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paddy. Thus in areas where it is difficult to grow *Sali* paddy after harvesting of *Ahu* or jute, the farmers do not grow any of these two crops at the expense of *Sali* paddy.

### *Conclusion*

In the monetized economy the growing of cash crop is very important to the farmers as they require liquid money for cash purchases of many of their essential requirements. The major sources for deriving cash income by the farmers in the Nowgong district are the autumn paddy and jute. The farmers are greatly influenced in their decision to grow commercial crop by economic considerations. Because of the higher return from jute, they are progressively increasing the acreage under jute. The acreage under autumn paddy has, on the other hand, been dependent on family requirements of paddy, cash need and the relationship between the prices of jute and autumn paddy. In Assam condition, *Sali* paddy is the main foodgrain, other types of paddy (particularly autumn paddy) serve the purpose of both foodgrain and commercial crop. Hence there is constant endeavour to sustain the acreage under *Sali* paddy. But jute as a competing crop of *Ahu* paddy has encroached greatly on *Ahu* land, although the total displacement of *Ahu* paddy by jute is not possible on account of other considerations.

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## A STUDY OF DEVELOPMENT OF HYBRID-4 COTTON IN GUJARAT AND ITS PRODUCTION ECONOMICS

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This paper attempts to discuss the development of Hybrid-4 cotton in Gujarat and its production economics. In the first section the development of cotton programme in Gujarat State has been given. In the second section the production economics of this crop is studied.

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## I

Gujarat is the foremost cotton producer State in our country. The State has nearly 17 lakh hectares of area under cotton cultivation and produces nearly 16 lakh bales of lint annually. This accounts for about 22 per cent of the total area and about 31 per cent of the total production of cotton in the country. The State is much above in the per hectare lint yield as compared to the all-India average, producing 169 kgs. of lint per hectare against the country's average of 120 kgs. (see Table II). Gujarat has a proud record of varietal improvement in cotton. The cotton breeding programme was initiated as early as in 1904 at Surat and subsequently several stations were established in the various agro-climatic cotton tracts. As a result of intensive research work, many improved varieties have been evolved from time to time and introduced for cultivation.

The State is leading in the country in the evolution and commercialisation of hybrid cotton types. In the past three hybrid varieties, namely, Hybrid-1, Hybrid-2 and Hybrid-3 were evolved and tried on pilot basis on farmers' fields. However, due to some defects in these hybrids, attempts to extend them further were abandoned. The recently evolved hybrid, *viz.*, Hybrid-4 has satisfied all the requisites and hence it was released for cultivation in 1970 under the popular name 'Sanker-4'. It has high yield potentials (see Table II) and is satisfactory in ginning outturn and fibre characters. It is resistant to disease and has early maturity. The seed has higher oil content and hence fetches higher rates as compared to other varieties. Because of overall satisfactory combination of economic characteristics, Hybrid-4 became much popular not only in Gujarat but also in other States.

*Seed Production*

To meet the demand of seed, the State Government started a scheme during 1968, under which the seed production programme is carried out by the farmers under the close supervision of the staff of the Department of Agriculture. The cotton crop being self-pollinated, the seed production is to be done by crossing with the help of labourers. For this about 100 to 120 well trained and efficient labourers are to be employed for a seed plot of one hectare, thus involving considerable amount of finance. Besides, finance is also required for tissue paper bags and processing of seed. Thus unlike cereals, seed production in cotton is an expensive proposition. On account of huge finance involved and the scientific background required, the mass scale seed production of hybrid cotton is a difficult and challenging job. However, the farmers of Gujarat have met this challenge with a great deal of success. The progress made in seed production is given in Table I.

