

FEASIBILITY OF DOUBLE CROPPING IN DRYLAND FARMING ON MEDIUM TEXTURED SOILS

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Double cropping play a vital role in exploiting the natural resources such as land, water and solar energy to maximize the production and profit per unit area. With the introduction of early maturing, photoinensitive, fertilizer responsive high yielding varieties of crops, multiple cropping has gained importance. The rainfed areas in Vindhya region of Madhya Pradesh are still under monoculture where farmers grow either paddy in uplands during wet season or wheat in conserved moisture farming during winter season. The practical feasibility of growing two successive crops in rainfed farming has been established for some parts of the country (Bandur 1976; yadahalli et al. 1973; Balerao and Chaudhari 1977; Bhan and Khan 1981). However, the information on feasibility of double cropping in mixed red and black soils of Madhya Pradesh under dryland conditions is scanty. Hence, an attempt was made in this study to select the crops coupled with the judicial combination of fertilizer for successful double cropping in this region.

Nine treatments of crop rotation viz. paddy cv. Dihula broadcasted without fertilizer - mixture of gram and wheat without fertilizer (farmer's practice), traditional long duration (L.D) paddy cv. Newari with 40:40:20 kg NPK/ha - fallow, short duration (S.D.) paddy cv. DR-92 with 40:40:20 kg NPK/ha - fallow, S.D. paddy cv. DR-92 with 20:20:10 kg NPK/ha - gram cv. JG-315 without fertilizer, S.D. paddy cv. DR-92 with 20:20:10 kg NPK/ha - gram cv. JG-315 with 10:30:0 kg NPK/ha, S.D. paddy cv. DR-92 with 20:20:10 kg NPK/ha - gram cv. JG-315 with 20:60:0 kg NPK/ha, S.D. paddy cv. DR-92 with 40:40:20 kg NPK/ha - gram cv. JG-315 without fertilizer, S.D. paddy cv. DR-92 with 40:40:20 kg NPK/ha - gram cv. JG-315 with 10:30:0 kg NPK/ha and S.D. paddy cv. DR-92 with 40:40:20 kg NPK/ha - gram cv. JG-315 with 20:60:0 kg NPK/ha, were evaluated in complete randomized block design with four replications during 1982-83, 1983-84 and 1984-85 under rainfed conditions. The soil was mixed red and black with 7.5 pH having 0.69 per cent organic carbon, 267 kg/ha available nitrogen, 21 kg/ha available phosphorus and 728 kg/ha available potassium. Full recommended fertilizer given to paddy and gram was 40:40:20 and 20:60:0 kg NPK/ha, respectively. The pooled analysis of three years result was carried out according to procedure suggested by Singh and Chaudhary (1978). The income equivalent ratio (IER) was determined as the ratio of net return in double cropping to the net return by monoculture at the same level of land.

The cultivation of crops in both seasons recorded significantly superior productivity than monoculture in one season. The average annual productivity of early paddy - gram in crop rotation was 3390 kg/ha which was 37.69, 82.16 and 96.75 per cent higher than paddy broadcasted - mixture of wheat and gram, traditional long duration paddy and short duration paddy - fallow, respectively indicating that early paddy - gram was suitable and beneficial crop rotation. Umrani et al. (1981) also reported that wheat should be replaced by chickpea in dry season while studying the crop performance in drought prone area of Maharashtra. Bhargawa and Wilson (1983) while discussing the limitations and potentials of Indian soils suggested that the alternative cropping system including the legumes in a rotation is beneficial for the improvement of yield and soil fertility. The mean highest productivity of 3741 kg/ha per year (Table 1) was recorded when full dose of fertilizer was applied during both seasons followed by full dose of fertilizer during wet season and half dose during winter season (3518 kg/ha) and half dose of fertilizer during wet and full dose during winter season (3406 kg/ha). The difference in productivity due to application of full dose of fertilizer in wet season and half dose in winter season and vice versa was not significant indicating that application of full dose in one season and half dose in other season ranked second for total productivity. The farmer's practice i.e. paddy broadcasted without fertilizer - mixture of wheat and gram recorded the productivity of 2462 kg/ha which was 20.32 and 34.19 per cent lower than growing gram without fertilizer after paddy with half dose of fertilizer and gram with full dose of fertilizer after paddy with full dose of fertilizer, respectively. The income equivalent ratio was also highest, on an average when full dose of fertilizer was applied in both seasons followed by short duration paddy with half dose of fertilizer during wet season and gram with full dose of fertilizer during winter season. The estimates of income equivalent ratio were maximum when calculated taking long duration paddy in monoculture in comparison to short duration paddy which indicates that the cultivation of short duration paddy was more economical than long duration paddy.

Environmental indices give an idea about the suitability of a particular crop sequence at a given location or environment. Hence, environmental indices were calculated according to Eberhart and Russell (1966) which were - 12.28, 2.39 and 9.89 for years 1982-83, 1983-84 and 1984-85, respectively. This indicated that cropping season of 1984-85 was the best for cultivation of paddy - gram under rainfed conditions in Vindhya region of Madhya Pradesh. The receipt of average and timely rains during monsoon and 21.0, 58.2, 50.2 and 6.2 mm rains during the months of October, January, February and March, respectively in year 1984-85 was main reason for the highest productivity recorded in this year.

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Table 1. Annual productivity of different crop rotations

Treatments	Grain yield (ka/ha)			Mean	Income equivalent ratio*	
	1982-83	1983-84	1984-85		A**	B
Paddy broadcasted without fertilizer	1347	2916	3124	2462	2.47	2.24
— Mixture of wheat and gram without fertilizer						
Traditional long duration paddy with full recommended fertilizer	1713	1952	1919	1861	1.00	0.97
— Fallow						
Short duration (S.D.) paddy with full recommended fertilizer	1146	1848	2175	1723	1.04	1.00
— Fallow						
S.D. paddy with 1/2 recommended fertilizer	1602	3241	4427	3090	3.33	3.13
— Gram without fertilizer						
S.D. paddy with 1/2 recommended fertilizer	1750	3463	4619	3277	3.67	3.46
— Gram with 1/2 recommended fertilizer						
S.D. paddy with 1/2 recommended fertilizer	1883	3666	4668	3406	3.84	3.63
— Gram with full recommended fertilizer						
S.D. paddy with full recommended fertilizer	1790	3489	4636	3305	3.47	3.26
— Gram without fertilizer						
S.D. paddy with full recommended fertilizer	2015	3824	4715	3518	3.74	3.54
— Gram with 1/2 recommended fertilizer						
S.D. paddy with full recommended fertilizer	2085	4138	5000	3741	4.18	3.96
— Gram with full recommended fertilizer						
C D 5%	1.22	3.92	4.66	3.58	0.29	0.35

* Based on three years average.

** A and B represent the IER based on long and short duration paddy, respectively.

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