding cereal crops and increased returns per unit area and time (Ahlawat *et al.*, 1981; Balyan, 1997). Further, fodder legumes are more potent in increasing the productivity of succeeding cereals due to their removal from the field when the nitrogen fixation in nodules is at their peak (Balyan and Seth, 1989). Keeping this in view, present investigation was carried out to study the effect of legume alone and as an intercrop on production potential of succeeding

wheat at different nitrogen levels.

MATERIALS AND METHODS

The experiment was carried out during the rainy and winter seasons of 1993-94 to 1995-96 at Dryland Farming Research Station, Arjia, Bhilwara (Rajasthan) to determine the residual effect of maize, cowpea and their intercrop on succeeding wheat under irrigated conditions. The soil was sandy loam, having pH 8.3, electric conductivity 0.38 dS/m, organic carbon 0.41%, available N, P and K 195.3, 10.2 and 182.1 kg/ha respectively. Six rainy-season cropping systems were tried in randomised block design and the above plots were split into 3 parts and levels of nitrogen were applied in winter season

(Table 1) with 4 replications. Fertilizer dose of 17.5 kg P/ha was applied to all the rainy and winter-season crops, whereas 120 and 20 kg N/ha was given to maize and cowpea, respectively. The varieties sown were 'Navjot', 'RC 19' and 'Lok 1' for maize, cowpea and wheat respectively. Maize and cowpea were removed from the field for green fodder, 50 days after sowing.

RESULTS AND DISCUSSION

Maize grain-equivalent yield was increased by 14.41 and 16.08 q/ha when cowpea was intercropped for fodder compared with maize and cowpea alone respectively (Table 1).

Among the different cropping systems, significantly maximum grain and straw yields of wheat were obtained when it was preceded by cowpea fodder (Table 1). Compared with all other cropping systems, perceptible lower wheat grain and straw yields were recorded under maize-wheat

system. The results confirm the findings of Balyan and Seth (1989). This shows the beneficial residual effect of legume on the succeeding wheat crop. All growth and yield-contributing characters of wheat were significantly improved by different cropping systems compared with maize-wheat system and maximum values were recorded in the cowpea (fodder)-wheat system except 1,000-grain weigh which was highest in the cowpea-wheat system (Table 1).

The grain and straw yields varied significantly with N levels (Table 1). The increase in grain yield due to 120 kg N/ha over 40 and 80 kg N/ha was 23.3 and 6.2 % respectively, while the increase in straw yield due to 120 kg N/ha over 40 and 80 kg N/ha was 26.1 and 6.5% respectively. The yield increase being basically owing to significantly more ears/m, ear length and grains/ear (Table 1). Singh *et al.* (1997) also reported similar results. However, 1,000-grain weight declined probably due

Table 1. Effect of cropping systems and nitrogen on yield attributes, yield and economics of wheat (pooled over 3 years)

Treatment	Maize-equivalent yield (q/ha)	Plant height (cm)	Ears/m row length	Ear length (cm)	Grains/ear	1,000-grain weight (g)	Wheat yield (q/ha)		Net return (Rs/ha)	Benefit : cost ratio
							Grain	Straw		
<i>Cropping system</i>										
Maize	17.30	74.0	63.6	7.1	32.5	48.18	32.76	41.71	17,351	2.4
Cowpea	15.63	76.0	68.1	8.3	36.0	50.29	36.18	46.03	19,470	2.9
Cowpea (F)	11.04	78.4	71.3	8.8	38.4	48.66	41.20	53.97	19,665	3.0
Maize + cowpea	17.84	75.3	67.2	8.2	33.5	49.28	34.35	45.08	18,465	2.5
Maize + cowpea (F)	31.71	76.9	70.3	8.6	36.2	48.26	38.48	50.16	23,292	3.1
Cowpea (SI)	15.56	77.0	68.9	8.4	35.9	48.52	36.96	48.13	18,558	2.8
CD (P=0.05)	1.94	1.04	1.10	0.15	0.66	0.78	0.75	1.52		
<i>N (kg/ha) to wheat</i>										
40		74.3	62.6	8.0	33.7	49.86	32.41	41.40	17,327	2.6
80		76.8	69.5	8.4	35.5	48.89	37.64	49.01	19,992	2.8
120		77.7	72.5	8.7	37.0	47.83	39.97	52.19	21,082	2.9
CD (P=0.05)		0.66	0.58	0.10	0.36	0.42	0.49	0.66		

F, Fodder; SI, straw incorporation

to increase in grains/ear which in turn caused depression on size of grain. Yadav and Verma (1991) reported similar view.

The net return and benefit : cost ratio varied with the various treatments. The net return as well as benefit : cost ratio due to different cropping systems were higher than due to maize alone (Table 1). Maximum net return and benefit : cost ratio were obtained under maize + cowpea (fodder)-wheat system. Each increasing level of N up to 120 kg/ha increased the net return and benefit : cost ratio.

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