Study No.73

EVALUATION OF FISH FARMERS' DEVELOPMENT AGENCIES IN MADHYA PRADESH

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INTRODUCTION

1.1 Introductory

Cotton is an important commercial crop of India. During 1992-93, the year for which area, production and yield data for different states were available, it was grown on an area of 7,542.7 thousand hectares. The major cotton producing states with percentage contribution to total area were, Maharashtra (32.88), Gujarat (15.26), Andhra Pradesh (10.68), Punjab (9.15), Karnataka (8.14), Haryana (7.04), Madhya Pradesh (6.36) and Rajasthan (6.32).

The production of cotton in terms of thousand bales (a bale of 170 kg.) during that year was 11,583.1. The percentage contribution to total production by different states was : Punjab (19.98), Gujarat (17.17), Maharashtra (15.61), Haryana (12.14), Andhra Pradesh (10.28), Rajasthan (8.77), Karnataka (8.42), Tamil Nadu (4.07) and Madhya Pradesh (3.12). The average yield for the country as a whole was 261 kg. per hectare. Punjab had highest yield of 570 kg. per hectare. Haryana had second highest yield of 450 kg.per hectare. Rajasthan ranked third with a yield of 363 kg.per hectare and Tamil Nadu and Gujarat ranked fourth and fifth with a yield of 296 and 294 kg. per hectare respectively.

The ranking of states according to area and production varied due to variation in yield. Thus Punjab which ranked 4th according to percentage contribution to area, ranked first according to percentage contribution to production. Maharashtra which ranked first in percentage contribution to area and third in production ranked 9th according to yield. Gujarat which accounted for second largest percentage of area (15.26) also ranked second in terms of percentage of production (17.17) but ranked fifth as far as yield was concerned. Madhya Pradesh ranked seventh as regards area (6.36 per cent) but ranked still lower by the criterion of production (9th rank and 3.12 per cent contribution). This was due to very low yield of 128 kg./ hectare. The state ranked 8th on the basis of criterion of yield.

The importance of cotton in the cropping pattern can be known by the percentage share of cotton area to gross cropped area. In India cotton area formed 4.2 per cent of the gross cropped area. The crop contributed highest percentage (12.2) in the state of

Maharashtra followed by Gujarat (11.0), Punjab (9.9) and Haryana (8.4). In Madhya Pradesh the cotton area contributed 2.6 per cent of the gross cropped area of the state (Table 1.1).

Table 1.1 Area, Production and Yield and percentage share of Cotton to total cropped area in different states, 1992-93.

S. No.	State	Area		Production		Yield	Percentage share of cotton to gross cropped area
		'000 ha.	Percentage	'000 bales	Percentage	Kg./ha.	
1.	Maharashtra	2,479.8	32.88	1,807.7	15.61	124	12.2
2.	Gujarat	1,151.2	15.26	1,988.5	17.17	294	11.0
3.	Andhra Pradesh	805.9	10.68	1,190.6	10.28	252	4.9
4.	Punjab	690.0	9.15	2,314.0	19.98	570	9.9
5.	Karnataka	614.3	8.14	975.2	8.42	270	5.8
6.	Haryana	531.0	7.04	1,406.0	12.14	450	8.4
7.	Madhya Pradesh	479.7	6.36	361.3	3.12	128	2.6
8.	Rajasthan	476.4	6.32	1,016.2	8.77	363	2.4
9.	Tamil Nadu	271.3	3.60	471.7	4.07	296	4.1
10.	Others	43.1	0.57	51.9	0.44	-	8.7
	All India	7,542.7	100.00	11,583.1	100.00	261	4.2

In Madhya Pradesh estimates of cotton production are made by the Directorate of Land Records through crop cutting experiments. Another source of estimates was the ginning mills. The ginning mills purchased cotton from open markets, ginned it and sold both lint and cotton seed. The ginners made the bales of cotton of 170 kg. each.

1.2 This study

The production estimates given by the Directorate of Land Records and those given by ginning mills varied considerably. This created a problem for planners and policy makers. Therefore, the Directorate of Economics and Statistics, Ministry of Agriculture, Govt.of India, initiated the study titled "Variations in Estimates of Cotton Production". The study was assigned to three Agro-Economic Research Centres located at Jabalpur, Pune and Waltair.

1.3 Objectives

The main objectives of the study were to assess the following.

1) Under estimation of production by the Directorate of Land Records may be due to non inclusion of factors like variety and irrigation in the selection of experimental plots and not giving proper weightage in the estimates.

2) The estimates of production may also tend to be low if all the pickings are not diligently covered and taken into account.

3) Inter state flow of cotton, particularly in the border areas, may tend to boost up the availability of cotton in the state thus creating a divergence between the estimates of Directorate of Land Records figures and the ginning mills figures, and,

4) The cotton industry's estimates are likely to be higher if the average weight of a bale is less than 170 kg.

1.4 Methodology

To know the variation and the extent of variation between the estimates of Directorate of Land Records and those given by ginning mills, data collected by the Directorate of Land Records were scrutinised. Additional data were collected for sample farmers. Discussions were held with the owners of ginning mills.

1.5 Sample Design

Three cotton growing districts viz. Khandwa, Khargon and Dhar were selected for the study as these had higher area under cotton. In each of the selected districts 50 per cent of the farmers, on the fields of whom crop cutting experiments for cotton were laid in 1994-95 were selected. Data were collected in schedules specially designed for the study.

1.6 Reference year

The reference year of the study was 1994-95.

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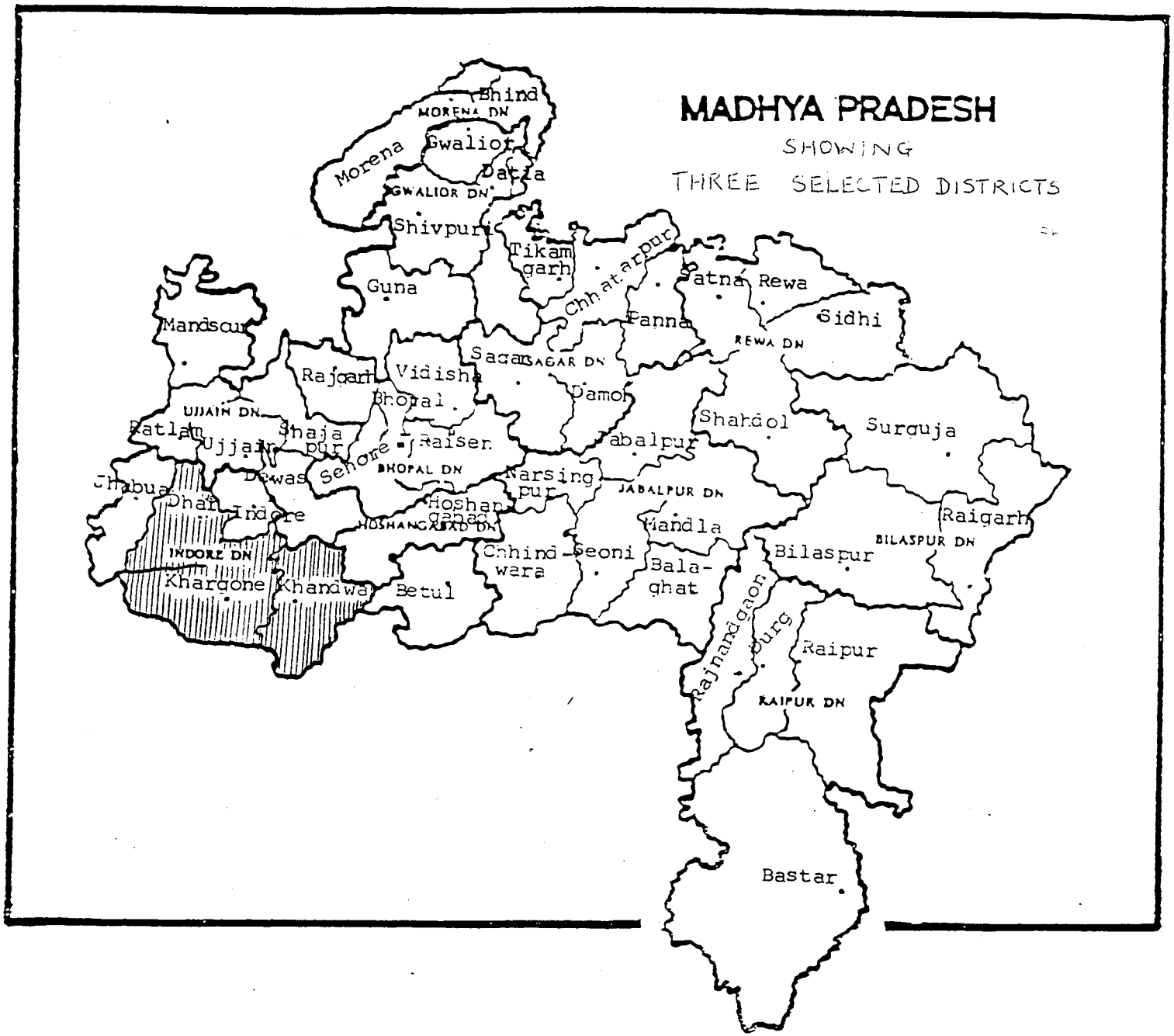
COTTON PRODUCTION IN MADHYA PRADESH

2.1 Area, Production and Yield Since 1970-71

The area under cotton fluctuated between 477.0 thousand hectares in 1994-95 to 705.6 thousand hectares in 1971-72. The index of area (base year 1970-71) indicated that the area under cotton, in general, decreased. The index decreased from 100.00 in 1970-71 to 83.9 in 1982-83. It further decreased to 69.0 in 1994-95. The production did not follow the trend in area because of fluctuating yields. The index of production increased from 100.0 in 1970-71 to 151.8 in 1982-83. In 1983-84 it reached the level of 1970-71 (100.8) but again increased in the subsequent years with considerable fluctuations and was 165.8 in 1994-95. Thus the overall trend in production was increasing while the trend of area was decreasing indicating thereby that the yields increased during the last 25 years. This is indicated by the index of yield. The index increased from 100.0 in 1970-71 to 182.4 in 1982-83. In the following years it decreased. However since 1987-88 it showed an increasing trend and registered 241.2 in 1994-95 (Table 2.1)

Table 2.1 Area, production and yield of cotton in Madhya Pradesh, 1970-71 to 1994-95

Year	Area		Production		Yield	
	'000 hect.	Index	'000 bales	Index	Kg./ha. (in lint)	Index
1970-71	691.5	100.0	208.5	100.0	51	100.0
1971-72	705.6	102.0	368.8	176.9	89	174.5
1972-73	684.1	98.9	334.5	160.4	83	162.7
1973-74	675.6	97.7	187.7	90.0	47	92.2
1974-75	612.2	88.5	401.0	192.3	111	217.6
1976-76	636.7	92.1	271.8	130.4	73	143.1
1976-77	606.9	87.8	277.8	133.2	78	152.9
1977-78	685.1	99.8	299.2	143.5	74	145.1
1978-79	674.9	97.6	296.5	142.2	75	147.1
1979-80	613.9	88.8	245.8	117.9	68	133.3
1980-81	594.6	86.0	267.7	128.4	77	151.0
1981-82	613.6	88.7	334.2	160.3	93	182.4
1982-83	579.9	83.9	316.6	151.8	93	182.4
1983-84	544.4	78.7	210.2	100.8	66	129.4
1984-85	525.4	76.0	269.1	129.1	87	170.6
1985-86	535.9	77.5	286.1	137.2	91	178.4
1986-87	522.7	75.6	240.1	115.2	78	152.9
1987-88	504.8	73.0	285.1	136.7	96	188.2
1988-89	561.9	81.3	354.1	169.8	107	209.8
1989-90	576.8	83.4	411.8	197.5	121	237.3
1990-91	608.0	87.9	396.5	190.2	111	217.6
1991-92	560.3	81.0	245.8	117.9	75	147.1
1992-93	479.7	69.4	361.3	173.4	128	251.0
1993-94	488.8	70.7	220.3	105.7	146	286.3
1994-95	477.0	69.0	345.7	165.8	123	241.2


