

STUDIES ON THE INTERCROPPING OF SORGHUM (*Sorghum bicolor*), REDGRAM (*Cajanus cajan*), GREENGRAM (*Vigna radiata*) AND SOYBEAN (*Glycine max*) WITH REFERENCE TO PLANT POPULATION II MONETARY RETURNS

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Intercropping of greengram (S-9), sorghum (CSH-6), redgram (UPAS-120) and soybean (Bragg) with two plant populations for each component crop (50 and 100% of their normal population) in a paired row system was studied at Dryland Research area of Haryana Agricultural University, Hissar, during *kharif* 1979 and 1980. Highest gross returns were obtained from sorghum + redgram (Rs. 6512.72/ha) followed by redgram + greengram (Rs. 6477.56/ha) in 1979 whereas in 1980, sorghum + greengram (Rs. 5,937.14/ha) gave highest returns followed by redgram + greengram (Rs. 5,234.12/ha). Normal population of both the component crops in intercropping system gave higher returns.

In the Indian context, mixed cropping, intercropping and monocropping are age-old practices (Chowdhury, 1979). Crop mixtures/intercrops have several benefits namely risk distribution, better utilization of labour resources and natural endowments, better quality product, and higher productivity/income.

Many experiments have shown that intercropping in sorghum has given higher returns than sole cropping (Singh *et al*., 1973; Chandravanshi, 1975; Tarhalkar and Rao, 1975 and Krant *et al*., 1976). and Satyanarayan Reddi, 1976).

Different workers have also indicated that intercropping of grain pulses (greengram, blackgram and soybean) in redgram have given higher returns Mahapatra *et al.*, 1974; (Saraf *et al.*, 1975; Singh *et al.*, 1979 and Saxena and Yadav, 1979).

MATERIAL AND METHODS

Details of the material and methods have been explained in the first paper of this series.

RESULTS AND DISCUSSION

Data on the grain yield of the base crop and intercrops and returns are presented in Tables 1 and 2 respectively. Returns during second year were less than first year because of drought and reduced yields. Averaging the gross returns over two seasons, it was observed that sorghum + greengram and redgram + greengram combinations gave better economic returns. Sorghum + redgram and sorghum + soybean combinations were less remunerative. Greengram crop possesses two special attributes. It is stable in production and sells at a higher market rate. Probably the stability in production of greengram is due to the fact that it escapes the drought as rains are

received till mid August. Later on in the event of drought with one supplemental irrigation at the time of flowering, it can give satisfactory yield and higher returns. When it is combined with sorghum, no doubt, its yields are reduced but it is compensated by sorghum which fetches higher returns due to its higher straw as well as its grain yield. In the first year due to the better performance of redgram, sorghum + redgram followed by redgram + greengram combination gave the highest returns. But during 1980, there was drastic reduction in redgram yield. As such the total returns from sorghum + redgram was also reduced. Similar was the case with redgram when with greengram. Soybean as an intercrop was not suitable due to its susceptibility to termites which devastated almost the whole crop in second year which was a drought year. So there is greater risk in growing soybean due to uncertainty of the seasons.

Among the plant populations, 100:100 for redgram, greengram and soybean with sorghum gave the highest returns. The reasons may be that sorghum as a dominant crop would suppress the yield of intercrops and thus they may not be able to add much to the gross returns, whereas intercropped sorghum would yield more or less same as

its sole crop. Thus the greater portion of the returns is obtained by sorghum when it is at its normal population. In case of redgram, greengram as an intercrop at 50:100 plant population gave the maximum returns. It may be due to higher yields of greengram at its full population and also to lesser intercrop competition as redgram is at 50 per cent of its normal population. Although redgram + soybean gave higher returns at 100:100 plant population, it may not be a suitable intercropping system due to uncertainty of soybean performance. Next best population among the different cropping systems would be 50:100 for main and intercrop but 100:100 is the best combination in case of redgram and greengram.

The senior author wishes to thank ASPEE Agricultural Research and Development Foundation, Bombay for granting Senior Fellowship, and Dr. C.K. Ramanath Chetty, Senior Scientist (Agricultural Statistics), AICRP for Dryland Agriculture, Hyderabad for assisting in the statistical analysis.

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Table 1. Grain (q/ha) of base crops of sorghum and redgram as by influenced by intercrops and plant population

base crop	Sorghum			Redgram		
	1979					
	Sole sorghum = 17.83			Sole greengram = 14.41		
	Sole redgram = 12.38			Sole soybean = 15.61		
	Intercrops			Intercrops		
	RG	GG	SOY	GG	SOY	
	100:100	17.33 (5.64)*	17.86(3.88)	16.71(2.12)	8.29(9.88)	13.02(7.10)
Pl.Popl.	50 : 50	16.02 (5.89)	10.77(4.20)	8.11(3.67)	9.63(10.31)	11.79(7.17)
(%)	100: 50	17.70 (3.51)	14.98(4.0*)	12.66(2.13)	12.42(9.25)	11.01(4.86)
	50 :100	13.83(11.68)	8.81(5.91)	13.89(4.66)	11.42(11.74)	13.02(6.24)
	1980					
	Sole sorghum = 15.63			Sole greengram = 10.56		
	Sole redgram = 6.21			Sole soybean = 1.91		
Pl.Popl	100:100	11.12 (1.14)	11.07(6.60)	20.16(0.84)	4.89(10.01)	4.04(0.62)
(%)	50 : 50	9.27 (1.95)	4.99(5.56)	8.91(0.56)	4.09 (9.40)	4.19(1.08)
	100: 50	5.64 (0.67)	8.98(4.64)	9.52(0.30)	4.04 (8.46)	2.98(0.31)
	50 :100	7.48 (1.24)	7.80(7.46)	10.34(1.10)	2.26(11.25)	4.18(0.95)

*Values in bracket indicate grain yield of intercrops.

I,R,G : Redgram as intercrop

I,G,G : Greengram

Isoy : Soybean

RATES FOLLOWED

	1979		(Rs/q)	1980	
	Grain	Straw		Grain	Straw
Sorghum	150	27		150	28
Redgram	225	5		265	7
Greengram	380	15		400	7
Soybean	200	5		200	7

Table 2. Gross returns (Rs/ha) of different cropping systems as influenced by intercrops and plant population

With base crop of:	Sorghum			Redgram	
	1979			1979	
Sole sorghum = 5527.59				Sole greengram = 5655.59	
Sole redgram = 2970.50				Sole soybean = 3245.15	
	Intercrops			Intercrops	
	RG	GG	SOY	GG	SOY
Pl. Popl. 100:100	6528.60	6542.93	5595.34	5795.35	4527.35
(%) 50 : 50	5979.70	5399.46	4090.24	6299.35	4241.65
100: 50	6105.00	5892.91	4763.54	6533.00	3585.90
50 :100	7437.59	5443.43	5624.11	7282.55	4330.35
Mean	6512.72	5819.68	5018.30	6477.56	4171.31
	1980			1980	
Sole sorghum = 4695.10				Sole greengram = 4428.33	
Sole redgram = 1936.15				Sole soybean = 509.19	
Pl. Popl. 100:100	4927.46	7145.58	6441.12	5612.40	1409.01
(%) 50 : 50	3966.23	4727.93	3965.91	5182.65	1496.81
100: 50	2973.89	5706.06	4577.17	4759.87	1037.55
50 :100	3281.10	6169.02	4325.30	5381.56	1499.65
Mean	3787.17	5937.14	4827.31	5234.12	1360.63

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