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RESEARCH ARTICLE

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Suitability of different crops and cropping systems for contingency crop planning

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ABSTRACT : The experiment was conducted at the Dry Land Agricultural Research Centre, Vasantrao Naik Marathwada Agricultural University, Parbhani during *Kharif* and *Rabi* seasons of 2006-2007 and 2007-2008. Eight different promising cropping systems of important crop of Marathwada region were tested in varied weather condition under rain fed agriculture. At the end of two year experiment it was investigated that, sowing of all the cropping systems in 26th MW recorded the highest mean productivity as compared to delayed sowing after 26th MW. The data further revealed that the parlimillet + pigeonpea (C_5), sorghum + pigeonpea (C_4), greengram – *Rabi* sorghum (C_8), soybean + pigeonpea (C_6) showed the better performance over the sowing dates as compared to all the other cropping systems.The lowest mean productivity of 537 kg/ha was obtained when sorghum + pigeonpea ICS sown in 32nd MW (D_4C_4) followed by D_4C_1, D_4C_7, D_3C_1 and D_3C_4 treatment combinations.

KEY WORDS : Suitability, Crops, Cropping systems, Contingency crop planning

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INTRODUCTION

In India, dryland agriculture has a distinct place in agriculture occupying 67 per cent (95.8 M ha) of the cultivated area, contributing 44 per cent of food grains and supporting 40 per cent human and 60 per cent livestock population. Dryland agriculture is characterized by poor resources, infrastructure and low investment in technology and inputs with small and marginal farmers. Besides arable farming, dryland farmers are dependent on livestock as an alternative source of income. This fact emphasizes the crucial role that dryland agriculture is playing in India economy and food security (Singh *et al.*, 2002). Dryland agriculture is characterized by wide spatio-temporal variations with regard to productivity of crops because of high fluctuations in agro climatic conditions.

Crop production in dryland region is a gamble with rainfall. In order to impact stability and provide sustainability, improved technology and appropriate cropping systems for a given agro-climatic environment. Intercropping is an important practice known for giving additional yield and returns without appreciable reduction in the yield of main crops and gives assurance against total crop failure especially under aberrant weather conditions. Similarly, the double cropping is one of the most important cropping system of increasing productivity and stability of dryland yields (Swaminathan, 1972).

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Table A : Main plot

Treat. code	Sowing dates (4)	2006-2007	2007-2008
D_1	Sowing within a week	26-06-2007	27-06-2007
D_2	Sowing 15 days after D_1(28 MW)	10-07-2006	09-07-2007
D_3	Sowing 15 days after D_2(30 MW)	25-07-2006	27-07-2007
D_4	Sowing 15 days after D_3(32 MW)	09-08-2006	09-08-2007

Amongst different cropping systems, double cropping had given increased productivity in dryland conditions (Ventateshwarulu, 1980).

The climate of Marathwada is characterized by a hot summer followed by general dryness throughout the year expect during the south west monsoon period. The most important crops of the regions are *Kharif* sorghum, cotton, soybean, pearl millet, pigeonpea, green gram, black gram, sunflower and castor. Similarly, *Rabi* sorghum, chickpea, safflower and linseed are grown in post monsoon season (*Rabi*).

Time of sowing is the most important non-monetary input affecting the yield of crops. Even in photo and thermo-insensitive crops, it is a critical input for higher yield. All these intercropping and double cropping are recommended for timely sowing and it was observed that these cropping systems were performed well under normal season. However, the research information on performance of these cropping systems under varied sowing dates (late) was not available to exploit the benefit of unfavorable weather conditions prevailing at a particular time.

Considering the above points in view an experiment entitled "Suitability of different crops and cropping systems for contingency crop planning" was conducted in order to know the best suitable cropping pattern suitable for the meteorological week of Marathwada.