MADHYA PRADESH
SHOWING
THREE SELECTED DISTRICTS
Bhind
MORENA DN
Morena
Gwalior
Datia
GWALIOR DN
Shivpuri
Tikam garh
Chhatarpur
Guna
Satna
Rewa
Sidhi
Mandsour
Panna
REWA DN
Sagar
SAGAR DN
Rajgarh
Vidisha
Damoh
Bhopal
UJJAIN DN
Ratlam
Ujjain
Shaja pur
Raisen
Jabalpur
Shahdol
Surguja
Sehore
BHOPAL DN
Narsing pur
JABALPUR DN
Chabua
Dhar
Dewas
Indore
Hoshan gabad
Mandla
Raigarh
HOSHANGABAD DN
BILASPUR DN
INDORE DN
Chhind wara
Seoni
Bala ghat
Bilaspur
Khargone
Khandwa
Betul
Rajnandgaon
Durg
Raipur
RAIPUR DN
Bastar

2.2 Cotton Producing Districts

Cotton producing districts are those which have high percentage of area under cotton to gross cropped area. These districts and the percentage according to 1994-95 data were khargone (26.12), Khandwa (25.94), Dhar (9.38) and Dewas (5.58). The remaining districts had less than 5.00 per cent of cotton area to gross cropped area. However, the position in 1970-71 was different, Khandwa had highest (31.04) percentage of cotton area to gross cropped area. The district with second highest (18.75) percentage was Shajapur, the third being Khargone (17.22) and the fourth, Dewas (17.21). Other districts in the order of percentages were Ujjain, Ratlam, Raigarh, Dhar, Hoshangabad and Jhabua. This shows two things: Firstly, cotton lost importance in many districts and, secondly, the districts which continued to be important have decreased percentage of cotton area except two districts of Khargon and Dhar. In the state as a whole cotton has a lower percentage of area to gross cropped area. It was 3.36 in 1970-71 and 1.92 in 1994-95 (Table 2.2).

Table 2.2 Cotton producing districts of Madhya Pradesh, 1970-71 & 1994-95

Districts	1970-71			1994-95		
	Cotton area ('000ha.)	Gross cropped area ('000ha.)	% of cotton area to gross cropped area	Cotton area ('000ha.)	Gross cropped area ('000ha.)	% of cotton area to gross cropped area
Chhindwara	8.9	509.0	1.75	11.3	602.1	1.88
Ratlam	36.7	330.0	11.12	17.2	486.9	3.53
Ujjain	62.2	481.0	12.93	Neg.	730.4	Neg.
Dewas	61.1	355.0	17.21	27.8	498.3	5.58
Dhar	48.9	533.0	9.17	64.0	682.5	9.38
Jhabua	27.0	365.0	7.40	13.0	485.9	2.68
Khargon	113.5	659.0	17.22	192.9	738.5	26.12
Khandwa	137.2	442.0	31.04	135.0	520.4	25.94
Sehore	12.1	499.0	2.42	2.1	493.9	0.43
Hoshangabad	33.0	445.0	7.42	7.7	571.6	1.35
Betul	2.7	428.0	0.63	1.2	524.1	0.23
Rajgarh	44.7	416.0	10.75	1.2	545.9	0.22
Shajapur	70.3	375.0	18.75	0.2	618.7	0.03
Madhya Pradesh	691.5	20561.0	3.36	477.0	24803.5	1.92

2.3 Cultural Practices of Cotton

2.3.1 Climate and Soil

Cotton is a sub-tropical crop. It thrives well in areas having rainfall varying from 30 inches to over 100 inches. It also grows in drier areas provided it is irrigated. It requires sufficient rainfall during the early stages of growth, but wants a comparatively dry weather during the flowering and fruiting stages. Rainfall during the boll-opening and harvesting period proves harmful. It can tolerate temperature as high as 43°C to 46°C but does not do well if the temperature falls below 21°C and succumbs to frost readily.

2.3.2 Field Preparation

Cotton is grown in a variety of soils. It is grown mainly as an irrigated crop in alluvial soils and as a dry crop in the black cotton and medium black soils.

Cotton requires light medium to heavy black soil which has higher water holding capacity and good drainage. After the harvesting of rabi crop, fields should be ploughed and harrowed 3 to 4 times and levelled with the help of leveller. If possible soil should be ploughed deep with the help of soil turning plough after every two to three years. If the soil is infested with white ants, BHC-10% or Aldrin-5% powder at the rate of 25 kg./hectare should be mixed with the last harrowing. The rotation of Jowar-groundnut-cotton is recommended.

2.3.3 Sowing

For Nimar area varieties Narmada, Khandwa-2, Khandwa-3, Hybrid JKH-1, JKH-11, Jawahar Cotton-2 and Vikram are recommended. For Malwa area varieties Badnawar-1, Khandwa-2, Maljury, Hybrid-4, JKH-1, JKH-11 and Vikram are recommended.

In the frost affected area Hybrid-4 is not recommended.

Seed treatment is necessary before sowing. The seed should be treated by sulphuric acid so that pest on the surface of the seed is distroyed. After this seed should be soaked in 0.01 per cent streptocycline (1 gm. in 1 litre of water) for 2 hours. Thereafter seed should be dried in shadow and treated by Delton, Vibiston or Bengay (3 gms per kg.of seed). Seed should be treated

by azetobactor culture at the rate of 10 gm. per kg. of seed at the time of sowing.

Sowing should be done about a week prior to monsoon rains. The row to row distance should be 45 cm. and plant to plant distance should be 30 cm. Lines should be in the east-west direction so that plants get adequate sun light.

2.3.4 Manure and Fertilizers

Well decomposed farm yard manure or compost should be applied at the rate of 20-25 cart loads per hectare. Fertilizers should be applied depending on the soil testing results.

Foliar spray of urea is recommended after the monsoon. First spray should be done after the boles appear. Second and third sprays should be done after 15-25 days. Spraying material should contain 2½ kg. of urea to 60 litres of water per hectare.

Irrigation should be given at an interval of 15-20 days in light soils. In medium soils interval should be 25-30 days. In heavy soils the interval should be 30-35 days. Irrigation should be necessarily given at the time of bud and flower formation.

Cotton is sensitive to water logging. Therefore, for proper drainage, drainage channels should be dug after 15-20 rows.

Hybrid varieties of cotton plants need support as the vegetative growth is faster. To avoid the lodging of plants these should be supported with the help of wire, bamboo and pegs. If necessary the branches should be pruned.

Moong, urd, soybean and groundnut can be mixed with cotton. After every 15-20 lines of cotton 2 lines of jowar or arhar can be sown.

2.3.5 Weeds, Insects and Pests

Cotton crop should be devoid of weeds. The weeds should be removed by either hand weeding or harrowing. Weedicide dieyuran @ 1/2 to 3/4 kg. per hectare should be sprayed after sowing and before germination. Necessary precautions should be taken in spraying the weedicides.

Following common insects are noticed in cotton.

1. Whitefly, Jassids and Aphids
2. Mites
3. Leaf roller and semi looper

4. Leaf eating cater piller
5. Pink and spotted bollworm
6. Heleothis

These should be controlled by using proper insecticides.

Cotton is also affected by following common diseases.

1. Wilt
2. Root rot
3. Black arm
4. Grey mildew
5. Anthracnose
6. Yellow leaf disease

These should be controlled by proper use of respective insecticides and pesticides.

2.3.6 Pickings

Following precautions should be taken at the time of picking.

1. Only those bolls should be picked which are fully open.
2. Insect affected bolls should be kept separate from the unaffected bolls.
3. On the day when dew formation is noticed the bolls should be picked im the later hours so that there is no moisture on cotton.
4. The cotton picked in the last picking should be kept separate from the first pickings.
5. Cotton of different varieties should be kept separately.
6. The cotton should be stored in a clean place devoid of moisture.

unlike food crops no part of cotton production is retained by the farmer. The entire quantity is sent to ginning mills for ginning and converting into bales. Cotton lint forms approximately 35 per cent of the total weight of cotton. The seed forms remaining 65 per cent. Normally a bale of cotton weighs 170 kgs.

2.4 Ginning and Pressing

There are total number of 75 gins in the state. These are mainly concentrated in the cotton growing tract of western Madhya Pradesh. While Khargon district had largest number of 29 gins, Khandwa district had 15 gins and Dhar district, 13 gins.

The total production in the ginning factories was 16,84,547 bales in 1994-95. Khargon district factories contributed 40.99 per cent and those of Khandwa district, 27.46 per cent. Dhar district ginning factories contributed 15.59 per cent of the production. Thus the contribution of Indore division was 84.24 per cent. Ujjain division ginning factories contributed 5.44 per cent and Chhindwara district ginning factories contributed 7.25 per cent. (Table 2.3)

Table 2.3 Number of ginning factories and production in Madhya Pradesh, 1994-95

District	No.of ginning factories	Percentage	Production (in bales)	Percentage
1. Khargon	29	38.67	6,90,422	40.99
2. Khandwa	15	20.00	4,62,579	27.46
3. Dhar	13	17.34	2,62,561	15.59
4. Jhabua	1	1.33	3,409	0.20
Indore division	58	77.34	14,18,971	84.24
5. Ratlam	4	5.33	51,245	3.04
6. Ujjain	3	4.00	4,901	0.29
7. Dewas	2	2.67	34,967	2.08
8. Mandsaur	1	1.33	602	0.03
Ujjain division	10	13.33	91,715	5.44
9. Chhindwara	3	4.00	1,22,200	7.25
10.Hoshangabad	4	5.33	51,661	3.07
Madhya Pradesh	75	100.00	16,84,547	100.00

Source : Cotton Association, Indore

2.4.1 Estimates of Directorate of Land Records

Against this the production estimate of the Directorate of Land Records was 3,42,605 bales. Thus the production figure of ginning factories was 4.92 times that of the Directorate of Land Records estimates. The proportion of production in different ginning factories of various districts varied from that of the

Directorate of Land Records estimates. Thus 81.97 per cent of the production was claimed by Indore division. Ujjain division claimed another 8.33 per cent (Table 2.4).

The figures given by the ginning mills not only were higher for the state as a whole but were higher in practically all the districts. Thus in Khargon district the figure of ginning mills was 4.38 times that of the Directorate of Land Records estimates. The figures in Khandwa and Dhar were 8.92 and 4.05 times respectively. Similar phenomenon was observed in all the districts except in Jhabua. In Jhabua district the estimate of Directorate of Land Records was higher than the figure given by ginning mill. This may be due to the fact that Jhabua district had a lone ginning mill and therefore large number of farmers took their produce to other districts.

Table 2.4 Estimates of Cotton Production by the Directorate of Land Records, selected cotton growing districts, M.P.

