Indian Journal of Agronomy 44 (1) : 200–202, (March 1999)

Production potential and economics of different cotton (*Gossypium hirsutum*) based cropping systems

G.L. MALIWAL[1], H.C. PARMAR, R.R. KASWALA, C.H. RANA, M.L. PATEL AND S. RAMAN

Narmada Irrigation Research Project, Gujarat Agricultural University, Khandha, Handod, Gujarat 391 240

Received: September 1997

ABSTRACT

A field experiment was conducted during 1990–97 (except 1993–94) at Khandha, Gujarat to access the production potential and economics of different cotton- based cropping systems. Results revealed that cotton-wheat-cropping system was the most remunerative and suitable for Narmada command.

Key words : Cotton-based cropping systems, Production potential, Economics

Cotton (*Gossypium hirsutum* L.) is one of the most important rainy-season (*kharif*) crops grown on Typic Chromustert soils of Narmada Command and 24% of total cultivated area of Region I of Command is under this crop. In winter (*rabi*) season, although sorghum [*Sorghum bicolor* (L.) Moench] remains the main crop, alternative include wheat (*Triticum aestivum* L. emend. Fiori & Paol.), pulse and oilseed crops. Selection of suitable *rabi* crops for cotton sequence can provide maximum production as well as net profit per unit investment per unit time to the farmers. Therefore the present study was undertaken to fnd out the production potential and economics of different cotton-based crop sequences.

MATERIALS AND METHODS

A field study was undertaken in Typic Chromustert at Khandha, Gujarat, from 1990–91 to 1996–97 except 1993–94 on cotton-based crop sequences in randomized block design with 6 replications. The cotton based-crop sequences were cotton sole, cotton–wheat, cotton–sunflower (*Helianthus annuus* L.) cotton–soybean [*Glycine max* (L.) Merr.] and cotton–sorghum.The soils were low in N (total N 0.029%) and phosphorus (11 kg/ha) and high in potash (1,179 kg/ha). 'Hybrid 8' cotton was sown during second week of June every year and 'Lok 1' wheat, 'Modern' sunflower, 'Gujarat Soybean 2' soybean and 'GJ 35' sorghum during the last week of December to first week of January during different years. The cotton crop in sequence treatment was harvested in first week of December, while cotton sole in February. The *rabi* crops were harvested in third week of April except sorghum which was harvested in the last week of May. Two irrigations of 80 mm depth were given to cotton sole crop after cessation of

Present address: [1]Department of Agricultural Chemistry and Soil Science, B.A. College of Agriculture, Anand, Gujarat

Table 1. Cotton and winter (*rabi*) crops yield (kg/ha) during different years

Treatment	1990–91	1991–92	1992–93	1994–95	1995–96	1996–97	Average
			Cotton yield				
Cotton sole	2,064	1,092	3,100	3,430	4,067	3,671	2,904
Cotton–wheat	2,029	1,007	2,776	2,930	3,476	3,130	2,558
Cotton–sunflower	2,006	1,038	2,756	2,585	2,896	2,963	2,372
Cotton–soybean	2,022	1,036	2,778	2,594	3,034	3,091	2,426
Cotton–sorghum	2,072	1,001	2,717	2,730	2,929	3,057	2,418
			Rabi *crops yield*				
Cotton–wheat	1,780	2,793	2,286	2,425	2,086	3,642	2,502
Cotton–sunflower	1,596	552	558	86	706	99	600
Cotton–soybean	238	181	257	82	414	540	285
Cotton–sorghum	846	786	1841	2444	3,064	3,536	2,986

Table 2. Cotton-equivalent yield under different sequences

Treatment	1990–91	1991–92	1992–93	1994–95	1995–96	1996–97	Pooled
			Cotton-equivalent yield (kg/ha)				
Cotton sole	2,064	1,092	3,100	3,430	4,067	3,671	2,904
Cotton–wheat	2,919	2,174	3,691	3,285	4,034	4,382	3,414
Cotton–sunflower	2,716	1,334	3,096	2,606	3,120	3,000	2,545
Cotton–soybean	2,141	1,126	2,921	2,613	3,209	3,260	2,545
Cotton–sorghum	2,331	1,251	3,269	3,167	3,574	3,936	2,921
CD (P = 0.05)	137.6	55.2	271.8	269.3	174.6	214.0	334.1
CV (%)	4.7	3.3	7.0	7.4	4.0	4.9	5.8
			Total duration (days) of crop in sequence				
Cotton–sole	222	235	254	287	294	322	254
Cotton–wheat	295	296	298	280	304	310	297
Cotton–sunflower	298	296	299	302	324	310	305
Cotton–soybean	315	314	310	287	327	344	316
Cotton–sorghum	314	313	334	309	331	345	324
			Cotton equivalent (kg/ha/day)				
Cotton sole	9.3	4.6	12.2	12.0	13.8	11.4	11.4
Cotton–wheat	9.9	7.3	12.4	11.7	13.3	14.1	11.5
Cotton–sunflower	9.1	4.5	10.4	8.6	9.6	9.7	8.7
Cotton–soybean	6.8	3.6	9.4	9.1	9.8	9.5	8.1
Cotton–sorghum	7.4	4.0	9.8	10.2	10.8	1.4	9.0