*Marketing and Pricing*

Like hybrid bajra, there is no central agency for pulling and marketing of hybrid cotton seed in the State. The seed is marketed both by the co-opera-

TABLE I—PROGRESS MADE IN SEED PRODUCTION OF HYBRID COTTON IN GUJARAT

Year						Area under seed production (hectares)	Quantity of seed produced (quintals)
1968-69	..	..	..	..	..	24.73	98.64
1969-70	..	..	..	..	..	115.70	74.95
1970-71	..	..	..	..	..	243.17	675.11
1971-72	..	..	..	..	..	727.00	6076.49
1972-73	..	..	..	..	..	669.00	7055.78
1973-74	..	..	..	..	..	1112.00	13424.45
1974-75	..	..	..	..	..	1240.00 (Estimated)	14000.00 (Estimated)

Source : Seed Certification Agency, Ahmedabad.

tive societies and also by individual producers and both in the State as well as outside the State and there is no uniformity in the selling rates. In the initial years of the programme when seed supply was short, the seed was sold at an average price of Rs. 150 per kg. However, few producers charged a price as high as Rs. 250 per kg. Currently, the seed is sold at a price ranging between Rs. 50 to Rs. 80 per kg. The cost of seed production comes to Rs. 38.29 per kg. (see Table IV). Attempts were made to entrust the work of pulling and selling the seed to the Gujarat State Co-operative Marketing Society, but somehow or the other it could not materialise. In the absence of a central agency, the marketing of seed is unorganized and there is a great deal of variation in the price of seed. The variation in price also creates doubts among the commercial growers about the purity of seed. Moreover, the large farmers are always at gain in disposing the seed both in the State as well as outside the State as compared to the small farmers. It is, therefore, very essential to have a central agency responsible for pulling, processing and selling the hybrid cotton seed in the State. This will ensure uniform and reasonable price of seed.

#### *Commercial Hybrid-4 Cotton and Its Contribution to Production*

Table II gives the data on area and production of cotton and the contribution of commercial crop of Hybrid-4 cotton variety in Gujarat. It is observed that rapid progress has been made in extension of this cotton in the State. Keeping in view the agro-climatic conditions, it has been suggested by the cotton experts that the potential area that can be covered by Hybrid-4 cotton in the State is about 6 lakh hectares. As against this, it has been extended in 3.63 lakh hectares (19.51 per cent of the total area under cotton crop) during 1973-74. The production of Hybrid-4 cotton during 1973-74 was 5.44 lakh bales (33.68 per cent of the total production) in the State. Thus Hybrid-4 cotton has contributed about one-third of the total production in the State, which is due to its high production potentials (compare lint yield figures

TABLE II—AREA AND PRODUCTION OF COTTON IN GUJARAT AND CONTRIBUTION OF COMMERCIAL CROP OF HYBRID-4 COTTON

(One bale = 180 kgs.)

Year	Total of all varieties including Hybrid-4								Hybrid-4 cotton					
	Area in hectares (lakhs)	Production of bales (lakhs)	Lint yield		Area in hectares (lakhs)	Per cent to total area of the State	Production of bales (lakhs)	Per cent to total production of the State	Lint yield					
			Bales per hectare	Kgs. per hectare					Bales per hectare	Kg. per hectare				
1950-51	..	..	..	12,241	7,320	0.59	107	—	—	—	—	—	—	
1968-69	..	..	..	17,005	14,614	0.85	154	0.00062	0.003	0.00243	0.016	3.91	703	
1969-70	..	..	..	17,337	16,421	0.95	169	0.04258	2.45	0.15160	0.92	3.56	641	
1970-71	..	..	..	15,818	15,713	0.99	178	0.22050	1.42	0.61443	3.91	2.78	494	
1971-72	..	..	..	18,474	22,805	1.23	221	0.45481	2.46	1.63075	7.15	3.58	644	
1972-73	..	..	..	17,899	13,832	0.77	138	1.75778	9.82	3.76242	22.20	2.14	385	
1973-74	..	..	..	18,632	16,178	0.86	155	3.63666	19.51	5.44983	33.68	1.49	268	
Average (of six years commencing from 1968-69)	..	..	..	17,555	16,594	0.94	169					2.91	522	
All-India average (of ten years commencing from 1962-63)	..	..	..	78,805	52,738	0.67	120							

Source : Cotton Extension Officer, Gujarat State, Surat.

given in Table II). In view of high-yielding ability Hybrid-4 cotton stands as a high hope for self-sufficiency of long staple cotton in the country. Therefore, besides Gujarat, it has been extended to other States also.