EXPERIMENTAL METHODS

The experiment was conducted at the Dryland Agricultural Research Centre, Marathwada Agricultural University, Parbhani during *Kharif* and *Rabi* seasons of the year 2006-2007 and 2007-2008. The experiment filed was uniform in soil depth (90 cm) and fairly leveled during both the years of experimentation.

The soil of the experimental filed was medium black clay having more than one mere depth. In general experimental plot was low in nitrogen (N), moderate in available phosphorus, high in available potash and slightly alkaline in reaction.

Eight different promising cropping systems of important crop of Marathwada region were tested in varied weather condition under rainfed agriculture. The experiment was laid out in split plot design with there replications. The treatment consisted of four sowing dates as a main plot and eight cropping systems as subs plot treatment having thirty two treatment combinations.

Table B: Sub plot

Treat. code	
C_1	Sole cotton
C_2	Sole pigeonpea
C_3	Sole castor
C_4	Sorghum + pigeonpea (4:2)
C_5	Pearlmillet + pigeonpea (3:3)
C_6	Soybean + pigeonpea (4:2)
C_7	Cotton + soybean (1:1)
C_8	Greengram – *Rabi* sorghum

Other details :

Experimental design : Split plot

Replications : Three

EXPERIMENTAL RESULTS AND ANALYSIS

The date pertaining to mean productivity as influenced by different sowing dates and cropping systems during 2006-2007 and 2007-2008 are presented in Table 1.

It was observed from the Table 1 that the mean productivity was influenced significantly due to different sowing dates, cropping systems and its interaction during both the years and in pooled analysis. In general, the highest mean productivity of 2451 kg/ha was recorded in 2006-2007 due to favorable rainfall situation as compared to 2007-2008 (1846 kg/ha) whereas, the mean pooled productivity was 1999 kg/ha.

From Table 1 it is revealed that the normal sowing on 26th and 27th June (D_1, 26th MW) recorded the highest mean productivity of 3026, 2779, 2903 kg/ha during 2006-2007, 2007-2008 and in pooled data, respectively and it was significantly higher than rest of sowing dates. Similarly, the second highest position in mean productivity was acquired by D_2 (15 days after normal sowing D_1, 26th MW) and it was significantly superior over subsequent delayed sowings during both the years of experimentation. The lowest mean productivity of 1363, 955 and 1159 kg/ha was observed when sowing of cropping system was taken up in D_4, (32nd MW) during

Table 1 : Mean productivity (kg/ha) of different cropping system as influenced by various showing dates

Treatments	2006-07	2007-08	Pooled
Sowing dates			
D_1 (26th MW)	3026	2779	2903
D_2 (28th MW)	2458	2252	2355
D_3 (30th MW)	1757	1397	1577
D_4 (32nd MW)	1363	955	1159
S.E. ±	21	26	29
C.D. (P=0.05)	56	69	80
Cropping systems			
C_1 – Sole cotton	1314	1056	1185
C_2 – Sole pigeonpea	1933	1599	1766
C_3 – Sole castor	1986	1759	1873
C_4 – Sorghum + pigeonpea (4:2)	2779	2318	2549
C_5 – Pearlmillent + pigeonpea (3:3)	2696	2985	2841
C_6 – Soybean + pigeonpea (4:2)	2170	1849	2010
C_7 – Cotton + soybean (1:1)	1971	1423	1697
C_8 – Greengram – R. sorghum	2359	1777	2068
S.E. ±	39	36	44
C.D. (P=0.05)	106	101	122
Interaction (C x D)			
S.E. ±	77	68	89
C.D. (P=0.05)	209	187	245
Mean	2151	1846	1999

Table 2 : Interaction effect of sowing dates x cropping systems on mean productivity (kg/ha) (Pooled 2006-2007 and 2007-2008)