S. No.	District	Production (in bales)	Percentage	Production given by gins / Production estimated by Directorate
1.	Khargon	1,57,662	46.02	4.38
2.	Khandwa	51,884	15.14	8.92
3.	Dhar	64,793	18.91	4.05
4.	Jhabua	6,505	1.90	(-) 0.52
	Indore division	2,80,844	81.97	5.05
5.	Ratlam	10,681	3.12	4.80
6.	Ujjain	41	0.01	119.54
7.	Dewas	17,645	5.15	1.98
8.	Mandsaur	179	0.05	3.36
	Ujjain division	28,546	8.33	3.21
9.	Chhindwara	27,623	8.07	4.42
10.	Hoshangabad	5,592	1.63	9.24
	Madhya Pradesh	3,42,605	100.00	4.92

2.4.2 Variation Between Two Estimates

Two things were very evident. Firstly, the figures given by the ginning mills were quite higher than the figures of Directorate of Land

Records estimates not only for the state as a whole but also for the individual cotton growing district. Secondly, the ginning mills owners and knowledgeable persons emphatically said that large quantities of cotton reached the markets in the state of Madhya Pradesh from across the border with Maharashtra and subsequently to the ginning mills of the districts of the state of Madhya Pradesh. Although, no definite estimate of the proportion of cotton brought in from Maharashtra could be given, some sources affirmed that nearly 2/3rd of the cotton ginned came from across the border with Maharashtra. The reason for this phenomenon is that in Maharashtra monopoly procurement scheme of cotton was in operation and the produce offered under this scheme fetched not only lower price than that offered in Madhya Pradesh but also the payment was deferred even to six months period. Moreover, there is no restriction on the movement of cotton from one state to another. Due to these reasons farmers preferred to sell their produce in the districts of Madhya Pradesh. This resulted in the divergence between the estimates of Directorate of Land Records figures and the ginning mills figures. We may add that the figures of the Directorate are estimates, whereas, the figures of ginning mills are actuals. With this the hypothesis stated at serial number 3 of para "1.3 objectives" proves to be true.

As regards hypothesis at serial number 4 it was observed that the weight of the bale varied by (±) 6 per cent. Even if all the bales were supposed to be under weighed the difference would be to the extent of 6 per cent. However, this may not be the sole reason for higher estimates of industries because, as observed earlier, the estimates worked to more than 4 times that of the Directorate of Land Records figures. Thus the hypothesis at serial number 4 proves to be wrong.

2.5 Crop Cutting Experiments of Cotton

The objectives of the crop cutting experiments are to estimate the yield and total production of different crops. The food crops included in crop cutting experiments are paddy, jowar, bajra, maize, arhar, kodo-kutki, wheat, gram, barley and teora. Among the non-food crops are cotton, groundnut, til, soybean, rapeseed and mustard and linseed. Among vegetables the experiments are laid for potato, onion and chilli. Fruits included banana and papaya. In the case of paddy and wheat separate experiments are laid for high yielding

varieties and irrigated crops. The experiments are laid by random sampling method. The scheme was started in 1972-73 in which 20 per cent villages were selected in each revenue inspectors' circle. In each village 2 fields were selected by random sampling method. While in all the crops the area of a plot is 5 mt. x 5 mt. for cotton the area comprised 11 lines of 10 mt. length.

2.5.1 Administrative Control and Supervision

In the state the work of the crop cutting experiments is done under the administrative supervision of commissioner land records. At the district level the work is done under the administrative supervision of Collector and Superintendent Land Records is responsible for the work. The field work is done by Revenue Inspectors and Patwaris and their work is supervised by Agricultural Officers and District Statistical Officers. In addition Deputy Commissioner Land Records, Assistant Commissioner/Supervisor (Crop cutting experiment) supervise the work. Supervision is also done by Officers of the National Sample Survey Organisation. Crop cutting experiments of cotton are of two types. In the first type the experiments are laid and conducted by Revenue Inspectors. These are called general category experiments. In the second type the experiments are laid and conducted by patwaris of head quarters. These are called world bank experiments.

Every year before the starting of the experiments all the concerned employees are given thorough training. Every tehsildar provides the necessary facilities to all the field employees engaged in crop cutting experiments. They should not be given any such work which would hamper the work of crop cutting experiments. They are also provided necessary material for conducting the experiments like tape, pegs, balance and weights and gunny bags. They are also given the advance for the payment of wages of the labourers.

2.5.2 Observations of Cotton Experiments

In every Revenue Inspector's circle atleast one village should be selected for crop cutting experiment of cotton. In the case of cotton following observations are to be noted.

1. Khasra Number and plot number
2. Length and breadth of the experimental plot.
3. The number of lines of cotton, arhar and other crops.
4. The proportion of area under different crops.

5. Irrigation - area and sources
6. Fertilizers- type, quantity and frequency of application.
7. Type of soil
8. Seed/varieties.
9. Damage due to animals.
10. Improved technology.
11. Area covered by bushes and trees.
12. Details of cotton picking should include :

    (1) Date of picking and serial number of picking.
    (2) Weight of cotton picked.
    (3) Reasons for low yield.
    (4) The duration between the two pickings should not be more than 20 days.
    (5) The number of pickings recorded and the number of pickings done by the farmer should be equal.
    (6) All the records of experiment conducted on kharif crops should be sent to Commissioner Land Records by 15th January and those conducted for rabi crops should be sent by 15th May.

The proportion of cotton seed and lint should be collected from the ginning mills for which a proforma has to be supplied by the collector. The supervision of all crop cutting experiments should be done at the time of harvesting. The supervising officers will necessarily supervise the work in atleast one of the villages in one R.I. circle. The date of the supervision should be decided in advance.

The Revenue Inspectors are expected to contact the farmers on whose fields the experiments are laid and explain the objectives of the experiments and tell them that the harvesting and other activities were being done at the cost of the government and that the harvested produce would be returned to the farmers. The farmers should be instructed not to harvest the crop before the fixed date. The fixed date of harvesting should be communicated to all the concerned officials by the Revenue Impector 15 days in advance.

2.5.3 Selection of Plots

The crop cutting experiment plot of cotton should be of 10 metre length and should have 11 rows. On the four corners of the plot pegs should be fixed. A rope should be tied around the four pegs and border line should be drawn with the help of lime. At the time of harvesting the patwari should arrange the labourers.

Observations regarding pickings should be noted in the proformas. The crop inside the boundary of CCE will be harvested. Picking should be done preferably in the morning. The field worker should do the pickings in his presence. He will explain to the patwari the method of entering weight in the card. The harvested material should be properly weighed and put in the gunny bag with a slip of details of experiment on it. The entries should also be made in the register prepared for it. After the last picking of cotton the produce should be weighed and handed over to be concerned farmer. The entries of all the pickings should be made in the card and sent to the head-quarters.

2.5.4 Proformas to be filled

Proforma number K-1 which contains plot decision and details of plot should be sent to Superintendent, Land Records by 15th of October. The Superintendent, Land Records will examine the proforma and after verification that there is no mistake in the selection of plot will send it to the Commissioner, Land Records by 31st October. Proforma K-2 which gives estimated production and yield of cotton is to be submitted by Revenue Inspector by 2nd week of November after estimating the production and yield of all the plots in the revenue circle. For the district the proformas should be sent to Commissioner, Land Records, Gwalior by 25th November. In proforma K-3 (fourth estimate) the observation of weight of cotton till 15th of January and estimates of cotton that would be picked thereafter should be entered. All the Revenue Inspectors will submit this proforma to the Superintendent, Land Records. The Superintendent, Land Records, in turn, would send the proformas to Commissioner, Land Records, Gwalior by 20th January.

Proforma K-4 should include datewise weight of each picking and total weight of cotton in a plot. This proforma should be submitted to the Commissioner, Land Records, Gwalior by 20th April.

Proforma K-5 (data of cotton ginning filled by ginning factories) which contain data on ginning from the beginning of the season should be submitted by 5th of every month by the Superintendent, Land Records for the district. There is a proforma for entering the weight of cotton in every picking in the form of a post card. This should be sent to the Superintendent, Land Records after every picking. A copy has to be submitted to the Commissioner, Land Records, Gwalior.

Superintendent, Land Records would submit the details of observations and information in the proformas to the Commissioner, Land Records, Gwalior by 15th January (for kharif crops) and 31st May (for rabi crops).

From the above description following important points emerge.

1. The crop cutting experiments should be laid, conducted and observations regarding pickings should be taken either by Revenue Inspector or Patwari. Their work should be supervised by the central and state government officials of various levels.

2. The plot size should be 10 metres in length and should include 11 rows in width.

3. The area of the experimental plot should be clearly demarcated with the help of pegs and lines drawn with the help of lime.

4. The farmers should be explained the objectives of the experiment and the produce of the experimental plot would be returned to him.

5. He should also be told that the crop should not be harvested before the pre decided dates.

6. Pickings should be done on pre decided dates and not on any date between the fixed dates.

7. Weight of every picking should be recorded.

Whether all these points were kept in mind or whether the procedure was followed was checked with the selected farmers. Their observations and experiences have been described in the fifth chapter which will show the extent of deviation between the procedure laid down and the procedure actually followed.

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CHAPTER-III

SELECTED DISTRICTS

As mentioned earlier the three major cotton growing districts viz. Khandwa, Khargon and Dhar were selected for the study. It will be useful to know the basic information of the districts.

3.1 Khandwa District

3.1.1 Location

Khandwa district belongs to Indore division and is located in the south western part of Madhya Pradesh. It is bounded on the east by Amravati district of Maharashtra and Betul and Hoshangabad districts of Madhya Pradesh. On the south it is bounded by Amaravati, Buldhana and Jalgaon districts of Maharashtra. On the west lies Khargon district and on the north lies Dewas district of Madhya Pradesh.

3.1.2 Area and Population

The geographical area of the district is 11,18,357 hectares. Population of Khandwa district as per 1991 census was 14.31 lakh/ comprising 51.61 per cent males and 48.39 per cent females. The district, like most other districts of the state was rural in character as 72.47 per cent population resided in villages and the remaining 27.53 per cent in urban centres. The rural character of the district was also noticeable from the occupational distribution of workers as 41.46 per cent of the workers were cultivators and 33.26 per cent, agricultural labourers. These two classes together formed 74.72 per cent of workers. The decennial growth rate (1981-1991) was lowest (24.11) among the three selected districts. The density of population was 133 per square kilometer. The literacy percentage was 45.49, slightly more than the state average of 44.20. The literacy percentage was significantly lower among females (31.53) as compared to males (58.53) (Table 3.1)