### *Impact of Programme on Economy*

In the rural areas where agriculture is the only means of livelihood and prosperity of farmers and farm labourers, introduction of a crop giving earnings to various classes of rural people would change the economy. In this respect Hybrid-4 programme has played a very important role, as right from the seed producers to commercial growers, it has opened a new field of economic betterment for all sections of people, viz., farm labourers, both skilled and unskilled engaged in various operations like manufacturing tissue paper bags, crossing operation, plant protection, picking, processing, etc. Thus the programme has provided gainful employment to the idle manpower in the villages. The seed production as well as crop production, being very remunerative, the farmers have benefited economically.

The greatest advantage of the programme is that it has trained the farmers in the proper application of inputs like fertilizers, pesticides, irrigation and in crossing operation which require technical know-how. The programme has helped to develop a spirit of co-operation among the people. The seed producers have organized several co-operative societies for selling the seed and processing the crop produce. The establishment of a most modern co-operative ginning, pressing and seed crushing plant at Anand is solely due to the success of Hybrid-4 programme in the region. The cultivation of Hybrid-4 cotton has widened the scope of manufacturing of plant protection equipments and chemicals, tissue papers, etc. Thus the programme has also encouraged agro-based industries.

## II

### *Economics of Production*

The study of economics of production of seed and commercial crop was confined to the villages of Amod taluka of Broach district and Sinor taluka of Baroda district. Both these talukas operate hybrid programme in a large area and hence the selection. The data on economics of seed production were collected from 60 seed growers selected from 307 seed growers spread in several villages of the selected talukas. Thus the ultimate sample constituted about 20 per cent of the seed growers. Proper care was taken to select the seed growers proportional to different seed plot size-groups. The data were collected for two seasons, viz., 1972-73 and 1973-74.

The economics of production of commercial hybrid crop was studied under irrigated as well as rain-fed conditions. For this, 30 farm households having irrigated cotton crop and 30 farm households having rain-fed cotton

crop were selected. These farmers were selected so as to have proportional representation in the sample of different size-groups of the cotton area grown by them. The data for irrigated crop were collected for two years, *viz.*, 1972-73 and 1973-74, while those for the rain-fed crop were collected for 1973-74. The data were collected during June-July, 1974 and personal interview method was used for the same.

### *Costs and Returns from Seed Production*

The data of cost of production of hybrid cotton seed per hectare are given in Table III. It is observed from the table that the average cost of