Cropping systems	Sowing dates				
	D_1	D_2	D_3	D_4	Mean
C_1 – Sole cotton	1864	1304	899	672	1185
C_2 – Sole pigeonpea	2093	1905	1660	1406	1766
C_3 – Sole castor	2377	1988	1857	1271	1873
C_4 – Sorghum + pigeonpea (4:2)	4816	3884	957	537	2549
C_5 – Pearlmillet + pigeonpea (3:3)	3652	3104	2568	2039	2841
C_6 – Soybean + pigeonpea (4:2)	3031	2393	1636	978	2010
C_7 – Cotton + soybean (1:1)	2634	2037	1358	759	1697
C_8 – Greengram – R. sorghum	2752	2229	1681	1610	2068
Mean	2903	2355	1577	1159	1999

	S.E. ±	C.D. (P=0.05)
Sowing date	29	80
Cropping system	44	122
Sowing date x cropping	89	245

2006-2007, 2007-2008 and in pooled data, respectively. The mean productivity was significantly reduced as the showing were delayed after D_1 (26th MW) during both the years of experimentation. The superior performance of various crops and cropping system sown at normal sowing time and subsequent reduction under delayed sowing were reported by Dhobale *et al.* (1987); Mokashi *et al*. (1997) and Brar *et al.* (2002).

Cropping systems :

The mean productivity was influenced significantly due to different cropping system during both the years and also in pooled data (Table 1). Amongst the different cropping systems pearlmillet + pigeonpea (C_5) ICS recorded highest mean productivity of 2985 and 2841 kg/ha in 2007-2008 and pooled data, respectively and it was significantly superior to that of the productivity obtained in rest of the cropping systems under study. In 2006-2007, sorghum + pigeonpea (C_4) recorded higher mean productivity than other cropping systems. The second highest position in mean productivity during 2007-2008 and in pooled data was recorded by sorghum + pigenpea (C_4) which was dignficantly superior over all other tratments except pearlmillet + pigeonpea. Greengram – *Rabi* sorghum (C_8) and soybean + pigeonpea (C_6) cropping systems were found at par to each other in respect of productivity and found significantly superior over cotton + soybean (C_7), sole castor (C_3), sole pigeonpea (C_2) and sole cotton (C_1) during both the years of experimentation and in pooled data. The lowest productivity of 1185 kg/ha was recorded by sole cotton (C_1). The advantage of higher mean productivity of pearlmillet + pigeonpea (C_5) over sowing dates was also reported by Gautam and Kaushik (1980); Shelke (1988); Sukhadia and Dhoble (1990) and Mokashi *et al*. (1997).

The data presented in Table 2 revealed that the treatment combination of sorghum + pigeonpea ICS in 26th MW (D_1C_4) recorded the highest man productivity of 4816 kg/ha and it was significantly superior over all other treatment combinations. The second highest position in mean productivity was acquired by treatment combination of pearlmillet + pigeonpea (D_1C_5) sown in 26th MW and it was significantly superior over rest of the treatment combinations. The greengram – *Rabi* sorghum (D_1C_8) and cotton + soybean (D_1C_7) were at par with each other and found significantly superior over D_1C_3, D_1C_2 and D_1C_1. The lowest productivity of 537 kg/ha was obtained when sorghum + pigeonpea ICS sown in 32nd MW (D_4C_4) followed by D_4C_1, D_4C_7 and D_3C_4 treatment combinations.

In general, sowing of all the cropping systems in 26th MW recorded the highest mean productivity as compared to delayed sowing after 26th MW. The data further revealed that the parlimillet + pigeonpea (C_5), sorghum + pigeonpea (C_4), greengram – *Rabi* sorghum (C_8), soybean + pigeonpea (C_6) showed the better performance over the sowing dates as compared to all the other cropping systems.

The lowest mean productivity of 537 kg/ha was obtained when sorghum + pigeonpea ICS sown in 32nd MW (D_4C_4) followed by D_4C_1, D_4C_7, D_3C_1 and D_3C_4 treatment combinations. The result were supported with the findings of Bhange (1985) and Dhobale *et al.* (1997).

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