KHANDWA DISTRICT, MADHYA PRADESH

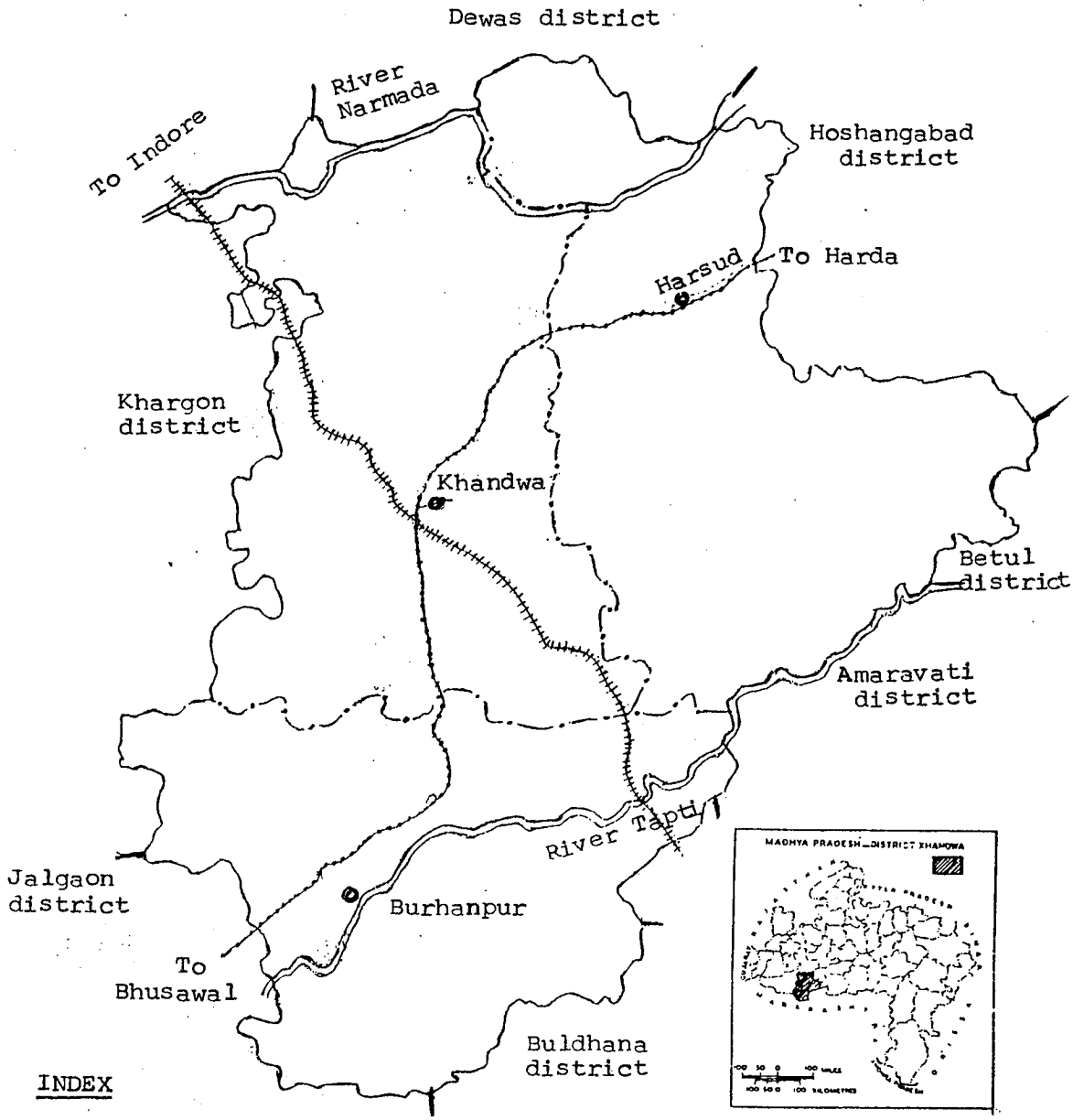


Table 3.1 Basic information of India, Madhya Pradesh & selected districts

Particulars	India	M.P.	Khandwa	Khargone	Dhar
Total Population	8,463.03	661.81	14.31	20.28	13.67
(a)Male(In lakhs)	4,392.31	342.67	7.39	10.39	7.01
(%)			(51.61)	(51.28)	(51.26)
(b)Female	4,070.72	319.14	6.92	9.88	6.66
(%)			(48.39)	(48.72)	(48.74)
(a)Rural	6,286.92	508.42	10.37	17.23	11.88
(%)	(74.29)	(76.82)	(72.47)	(84.95)	(86.86)
(b)Urban	2,176.11	153.39	3.94	3.05	1.79
(%)	(25.71)	(23.18)	(27.53)	(15.05)	(13.14)
Total workers	3,141.31	283.41	5.68	8.11	5.65
(%)			(100.00)	(100.00)	(100.00)
(a)Cultivators	1,107.02	129.04	2.36	4.45	3.35
(%)	(35.24)	(45.53)	(41.46)	(54.89)	(59.23)
(b)Agril.Lab.	745.98	58.63	1.89	2.33	1.36
(%)	(23.75)	(20.69)	(33.26)	(28.78)	(24.12)
			(74.72)	(83.67)	(83.35)
2. Decennial growth rate (1981-91)	23.85	26.84	24.11	24.35	29.31
3. Density per sq. km.	274	149	133	151	168
4. Sex ratio (Female per thousand males)	927	931	938	950	951
5. % S.C.to total population	16.48	14.55	11.40	9.76	6.94
6. % S.T. to total population	8.08	23.27	26.77	46.23	53.48
7. Literacy percentage	52.21	44.20	45.49	35.95	34.54
(a) Male	64.13	58.42	58.53	47.99	47.62
(b) Female	39.29	28.85	31.53	23.23	20.71
8. Total no.of towns	4,689	465	7	14	9
9. No of Tehsils	4,006	317	4	13	7
10. No. of C.D. Blocks	5,893	459	9	16	13

3.1.3 Agriculture

Of the total geographical area of 11,18,357 hectares, 45.72 per cent was occupied by forest. Another 38.96 per cent was net sown area (Table 3.2).

Table 3.2 Land Utilisation of Khandwa district, Madhya Pradesh, 1994-95

S. No.	Particulars	Area (hectares)	Percentage
1.	Forest	5,11,325	45.72
2.	Land under non agricultural uses	56,467	5.05
3.	Barren and un-culturable land	15,119	1.35
4.	Permanent pastures and grazing land	71,260	6.37
5.	Land under miscellaneous trees, crops and groves	234	0.02
6.	Culturable wasteland	2,223	0.20
7.	Old fallow	12,423	1.11
8.	Current fallow	13,609	1.22
9.	Net area sown	4,35,697	38.96
	Geographical area	11,18,357	100.00

The main crops of the district were jowar (16.46 per cent), wheat (11.44 per cent) and soybean (11.15 per cent). Cotton occupied 25.95 per cent of the gross cropped area. The important irrigated crops were wheat, gram, fruits and vegetables and cotton. Wheat was irrigated to the extent of 98.37 per cent and gram, 75.76 per cent. Sugarcane, fruits and vegetables were nearly entirely irrigated. Cotton was irrigated to the extent of 14.27 per cent (Table 3.3)

Wells were tne most important sources of irrigation and contributed 76.59 per cent to the total irrigated area. "Other" sources such as pumps fitted on rivers and nallahs and stop dams contributed 16.93 per cent (Table 3.4)

Table 3.4 Sources of irrigation, Khandwa district, Madhya Pradesh, 1994-95

Source	Area (hectares)	Percentage
Government canals	5,793	4.95
Tanks	1,782	1.53
Wells	89,587	76.59
Other	19,803	16.93
Total	1,16,965	100.00

Table 3.3 Cropping pattern and irrigated crops, Khandwa district, Madhya Pradesh, 1994-95

Crop	Area (Hectares)	Percentage to gross cropped area	Irrigated area (Hectares)	Percentage to total irrigated area	Percentage of irrigated cropped area to cropped area
Paddy	28,957	5.56	34	0.03	0.12
Jowar	85,587	16.46	272	0.22	0.32
Bajra	1,009	0.19	-	-	-
Maize	3,813	0.73	73	0.06	7.23
Wheat	59,546	11.44	58,576	46.69	98.37
Other cereals	9,062	1.74	10	Neg	0.11
Total cereals	1,87,974	36.12	58,965	47.00	31.37
Gram	21,807	4.19	16,522	13.17	75.76
Tur	15,710	3.02	1,226	0.98	7.80
Other pulses	33,564	6.45	1,462	1.16	4.36
Total pulses	71,081	13.66	19,210	15.31	27.03
Total food grains	2,59,055	49.78	78,175	62.31	30.18
Sugarcane	3,609	0.69	3,609	2.88	100.00
Spices	4,345	0.84	3,904	3.11	89.85
Fruits and vegetables	19,648	3.77	19,448	15.50	98.98
Total food crops	2,86,657	55.08	1,05,136	83.80	36.68
Groundnut	18,889	3.63	195	0.16	1.03
Soybean	58,039	11.15	181	0.14	0.31
Other	14,667	2.82	259	0.21	1.77
Total oilseeds	91,595	17.60	635	0.51	0.69
Cotton	1,35,035	25.95	19,273	15.36	14.27
Fodder crops	5,891	1.13	49	0.04	0.83
Other non-food crops	1,227	0.24	365	0.29	29.74
Total non-food crops	2,33,748	44.92	20,322	16.20	8.69
Total cropped area	5,20,405	100.00	125,458	100.00	24.11

3.2 Khargon District

3.2.1 Location

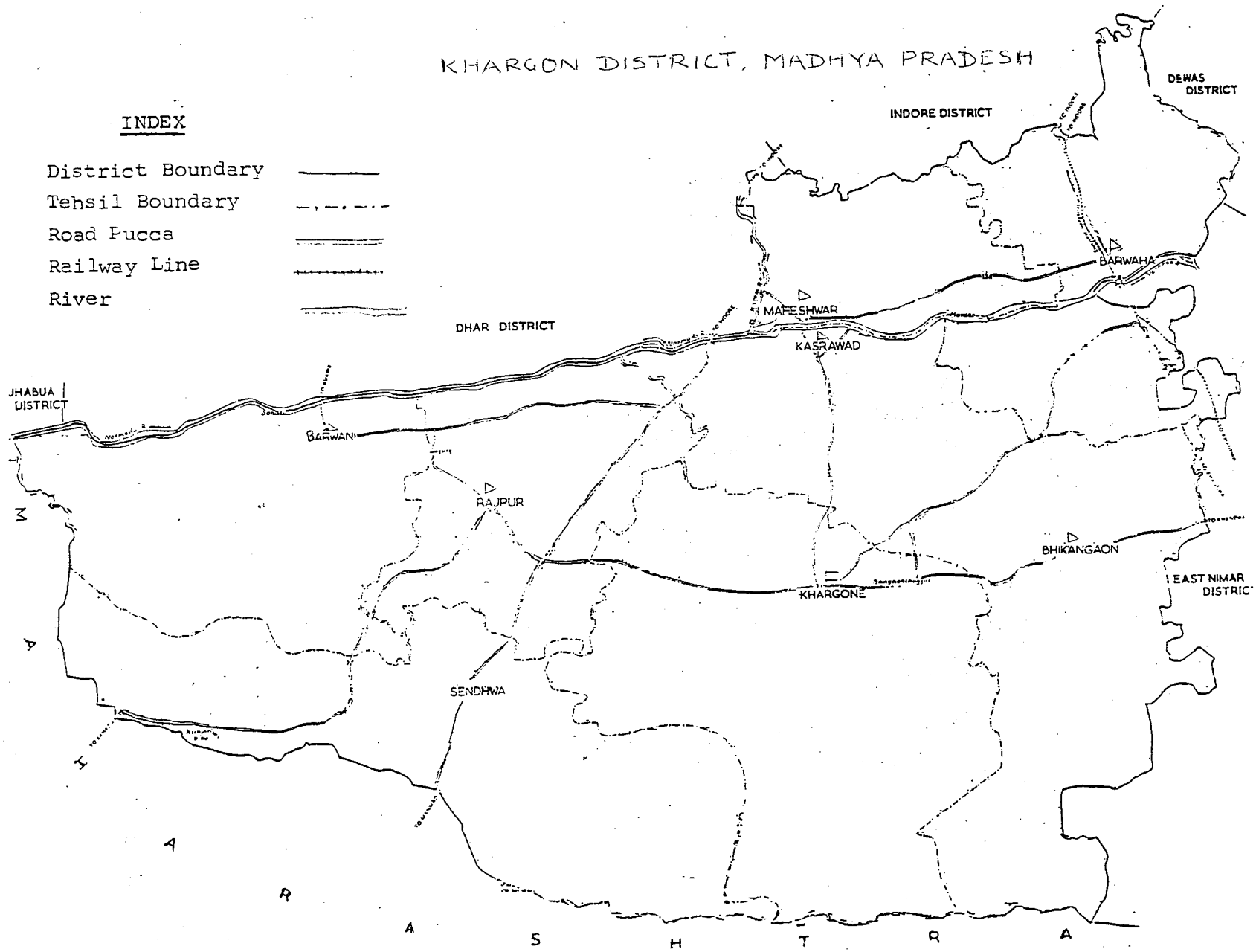
Khargon district lay in the south-west corner of Madhya Pradesh in Indore division. It was encased between the Vindhyas on the north and the Satpuras on the south, with the Narmada flowing in between. The south-western and southern boundary of the district marched respectively with the districts of Dhulia and Jalgaon of Maharashtra state. With the exceptions of a few kilometres of the boundary in the north-west which was along the Jhabua border, the districts of Dhar and Indore made the northern boundary of the district, the bulk of the former in the west and the latter in the east. The eastern boundary of the district ran with those of Dewas (north-east) and Khandwa districts of Madhya Pradesh.