TABLE III—COST OF PRODUCTION OF HYBRID COTTON SEED DURING 1972-73 AND 1973-74

Sr. No.	Items of costs	(Rupees per hectare)		
		1972-73	1973-74	Average
1.	Seeds .. .. .	78.67 (0.18)	74.42 (0.16)	76.54 (0.16)
2.	Farmyard manure .. .. .	482.12 (1.08)	451.96 (1.01)	467.04 (1.04)
3.	Fertilizers .. .. .	841.43 (1.89)	1,313.59 (2.93)	1,077.51 (2.44)
4.	Insecticides/fungicides .. .. .	1,564.18 (3.51)	1,753.87 (3.92)	1,659.02 (3.72)
5.	Irrigation .. .. .	896.76 (2.02)	848.49 (1.89)	872.62 (1.96)
6.	Paper bags for crossing .. .. .	5,534.40 (12.43)	5,848.22 (13.03)	5,691.31 (12.37)
7.	Yarn threads .. .. .	563.36 (1.26)	654.97 (1.45)	609.16 (1.36)
8.	Miscellaneous variable costs .. .. .	143.46 (0.32)	97.64 (0.22)	120.50 (0.27)
9.	Interest on working capital for 9 months at 8 per cent .. .. .	606.26 (1.36)	705.03 (1.58)	655.64 (1.47)
10.	Interest on fixed capital .. .. .	226.03 (0.52)	226.03 (0.50)	226.03 (0.51)
11.	Labour charges for cultural operations	685.42 (1.53)	741.10 (1.65)	713.26 (1.59)
12.	Labour charges for crossing operation ..	20,412.33 (45.85)	20,042.66 (44.68)	20,227.49 (45.26)
13.	Labour charges for removal of bags, etc.	203.92 (0.46)	199.11 (0.44)	201.51 (0.45)
14.	Bullock labour .. .. .	357.04 (0.82)	323.69 (0.72)	340.36 (0.76)
15.	Land revenue, local taxes, etc. .. .. .	31.27 (0.07)	26.35 (0.06)	28.81 (0.06)
16.	Processing charges at Rs. 10 per kg. of seed (ginning, cleaning, treating, bagging and certification charges) .. .. .	11,830.00 (26.58)	11,510.00 (25.65)	11,670.00 (26.11)
17.	Marketing charges (transportation, unloading, weighing, etc. .. .. .	53.99 (0.12)	48.83 (0.11)	51.41 (0.11)
	Total .. .. .	44,510.64 (100.00)	44,865.96 (100.00)	44,688.80 (100.00)

Figures within brackets indicate percentages to the total.

Source : Field Survey.

seed production came to Rs. 44,688.80 per hectare. The labour charges for crossing operation, the paper bags and the processing accounted for 45.26 per cent, 12.73 per cent and 26.11 per cent of the total cost respectively. The data for returns of seed production are given in Table IV. It is seen

TABLE IV—RETURNS FROM HYBRID COTTON SEED PRODUCTION DURING 1972-73 AND 1973-74

Sr. No.	Item	1972-73	1973-74	Average
1.	Seed obtained after ginning (kgs. per hectare)	1183	1151	1167
2.	Rate of selling the seed (Rs. per kg.)	77.88	63.15	69.51
3.	Value of seed (Rs.)	92,132.04	72,685.65	81,118.17
4.	Lint obtained (kgs.)	593	578	585
5.	Rate of lint (Rs. per kg.)	8.30	12.50	10.40
6.	Value of lint (Rs.)	4,921.90	7,225.00	6,084.00
7.	By-product (cartloads per hectare)	7.83	6.74	7.28
8.	Value of by-product (Rs.)	39.15	33.70	39.40
9.	Gross return (3+6+8) (Rs. per hectare)	97,093.09	79,944.35	87,238.57
10.	Net return (Rs. per hectare)	52,582.45	35,078.39	42,549.77
11.	Cost of seed production (Rs. per kg.)	37.62	38.97	38.29
12.	Input-output ratio (per hectare)	1:2.18	1:1.78	1:1.95

Source : Field Survey.

from the table that the average net return from seed production amounted to Rs. 42,549.77 per hectare. Thus, the seed production of hybrid cotton is very remunerative. The cost of seed production comes to Rs. 38.29 per kg. The seed is sold at Rs. 69.51 per kg. Hence it is obvious that there is a big margin of profit in selling of hybrid cotton seed.

#### *Costs and Returns from Commercial Crop*

The data on costs of production and returns of commercial hybrid crop are given in Tables V and VI respectively. The average cost of production of irrigated hybrid cotton was Rs. 2,667.02 per hectare and that for rain-fed crop was Rs. 1,605.29 per hectare. In both the cases insecticides/fungicides, fertilizers and the labour charges are the major items of cost structure (*i.e.*, 23.21 per cent, 17.21 per cent and 15.18 per cent in the case of irrigated cotton and 25.52 per cent, 21.69 per cent and 13.62 per cent in the case of rain-fed cotton respectively). The net return from irrigated cotton amounted to Rs. 3,674.71 per hectare and Rs. 2,088.01 per hectare in the case of rain-fed cotton. Thus the commercial crop of hybrid cotton is very remunerative.

