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Rainfall based cropping system for rainfed vertisols of south Tamil Nadu

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Abstract : Field experiments were conducted at Regional Research Station, Aruppukottai to find out a suitable contingent cropping system for late monsoon situation. The treatment combination consisted of ten crops and three sowing times *viz.*, 15th October, 30th October and 15th November. Three years pooled data revealed that pearl millet gave higher gross income of Rs. 5934 ha^{-1} when sown on 15th October with the normal onset of monsoon situation. If the rainfall delayed by 15-30 days, sunflower and coriander were suitable for sowing during 30th October. Under very later monsoon situation upto 15th November, sunflower, horsegram and senna were suitable choice of crops for rainfed vertisols. ***(Key Words** : Late monsoon, Crops, Contingent cropping).*

Response of crops and cropping sequences to the vital input differs in terms of productivity and profitability, depending upon the agro-climatic features of the area and the cost and level of the various management inputs (Mahendra Singh and Banarasi Lal, 1994). Normally cotton, pulses and sorghum are being sown in the month of September, with the help of retreading South West monsoon and pearl millet and sunflower in the month of October after the onset of North East monsoon. The North East monsoon rains are primarily cyclonic and take place when depression occur in the Bay of Bengal. The data of onset of rains varies considerably and hence the rainy season cropping is more risky (Virmani, 1991). Delayed onset of monsoon occurs frequently in the southern districts of Tamil Nadu. The crops, sown under late or very late monsoon conditions, will suffer due to moisture stress at reproductive stage. Hence the present study was under taken to identify suitable contingent cropping system for late monsoon and aberrant monsoon situations for the rainfed vertisol.

Materials and Methods

Field experiments were conducted at Regional research Station, Aruppukottai during the rabi season of 1996-97, 1997-98 and 1998-99 in a randomised blocks design, with three replications. The experimental site is clay loam, having low available N, medium P and high K with 8.0 pH. The soil moisture content at field capacity and at permanent wilting point was 31.5 and 12.47 per cent. The treatment consisted combinations of ten crops *viz.*, pearl millet, green gram, sunflower, gingelly, coriander, bengalgram, horsegram, senna, coriander + bengalgram and gingelly + senna and three sowing times *viz.*, 15th October, 30th October and 15th November. The first sowing was taken up on 15th October with the onset of monsoon and the subsequent sowings were taken up on second and 15th November during 1996-97, on 30th October and 13th November during 1997-98 and on second and 14th November during 1998-99 with the receipt of rain.

Results and Discussion

Rainfall distribution

During 1996-97, the monsoon was set by 15th October and the distribution was poor during November and December. During the crop season, the crops sown during 15th October, 2nd November and 15th November received a total rainfall of 378.2, 201.8 and 129.2 mm respectively. During 1997-98 season, the monsoon was set by 15th October and the distribution was uniform through out the crop season. The crops sown during 15th October, 30th October and 13th November benefited with a total rainfall of 533.5, 381.1 and 218.7 mm respectively. During 1997-98 season, the monsoon was set by 15th October and the distribution was satisfactory in the months of November and December. In the crop season, the crops sown during 14th October, 2nd November and 14th November benefited with a total rainfall of 370.4, 362.4 and 250.6 mm respectively (Table 1).

Yield of crops

During 1996-97 season, the yield was more in the crops sown during 15th October which was gradually declined when the sowing was delayed and in the second sown crops the yield reduction ranged from 4.6 to 61.5 per cent as compared to first sown

Table 1. Rainfall data (for the crop period - mm)

Sowing time	1996-97		1997-98		1998-99	
	Rainfall	Rainy day	Rainfall	Rainy day	Rainfall	Rainy day
October 15	378.2	23	533.5	35	370.4	22
October 30	201.8	18	381.1	25	364.4	21
November 15	129.2	16	218.7	17	250.6	14

Table 2. Yield of crops under different sowing time (kg ha^{-1})

Crop	Grain yield (kg ha^{-1})-1996-97			Grain yield (kg ha^{-1})-1997-98			Grain yield (kg ha^{-1})-1998-99			Pooled data on grain yield		
	I sowing	II sowing	III sowing	I sowing	II sowing	III sowing	I sowing	II sowing	III sowing	I sowing	II sowing	III sowing
Cumbu	1217	781	221	2102	1718	857	1130	1409	895	1483	1303	658
Greengram	218	84	45	210	109	76	210	121	63	213	105	61
Sunflower	843	635	328	462	760	451	339	782	693	548	736	491
Gingelly	303	215	141	361	386	276	238	378	215	301	326	211
Coriander	362	326	120	259	379	208	137	344	161	253	350	163
Bengalgram	234	218	121	216	231	183	173	219	131	208	223	145
Horsegram	679	593	428	432	472	412	319	494	429	477	520	423
Senna leaf	3278	3015	2842	2452	2534	2862	2062	2812	2902	2597	2787	2869
Seed	65	62	60	35	38	44	41	60	64	47	53	56
Coriander +	251	241	95	165	183	124	109	217	98	175	214	106
Bengalgram	55	40	33	90	102	47	69	104	53	71	82	44
Gingelly +	259	166	99	163	199	107	152	223	121	191	196	109
Senna leaf	1474	1279	1187	750	883	1070	1195	1323	1358	1140	1162	1205
Seed	16	15	14	10	14	19	19	24	22	15	18	18