3.2.2 Area and Population

The geographical area of the district was 13,48,503 hectares. Population of Khargon district as per 1991 census was 20.28 lakhs comprising 51.28 per cent males and 48.72 per cent females. The district was rural in character as 84.95 per cent population resided in villages and the remaining 15.05 per cent in urban centres. The rural character of the district was also reflected from the occupational distribution of workers as 54.89 per cent of the workers were cultivators and 28.78 per cent, agricultural labourers. These two classes together formed 83.67 per cent of wor ers. The decennial (1981 - 1991) growth rate was 24.35 per cent and the density per square kilometre was 151. The district had a much lower literacy percentage of 35.95 as compared to 44.20 for the state as a whole. The literacy percentage among males (47.99) was slightly higher than double that of females (23.23) (Table 3.1).

3.2.3 Agriculture

Of the total geographical area of 13,48,503 hectares, 47.95 per cent was net sown area and 31.96 per cent was area under forest (Table 3.5).


KHARGON DISTRICT, MADHYA PRADESH
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District Boundary
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INDORE DISTRICT
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MAHESHWAR
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KASRAWAD
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BARWANI
RAJPUR
BHIKANGAON
EAST NIMAR DISTRICT
KHARGONE
SENDHWA
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Table 3.5 Land utilization of Khargon district, Madhya Pradesh, 1994-95

S. No.	Particulars	Area (Hectares)	Percentage
1.	Forest	4,30,993	31.96
2.	Land under non agricultural uses	55,742	4.13
3.	Barren and Un-culturable land	66,376	4.92
4.	Permanent pastures and grazing land	99,631	7.39
5.	Land under miscellaneous tree crops and groves	38	Neg.
6.	Culturable waste land	33,415	2.48
7.	Old fallow	9,115	0.68
8.	Current fallow	6,631	0.49
9.	Net area sown	6,46,562	47.95
	Geographical area	13,48,503	100.00

The main crops of the district were jowar (24.13 per cent) and cotton (26.12 per cent). The important irrigated crops were wheat and cotton, occupying 35.97 and 45.52 per cent of the irriga- area. While sugarcane, wheat and fruits and vegetables were entirely irrigated, gram was irrigated to the extent of 67.55 and cotton, 46.04 per cent (Table 3.6).

Like Khandwa district wells were the most important sources of irrigation in this district. These contributed 59.17 per cent of the irrigated area, 'other' sources contributed 28.99 per cent (Table 3.7).

Table 3.7 Sources of irrigation, Khargon district, Madhya Pradesh, 1994-95

Sources	Area (Hectares)	Percentage
Government canals	21,907	11.23
Tanks	1,194	0.61
Wells	1,15,431	59.17
Other	56,557	28.99
Total	1,95,089	100.00

Table 3.6 Cropping pattern and irrigated crops, Khargon district, Madhya Pradesh, 1994-95

Crop	Area (Hectares)	Percentage of gross cropped area	Irrigated area (Hectares)	Percentage to total irrigated area	Percentage of irrigated cropped area to cropped area
Paddy	11,866	1.60	111	0.06	0.94
Jowar	1,78,173	24.13	147	0.07	0.08
Bajra	20,740	2.81	--	--	--
Maize	47,550	6.44	1,506	0.77	3.17
Wheat	70,344	9.53	70,172	35.97	99.76
Other cerels	2,309	0.31	3	Neg	0.13
Total cereals	3,30,982	44.82	71,939	36.87	21.74
Gram	10,975	1.49	7,414	3.80	67.55
Tur	24,888	3.37	908	0.47	3.65
Other pulses	64,637	8.75	337	0.17	0.52
Total pulses	1,00,500	13.61	8,658	4.44	8.61
Total food grains	4,31,482	58.43	80,597	41.31	18.68
Sugarcane	4,656	0.63	4,656	2.39	100.00
Spices	12,211	1.65	11,305	5.80	92.58
Fruits and Vegetables	4,697	0.64	4,593	2.35	97.79
Total food crops	4,53,046	61.35	1,01,151	51.85	22.33
Groundnut	52,960	7.17	2,776	1.42	5.24
Soybean	27,276	3.69	258	0.13	0.95
Other oilseeds	1,648	0.22	366	0.19	22.21
Total oilseeds	81,884	11.08	3,400	1.74	4.15
Cotton	1,92,855	26.12	88,797	45.52	46.04
Fodder crops	8,490	1.15	1,568	0.80	18.47
Other non food crops	2,196	0.30	173	0.09	7.88
Total non food crops	2,85,425	38.65	93,938	48.15	32.91
Total	7,38,471	100.00	1,95,089	100.00	26.42

3.3 Dhar District

3.3.1 Location

Dhar district is situated in south-west corner of Madhya Pradesh. It is a part of Indore division. The district is bounded on the east by Indore, on the south by Khargon, on the west by Jhabua and on the north by Ratlam and Ujjain districts of the state.

3.3.2 Area and Population

The geographical area of the district is 8,19,541 hectares. Population of Dhar district as per 1991 census was 13.67 lakhs comprising 51.26 per cent males and 47.84 per cent females. The district was rural in character as 86.86 per cent population resided in villages and the remaining 13.14 per cent in urban centres. The occupational distribution of workers was such that 59.32 per cent of the workers were cultivators and 24.12 per cent, agricultural labourers. These two classes together formed 83.35 per cent of workers. The decennial (1981-91) growth rate of the district was highest (29.31) among the three selected districts. The density per square kilometre was also highest (168) in the district. The literacy percentage was only 34.54 against the state average of 44.20. It was more than double for males (47.62) than females (20.71) (Table 3.1).

3.3.3 Agriculture

Dhar district had highest percentage of net area sown (61.39) and lowest percentage of area under forest (14.66) among the three selected districts (Table 3.8).

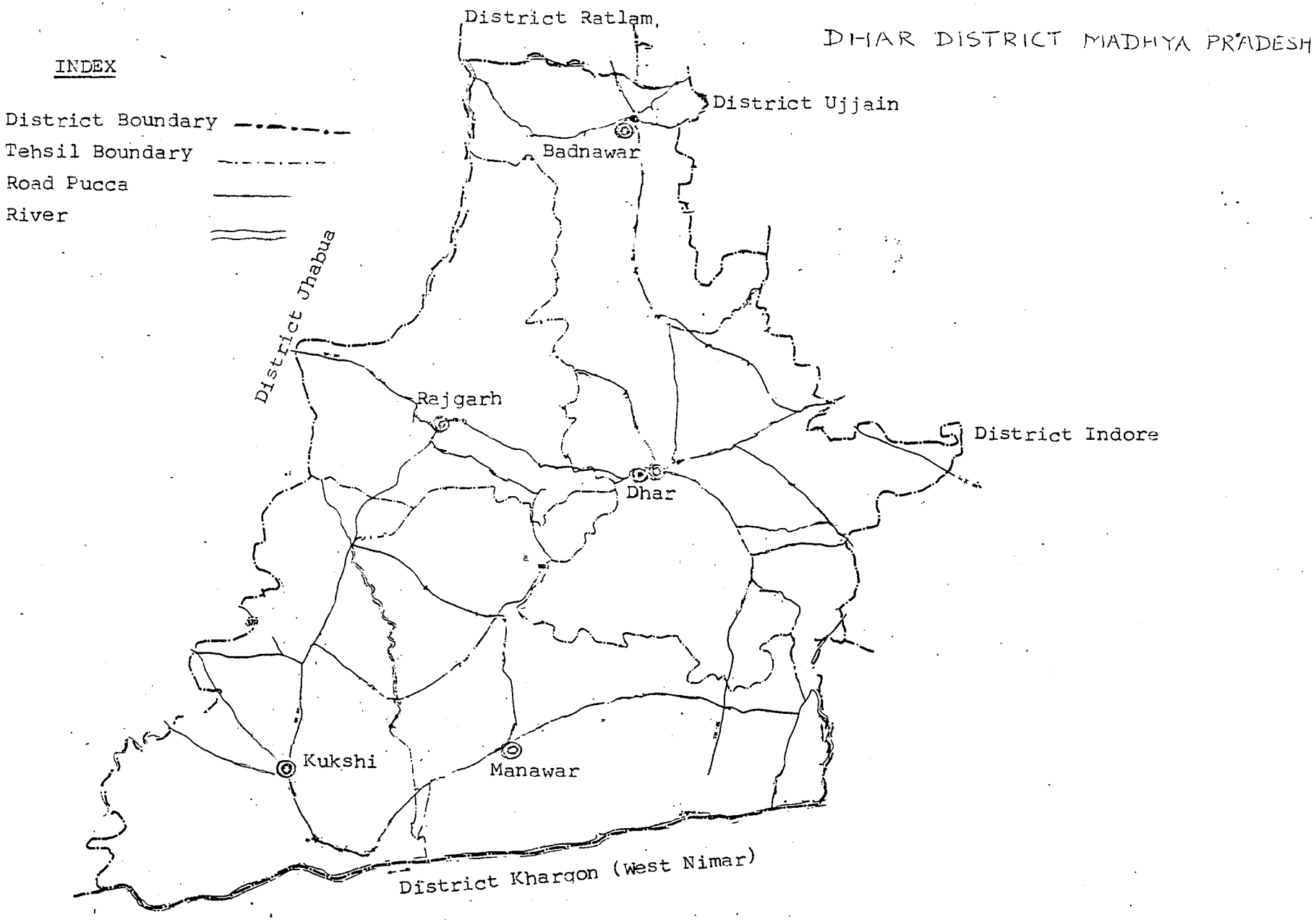
Table 3.8 Land utilization of Dhar district, Madhya Pradesh, 1994-95

S.No.	Particulars	Area (Hectares)	Percentage
1.	Forest	1,20,161	14.66
2.	Land under non agricultural uses	46,633	5.69
3.	Barren and unculturable land	67,293	8.21
4.	Permanent pastures and grazing land	55,034	6.72
5.	Land under miscellaneous tree crops and groves	37	Neg.
6.	Culturable wasteland	19,507	2.38
7.	Old fallow	3,219	0.39
8.	Current fallow	4,605	0.56
9.	Net area sown	5,03,052	61.39
	Geographical area	8,19,541	100.00

Maize (11.82 per cent), wheat (17.99 per cent), soybean (30.23 per cent) and cotton (9.38 per cent) were important crops of the district. Wheat, gram and cotton were important irrigated crops and occupied 63.42, 11.03 and 17.00 per cent of irrigated area. Sugarcane, wheat, and fruits and vegetables were irrigated to the extent of more than 90.00 per cent. Nearly half (50.26) of the area under cotton was irrigated (Table 3.9).