TABLE V—COST OF PRODUCTION OF COMMERCIAL HYBRID CROP

Sr. No.	Items of costs	Irrigated			Rain-fed 1973-74
		1972-73	1973-74	Average	
1.	Seeds .. .. .	191.77 (7.11)	179.20 (6.79)	185.48 (6.95)	169.56 (10.56)
2.	Farmyard manure .. .. .	115.32 (4.28)	117.75 (4.46)	116.52 (4.37)	77.38 (4.82)
3.	Fertilizers .. .. .	451.56 (16.76)	466.16 (17.65)	458.85 (17.21)	348.32 (21.69)
4.	Insecticides/fungicides .. .. .	733.96 (27.25)	504.19 (19.09)	619.07 (23.21)	409.77 (25.52)
5.	Irrigation .. .. .	279.43 (10.37)	402.68 (15.26)	341.05 (12.79)	—
6.	Miscellaneous variable costs .. .. .	36.11 (1.35)	36.70 (1.38)	36.40 (1.36)	25.09 (1.56)
7.	Interest on working capital for 9 months at 8 per cent	108.41 (4.03)	128.34 (4.86)	118.37 (4.44)	81.21 (5.05)
8.	Interest on fixed capital .. .. .	208.31 (7.73)	208.31 (7.89)	208.31 (7.81)	155.21 (9.69)
9.	Labour charges .. .. .	398.75 (14.81)	410.86 (15.56)	404.86 (15.18)	218.69 (13.62)
10.	Bullock labour .. .. .	119.79 (4.45)	138.42 (5.24)	129.10 (4.84)	92.33 (5.76)
11.	Land revenue, local taxes, etc. .. .. .	20.97 (0.78)	21.29 (0.82)	21.13 (0.80)	18.20 (1.14)
12.	Marketing costs (transportation, unloading, weighing, etc.)	29.27 (1.08)	26.50 (1.00)	27.88 (1.04)	9.53 (0.59)
	Total .. .. .	2,693.65 (100.0)	2,640.40 (100.0)	2,667.02 (100.0)	1,605.29 (100.0)

Figures in brackets are the percentages to the total.

Source : Field Survey.

TABLE VI—RETURNS FROM COMMERCIAL HYBRID COTTON CROP

Sr. No.	Items	Irrigated			Rain-fed 1973-74
		1972-73	1973-74	Average	
1.	Kapas harvested (kgs. per hectare) .. .. .	1507	1319	1413	667
2.	Rate of selling (Rs. per kg.) .. .. .	3.42	5.50	4.46	5.50
3.	Value of kapas (Rs.) .. .. .	5,153.94	7,254.50	6,301.98	3,668.50
4.	Quantity of by-product (cartloads per hectare) .. .. .	8.30	7.61	7.95	4.96
5.	Value of by-products (Rs.) .. .. .	41.50	38.05	39.75	24.80
6.	Gross return (3+5) (Rs. per hectare) .. .. .	5,195.44	7,293.00	6,341.73	3,693.30
7.	Net return (Rs. per hectare) .. .. .	2,501.79	4,652.60	3,674.71	2,088.01
8.	Cost of producing one quintal of kapas .. .. .	178.74	200.18	188.74	240.67
9.	Input-output ratio (per hectare) .. .. .	1:1.92	1:2.76	1:2.37	1:2.30

Source : Field Survey.

To conclude, on the basis of foregoing analysis one can say that expansion of Hybrid-4 cotton programme is very successful in the State and it has definitely brought considerable change in the rural economy. The seed production as well as commercial crop production of Hybrid-4 cotton in both irrigated and rain-fed area are very remunerative.

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