monsoon. The wheat, sunflower and soybean were given 5 irrigations of 80 mm depth, while 6 irrigations to sorghum during crop period. The recommended practices for spacing, seed rate, fertilizer and plant protection were followed for raising the crops.

To compare the productivity of different cropping systems, the yield of different crops was converted to their cotton-equivalent yield (CEY) by using the following formula :

$$\text{CEY (kg/ha)} = \frac{\text{Economic yield of a crop x price/kg of same crop}}{\text{Price/kg cotton}}$$

The productivity/day/ha was worked out by dividing cotton-equivalent yield (kg/ha) by total duration (in days) of crop sequence. The economics of different treatments was worked out with the cost of cultivation at current prices at the end of experiment and gross in-

Table 3. Economics of different sequences

Treatment	Seed-cotton equivalent yield (kg/ha)	Gross income (Rs/ha)	Cost of cultivation (Rs/ha)	Net income (Rs/ha)	Cost : benefit ratio
		Cotton yield			
Cotton sole	2,904	45,302	16,900	28,602	1 : 2.71
Cotton–wheat	3,414	53,260	25,596	30,664	1 : 2.36
Cotton–sunflower	2,645	41,268	22,788	18,480	1 : 1.81
Cotton–soybean	2,545	39,702	22,580	17,122	1 : 1.76
Cotton–sorghum	2,921	45,512	25,275	20,297	1 : 1.80

Sale price of seed cotton (average of 6 years), Rs 1,560/100 kg

come at local market price, i.e. average of experimental years.

RESULTS AND DISCUSSION

The higher total production (5,060 kg/ha/year) was observed with cotton–wheat sequence, followed by cotton–sorghum sequence which prodeuced 4,504 kg/ha/year (Table 1). The other cotton sequences, viz. cotton–sunflower and cotton–soybean, gave 2,972 and 2,711 kg/ha/year. All sequences except cotton–soybean gave higher total production than cotton sole crop. This may be due to late sowing of soybean resulted in poor yield.

Cotton–wheat crop sequence resulted in maximum cotton equivalent/ha and also per day production, followed by cotton–sorghum and cotton sole. The productivity/day was lower in cotton–sorghum, cotton–sunflower and cotton–soybean than sole crop of cotton (Table 2). This may be due to the poor yield of *rabi* crops and longer period of crop growth than wheat. Similar results were observed by Tomar and Tiwari (1990) and Thakur and Khan (1994).

The cotton sequences require (Table 3) higher investment than sole crop of cotton. The cost of production/ha including labour, inputs (seeds, fertilizers), irrigation and plant protection for cotton, wheat, sunflower, soybean and sorghum was Rs 16,900, Rs 8,695, Rs 5,888, Rs 5,680 and Rs 8,375 respectively. Among the sequences, the cost of cultivation for cotton–wheat (Rs 25,596/ha) and cotton–sorghum (Rs 25,275/ha) was almost the same but higher than other 2 sequences.

Economic analysis (Table 3) of different crop sequences indicated that maximum net return was obtained in cotton–wheat, followed by sole crop of cotton. The net return under cotton–sunflower and cotton–soybean crop sequences were reduced due to reduction in their yield. The net return under cotton–sorghum crop sequence was lower than sole crop of cotton, due to high cost of cultivation. Higher net return from cotton–wheat crop sequence is due to higher cotton-equivalent yield.

Thus the study revealed that cotton–wheat crop sequence was remunerative and suitable cropping sequence for Narmada Command Region-I. This sequence may be preferred over traditional cropping of sole crop of cotton.

REFERENCES

Thakur, B.S. and Khan, B.A. 1994. Production potential and economics of different croping sequences in sandy loam soil under Towa Command. *Indian Journal of Agronomy* **39** : 287–288.

Tomar, S.S. and Tiwari, A.S. 1990. Production potential and economics of different crop sequences. *Indian Journal of Agronomy* **35** : 30–35.