Table 3.9 Cropping pattern and irrigated crops, Dhar district, Madhya Pradesh, 1994-95

Crop	Area (Hectares)	Percentage of gross cropped area	Irrigated area (Hectares)	Percentage to total irrigated area	Percentage of irrigated cropped area to cropped area
Paddy	4,652	0.68	--	--	--
Jowar	34,419	5.04	2	Neg	Neg
Bajra	6,188	0.91	--	--	--
Maize	80,620	11.82	1,105	0.59	1.37
Wheat	1,22,790	17.99	1,20,081	63.42	97.79
Other cereals	565	0.08	83	0.04	14.69
Total cereals	2,49,234	36.52	1,21,271	64.05	48.66
Gram	49,994	7.33	20,891	11.03	41.79
Tur	7,237	1.06	9	Neg	Neg
Other pulses	41,869	6.13	709	0.38	1.69
Total pulses	99,100	14.52	21,609	11.41	21.81
Total food grains	3,48,334	51.04	1,42,880	75.46	41.02
Sugarcane	722	0.10	722	0.38	100.00
Spices	9,438	1.38	8,267	4.37	87.59
Fruits and Vegetables	3,131	0.46	2,931	1.55	93.61
Total food Crops	3,61,625	52.98	1,54,800	81.76	42.81
Groundnut	13,527	1.98	102	0.05	0.75
Soybean	2,06,289	30.23	128	0.07	0.06
Other Oilseeds	2,282	0.33	302	0.16	13.23
Total oilseeds	2,22,098	32.54	532	0.28	0.24
Cotton	64,024	9.38	32,180	17.00	50.26
Fodder crops	33,963	4.98	1,736	0.92	5.11
Other non food crops	801	0.12	84	0.04	10.49
Total non food crops	3,20,886	47.02	34,532	18.24	10.76
Total	6,82,51	100.00	1,89,332	100.00	27.74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Badnawar
District Jhabua
Rajgarh
District Indore
Dhar
Kukshi
Manawar
District Khargon (West Nimar)

Among the sources of irrigation 'others' contibuted highest percentage of 54.13 of the irrigated area. Another 36.12 per cent of irrigated area was commanded by wells (Table 3.10).

Table 3.10 Sources of irrigation, Dhar district, Madhya Pradesh, 1994-95

Source	Area(Hectares)	Percentage
Government canals	12,603	6.66
Tanks	5,852	3.09
Wells	68,384	36.12
Other	1,02,476	54.13
Total	1,89,315	100.00

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CHAPTER-IV

CHARACTERISTICS OF SAMPLE FARMS

This chapter gives the analysis of data collected from the selected farmers. As indicated earlier half of the total number of farmers selected for crop cutting experiments in Khandwa, Khargon and Dhar districts in 1994-95 formed the sample of the study. Thus 100 farmers in Khandwa, 121 in Khargon and 50 in Dhar comprised the sample. The total number of farmers was 271. There were two categories of the crop cutting experiments. In "general" category the experiments were laid and conducted by the Revenue Inspectors. In the case of "World Bank" experiments these were laid and conducted by the Patwari stationed at the tehsil headquarters, Our sample represented 50 per cent of both the categories (Table 4.1).

Table 4.1 Distribution of sample farms

S. No.	District	Sample of Farms			
		General		World Bank	
		Directorate of Land Records	Our Sample	Directorate of Land Records	Our Sample
1.	Khandwa	140	70	60	30
2.	Khargon	142	71	100	50
3.	Dhar	60	30	40	20
	Total	342	171	200	100

The description hereafter refers to the sample selected by us for the study.

4.1 Size of Farms

The operated area of farms in Khandwa district was 643.478 hectares, that in Khargon district was 532.521 hectares and in Dhar district it was 232.116 hectares. Of the total area the area under cotton was 218.815 hectares in Khandwa district and 218.647 hectares in Khargon district and 72.849 hectares in Dhar district. Thus cotton area formed 36.24 per cent of the operated area. The percentage was highest (41.06) in Khargon district, 34.01 in Khandwa district and 31.38 in Dhar district. The average size of farm was 5.20 hectares. It was largest (6.43) in Khandwa and smallest (4.40) in Khargon district. In Dhar district the average size was 4.40. (Table 4.2)

Table 4.2 Details of area under cotton, selected farms

S. No.	District	Operated area	Area under cotton	Av. size	Percentage of area under cotton to operated area
1.	Khandwa	643.478	218.815	6.43	34.01
2.	Khargon	532.521	218.647	4.40	41.06
3.	Dhar	232.116	72.849	4.64	31.38
	Total	1,408.115	510.311	5.20	36.24

4.2 Size of Plots

The crop cutting experiments were laid on specific plot size. The two sides of the lengths of the plots were 10 metres. The breadths of the plots varied depending on the distance between the 11 rows of the crop. It was found that in Khandwa district the total area of the selected crop cutting experiment plots (hereafter termed CCE plots) was 0.969 hectare . The area in Khargon district was 1.125 hectares and that in Dhar district was 0.513 hectares.

4.3 Irrigation

As regards irrigation it was observed that in Khandwa district 38 per cent farms were irrigated. The percentage of farms irrigated in Khargon district was 70.59 and 50 per cent in Dhar district.

On the CCE plots of selected farms the percentage of area under irrigation was 57.69 It varied from 40.35 in Khandwa, 69.07 in Khargon and 65.50 in Dhar district (Table 4.3).

Table 4.3 Irrigation on experimental plots, selected farms

S. No.	District	Irrigated area	Unirrigated area	Total area
1.	Khandwa	0.391 (40.35)	0.578 (59.65)	0.969 (100.00)
2.	Khargon	0.777 (69.07)	0.348 (30.93)	1.125 (100.00)
3.	Dhar	0.336 (65.50)	0.177 (34.50)	0.513 (100.00)
	Total	1.504 (57.69)	1.103 (42.31)	2.607 (100.00)

It is clear that the sample farms were not drawn on the basis of irrigated/unirrigated farms. They were also not drawn on the basis of irrigated/unirrigated area. The results of analysis of production of CCE plots does not mention production for irrigated/unirrigated farms separately or irrigated/unirrigated area separately. Thus the doubt expressed in objective at serial number 1 proves to be true. The analysis was not done separately and no weightage was given to the irrigation input.

4.4 Sources of Irrigation

Wells were the most important sources of irrigation as they contributed 78.87 per cent of the irrigated area. Rivers contributed 13.03 per cent and nallahs, 6.38 per cent. The percentage variation between districts was such that in Khandwa district wells contributed 92.32 per cent. In Khargon district wells contibuted 72.97 per cent and rivers contributed 16.73 per cent and nallahs, 8.24 per cent. In Dhar district wells had a contribution of 76.79 per cent, rivers had 16.67 per cent and nallahs, 6.54 per cent (Table 4.4).

Table 4.4 Sources of irrigation, selected farms

S. No.	District	Source of Irrigation					
		Well	Tubewell	River	Canal	nallah	Total
1.	Khandwa	0.361 (92.32)	0.010 (2.56)	0.010 (2.56)	-	0.010 (2.56)	0.0391 (100.00)
2.	Khargon	0.567 (72.97)	- -	0.130 (16.73)	0.016 (2.06)	0.064 (8.24)	0.777 (100.00)
3.	Dhar	0.258 (76.79)	- -	0.056 (16.67)	- -	0.022 (6.54)	0.336 (100.00)
	Total	1.186 (78.87)	0.010 (0.66)	0.196 (13.03)	0.016 (1.06)	0.096 (6.38)	1.504 (100.00)

4.5 High Yielding and Local Varieties

High yielding varieties of cotton have made good progress on selected farms. It was observed that two third of the farms of Khandwa district grew high yielding varieties. In Khargon district nearly three fourth of the selected farms grew high yielding varieties. In Dhar district the percentage of farms growing high yielding varieties was 96.00. Distribution of area showed that 65.84 per cent aree in Khandwa district was under high yielding varieties. In Khargon district 71.73 per cent of the area was under high yielding varieties and in Dhar the area was as high as 94 per cent (Table 4.5).

Table 4.5 Area under HYV and local varieties, selected farms

S.No.	District	H.Y.V.	Local	Total
1.	Khandwa	0.638 (65.84)	0.331 (34.16)	0.969 (100.00)
2.	Khargon	0.807 (71.73)	0.318 (28.27)	1.125 (100.00)
3.	Dhar	0.484 (94.35)	0.029 (5.65)	0.513 (100.00)
	Total	1.929 (73.99)	0.678 (26.01)	2.607 (100.00)

It is evident that the selection of farms was not based on the variety grown. It was also noted that the analysis of production was not done separately for HYV/local varieties. Only one figure on production was given without consideration of irrigation status or type of varieties grown. Therefore the hypothesis at serial number 1 expressed under "objectives" proves to be true.

4.6 Varieties and Irrigation

Analysis of area under high yielding varieties and local varieties according to irrigation status showed that 70.09 per cent of the area under high yielding varieties was irrigated. This percentage was 57.37 in Khandwa district, 80.55 in Khargon and 69.42 in Dhar district. On the other hand, the percentage of area under irrigation under local varieties was only 22.27. The percentage in Khandwa district was 7.55 and that in Khargon district was 39.62. In Dhar district local varieties were grown totally without irrigation. It is thus evident that high yielding varieties were grown mostly on irrigated fields and local varieties on unirrigated fields. It was so because high yielding varieties required right amount of water at specific stages of growth (Table 4.6).

Table 4.6 Distribution of area under H.Y.V. and local varieties according to irrigation status

S. No.	District	H.Y.V.			Local		
		Irri.	Unirri.	Total	Irri.	Unirri.	Total
1.	Khandwa	0.366 (57.37)	0.272 (42.63)	0.638 (100.00)	0.025 (7.55)	0.306 (92.45)	0.331 (100.00)
2.	Khargon	0.650 (80.55)	0.157 (19.45)	0.807 (100.00)	0.126 (39.62)	0.192 (60.38)	0.318 (100.00)
3.	Dhar	0.336 (69.42)	0.148) (30.58)	0.484 (100.00)	- -	0.029 (100.00)	0.029 (100.00)
	Total	1.352 (70.09)	0.577 (29.91)	1.929 (100.00)	0.151 (22.27)	0.527 (77.73)	0.678 (100.00)

4.7 Single and Mixed Crop

Cotton can be grown as a single crop or mixed with some pulse crop. In the selected districts arhar was mixed with cotton. Mixed crops have some advantages. One of them was security against the failure of cotton crop. Another reason was that pulse crops fixed nitrogen and enriched the soil. It was observed that cotton was grown as a single crop in 68.28 per cent of the cotton area. Single crop of cotton was most common in Khargon district where 92.53 per cent area was under single crop of cotton. In Dhar district 85.96 per cent of the cotton area was under single crop. On the contrary 69.67 per cent of the cotton area in Khandwa district was under mixed crop of cotton and arhar (Table 4.7).

Table 4.7 Distribution of area under cotton as single crop and mixed crop

S. No.	District	Cotton single crop	Cotton mixed with Arhar	Total
1.	Khandwa	0.291 (30.03)	0.678 (69.97)	0.969 (100.00)
2.	Khargon	1.041 (92.53)	0.084 (7.47)	1.125 (100.00)
3.	Dhar	0.441 (85.96)	0.072 (14.04)	0.513 (100.00)
	Total	1.780 (68.28)	0.827 (31.72)	2.607 (100.00)

4.8 Pickings

On the selected farms the earliest picking was done on 2.10.94. The latest picking was done on 27.4.95. Both the earliest and latest pickings were reported from Dhar district. In Khargon district the first picking was done on 11.10.94 and the latest on 1.4.95. In Khandwa district the first picking was done on 20.10.94. The latest picking was done on 5.3.95. Thus the range of duration between the first and last picking was largest in Dhar district and was smallest in Khandwa district. The average number of pickings were smallest (3.89) in Khandwa district. These were higher (6.43) in Dhar district and were highest (7.64) in Khargon district (Table 4.8).