Table 3. Pooled data on economics

Sl. No.	Crop	Gross income (Rs. ha^{-1})				Cost benefit ratio			
		I sowing	II sowing	III sowing	Mean	I sowing	II sowing	III sowing	Mean
1.	Cumbu	5934	5211	2630	4592	2.07	1.82	0.92	1.60
2.	Greengram	3190	1573	919	1894	1.08	0.53	0.31	0.64
3.	Sunflower	5481	7358	4906	5915	1.83	2.45	1.64	1.97
4.	Gingelly	4505	4893	3160	4186	1.62	1.76	1.14	1.51
5.	Coriander	5049	6993	3252	5100	1.74	2.41	1.13	1.76
6.	Bengalgram	4149	4449	2900	3832	1.41	1.51	0.98	1.30
7.	Horsegram	4699	5195	4229	4708	1.62	1.76	1.44	1.60
8.	Senna	3643	4055	4234	3977	1.26	1.40	1.46	1.37
9.	Coriander + Bengalgram	4927	5916	3000	4614	1.67	2.01	1.02	1.56
10.	Gingelly + Senna	4186	4410	3152	3916	1.47	1.55	1.11	1.37
	Mean	4576	5005	3239	-	1.58	1.72	1.11	-

	SE_d	CD5%	SE_d	CD 5%
Sowing time	310	621	0.107	0.213
Crop	566	1133	0.194	0.386
Interaction	980	1963	0.337	0.674

crops. The yield reduction was less in senna (4.6%) and more in greengram (61.5%). In the reduction ranged was minimum in senna (7.7%), where as, it was maximum in greengram (79.4%). The higher yield reduction in pearl millet, sunflower, gingelly under late sown situation was mainly due to low rainfall in the months of November and December. Such type of advantage from early sowing was reported in pearl millet and sunflower by Chandra sagar *et al.* (1985) and low yield under late sowing situation, is associated with the depletion of soil moisture (Bajpai *et al.* 1990)

In 1997-98 season, pearl millet sown during 15th October recorded higher grain yield of 2102 kg ha^{-1}(Table 2). Sunflower, gingelly, coriander, bengalgram and horsegram recorded higher grain yield of 790, 386, 379, 231 and 472 kg ha^{-1} which were 71, 6.9, 46.3, 6.9 and 9.3 per cent higher than crops sown during 15th October and 75, 39.9, 82.2, 26.2 and 14.6 per cent higher than crops sown during 13th November. Senna crop produced more leaf (2862 kg ha^{-1}) yield under late sown situation. The low yield in first sown crops of sunflower and coriander might be due to continuous dry spell during second fortnight of October and heavy rain during November.

During 1998-99 season, the yield was more from the crops sown during 2nd November. Pearl millet, sunflower, gingelly, coriander, bengalgram and horsegram have registered higher grain yield of 1409, 782, 378, 344, 219 and 494 kg ha^{-1} when they were sown during 2nd November which were 24.7, 130.7, 58.8, 151.1, 26.6 and 54.9 per cent higher than crops sown during 14th October and 57.4, 12.8, 75.8, 113.7, 67.2 and 15.2 per cent higher than crops sown during 15th November respectively. Continuous dry spell prevailed during the second fortnight of October has affected the crop stand which was the reason for yield reduction of crops sown during 15th October. The performance of greengram revealed its unsuitability for late sowing situation. Similar contingent cropping plan with pearl millet and sunflower was reported by Mokashi *et al.* (1997) for moisture stress condition.

Economics (mean for three years)

The pooled mean data revealed that among the various crops sown during 15th October with the normal onset of monsoon, pearl millet gave higher gross income of Rs.5934 ha^{-1} with benefit-cost ratio of 2.07, which was closely followed by sunflower (Table 3). The second sowing situation, with the onset of monsoon during last week of October or first week of November gave higher gross income of Rs. 7358 ha^{-1} and B-C ratio of 2.45. If the rainfall delayed upto 15th November, with uniform distribution of rainfall during December, sunflower is the best suited crop which gave gross income of Rs.4906 ha^{-1}. Under late sown situation, with low rainfall distribution in the subsequent months, senna and horse gram gave higher gross income. Hence it can be concluded that 15th and 30th October are optimum sowing time for rabi crops utilizing the monsoon rains; when the rainfall delayed upto 15th November, the choice should be restricted for getting optimum income.

References

Bajpai, R.P., Singh, V.K. and Dwivedi, R.K. (1990). Performance of horsegram on different dates of sowing, phosphorus and intercropping. *Indian J. Pulses Res.* **3** : 159-162.

Chandrasagar, G., Raikhelkar, S.V. and Dhoble, M.V. (1985). Intercropping of castor under late sowing conditions as a mid-season correction crop. *J. Maharastra Agric. Univ.* **10** : 200-202.

Mehendra Singh and Banarasi Lal (1994). Grain yield and economic returns under varying crop sequence and levels of rainy season and winter season irrigation. *Indian J. Agron.* **36** : 211-215.

Mokashi, D.D., Jadhav, J.D., Shewale, M.R. Gaikawad, C.B. and Patil, J.D. (1997). Performance of crops and cropping system under different dates of sowing. *Indian J. Agron.* **42** : 220-223.

Virmani, S.M. (1991). Climate-crop relations in dry land agriculture. In : summer institute on "Water shed based land use planning and management" held on 2-21 May, 1991 at CRIDA, Hyderabad.

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