Table 4.8 No.of pickings, selected farms

S. No.	District	Date of earliest picking	Date of latest picking	Total number of pickings	Average number of pickings for normal conditions
1.	Khandwa	20.10.94	05.3.95	370	3.89
2.	Khargon	11.10.94	01.4.95	924	7.64
3.	Dhar	02.10.94	27.4.95	296	6.43

4.9 Disposal of Cotton Production

It was seen that 42.45 per cent of the total production was sold at markets at block/tehsil levels. Another 25.63 per cent of the produce was sold within the villages and 21.37 per cent was sold in the nearest markets. The remaining 10.55 per cent of the produce was sold at the district markets. It was also noted that no quantity

was sold at places beyond the state border. Thus there are no chances of under estimation of the figures of production at district level. The proportion of quantity sold in different markets varied from district to district. In all the three districts the proportion of produce sold at block/tehsil level market was highest. It was 45.67 in Khandwa, 39.57 in Khargon and 40.41 in Dhar. The proportion sold within the villages was second highest (29.44) in Khandwa district. It was 26.74 in district level markets in Khargon district. In Dhar district, however, the second largest proportion (34.03) was claimed by nearest markets. While the third highest proportion was sold in nearest marketss in Khandwa district, it was so (20.40) within the villages in Khargon district. In Dhar district the third position was claimed by the villages themselves (25.56 per cent)(Table 4.9).

Table 4.9 Disposal of cotton production, selected farms

(Quantity - quintals)

Place of sale	Khandwa		Khargon		Dhar		Total	
	Qty.	Percentage	Qty.	Percentage	Qty.	Percentage	Qty.	Percentage
1. Within the village	488.75	29.44	244.50	20.40	238.50	25.56	971.75	25.63
2. Nearest market	333.60	20.10	159.00	13.27	317.50	34.03	810.10	21.37
3. Market at block/tehsil	758.00	45.67	474.50	39.59	377.00	40.41	1,609.50	42.45
4. Market at district	79.50	4.79	320.50	26.74	-	-	400.00	10.55
5. Outside state	-	-	-	-	-	-	-	-
Total	1,659.85	100.00	1,198.50	100.00	933.00	100.00	3,791.35	100.00

4.10 Price per quintal

It was also noted that the proportion of quantity sold at different places was similar to that of proportion of value. Like any other commodity the price received per quintal was lowest within the villages (Rs.2,081.00). It was slightly higher (Rs.2,129.16) in the nearest markets. It was still higher (Rs.2,162.58) in the markets at block or tehsil. The price received was highest at the district level markets (Rs.2,163.06) (Table 4.10).

Table 4.10 Average Price received per quintal of cotton in different markets

Place of sale	Price received per quintal (in Rs.)
1. Within the village	2081.00
2. Nearest market	2129.16
3. Market at block/tehsil	2162.58
4. Market at district	2163.06
5. Outside state	-
Total	2134.58

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CHAPTER-V

RESULTS AND DISCUSSION

In this chapter discrepancies between the observations noted by the officials in the proformas for crop cutting experiments of cotton and opinions of the concerned farmers are analysed. Reasons for wrong estimation and under estimation are also noted.

5.1 Knowledge of Objectives of CCE

A very small minority of 15.50 per cent of farmers knew the objectives of CCE. In this respect the general category farmers were some what better placed as 18.71 per cent of them knew the objectives against only 10 per cent of the World Bank category farmers (Table 5.1).

Table 5.1 Percentage of farmers knowing the objectives of the CCE, selected farms

District	Knowledge of the objectives of the CCE		
	General	World Bank	Total
Khandwa	18.57	13.33	17.00
Khargon	21.13	8.00	15.70
Dhar	13.33	10.00	12.00
Total	18.71	10.00	15.50

5.2 Knowledge of Persons Laying the Plots

A good percentage (86.72) of farmers had the knowledge as to who laid the plot. Among the two categories the percentage of such farmers was higher (91.23) for general category than the World Bank category (79.00). Among the districts selected the percentage was highest 96.00 for Khandwa district (Table 5.2).

Table 5.2 Knowledge of persons laying the CCE plots

District	Knowledge of persons laying the plots		
	General (Revenue Inspector)	World Bank (H.Q.Patwari)	Total
Khandwa	97.14	93.33	96.00
Khargon	85.92	74.00	80.99
Dhar	90.00	70.00	82.00
Total	91.23	79.00	86.72

5.3 Knowledge of Dimensions of Plots

It was amply stressed that the selected farmers should have full knowledge of the plot dimensions. However, the field data showed otherwise. It was seen that only 9.23 per cent farmers knew the dimensions of CCE plots. The percentage of such farmers was highest (14.00) in Dhar district. Between the two categories the percentage of farmers knowing plot dimensions was higher (11.11) in general category CCE then World Bank category (6.00). The percentage of farmers having knowledge of plot dimensions was higher in Dhar district for both the categories (Table 5.3).

Table 5.3 Farmers with knowledge of plot's dimensions, selected farms

District	Knowledge of plot's dimensions		
	General	World Bank	Total
Khandwa	10.00	3.33	8.00
Khargon	11.27	4.00	8.26
Dhar	13.33	15.00	14.00
Total	11.11	6.00	9.23

5.4 Knowledge of Number of Rows

There were large percentage of farmers who although did not know the dimensions of the CCE plots did remember that the plots had 11 rows of cotton. The percentage of such farmers was 71.22. Such farmers were in highest proportion (76.00) in Dhar district. Again, the proportion of such farmers was higher in general category CCE (80.12) than World Bank category (56.00). In both the categories Dhar farmers had an edge over other districts (Table 5.4).

Table 5.4 Farmers having knowledge of only 11 rows of cotton in CCE plots, selected farms

District	Knowledge of 11 rows of cotton of CCE plots		
	General	World Bank	Total
Khandwa	82.85	53.33	74.00
Khargon	74.65	56.00	66.94
Dhar	86.67	60.00	76.00
Total	80.12	56.00	71.22

5.5 Knowledge of the weight of CCE Produce

One of the objectives of conducting CCE was to let the farmers know its details. However it came out during investigation that only 2.58 per cent of the farmers knew the weight of the product of CCE. The percentage of such farmers was highest (6.00) in Dhar district. In both the categories this aspect was nearly neglected (Table 5.5).

Table 5.5 Percentage of farmers knowing the weight of the cotton of CCE, selected farms

District	Knowing the weight of cotton of CCE		
	General	World Bank	Total
Khandwa	2.86	3.33	3.00
Khargon	1.41	-	0.83
Dhar	6.67	5.00	6.00
Total	2.92	2.00	2.58

5.6 Plots Not Laid

Of the total sample farmers 10.33 per cent said that plots were not laid on their fields. They did not know how and who made the observations in the proformas. Percentage of such farmers was 3.00 in Khandwa, 14.88 in Khargon and 14.00 in Dhar district. Between the two categories of CCE the occurance of such farmers was higher (18.00) in the case of World Bank category than the general category (5.85). Between the selected districts the occurance of such farmers in World Bank category was highest (30.00) in Dhar district and in general category it was highest (11.27) in Khargon district (Table 5.6).

Table 5.6 Farmers reporting "plots not laid", selected farms

District	Plots not laid		
	General	World Bank	Total
Khandwa	1.43	6.67	3.00
Khargon	11.27	20.00	14.88
Dhar	3.33	30.00	14.00
Total	5.85	18.00	10.33

This is a clear example of wrong reporting of CCE production.

5.7 Plots Not Properly Demarcated

As per the procedure the area of CCE had to be properly demarcated with the help of four pegs fixed on four corners of the CCE plot. Moreover, the plot had to be demarcated with the help of lime or rope. The selected farmers reported that pegs were fixed on four corners but the line of lime was either not drawn or if drawn it was washed away during the crop season. This resulted in non identification of the demarcated area. Since the CCE area was not properly identified the picking of cotton within the CCE area was done along with the crop in area surrounding the CCE plots by the family members or labourers engaged by the farmers. This resulted in under estimation of production in CCE area. The farmers reporting such occurance were 31.37 per cent. Percentage of such farmers was highest (32.23) in Khargon district. Such phenomenon was higher 38.00 per cent in World Bank CCE than general category CCE (27.49) (Table 5.7).

Table 5.7 Farmers reporting "plots not properly demarcated", selected farms

District	Plots not properly demarcated		
	General	World Bank	Total
Khandwa	25.71	43.33	31.00
Khargon	29.58	36.00	32.23
Dhar	26.67	35.00	30.00
Total	27.49	38.00	31.37

5.8 Inspection of CCE Plots

Of the total crop cutting experiments 28.41 per cent were inspected by officials. The percentage of such experiments was highest (42.00) in Dhar district. It was noted that general category CCE were more intensively inspected (34.50) than the World Bank experiments (18.00). It may be mentioned that inspection was done mostly at the time of first picking. (Table 5.8)

Table 5.8 Percentage of farmers whose CCE were inspected by officials, selected farms

District	Inspection of CCE by officials		
	General	World Bank	Total
Khandwa	31.43	20.00	28.00
Khargon	26.76	18.00	23.14
Dhar	60.00	15.00	42.00
Total	34.50	18.00	28.41

5.9 Weighment of CCE Produce

The procedure laid down mentioned that the cotton picked in the CCE should be weighed and kept separately. After the pickings were completed the cotton so kept separately should be weighed. The intention was to weigh the completely dry cotton. However, on the selected CCE only 9.96 per cent farmers reported that the cotton of CCE was kept separate. The percentage of such farmers was highest (20.00) in Dhar district. In the two categories of CCE the position was about same. While in general category 10.53 per cent CCE the cotton was kept separate in World Bank Category the percentage was 9.00. In both the categories the percentage was highest in the case of Dhar district (Table 5.9).

Table 5.9 Percentage of farmers reporting that cotton of CCE was kept separate

District	Cotton of CCE plots was kept separate		
	General	World Bank	Total
Khandwa	7.14	6.67	7.00
Khargon	8.45	8.00	8.26
Dhar	23.33	15.00	20.00
Total	10.53	9.00	9.96

5.10 Persons Doing the First Picking

As mentioned earlier in the general category of CCE the presence of Revenue Inspectors and Patwaris was essential in all the pickings. In World Bank category of CCE the presence of Patwaris was essential. However, it was observed that whenever they were present mostly in the first picking only. In some cases farmers themselves did the picking. Suprisingly in some cases farmers were totally unaware as to who did the pickings. It was noted that in 36.16 per cent of the first pickings Revenue Inspectors/Patwaris were present. In 28.05 per cent of first pickings the work was done by Kotwars. In another 18.08 per cent of the first pickings farmers themselves did the work. In the remaining 17.71 per cent of first pickings the farmers had no knowledge as to who did the pickings (Table 5.10).

Table 5.10 Persons doing the first picking, selected farms

District	Persons doing the first picking														
	General					World Bank					Total				
	R.I./ Patwari	Kotwar	Farmer	Don't know	Total	Patwari	Kotwar	Farmer	Don't know	Total	R.I./ Patwari	Kotwar	Farmer	Don't know	Total
Khandwa	34.29	37.14	17.14	11.43	100.00	26.67	43.33	20.00	10.00	100.00	32.00	39.00	18.00	11.00	100.00
Khargon	40.85	23.94	12.68	22.53	100.00	36.00	26.00	24.00	14.00	100.00	38.84	24.79	17.36	19.01	100.00
Dhar	50.00	6.67	16.67	26.66	100.00	20.00	25.00	25.00	30.00	100.00	38.00	14.00	20.00	28.00	100.00
Total	39.77	26.32	15.20	18.71	100.00	30.00	31.00	23.00	16.00	100.00	36.16	28.05	18.08	17.71	100.00

The above observations clearly indicate that not all the pickings were done under the proper supervision of the concerned staff. One can not expect the correctness of weighment, separation of the CCE produce, drying of the produce and weighment of dried produce done by Kotwars and farmers themselves in the absence of supervisory staff. All this leads one to believe that there was certainly wrong estimation/under estimation of the CCE produce.

5.11 Ratooning of Cotton

Like sugarcane ratooning of cotton is practised in many areas specially in irrigated fields. After the normal pickings of cotton are done the standing crop is not uprooted but is irrigated and in many cases fertilizer is also applied. This results in flowering, boll formation and the production of cotton. Since this phenomenon took place after the normal production and pickings of cotton, it is not recorded in the official proformas and hence the resultant under-estimation by the Directorate of Land Records.

5.12 Patwari Record of Area Estimates of Cotton

Once the CCE observations are complete the analysis of data provides the yield of cotton per hectare. The estimates of production for tehsils and districts are made by multiplying the yield figure provided by CCE by the estimates of area done by patwaris and district officials. If there was even a slight mistake in the estimation of area the figure of total production would magnify significantly. This the reason for wrong estimation or under or over estimation of production for a tehsil, district and the state as a whole.

5.13 Suggestions and Policy Implications

In the aforesaid paragraphs many discrepancies came to the light. To begin with in nearly 10 per cent cases farmers reported that plots were not laid in their fields. This meant that fake observations were noted. In as high as 31 per cent cases CCE plots were not properly demarcated. In the absence of proper demarcation of CCE plots the produce in the CCE plots might have been picked up by farmers with the produce in the area encircling the CCE plots, thereby reducing the estimate in the CCE plot. Inspection of CCE plots was done only in 28 per cent cases. In the absence of proper inspection by officials wrong estimates would naturally result. Another lacuna was non separation of CCE production and weighment after proper drying of the produce. This has resulted in wrong

estimate of CCE produce. It was also noted that the farmers did not have proper knowledge of objectives of the CCE plots, knowledge of dimensions of CCE plots, knowledge of weight of the CCE produce and knowledge of who inspected and conducted the CCE. Due to these reasons the seriousness about the CCE plots was lost and might have resulted in wrong estimates. In the CCE of cotton every picking is important. Negligence in a few pickings can result in wrong estimates. We recommend that farmers should be convinced about the utility of CCE and they should be provided with a copy of all the observations of the CCE. It is very important for the farmers to know the date of next picking and this should be strictly adhered to. If this is not done farmers would not wait indefinitely for officials and would do the pickings themselves including the area under CCE. We have noted that the number of pickings done by the farmers were far higher than those recorded by the officials. Another reason for this phenomenon was the fear of the theft. Due to this reason many farmers did pickings at an interval of 4-5 days even during the night time. Farmers should be given incentive like issue of certificates for cooperating in the CCE. They should also be given cash incentive and kind incentive like new varieties of seed and minikits.

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CHAPTER VI

SUMMARY AND CONCLUSIONS

6.1 Cotton is one of the important commercial crops of India. In 1992-93, it was grown on an area of 7,542.7 thousand hectares. The major cotton growing states were Maharashtra, Gujarat, Andhra Pradesh, Punjab and Karnataka. The production of cotton was 11,583.1 thousand bales (a bale of 170 kg.). The important states contributing to production were Punjab, Gujarat, Maharashtra, Haryana and Andhra Pradesh. During that year the average yield for the country was 261 kg./hectare. The states with higher yields were Punjab, Haryana, Rajasthan, Tamil Nadu and Gujarat. Cotton crop formed 4.2 per cent of the gross cropped area of the country. It contributed 12.2 per cent in Maharashtra, 11.0 per cent in Gujarat, 9.9 per cent in Punjab and 8.4 per cent in Haryana.

Madhya Pradesh contributed 6.36 per cent to the cotton area and 3.12 per cent to the production of cotton in the country. It had a very low yield of 128 kg./hectare. The crop formed only 2.6 per cent of the gross cropped area of the state.

In Madhya Pradesh estimates of cotton production are made by Directorate of Land Records through crop cutting experiments. Another source of estimates was the ginning mills. The production estimates given by these sources varied considerably creating problems for planners and policy makers. The Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India, initiated the study titled "Variations of Estimates of Cotton Production". The study was assigned to three Agro-Economic Research Centres located at Jabalpur, Pune and Waltair.

The specific objectives of the study were :

1) Under estimation of production by the Directorate of Land Records may be due to non inclusion of factors like variety and irrigation in the selection of experimental plots and not giving proper weightage in the estimates.

2) The estimates of production may also tend to low if all the pickings are not diligently covered and taken into account.

3) Inter state flow of cotton, particularly in the border areas, may tend to boost up the availability of cotton in the state thus

creating a divergence between the estimates of Directorate of Land Records figures and the ginning mills figures, and,

4) The cotton industry's estimates are likely to be higher if the average weight of a bale is less than 170 kg.

Both secondary and primary data were collected. Three cotton growing districts viz. Khandwa, Khargon and Dhar were selected for the study. In each of the selected districts 50 per cent of the farmers on whose fields crop cutting experiments for cotton were laid in 1994-95 were selected. Data were collected in schedules. The reference year for the study was 1994-95.

6.2 In Madhya Pradesh the index of area (base year 1970-71) indicated that the area under cotton in general decreased. It decreased from 100 in 1970-71 to 69.0 in 1994-95. The production did not follow the trend in area because of variation in yields. The index of production increased from 100 in 1970-71 to 151.8 in 1982-83. In 1983-84, it decreased to the base level but again increased in the following years and was 165.8 in 1994-95. The index of yield increased from 100.0 in 1970-71 to 182.4 in 1982-83. In the following years it decreased. However, it showed an increasing trend since 1987-88 and was 241.2 in 1994-95. Thus the over all trend in production was increasing while the trend of area was decreasing indicating thereby that the yields increased during the last 25 years. The main cotton producing districts with percentage of cotton area to gross cropped area were Khargon (36.12), Khandwa (25.94), Dhar (9.38) and Dewas (5.58). The statistics showed that cotton lost importance in many districts and secondly the districts which continued to be important had decreased percentage of cotton area. For the state as a whole the percentage decreased from 3.36 in 1970-71 to 1.92 in 1994-95. There are 75 cotton ginning mills in the state. The total production reported by ginning mills in 1994-95 was 16,84,547 bales. The production estimate of Directorate of Land Records was 3,42,605 bales. Thus the production figure of ginning mills was nearly 5 times that of the Directorate of Land Records. This was so for individual districts also. Ginning mill owners and knowledgeable persons informed that the large quantities of cotton reached the markets in the state from across the border from Maharashtra. Some ginners said that nearly two-third of cotton ginned came from across the

border of Maharashtra. With this the hypothesis stated at serial number 3 of objectives proves to be true. It was observed that the weight of the bale varied by (±)6 per cent. Even if all the bales are under weighed the difference would be to the extent of 6 per cent. Since the mills estimates worked to more than 4 times that of the Directorate of Land Records under weighing can not be the sole reason for higher estimates by the mills. Thus the hypothesis at serial number 4 proves to be wrong.

In all the crop cutting experiments the area of a plot is 5 mt. x 5 mt. For cotton the area comprises 11 lines of 10 mt. length. At the state level, the administrative supervision of crop cutting experiments is done by Commissioner, Land Records. At the district level, it is done by the Collector. Superintendant, Land Records is responsible for the work. The field work is done by Revenue Inspectors and Patwaris. The cotton experiments are of two types. In "general" category, experiments are laid by Revenue Inspectors. In the "World Bank" category the experiments are laid by Patwaris of head quarters. In the case of cotton experiments the observations noted are khasra number and plot number, length and breadth of plot, number of lines of cotton and other crops, irrigated area and sources, fertilizers applied, type of soil and seed varieties, etc. Details of pickings should include serial number and date of picking, weight of cotton picked, official present etc. The CCE plots should be demarcated with the help of pegs fixed on four corners. A rope should be tied around the four pegs and border line should be drawn with the help of lime. Picking should be done preferably in the morning. The harvested produce should be dried and weighed and should be put in the gunny bags with the slip of details of experiment. After the last picking, the produce should be handed over to the farmer.

6.3 The selected districts of Khandwa, Khargon and Dhar belonged to Indore Revenue division and were located in the south western part of the state. Khandwa district is bounded on the east and south by Amravati, Buldana and Jalgaon districts of Maharashtra. The geographical area of the district is 11,18,357 hectares and population is 14.31 lakhs. All the three selected districts were rural in character as very high percentage of population resided in villages. Secondly the proportion of cultivators and agricultural

selected districts the percentage was highest in Dhar district. Although, the exact dimensions of the plot were not known, the percentage of farmers having the knowledge that the plot contained 11 rows was quite high (71.22). The percentage of such farmers was highest (76.00) in Dhar district. Among the two categories the percentage was higher (80.12) in general category than World Bank category (56.00). Here again, Dhar district farmers had better knowledge than other two districts. Only 2.58 per cent of the farmers knew the weight of produce of CCE. The situation was about same among two categories and among the selected districts. More serious matter was regarding the statement by farmers that the plot was not laid in their fields. They did not know as to who and how the observations in the proformas were made. Between the two categories of CCE the occurance of such farmers was higher (18.00) in the World Bank category than the general category (5.85). Khargon and Dhar districts had about 14.00 per cent of such farmers. About one third (31.37 per cent) farmers reported that the CCE plots were not properly demarcated. Pegs were fixed on four corners of the plot but the lines with lime around the plots were either not drawn or if drawn were washed away. This resulted in picking of cotton within CCE area along with the crop in area surrounding the CCE plot. This, in turn, resulted in under estimation of CCE area. Of the total crop cutting experiments only 28.41 per cent were inspected by officials. The percentage was highest (42.00) in Dhar district. It was also noted that general category plots were far more intensively inspected (34.50) than the World Bank experiments (18.00). On the selected CCE plots only 9.96 per cent farmers reported that CCE produce was kept separate and weighed separately. The percentage of such farmers was highest (20.00) in Dhar district. In general category of CCE the presence of Revenue Inspectors and Patwaris was essential in all the pickings. In World Bank category the presence of Patwaris was essential. However, it was observed that wherever they were present it was mostly in the first picking only. It was noted that in 36.16 per cent of the first pickings Revenue Inspectors/Patwaris were present. In 28.05 per cent of first pickings the work was done by Kotwars. In another 18.08 per cent of the first pickings farmers themselves did the work. In the remaining 17.71 per cent of first pickings the farmers had no knowledge as to who did the pickings. Thus not all the pickings were done under proper supervision.

This must have resulted in wrong estimation/under estimation of the produce. Like sugarcane ratooning of cotton is practised in many irrigated areas. Since this phenomenon took place after the normal production and picking of cotton, it was not recorded in the proformas by officials. This resulted in under estimation by the Directorate of Land Records. The CCE date provided the yield of cotton per hectare. The estimates of production for tehsils etc. were made by multiplying the yield figure provided by CCE by the estimates of area done by Patwaris and other officials. The area estimates are only eye estimates and are very crude. A slight mistake in the estimation of area would magnify the mistake in estimate of production. This was another reason of wrong estimation or under or over estimation of production.

There were many discrepancies in the CCE. These included no knowledge of farmers regarding plots laid in their fields, plots not properly demarcated, no proper inspection of plots, recording of CCE production by not separating it from the rest of the produce, no knowledge of objectives of CCE plots etc. Due to these discrepancies wrong estimates resulted. It is, therefore, essential that the farmers are convinced about the seriousness of the crop cutting experiments. Laying of plots, observations regarding growth, proper picking and recording of produce should be done. Farmers should be informed about the date of next picking in advance. They should be given incentives in cash and kind in order to sustain their interest in CCE. They should be provided with a copy of observations made on the CCE plots of their farms.

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